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INIB

ENERGY AND ENVIRONMENT
SERIES

Industrial Safety

INTIB

Energy and Environment Series, No. 4

INDUSTRIAL SAFETY

Compiled by

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Industrial and Technological Information Bank

United Nations Industrial Development Organization
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Note

The *Energy and Environment Series* of the Industrial and Technological Information Bank (INTIB) is produced by UNIDO. INTIB is the information clearing-house of UNIDO, providing industry in developing countries with the necessary background for sound technological and business decisions.

INTIB
Energy and Environment Series, No. 4: Industrial Safety

PREFACE

Industrial Safety is the fourth issue in the *Energy and Environment Series* of the Industrial and Technological Information Bank (INTIB), thereby completing the first year of production.

During this year, the *Series* covered the topics of hazardous waste, energy conservation, effluent control and industrial safety. A pre-series volume was also released dealing with recycling. Each volume contains: at least 600 bibliographic references; instructions on how to order the actual documents; subject, author and corporate author (including author affiliation) indexes; a selection of information centres dealing with the subject of the volume; and a leading article on the subject prepared during the technical assistance activities of the United Nations Industrial Development Organization (UNIDO).

Over 3,600 items of information are presented in these numbers, which mainly cover the following industrial sectors: metallurgy; plastics and composites; pulp and paper; chemicals, including pesticides; and agro-industry. Other main 'sectors' covered are: business information for metals and plastics; energy technologies in relation to climate change; and remediation of waste sites.

All the above topics are of increasing concern to the international community. This is especially so in the light of the political effort under way to address some of the problems identified during the United Nations Conference on Environment and Development (UNCED) held at Rio de Janeiro, Brazil, from 3 to 14 June 1992. Even while the present issue was going to press, the next major round of post-UNCED discussions was under way in Barbados.

Agenda 21, the main result of UNCED, was considered by many observers to be an information agenda. A careful reading of its 40 chapters shows that for all the areas of world concern, information gathering, packaging and flow are essential prerequisites. There is even one whole chapter on information *per se*, while all but one of the remaining 39 chapters have a recurring section on the impact of information on the topic covered by each chapter. Many of the topics of Agenda 21 are of direct concern to UNIDO, while industrial activity has a strong impact on others. A few will not be the subject of UNIDO assistance-because of their non-industrial nature.

The *Series* will continue to package information from a variety of both commercial and 'grey literature' sources in an attempt to cover those issues which UNIDO is addressing in its response to the industrial aspects of implementing Agenda 21. Some of the subjects covered during the first year will be repeated if they are areas of concentrated international development. For example, it is expected that energy conservation and recycling will recur.

The current volume of the *Series* mainly covers issues related to industrial safety and risk, from the points of view of plant operation, occupational health and safety and regulations.

The volume starts with an article on accident and risk management, developed as a guide on the subject for UNIDO activities. The article covers the types of industrial risks and the nature of controls that may be applied, followed by specific measures in general and as applied to the various stages of industrial development, including decommissioning.

The major contributor, as always, is Materials Information, which, through a special licence agreement with UNIDO allowing the utilization of their internationally available databases, has enabled information to be presented on industrial safety in the metallurgy and plastics industries, as well as business information (mostly regulations in the present issue) on those materials. Such entries constitute approximately one half of the information presented in this volume.

Information has again been obtained from United Nations sources including: the *Industry and Environment Review*, issued by the Industry and Environment Programme Activity Centre of the United Nations Environment Programme; the International Information System for the Agricultural Sciences and Technology of the Food and Agriculture Organization of the UN; and UNIDO itself.

The material utilized from our own activities fits into two main categories in this volume, namely abstracts of technical documents and technical guidelines. The abstracts have been taken from the Industrial Development Abstracts (IDA) database, which records well over 20 years of industrial activity in and for developing countries. Among the types of documents recorded in the IDA are guidelines for specific industrial activities, as evidenced by the lead article for this volume. Another example of such a document has been included in the abstract section itself—the results of several years' work in the preparation of safety guidelines for pesticide formulation in developing countries.

At the end of the first year of the *Energy and Environment Series*, we would welcome hearing from our readers and contributors, as we need your feedback to evaluate the results achieved.

INDUSTRIAL AND TECHNOLOGICAL INFORMATION BANK

Previously published titles

INECA Journal Vol. 1, Nos. 1 and 2, 1990
Abstracts of industrial energy conservation technologies and technical papers

INECA Journal Vol. 2, No. 1, 1991
Recycling '91[*]

Industry and Environment: A Guide to Sources of Information, 1991[**]

Energy and Environment Series

No. 1: *Energy Conservation in Industry*, 1992[*]
No. 2: *Effluent Control in Industry*, 1993[*]
No. 3: *Hazardous Waste Management in Industry*, 1994[*]
No. 4: *Industrial Safety*, 1994[*]

* Available from Materials Information. Separate order form supplied.
** Available from Verlag Dr. Grüb. Separate order form supplied

CONTENTS

HOW TO USE THIS PUBLICATION

The *Energy and Environment Series* consists of a recent technical report on a current topic (in this case, industrial safety), followed by two sections containing abstracts of technical material.

The first section is entitled "Industrial Safety" and contains over 400 abstracts of papers taken from three leading international databases on materials technology. The abstracts are arranged under three topics: metals, advanced materials and business aspects of materials technology.

The second section is entitled "CLEANTEC DATA" and contains a similar number of abstracts of technical reports (mostly unpublished) obtained and processed by UNIDO in the course of its energy and environment information activities. CLEANTEC DATA is the name of the system of databases established by INTIB.

This section is subdivided according to the source of the information as follows: IDA (Industrial Development Abstracts, the oldest database of UNIDO on industrial development reports on assistance to developing countries since 1965); UNIDO (United Nations Industrial Development Organization, *Integrated International Safety Guidelines for Pesticide Formulation in Developing Countries*); AGRIS (an international information system/network on agriculture run by the Food and Agriculture Organization of the United Nations); UNEP/IEPAC (the Industry and Environment Programme Activity Centre of the United Nations Environment Programme).

All the abstracts include:

- A sequential record number;
- The title of the document in upper-case letters;
- An alphanumeric code in brackets;
- An abstract;
- Author(s) and/or corporate author(s);
- Other bibliographic details.

Three indexes are available, covering both data sections, using subject descriptors from the *Thesaurus of Metallurgical Terms* and *Thesaurus of Engineered Materials*, published by Materials Information, and the *Thesaurus of Industrial Development Terms*, published by UNIDO. Therfore, there may be variations in the application of terminology from the three thesaurii: in some cases the use of singular or plural varies, in others American English spelling is used.

NB: Please note that the following terms will not be found in the subject index, as they are the main subject of this issue: health; toxic substances; safety, or variations thereof. The subject index includes the sequential record number of the abstract and the title of the document.

Please note that materials presented in the data sections may have more than one author with multiple corporate affiliations. Therefore, to avoid ambiguity, the corporate affiliations have not been included in the abstract. Corporate affiliation is, however, included in the corporate author index.

The author and corporate author (which includes author affiliation) index entries include the name in alphabetical order followed by the sequential record number.

General points to note:

- In some cases, the titles of documents have been edited or translated;
- In the second section, the technical reports are mainly unedited, unpublished papers.

SAMPLE EXERCISES:

To find abstracts on the subject "noise":

a) turn to the "combined subject index";
b) look up the term "noise" — there are seven references which contain a number and the document title;
c) taking the first reference, number "3102", turn to the data sections, which are in ascending numerical sequence, and look up the item — i.e. the full abstract with bibliographic references.

To find abstracts of documents written by the author "Monks, R.":

a) turn to the "combined author index";
b) look up the name "Monks, R." — there are two references which consist of an abstract number;
c) taking the first reference, number "3319", turn to the data sections, which are in ascending numerical sequence, and look up the item — i.e. the full abstract with bibliographic references.

To find abstracts of documents associated with the organization "Alcan Smelters and Chemicals":

a) turn to the "corporate author/affiliation index";
b) look up the term "Alcan Smelters and Chemicals" — there are two references which consist of an abstract number;
c) taking the first reference, number "2978", turn to the data sections, which are in ascending numerical sequence, and look up the item — i.e. the full abstract with bibliographic references.

To order the document with the item number "3007":

a) note the page heading — "Industrial Safety - Metals";
b) turn to page viii and follow the instructions under "INDUSTRIAL SAFETY".

To order the document with the item number "3592":

a) note the page heading — "CLEANTEC DATA - AGRIS";
b) turn to page viii and follow the instructions under "CLEANTEC DATA - AGRIS".

DOCUMENT DELIVERY / PHOTOCOPYING SERVICE

All items presented in this volume have been prepared from documents available at the source of the abstract. Should you be interested in a full text copy of the articles/reports, please send requests to the following addresses where they are stored:

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London SW1 5DB
UK
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Fax: (+71) 839 2289

For an article of ten pages or less the photocopying rates are £8.00/US$14.00 (US$17.00 overseas) with a mailing charge for outside the respective countries of £1.00/US$2.00 (US$3.00 overseas). Advance payment is recommended to ensure fast processing of orders. When ordering, please quote the title, the subsequent numeric code and the bibliographic details contained in parenthesis at the end of the abstract.

CLEANTEC DATA—IDA

Paper copies can be obtained from:
Chief, Industrial and Technological Information Bank
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PO Box 300
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As many of the older UNIDO documents are no longer in print, orders for microfiche may be addressed to the UN Sales Section. Please give the order number contained in brackets at the end of the title—e.g. [IDA–014622], stating that this is a UNIDO document. Each microfiche costs US$2.00 and one document may consist of several fiches (orders from official and government bodies benefit from a 25% discount).

CLEANTEC DATA—PESTICIDE FORMULATION GUIDELINES

The items in this section were taken from *Integrated International Safety Guidelines for Pesticide Formulation in Developing Countries*, Publisher: UNIDO, 1992.

Copies of this document may be obtained from:
Chief, Agrochemicals Unit
UNIDO
P.O. Box 300, A-1400 Vienna, Austria
Tel. (43 1) 21 131-3940, Fax (43 1) 2309615

CLEANTEC DATA—AGRIS

(See Index of AGRIS Information Centres, pages 160-166, for addresses)

AGRIS abstracts are prepared by special national and regional agricultural information centres throughout the world. The documents themselves can be obtained either from the published sources given in each abstract, or from the input centre directly.

The input centre is identified in the abstract code and the address can be obtained by referring to that code in the AGRIS Information Centres index at the back of this volume.

The code is structured as follows:

AGRIS-**PL**9000419

where **PL** is the country code–in this case for Poland.

Details of costs for photocopying should be obtained directly from the AGRIS centres.

CLEANTEC DATA—UNEP/IEPAC

UNEP/IEPAC
Tour Mirabeau
39-43 quai André Citroën
75739 Paris Cedex 15
France
Tel: (+33 1) 4058 88 50
Fax: (+33 1) 40 48 88 74

The full volume of the *Industry and Environment Review* (Volume 16, No. 1-2) is available from the address above at a cost of FFr 50 per issue.

Copies of individual articles from the *Review* are available from UNIDO (for details see under ordering paper copies from IDA).

INDUSTRIAL
ACCIDENT (SAFETY-) RISK MANAGEMENT
Guide to Concepts and Measures
for the United Nations Industrial Development Organisation

EXPLANATORY NOTES

ALARA	As low as reasonably achievable
APELL	Awareness and Preparedness for Emergencies at the Local Level
API	American Petroleum Institute
BACT	Best Available Control Technology
BART	Best Availalable Retrofit Technology
CAER	Community Awareness and Energy Response
CCPS	Centre for Chemical Process Safety
CHRIS	Chemical Hazards Response Information System (United States Coast Guard)
CIMAH	Control of Industrial Major Hazards Regulations
CMA	US-Chemical Manufacturers Association
ENVIROTIPS	Canada Technical Information for Problem Spills
FAR	Fatal Accident Rate
FMECA	Falure modes, effects and criticality analysis (earlier form, FMEA)
GACT	Generally Achievable Control Technology
HAZOP	Hazard and operability study
HSE	Health and Safety Executive of the United Kingdom
IAEA	International Atomic Energy Agency
ICI	Imperial Chemical Industries
IMO	International Maritime Organization
IRPTC	International Register of Potentialally Toxic Chemicals
ISRS	International Safety Rating System
LAER	Lowest Achievable Emission Rate
LPG	Liquified petroleum gas
MACT	Maximum Achievable Control Technology
NIOSH	National Institute for Occupational Safety and Health (United States)
NSPS	New Source Performance Standards
OECD	Organisation for Economic Cooperation and Development
OSHA	Occupational Safety and Health Administration (United States)
PHA	Preliminary hazards analysis
QRA	Quantified Risk Assessment
RACT	Reasonably Achievable Control Technology
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
USEPA	United States Environmental Protection Agency
VROM	Ministry of Housing, Physical Planning and Environment, The Netherlands
WHO	World Health Organization

INTRODUCTION

With the growing importance of the prevention of environmental damage due to industrial activities (and to human activities in general), interest is also increasing in the assessment of the possibility of damage or harm, that is, the assessment of risk. There are various types of risk, but this document focuses on major safety risks: the risks of a serious number of fatalities as the result of an industrial accident. Safety risks are related to, but are not to be equated with, occupational health risks or ecological risks.

The objective of this document is to provide UNIDO technical staff and developing country counterparts with a common understanding of the nature of such safety risks and how they could be reduced. Such an understanding will help communication with competent authorities in developing countries as well as with management in industry on how to allocate available resources most effectively in order to improve plant safety.

Complete safety is an important goal for planners, managers and workers in industry. However, it is virtually impossible to prevent accidents altogether. Therefore, a realistic target is to reduce the possibility of accidents to a level which is as low as reasonably practicable, that is, not entailing excessive costs. This should take account of two desires of society:

- The desire to spend its resources on risk-reduction measures most effectively and, at the same time,
- The desire to invest in a financially viable industry generating benefits to all.

The process of reducing risk to a realistic minimum is called risk management. This guide is divided into four chapters.

In chapter I, a conceptual framework for distinguishing the various types of risks (for example, health, safety, ecological and property risks) is offered. Next, an overview is presented of where in industry safety risks exist and of what nature they are.

In chapter II, the structure of risk-management is discussed. Emphasis is placed on the importance of various levels of control. Four methodological stages of safety-risk management are described:

- Hazard assessment
- Risk analysis
- Choosing tolerable levels of risk and
- Risk reduction.

In chapter III, this methodical approach is elaborated in more detail. The various methods and techniques are presented that have been developed specifically to detect and/or to reduce safety risks. Here, attention is paid as much as possible to the particular situation of developing countries. The techniques used by the chemical industry appear most appropriate for the wide range of industries in developing countries. As many of the techniques are intended for the chemical process industries, and as the interest in this report originated from within the agrochemical sector of UNIDO, the pesticide and fertiliser industries are highlighted in this guide.

In chapter IV, safety-risk management is discussed for each of five different stages of industrial development:

- Design
- Construction/Operation
- Transports to and from the premises
- Aging/Shut-down
- Altering Surroundings.

For each of these five, a number of typical measures are highlighted that should be taken to establish safety.

The Annex lists major international governmental programmes. Of particular importance in this respect is the *Procedural Guide* of the Inter-Agency Programme (UNEP, WHO, IAEA, UNIDO) on the Assessment and Management of Health and Environmental Risks from Energy and Other Complex Industrial Systems. This guide offers a sophisticated tool to the rapid ranking of a wide range of safety risks at the local level. As such, it provides the decision maker (authority or industry) with a first but comprehensive criterion for the assignment of risk-reduction priorities.

I. CHARACTERIZING RISKS AND SAFETY RISKS

There exist numerous definitions of risk ranging from highly qualitative to highly quantitative terms. It is commonly agreed that no single measure can capture all aspects of people's concern: risk is "a multi-attribute phenomenon". Furthermore, the specific meaning of risk is often dependent upon culture. For example, in United States-based literature "risk" is often conceived of as probability, which is implicit in phrases like "high hazard-low risk installations". In this report, risks are defined globally as the possibility of harm or damage, with harm/damage being any adverse effect to man and/or his environment. Hazards are defined as any physical situation that has the potential to cause harm to man or his environment (in the broadest sense). Safety is defined as the presence of negligible risks, irrespective of the nature of the risks (see below).

It is useful to analyze hazardous situations as single events determined by, and leading to, a series of other events: the so-called hazard chain (see Figure I). The actual availability of mechanisms to "break" the links of the chain determines whether a hazard will be realized or not. Risks exist because of the probabilistic nature of such availability. Table 1 presents concrete examples of these abstract labels for the specific case of the pesticide industry.

With the help of the causal hazard chain, industrial risks can be distinguished in a number of ways. This is important as, to some extent, different types of risks demand different treatment. A first distinction is in terms of the types of harmful consequences. It can be damage to human health (somatic and/or psychic illness), loss of life (fatalities) or degradation of the physical and biological environment (ecological harm). Also, as a consequence of accidents there is usually damage to (cultural) property and investments by interruption of production and

Figure I. Structure of the causal hazard chain and its several blocking mechanisms

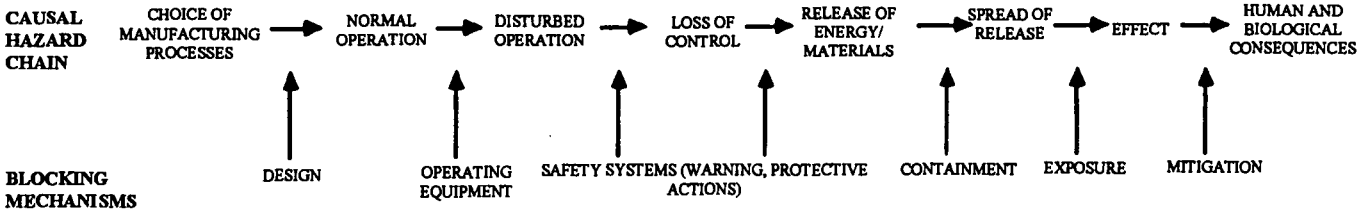

Table 1. Example use of terms on hazards and risks

Pesticide industry	
Activities	Pesticide formulation Storage in a warehouse Transport
Hazards	Leak of Pesticide Involvement in a fire A road accident involving a vehicle ccarrying pesticide
Accidents	A fork-lift truck punctures a drum and spills pesticide A fire causes a plume of toxic smoke affecting a residential area
Harm	Workers die from pesticide poisoning Health of nearby residents affected Rivers contaminated and wildlife killed
Risk	A 1 in a million chance per year of a member of the public being killed by a pesticide release One worker being killed every 10 million hours worked
Risk Management	Use of hazard assessment to improve understanding of the risks A decision to introduce a safety training scheme for workers A decision that a computerised model of possible pesticide releases is not cost-effective

disruption of business. This leads to the breakdown of risks into health, safety, ecological and property risks*.

A second distinction is in terms of the size of the harmful consequences: minor and major. Some industries have the potential for major accidents which may cause harm beyond the immediate vicinity of the workplace, affecting many people or large areas of the environment.** Minor, personal accidents, affecting only one or two individuals at the same time (most often workers), occur relatively frequently. Major accidents are very infrequent but when they do occur affect many people, workers as well as members of the public.***

Third, risks can be distinguished in terms of causation. They can originate as a direct result of "normal" operations, that is routine releases, or arise from disturbed operations, that is of a sudden nature. This leads to the breakdown of risks into continuous and accidental (sudden) risks. Thus, for example, the disposal of hazardous waste is posing a continuous risk.

Fourth, risks can be distinguished in terms of the spread of releases. It can be restricted to those on-site (for example, employees: occupational health) or be extended to those off-site (public). This leads to the breakdown of risks into internal (occupational) and external risks.****

A final distinction in use is between acute and chronic risks, the contrast typically being defined in dose and duration of exposure. Chronic risks, then, refer to the field of health effects, arising from long-term exposure and usually to low concentrations of hazardous materials or working conditions.

A few additional observations regarding the above distinctions may be made. First of all, any particular risk can be characterised along the various dimensions described. Still other related dimensions exist, like immediate vs. delayed effect. With respect to the distinction between health, safety and ecological risks, it should be noted that relatively few materials form major hazards to both humans and the ecology. Usually one hazard dominates. Apart from that, it has become common to speak of health, safety and environmental (HSE) risks instead of health, safety and ecological risks. Although the HSE-characterization is not entirely consistent+, it has become so widespread that this report will adopt this terminology, too.

as they originate from hazardous industrial activities. Where instructive, the particular case of the pesticide or fertilizer industry is taken to illustrate the general approach outlined. Thus, fatalities that result from long-term exposure to mostly relatively low concentrations are beyond the immediate scope, although their incidence may be affected directly by measures taken to reduce major safety risks. Also, safety risks resulting from exposure to natural hazard sources or social stresses (for example, urbanization) are not considered.

A. The occurrence of safety risks

Safety risks are determined by the nature of the materials involved in the hazardous activity and by the way they are handled (storage, transportation and processing, sometimes at high temperatures).

These materials may be hazardous because of being++:

- Flammable (flammable means the same as inflammable; the opposite is non-flammable!)
- Explosive (unstable or reactive materials, including dust explosions)
- Toxic (that is, poisonous)
- Corrosive
- Stored under high pressure.

The 1991 OECD publication "The State of the Environment" contains a list of major industrial accidents involving hazardous substances defined by one of the following criteria+++:

(a) 25 or more deaths;
(b) 125 or more injuries;
(c) 10,000 or more persons evacuated or deprived of potable water;
(d) $10 million or more damage to third parties (in $ 1980).

When comparing the recorded incidence of injuries and multiple fatalities (in this case over 25 deaths at one accident) it

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* In the somewhat tautological notion of "safety-risk" the term safety has a restricted application, that is referring to the risk of lethal effects only.

** The distinction between minor and major harm should not be equated with the distinction between individual and societal risks. Typically, the latter distinction is made when referring to major hazards (see also chapter III.C.). Thus, it is possible to speak of individual risks with the potential of a major hazard.

*** As a cause of death in hazardous industries, major and minor accidents are roughly of equal significance. For example, the chemical industry in the United Kingdom found that about half of its fatalities came from minor, personal accidents and half from major accidents. However, in terms of adverse publicity and public concern, there is no doubt that with equal total number of fatalities, major accidents dominate.

**** The subject of internal as opposed to external health and safety is covered in guidelines such as the World Bank Occupational Health and Safety Guidelines (1988). These give brief but specific recommendations in a wide range of industrial activities.

\+ The term "environment" usually covers not only "consequences" (that is, ecological harm) but "effects" as well (see Figure I). Examples of the latter category are effects on water supply, recreational amenities etc.

++ There are many different classifications of hazardous materials. The most important is the United Nations Dangerous Goods Classification. See United Nations (1991); IMO (1986).

+++ These criteria were selected in order to include all accidents that were significant and to be confident that at least 80% of all accidents that satisfied the criteria would be covered. Oil spills from maritime transport, mining accidents, voluntary destruction of transportation means as well as accidents caused by defective products were not considered. Databases used are likely to be more incomplete with respect to non-OECD countries.

Table 2. Geographic distibution of accidents involving 25 deaths or more (excluding accidents on high seas)

	1970-1974	1975-1979	1980-1984	1985-1989	TOTAL
OECD					
Europe	1	4	4	1	10
North America	2	2	0	0	4
Pacific	1	0	0	0	1
OECD Total	4	6	4	1	15
Non-OECD					
Europe	2	2	1	3	8
Asia and Africa	4	3	7	11	25
Latin America	1	3	5		10
Non-OECD Total	7	8	13	15	43
World Total	11	14	17	16	58

Table 3. Hazardous substances most often involved in selected major accidents

Substance	Number of accidents	
	OECD	Non-OECD
Explosives, gunpowder, dynamite, ammunition	1	10
Fireworks	0	5
Butane, propane, LPG, butadiene, propylene	17	10
Gasoline, oil, kerosene, petrochemicals	9	18
Chlorine	13	3
Ammonia	2	9
Sub-total	42	50
Other (e.g. pesticide, fertilizer, acit etc).	54	23
Total number of recorded accidents	96	73

appears that storing, transporting and processing of chlorine and ammonia poses health hazards (b) more than safety hazards (a).

Table 2 gives a breakdown of accidents with 25 deaths or more by geographic region. It is seen that non-OECD countries, especially Asia, had a growing number of major accidents. Many more major accidents are happening outside OECD countries than in OECD countries. Table 3 shows the number of accidents by substance involved. The number of explosions with explosives and similar substances outside OECD is very high. The same is observed with ammonia. The higher incidence of major accidents in the category "gasoline, oil, kerosine and petrochemicals" may indicate particularly unsafe handling and transportation of these hazardous materials (see also chapter IV).

B. Safety risks and regulatory responses

There is a close link between major accidents and the development of risk management techniques and procedures. As Table 4 shows, the shock of major accidents has often led company management and regulatory authorities to develop more strict methods to control the risks. A breakdown of accidents (period 1970-1989) within OECD countries by type of installation, region and date shows that major accidents with multiple deaths in fixed installations or transport activities have nearly disappeared in the 1980's. This result may well be due to

the accident prevention programmes and policies developed after the Flixborough and Seveso accidents.

One of the first government agencies to make specific legislation on major hazards was the Health and Safety Inspectorate of Great Britain with the Control of Industrial Major Hazards Regulations (CIMAH, 1985). Guidelines of many other institutions have been based closely upon these regulations (for example, the World Bank Guidelines for Identifying and Controlling Major Hazard Installations in Developing Countries). The CIMAH Regulations require a Safety Case to be written, part of which may be a risk analysis. The World Bank Guidelines specify a hazard analysis as the basis for risk management, because of these simpler techniques are more appropriate for developing countries. The Seveso Directive of the European Community requires a risk analysis of the plant as a basis for accident prevention, emergency planning and informing the public. The United States Congress in 1990 amended the Clean Air Act, requiring that each facility conduct a hazard assessment, develop a risk management plan for review by the Environmental Protection Agency and take necessary corrective measures to improve facility safety and prevent accidental releases. The importance of these amendments is evidenced by the inclusion of far-reaching provisions authorizing USEPA to enforce and penalise, and to seek criminal prosecution of company management posing "imminent or substantial endangerment" to public health or the environment.

II. CHARACTERIZING RISK MANAGEMENT

Risks arise from the absence of appropriate action or, in terms of Figure I, are due to improperly operating blocking mechanisms. Thus, it is the management of action that matters. In fact, accident analysis continues to reveal the predominance of organizational deficiencies over equipment defects. If there is good quality management, it will usually improve not only the level of health risks but will have a positive effect on the other types of risks as well. Risk management in the context of this report is defined as the process of making optimal use of available resources to minimise industrial (safety-) risks*.

Risk management requires decisions to be made about issues like:

- Should the activity be permitted at all? (In the case of UNIDO: should the activity be supported at all?)
- Are measures necessary to reduce its risk?
- How extensive does the risk reduction measure need to be?
- What other land use should be permitted nearby?
- Which of various options or alternative routes should be chosen, and what would be its immediate and future costs?
- And even, what level of risk management is appropriate?

A. The importance of control

The risks of hazardous industrial activities per se are but one of the factors that influence the answers to the above questions. Operational, economic, social and political factors are as important. Safety is a variable to be actively controlled during the entire life cycle of a plant or installation. All parties involved in this control, that is organizations involved in design, operation, legislation etc., should be elements of one integrated control function. Thus, optimal or cost-effective risk management requires the cooperation of professionals with different expertise at all stages of the safety-management cycle, in-house as well outside. This is expressed by Figure II.

Putting this control into practice is the major condition enabling a satisfactory management of industrial risks. Rapid technological changes and the trend toward very large installations for centralized services have emphasised the core value of a control philosophy. In a series of World Bank workshops on safety control and risk management (Rasmussen and Batstone, 1991) it was concluded that, in general, an effective safety strategy includes the use of two control principles: both traditional feedback control (reactive) and advanced feedforward control (proactive). The latter requires a predictive model of possible disturbances and, consequently, a model of the internal processes. It is needed for example, when measurement of performance quality takes time considerably longer than the propagation of disturbances through the system, or when the response of the system to control actions is subject to excessive delays.

In many cases insufficient provision is made for the feedback and feedforward of information. This criticism applies equally to the exercise of control by public/regulatory bodies and by plant management **.

B. Stages of (safety-)risk management

As major accident risks are often not apparent in statistics for

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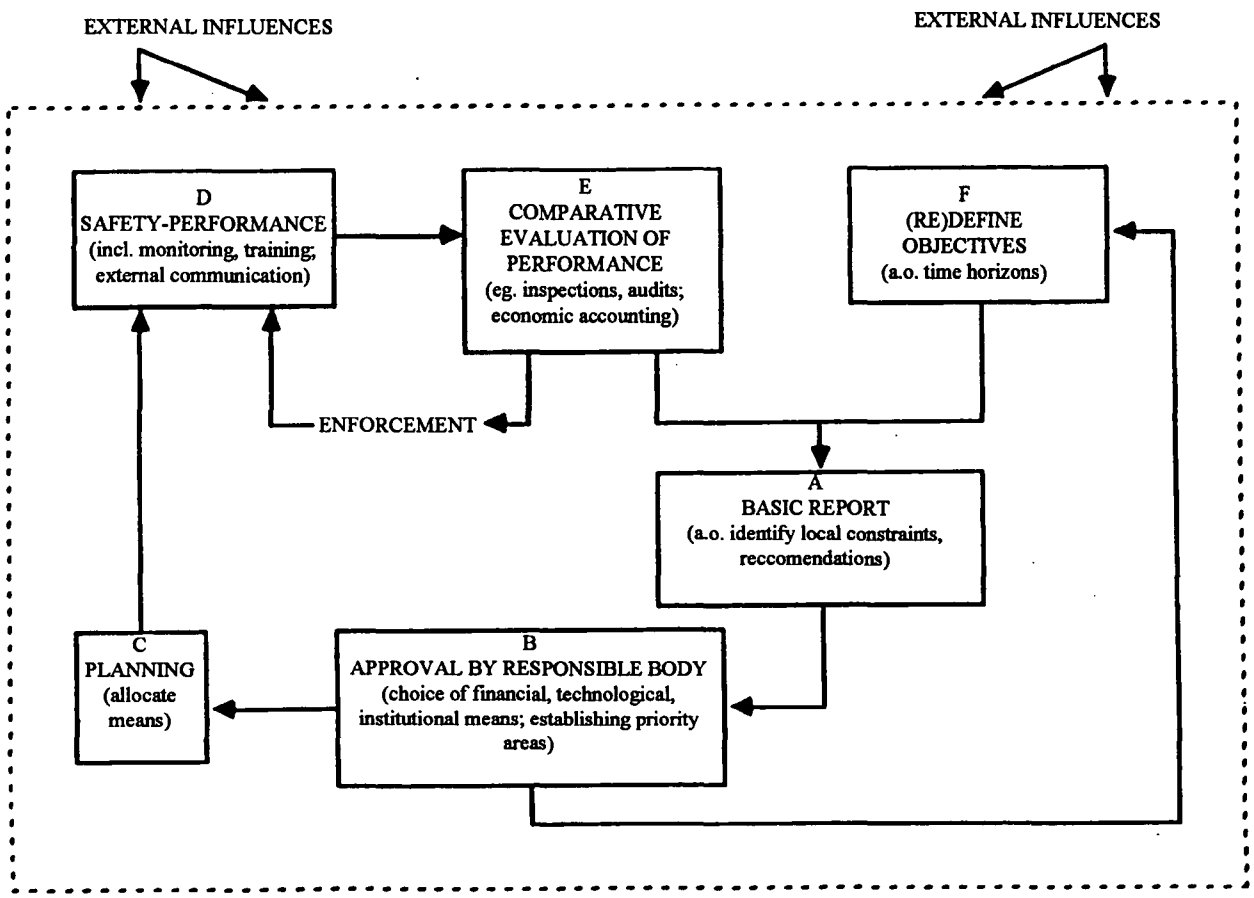
* In the overall science of industrial business, risk management is commonly viewed as the making of appropriate provisions to secure the company from financial risks, e.g., protection against liabilities. This often includes insurance costs regarding accidents. However, the insurance market has tended to insure on the basis of "maximum expected loss" relying on historical frequencies; hence, it has not adopted the risk assessment techniques described in this guidance, that is techniques relying on historical and estimated frequencies, to any significant degree. Also, it fears the nearly unlimited claims if it were to provide coverage for continuous and chronic risks. For these reasons, the technical and financial approaches of risk assessment often take place in parallel with only minimal overlap. However, for a number of reasons harmonisation and integration of approaches is commencing now in some industrialised countries by some of the larger hazardous industries.

** Typically underestimated is the relationship between stage E and C: did the planned activities lead to the desired performance/effects? In fact, are concrete evaluations performed in order to provide the responsible body with an assessment of the performance of business?

Table 4. Examples of standard setting-responses to accidents

Event		Policy Measure
1974	Explosion of chemical plan Flixborogh/UK	Widespread use of Quantified Risk Assessment (QRA) in the UK.
1977	Release of toxic dust from factory, Seveso/Italy	EC-Directive (82/501) which required control of major hazards throughout the European community.
1984	Explosion at LPG-storage Mexico City	Development of Codes of Conduct by multinational chemical companies applied to operations worldwide (Community Awareness and Emergency Response-CAER; Responsible Care-Program; Standardising QRA-approaches).
1984	Release of toxic gas from factory, Bhopal/India	Wide encouragement for accident prevention and emergency planning in India.
1987	Sinking of British passenger ferry at Zeebrugge/Belgum	First application of risk assessment to these ships; the adoption of international regulations based on risk analysis.
1988	Explosion and fire on British offshore production platform	Adoption of advanced safety regime based on QRA for offshore production.

Figure II. Schematic representation of the safety management cycle



many years, and as our ability to cause such accidents has arisen very recently (in evolutionary terms), our only reliable means to control such risks is scientific risk management. Risk analysis and other instruments of risk management are still changing very rapidly. Most techniques have been developed within three industries which have the potential to cause major accidents:

- The nuclear power industry
- The on-shore chemical industry
- The off-shore oil and gas industry

Unfortunately, terminology for the different stages of risk management is not very well standardised. One of the reasons is that some programmes, for example the WHO (see Annex), are not focusing on concrete hazardous industrial activities but concentrate on chemical substances. However, most approaches agree that sound risk management requires judgments to be made at each of four consecutive stages (see Figure III), while at the same time admitting that no clear-cut borderlines can be drawn between them.

1. **Hazard assessment***
   Hazard assessment consists of a range of relatively simple techniques to scope, analyze and evaluate hazards, involving mainly subjective and qualitative assessments of means to minimize them (also called Hazard Analysis; see OECD, 1991). The various techniques are not intended to quantify by detailed analysis the likelihood of events.

2. **Risk analysis**
   Risk analysis consists of more detailed and usually quantitative techniques to calculate/estimate the likelihood and potential consequences of possible major accidents, thereby providing a quantitative basis selection of risk reduction measures**.

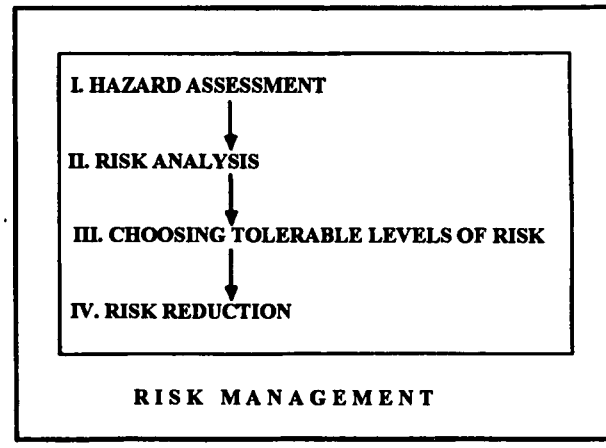
   In developing countries most safety problems can be resolved considerably by applying the relatively simple techniques of hazard assessment. The main use of scientific risk analysis in developing countries has been by multinational oil and chemical companies that have one single safety policy for all their operations.

3. **Choosing tolerable levels of risk**
   Choosing tolerable levels of risk is the next stage. It consists of the selection and weighing of criteria upon which to base the decisions about how acceptable or, better, tolerable the proposed action at the estimated level of risk is***. Evidently, this implies social and economic judgments: do the benefits from having the industry (for example, in the form of jobs, tax revenues, petroleum products, fertilizers etc.) outweigh the risks? If not, at which level of risk would they? It requires answers to political questions as well.

   In developing countries the incremental benefits of industrial activity may be very large. Thus, on the one hand, the safety risks it may impose on workers and nearby residents, with a background of relatively high risks in daily life, may be considered less significant than in a developed country. On the other hand, accident records have revealed a trend for safety levels of aging plants to decline much faster in developing countries (notably as a result of encroaching population). Therefore, one might argue in favour of using the risk criteria of developed countries, in order to allow a safety margin for anticipated deterioration during plant life.

4. **Risk Reduction**
   Risk reduction refers to the selection and implementation of concrete measures to achieve the chosen level of safety

Figure III. Gradual enlargement of rields of risk management



* As will be discussed in the next section, it is not always necessary for making sound decisions on risk reduction to enter the next stage of risk analysis. However, when the results of a hazard assessment indicate that a more detailed assessment of the risk is needed (entering the stage of risk analysis), the first stage of hazard assessment is also called hazard identification.

** The process is also often referred to as Quantified Risk Assessment (QRA) when the distinction from the qualitative hazard assessment needs to be emphasised. The term "assessment" already signals that there can be no sharp distinction with the next third stage. As a consequence, the label "risk assessment" is often used when referring to all first three stages and, thus, to cases that require application of the more sophisticated methods of stage 2.

*** The terms "acceptable", "tolerable" or "justifiable" all are often used interchangeably. The definition used in this report is that an activity as a whole, comprising a package of risks and benefits, may be regarded as "acceptable" to the operator, to UNIDO, or to the regulatory agency on behalf of the public. Its risks alone, which are borne with some reluctance, would then be regarded as "tolerable".

considered tolerable. These could be measures affecting early and/or later links of the causal hazard chain. Although in general it is preferred to make in-process changes (source-oriented), in some situations add-on technologies (effect-oriented) or measures directed at the tail end of the hazard chain, like improved emergency provisions, are the most reasonable contribution to risk reduction.

With the above distinctions in mind, it is possible to further qualify the terms risk assessment and risk management, with risk assessment applying to the first three stages and risk management including all four. However, as the distinction between the two terms essentially concerns the stage of implementation, it may not be surprising to find the two often used interchangeably.

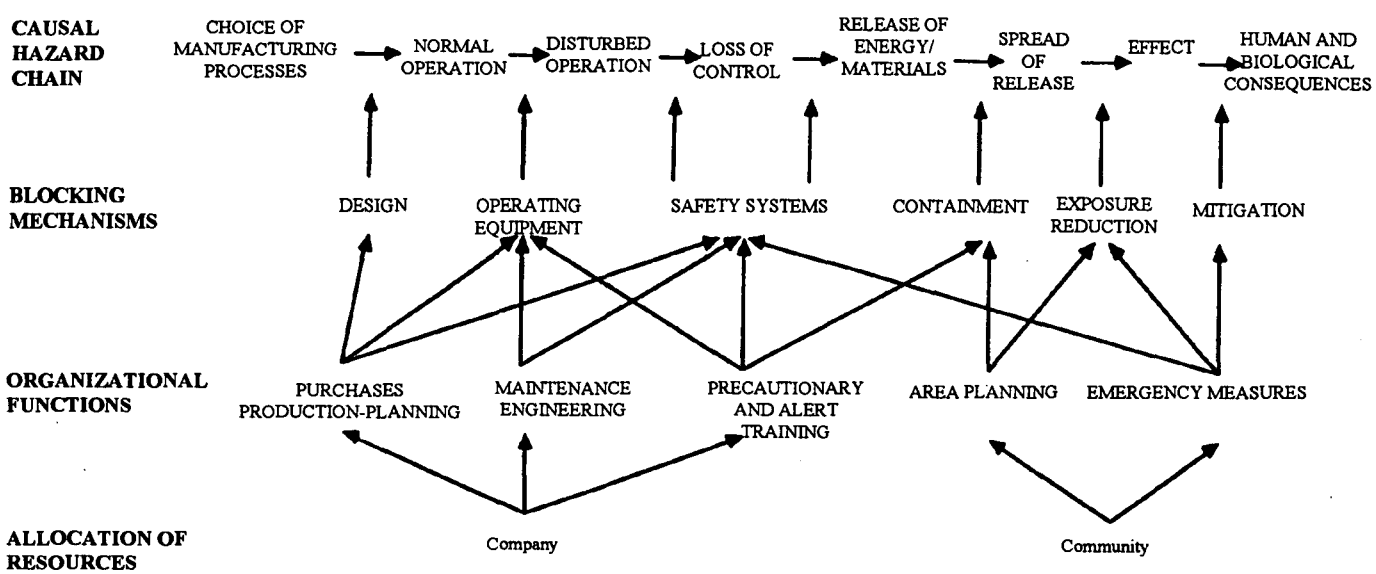
Whereas the various types of risk can be distinguished conceptually in terms of the various links of the hazard chain, as indicated in chapter I, with a more in-depth perspective of the hazard chain there appears to be a considerable overlap. Human error (and also human violation of rules) plays a role in the operation of all blocking mechanisms and thus is at the heart of risk management (see CMA, 1990). In fact, it is the same organizational functions that affect the various links. This is illustrated by Figure IV.

A major topic then becomes how tight (or loose) the various organizational functions should be coupled in order to maintain the required flexibility of response to changing local conditions or disturbances.

There appear to be major cultural differences in approaches to this subject. In particular, it is by no means clear that operation of complex high-hazard systems in developing countries is less safe than in the Western world*.

Therefore, it is the quality of the management that, in the end, rules the health, safety and environmental risks . Measures to affect one particular type of risks usually have beneficial spin-offs to other types of risk as well. Also, it has been argued that good and bad organizations have the same kind of accidents but their frequency changes (see Rasmussen and Batstone, 1991). It is important to have managers not only interested in major accidents but in small accidents as well as, to a great extent, they both have the same origin. A high frequency of minor events may signal general lack of concern and, consequently, increased likelihood of major accidents. On the other hand, from a low frequency in itself one may not infer good protection against major accidents.

Figure IV. Defence-in-depth representation of blocking mechanisms to casual hazard chain



* Positive influences in developing countries may be the pride and concern of the operating staff; the selection mechanisms applied; the particular career patterns promoting technical staff with in depth operational experience to management levels in contrast to the usual Western tradition of hiring lawyers or business school graduates for management levels (Rasmussen and Batstone, 1991).

III. RISK MANAGEMENT TECHNIQUES

A. Special measures and techniques of hazard assessment

Hazard assessment is intended to prompt consideration of hazards which might otherwise be overlooked in a project design, so that the risks can be minimized before they are locked into a completed design. The results of a hazard assessment may show that a more detailed assessment of the risks is justified.

The main techniques of hazard assessment are:

- Hazard survey (or preliminary hazard analysis);
- Hazard and operability study (HAZOP);
- Failure modes, effects and criticality analysis (FMECA);
- Hazard indices (or hazard ranking).

Hazard assessment may involve quantitative calculations (for example, consequence analysis; see below), but it is primarily qualitative. Because it is relatively simple, it is particularly suitable for use in projects in developing countries. For this reason, special measures and techniques of hazard assessment will be presented in this guide with more detail.

1. Hazard Survey

A hazard survey (or preliminary hazard analysis, PHA) is a review of an activity to identify the hazards and gain a qualitative understanding of their significance. As a mainly intuitive exercise, it gathers information from a number of sources.

Surveys of previous accidents

Has the activity suffered accidents in the past? This is one of the easiest (and most frequently overlooked) ways of identifying hazards. It provides a simple intuitive warning of the types of accidents which may occur, although it cannot be comprehensive, especially for new or unusual materials and technologies. Nevertheless, this is a very important first step and ensures that the lessons from previous accidents are not overlooked.

Previous experience

Has the activity suffered any near-misses or operating problems? For an existing activity, operating staff are likely to have ideas on potential accidents based on their own experience. This may be structured in a HAZOP or FMECA (see below). However, they may tend to concentrate on relatively frequent "nuisance" problems and overlook less likely major accidents.

Hazardous materials data

Does the activity involve intrinsically hazardous materials? Most hazardous chemicals are now included in standard classifications which indicate their primary hazard, for example, flammable, toxic or explosive. Many of the more common chemicals are covered by data sheets which indicate their properties in more detail. Sources of such data sheets include:

- Environmental Canada Technical Information for Problem Spills (ENVIROTIPS), a series of detailed reports on 35 common materials.
- United States Coast Guard, *Chemical Hazards Response Information System (CHRIS)*, a manual containing two pages of data for each of about 300 materials.
- United States National Institute for Occupational Safety and Health (NIOSH), *Pocket Guide to Chemical Hazards*, with brief data on about 400 materials.
- Sax & Lewis (1989), *Dangerous Properties of Industrial Materials*, a reference book with brief data on about 20,000 materials.

Several organizations maintain computerized databases. A guide to them was produced by OECD (1991).

Guidelines and codes of conduct

Does the activity conform to good engineering practice? Codes of practice for design and operation exist for almost every major type of hazardous industry. They usually take account of previous accident experience. However, because they are written as guides for design or operation, they usually do not specify the hazards which each measure is intended to control and therefore are difficult to use for the identification of specific hazards. Detailed guidelines and codes of practice exist on virtually every aspect of the storage and handling of hazardous materials* .

They typically provide:

- A general identification of the hazards in the activity
- Advice on location of buildings and other hardware design issues
- Reviews of safety management aspects relevant to the activity
- Guidance on fire protection and emergency planning
- Checklists for a preliminary hazard review.

Guidelines are published by standards bodies (for example, the American National Standards Institute), industry associations (for example, American Petroleum Institute), large chemical manufacturers (for example, ICI), national regulatory bodies (for example, United Kingdom HS-Executive) and international organizations (for example, ILO).

Major hazard threshold quantities

Does the activity involve quantities of hazardous materials which would bring the installation under major hazard legislation? Threshold quantities in these regulations provide a very simple indication of relative hazards, although they are not necessarily reliable in every case. For example, the Seveso Directive of the European Community specifies threshold quantities for process and storage of 180 materials, including many pesticides, above which the provisions of the regulation applies. Table 5 specifies a number of them. These values were not developed rigorously and should not be used as the only assessment method.

Hazard checklists

These may range from a simple list of hazards identified by other means in previous risk assessments, to a detailed questionnaire designed to prompt consideration of all possible accident

* However, blank spots exist. For example, UNIDO is initiating a project to develop integrated safety guidelines for pesticide formulation in developing countries.

Table 5. Example threshold quantities in Seveso directive

Material	Threshold quantity (tonnes)
General flammable substances	
Flammable gases	200
Highly flammable liquids	5000
Specific flammable substances	
Hydrogen	50
Ethylene oxide	50
Specific explosives	
Ammonium nitrate fertiliser	†5000
Nitroglycerine	10
Trinitrotoluene	50
Specific toxic substances	
Acrylonitrile	200
Ammonia	500
Chlorine	25
Sulphur dioxide	250
Hydrogen sulphide	50
Hydrogen cyanide	20
Carbon disulphide	200
Hydrogen fluoride	50
Hydrogen chloride	250
Sulphur trioxide	75
Specific very toxic substances	
Methyl isocyonate	†0.15
Phosgene	0.75

†As ammended in 1987

causes. They can only really be drawn up with a specific activity in mind.

2. Hazard and operability studies (HAZOP)

A hazard and operability study is a systematic review of a process-plant design, considering each subsystem of the process in turn and subjectively evaluating the consequences of deviations from normal operating conditions. It is normally used to generate recommendations to improve the safety and operability of a design but has also been applied to other operations, for example, hydrocarbon well-drilling. A guide to the technique is included in ILO (1988).

3. Failure modes, effects and criticality analysis (FMECA)

A failure modes, effects and criticality analysis (or its earlier form, FMEA) is a systematic review of a mechanical system, considering each component in turn, and subjectively evaluating the effects and criticality (that is, importance) of a failure there. It may be used to check that nothing has been overlooked in the design or to identify hazards for a risk or reliability analysis.

The analysis is based on a form which begins with a systematic list of all components. For each component the form requests component name; function of component; possible failure modes; causes of failure; how failures are detected; effects of failure on primary system function; effects of failure on other components; necessary preventive/repair action. In addition, it requires a rating of frequency of failure and a rating of the severity (that is, consequence) of failure. Failures are rated as critical if they have high frequency and/or severity ratings. In these cases, special protection measures may be considered.

FMECA has been applied to mechanical systems such as aircraft, hydrofoil vessels and oil production wells. It is not normally used for chemical plants, since HAZOP is preferred.

4. Hazard Indices

The DOW Index and its development, the DOW/MOND-Index, provides an easy method of ranking the relative risks between process plants. These methods assign debits and credits to various plant features: debits are assigned to safety features which might contribute to an incident and credits to safety features which might mitigate its effects or frequency. The debits and credits are combined into an index which is the relative hazard ranking of the plant. A simplified version is given in ILO (1988).

These hazard index methods are useful at the conceptual stage for obtaining a rough assessment of the risk likely to be associated with a plant and for indicating where additional emphasis on safety might be placed. However, they do not necessarily encompass all the hazards associated with a novel process, and they are relatively superficial. They are not particularly helpful for identifying specific hazards, yet they are widely used for insurance purposes.

The above indices apply to the relative risks between plants, that is risks to one individual (employee, resident) exposed. They are primarily tools for industry management. From the point of view of the local authorities there is often a need, too, to compare the various industrial sources of major hazard in terms of the risks they pose to the community as a whole.

Recently, a comprehensive method has been proposed to achieve an initial ranking of such collective or "societal risks" for areas that accommodate a large number of varying major hazard sources (for the concept of societal risk, see chapter III.B.3.). For a large number of substances used either in fixed installations or in transportation, the off-site consequences (C, the number of people killed at one accident) are estimated quantitatively, taking into account specific area conditions like emergency preparation. As the next step, for each of the estimated major consequences the probability of occurring (P) is estimated, again taking into account a number of source characteristics like average weather conditions and plant safety management. The combination of estimates C and P provides the indices that enable the setting of priorities for further detailed analysis of the different sources of group risk. The method is described in detail in the Inter-Agency Project (1992).

sible to prescribe universally applicable criteria that determine whether or not risks are tolerable. In the following chapter III.C, numerical risk criteria are discussed. Other approaches are discussed in chapter III.C.

1. Numerical individual risk thresholds

Individual risk criteria ensure that individuals living or working near the transport route do not bear an intolerable risk. They may also be used for land-use planning or to help protect hospitals etc., which are difficult to evacuate in an emergency. Individual risk criteria are normally applied to members of the public without taking account of the benefits of the activity, that is, assuming that people nearby receive no more benefit from the chlorine transportation than average. Consequently, individual risk criteria are largely independent of the activity to which they apply. Once a risk has been defined which members of the public are expected to tolerate from hazardous activities over which they have no control, it should not matter whether this risk comes from, for example, chlorine or LPG, road/rail or sea transport, or a fixed installation.

A number of government authorities are basing their value judgments, (for example, licensing policy) directly on numerical estimates of individual risk (reviewed and compared by Technica, 1990). Criteria which these Governments use for individual risk regarding the public are summarized in Table 6. The first HSE criteria in the United Kingdom originated as guidelines for nuclear power stations but have been proposed for the transport of dangerous substances as well. The HSE criteria for new housing developments near existing installations are somewhat different, and refer to a "dangerous dose" rather than risk of death. They are roughly equivalent to risk of death lower by a factor of 3.

Workers involved in a hazardous activity are normally expected to tolerate higher risks than members of the public. The HSE has suggested a criterion for maximum tolerable risk of 10-3 per year. Other criteria for workers are often expressed in the form of Fatal Accident Rate (FAR), which is defined as:

$$FAR = \frac{Fatalities \times 10^{8}/_{year}}{Person\text{–}hour^{\,exposed}/_{year}}$$

The chemical industry in the United Kingdom has used its historical FAR of 3.5 prior to the Flixborough accident as a target value. ICI discovered that about half of its FAR was due to minor accidents (for example, dropped objects, falls) and so adopted a FAR of 2 for major hazard accidents (for example, chlorine releases).

2. Numerical societal risk thresholds

Societal risk criteria ensure that the risk to society as a whole or to individual communities from the activity are not disproportionate to the benefits it brings. Societal risks include the risk to every exposed person, even if they are only exposed on a brief occasion. They are usually the dominant consideration for transport activities which spread their risks over a constantly changing population along the routes. Societal risk criteria are often expressed as lines on a F-N curve, showing the frequency (F) of accidents involving N or more fatalities. This allows them to control not only the average number of fatalities or injuries from

Table 6. Official individual risk criteria for the public

Authority	Type of construction	Maximim tolerable risk (per year)	Negligible risk (per year)
Ministry of Housing, Physical Planning and Environment (VROM), The Netherlands.	New plants	10^{-6}	10^{-8}
Ministry of Housing, Physical Planning and Environment (VROM), The Netherlands.	Existing plants/Combined with new plants	10^{-5}	10^{-6}
Health and Safety Executive (HSE) of the United Kingdom.	Nuclear power stations	10^{-4}	10^{-6}
Health and Safety Executive (HSE) of the United Kingdom.	New housing near existing plants	10^{-5}	10^{-6}
Interdepartmental Co-ordinating Committee for Potentially Hazardous Installations of Hong Kong.		10^{-5}	not used
Department of Planning (DP) of New South Wales, Australia	New plants and Housing	10^{-6}	not used
Environment Protection Agency (EPA), Western Australia.	New plants	10^{-5}	10^{-6}

B. Special measures and techniques of risk analysis

Risk analysis, conceived of as the second stage of risk management, is performed only for highly hazardous activities where the more qualitative hazard assessment approach and even prudent safety management cannot be considered sufficient. Usually it must be performed by specialist consultants, making it a relatively expensive exercise.

Risk Analysis starts with defining the system, that is,by identifying a comprehensive list of possible accidental events. Once the hazards have been defined, the next step is to evaluate the potential consequences if accidents occur. It requires exposure assessment and dose-response assessments (see Figure I). This often involves some computer modelling, for example, calculating the dispersion pattern of a pesticide in the prevailing wind if a drum happens to leak and the number of injuries or fatalities which could result. In parallel with considering the consequences, a risk analysis must consider how likely it is for the accident to occur. The likelihood is normally expressed as frequency per year. Combination of the two elements—likelihood and consequences—of each hazard allows the risk to be calculated; they may be presented in different forms.

1. Consequence modelling

In the context of safety risks, consequences are measured in terms such as the size of zone affected by the accident and the number of people in the zone who may be killed or injured. These consequences cannot be predicted deterministically, because they depend on many unknown variables, such as the amount of hazardous material released, the time of the day and the warning received. Therefore, they can only be predicted for particular circumstances known as failure cases, or probabilistically on the basis of:

- Analysis of previous accidents
- Theoretical modelling of consequence zones, population distributions, failure case probabilities and impacts.

Techniques for consequence modelling are described in detail in CCPS (1989). This textbook contains a chapter on consequence analysis with a review of available models and full presentation of relatively simple models, including worked examples. Another major source is the World Bank *Guidelines for Major Hazard Control in Developing Countries* (1988). As a complement to this document a manual has been developed of relatively simple techniques for analyzing the consequences of the releases of toxic, flammable or explosive materials, usually used in the form of a computer programme (see Technica, 1988).

2. Frequency estimation

The key aspect which distinguishes risk analysis from hazard analysis is the quantified estimation of how likely it is that the accidents will occur. The are four main approaches to estimating accident frequencies.

Historical accident frequency data

This approach uses previous experience of major accidents without analyzing the initiating causes. It is a simple approach, relatively easy to understand, but it is only applicable to existing technology with significant experience of accidents.

Fault-tree analysis

This approach involves breaking down an accident into its component causes, including human error, and estimating the frequency of each component from a combination of generic historical data and informed judgment. It is a relatively complex technique and requires a more sophisticated approach to component probabilities and system reliability.

Theoretical modelling

The frequencies of some types of accidents can be predicted using theoretical models of the accident situation. An example of this is ship collision, where the ship movements can be represented by a theoretical model and the frequency of collisions determined by simulation or analytical solution.

Event tree analysis

This approach shows the way an accident may develop from an initiating event through several branches to one of several possible effects/consequences (see Figure I). The technique is usually used to develop the initiating event frequency estimated by one of the above three means into a failure case frequency suitable for combining with the consequence models of chapter III.B.1.

3. Risk composition and presentation

When the frequencies and consequences of each hazard in the activity have been estimated, they can be combined to form measures of its overall risk. The exercise of combining the consequence zones from numerous failure cases and weighting them by their frequencies is a complex task for which special computer programs exist.

Risks of major hazards, calculated in the above way, are often expressed in two complementary forms:

- Individual risk: the risk of lethal harm to one individual person, worker or member of the public (see chapter III.C.1)
- Collective or societal risk: the risk of lethal harm to a whole group of persons exposed to the hazard (see chapter III.C.2.).

C. Special measures and techniques of choosing tolerable levels of risk.

The numerical risk estimates which result from the risk-analysis process have to be translated into qualitative terms, as decision makers must balance risks against other relevant factors. Risk criteria are the (chosen!) standards that determine whether the calculated numerical risk estimates (for example, 10-7 per year) are above, equal to or below threshold values ("intolerable", "negligible" or in-between, that is, the "grey area"). These judgments are presented to the public to justify the decision to continue, to modify or to terminate a given hazardous activity.

It should be emphasized that the adoption of any particular risk criterion entails a societal trade-off, however implicit, of economic costs of alternative ways to allocate tax money. Thus, it implies a particular valuation of the value of human and biological life. Because of the nature of these value judgments (for example, varying between individuals and economic regimes, altering with time, accident experience, etc.) it is impos-

all sizes of accident but also the risks of catastrophic accidents killing many people at once. It should ensure that the public fear of a major accident is balanced by the benefits received from the hazardous activity.

Societal criteria have not been as widely used as individual risk criteria because the concepts and calculations involved are much more difficult. However, their value is beginning to be recognized, especially for transport activities but also as complementary to individual risk criteria in general (see Smets, 1991, for recent developments at the OECD-level).

Two Governments have published interim numerical societal risk levels. The Netherlands (VROM) criteria for off-site risk from new chemical plants indicates the maximum tolerable risk of accidents involving 100 or more fatalities as 10^{7} per year for a single plant. Hong Kong interim guidelines for off-site risks from potentially hazardous installations show the maximum tolerable risk of accidents involving 100 or more fatalities to be 10^{-5} per year per single plant (see Figure V).

D. Special measures and techniques of risk reduction

Risk reduction is the process of selecting the practical means to achieve the lower level of risk as indicated by the outcomes of the risk assessment, whether this assessment was conducted largely in a formal way (as at the stage of risk analysis) or whether it relied primarily on professional judgment (as with many hazard assessment techniques). Several possible approaches exist to the selection of risk reduction measures. In addition, one would like the selection to lead to enduring improvements. The most important means to ensure such improvement are audits.

1. Different approaches

Although various typologies have been suggested, in general three basic approaches could be distinguished:

- Ambient- or effect-oriented.
- Technology- or source-oriented.
- Cost/benefit-oriented.

Ambient-oriented

Ambient-oriented approaches specify the level of human health and welfare that is to be considered safe (or clean) without consideration of costs or technological feasibility. Often the required levels of protection are set close to the background exposure levels.

The Risk criteria approach (see chapter III.C.) is a particular case of this general category of approaches. The numerical risk thresholds chosen have been determined as a very small deviation of the total risk for someone to die taking all sources of exposure into account. If the risks are rated intolerable, risk reduction measures must be adopted regardless of costs. If the risks are negligible no further measures are needed. This approach has the advantage of giving clear guidance about major hazards, and it may show that many industries have negligible major hazards. However, it requires a risk assessment to be performed and stringent numerical risk thresholds to be set, and so may not yet be appropriate for many situations in developing countries.

Technology-oriented

Here, the best available technology (BAT) is selected, regardless of the risk reduction it achieves and sometimes regardless of costs. This has the advantage of not requiring a risk assessment and of being easy to justify to the public, so it tends to be selected when there is heavy political pressure in decision making. It has the disadvantages that the best technology can be unproven and difficult to obtain, and this approach is often an extremely expensive way of reducing risks. This makes it inappropriate for developing countries as it may lead to industry becoming uneconomic. A great number of alternatives to BAT have been developed which, to some extent, should take account of these objections. Well-known examples are "best practicable technology" and "best available technology not entailing excessive costs"*.

Cost/Benefit-oriented

Within this category of approaches measures are selected if they have a favourable ratio of benefit (that is, risk reduction) to cost (that is, capital expenditure and operating costs). It involves a trade-off between safety and economy, which is sometimes difficult to justify to those who do not directly bear the costs. Figure VI shows that not all money spent on safety is wisely spent.

Particularly regarding decisions between alternative risks, that is, decisions between options aimed at the same benefit, the cost/benefit approach is a very powerful approach. In environmental legislation, it has been shown to be the most efficient way of achieving risk reductions (see Luken, 1991). Cost/benefit trade-offs can be made in a number of ways ranging, in theory, from highly personal and subjective to highly formalized

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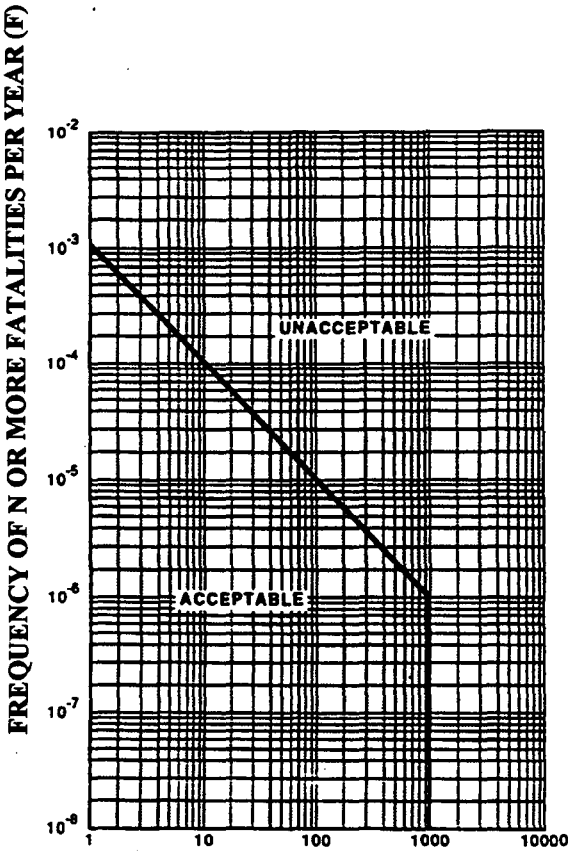
* This approach has been carried to considerable lengths under the United States Clean Air Act (1970), which incorporates a variety of different technology standards, including:

Best Available Control Technology (BACT)
Best Availalable Retrofit Technology (BART)
Lowest Achievable Emission Rate (LAER)
New Source Performance Standards (NSPS)
Reasonably Achievable Control Technology (RACT)
Maximum Achievable Control Technology (MACT)
Generally Achievable Control Technology (GACT)

Quoted from UNIDO (1991), *Policy Advice on Integrated Industrial and Environmental planning and Management in the Yugoslavian Republic of Montenegro*, Vienna.

Figure V. Hong Kong governemnt societal risk thresholds (interim)



and objectified. When made subjectively, decision makers, whether in government or industry, consider the range of possible actions and select those which they believe are appropriate for the industry and society. This has the advantage of being very flexible and of automatically taking account of immediate economic and local constraints. It may be appropriate for low-hazard industries in developing countries.

Less subjective is to rely upon the experiential history of the craft or profession itself. Indeed, it is the professional himself who has learned best to balance costs and benefits in the interest of his own business. Within such a code-based approach, measures are selected which conform to good engineering practice according to relevant industry guidelines and/or codes of practice. This has the advantage of giving objective guidance and taking account of practical constraints. However, guidelines based upon codes of conduct often do not specifically address major hazards, and most are based on experience in industrialized countries, so compliance may be uneconomic for developing countries.

Calculating costs and benefits in a formal way is the most explicit approach. Its openness is both its strength and its weakness, as in matters of risk assessment one is often facing large uncertainties.

The above approaches to risk reduction are not as mutually exclusive as they might appear. Hybrid approaches exist also. For example, cost/benefit considerations can be included in the risk criteria approach and applied to the grey area where risks are neither negligible nor intolerable. Because of the importance of cost/benefit considerations in risk reduction, the most explicit and formal of the cost/benefit approaches will be presented in more detail below.

2. Cost/benefit analysis of safety-risk reduction

Cost/benefit analysis is a technique for evaluating the risk and economic implications of a remedial measure by calculating and comparing

a) the cost of implementing the measure with

b) the benefits of the measure, in terms of the risk-factored cost of the accidents it would avert. Usually, not only the value of lives saved is taken into account but also the economic "savings" by not incurring costs caused by other types of harm/damage.

Costs of safety-risk reduction

The total annual cost of risk reduction measures includes one or more of the following:

- Costs of capital investment (for example, on safety hardware, land purchase, relocation costs) written off over an assumed working lifetime of the measure at an appropriate interest rate.
- Operating expenditures (for example, on annual safety training, extra staff). Extra operating costs of safer workplace practices are normally not included as they are assumed to be balanced by cost savings from the generally more efficient operation.
- Lost profits (before tax) if the measure involves withdrawing from an activity altogether.

Table 7 presents an example of some of the above costs for safety improvement in a pesticide warehouse.

Value of damage costs averted

The costs of accidents averted by the (safety-)risk reduction measures includes the following.

- The value of (statistical) fatalities averted. A typical value of £ 2 million (or FF 20 million: see Smets, 1991) has been used in recent analysis in some developed countries. Explicit valuation of human life has been recognized to provide an efficient and objec tive means of risk management in industrialized societies. The main approaches to valuation of lifes are:
- Human capital approaches. These estimate the value of life in terms of the future economic output which is lost when a person is killed.This may be in terms of gross output (in effect, the lifetime salary) or net output (in effect, the lifetime tax payments). This narrow economic approach is now largely discredited since it is recognized that people value life for its own sake rather than for its capacity to maintain economic output.

- Willingness-to-pay approaches. These estimate the amount that people in society would be prepared to pay to avoid a statistical fatality, using their observed behaviour in the past or their expressed opinions on hypothetical situations in questionnaires. This is generally considered to be the most credible approach, although estimates are very variable.
- Implicit value of life or revealed preference approach. The costs and benefits of legislation which public authorities have adopted on safety measures can sometimes be analyzed to show the implicit values of life. However, these show wide variations*, and the approach assumes that the previous decisions were correct.
- Court awards. Sums awarded to dependants for accidental death show the differing values of life in many countries but are not an ideal measure. For example, in the United Kingdom damages to dependants for wrongful death reflect only their share of the income the victim would have earned, that is,a net output approach. In the US, awards may include a large component for subjective loss to dependants and are partly seen as penalizing the perpetrator.
- Costs of hospital treatment, lost production and injury payments. Except in releases or accidents with no fatality potential, these costs are usually a negligible addition to the total.
- Property damage costs, both for the plant and the surrounding area. These can be estimated as fractions of fatality costs from historical data.
- Business interruption costs. These are very difficult to estimate and are often omitted for this reason.
- Ecological damage costs. These are also difficult to estimate and value; sometimes they are assumed equal to clean-up costs.

Some of these costs may be covered by insurance, but insurance in effect only spreads the cost from firms which have suffered accidents onto those which have not. Companies therefore usually include all costs in a cost/benefit analysis, whether insured or not.

As many people find decisions about safety-risk reduction on the basis of the value of a life difficult to accept, remedial measures should generally be adopted unless their cost is grossly disproportionate to the costs of accidents averted. As a guideline, a factor of 10 could be used, which is well within the range of values for the valuation of life. Thus, a remedial measure whose cost is less than 10 times the risk-factored cost of accidents averted is not grossly disproportionate and hence should be adopted in order to make the risk "As low as reasonably achievable" (ALARA). Table 8 shows this calculation for the example presented earlier**.

3. Safety management guidelines

The above-described cost-benefit analyses and the "grossly disproportiate"-rule can be considered as a guideline for risk managers on how to allocate resources for risk reduction. A number of more general guidelines exist on what a good safety management system should contain (see also the Annex). Specific guidelines for the chemical process industry are:

- American Petroleum Institute Recommended Practice on Management of Process Hazards (API, 1990).
- Occupational Safety and Health Administration proposed rule on process safety management of highly hazardous chemicals (OSHA, 1990). This is similar to the API code but will be a legal requirement for highly hazardous chemical plants in the USA.
- Centre for Chemical Process Safety Guidelines for Technical Management of Chemical Process Safety (CCPS, 1989). This is more detailed but broadly similar to the API and OSHA rules.

Of particular interest is the set of codes of conduct developed by the US-Chemical Manufacturers Association (CMA) over the past years. Its development was motivated especially by the need to broaden the dialogue and interaction between a plant and its several audiences. The set necessarily covers a broader range than safety risks only.

The separate codes are:

- The process safety code;
- The pollution prevention code;
- The employee health and safety code;
- The distribution code ***;
- The product stewardship code.

4. Audit techniques

There are several techniques for reviewing, auditing and assessing safety management systems, which also give useful guidance on how an existing system might best be improved. They range from evaluations by external auditors to assessments conducted by in-house professionals, from audits lasting several days to checks of much shorter duration. Each type of audit has its own characteristic advantages and disadvantages and thus is dependent upon the particular hazard situation which one is chosen.

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* For example, costs range from $200,000 for initiating the trihalomethane drinking water standards to $92 billion for the atrazine/alachlor drinking water standard. Analysis of 18Environmental Protection Agency regulations reveals a mean value of $66.9 billion per premature death averted. Eight OSHA standards imply a mean value of premature worker death of $9.8 million. The National Highway Traffic Safety Administration appeared to maintain the highest cost/benefit ratio with a mean cost of $1 million. Source: Office of Management and Budget, *Reforming Regulation and Managing Risk-Reduction Sensibly*, 1992 Budget Document, sent to Congress January 1991 (IX,C,Part Two). All values are in 1990 dollars.

** Note: The factor of 10 is not included as in this case a value of life from the upper end of the range has been used.

*** focusing on conducts in transportation

Table 7. Example costs for improvement of warehouse safety

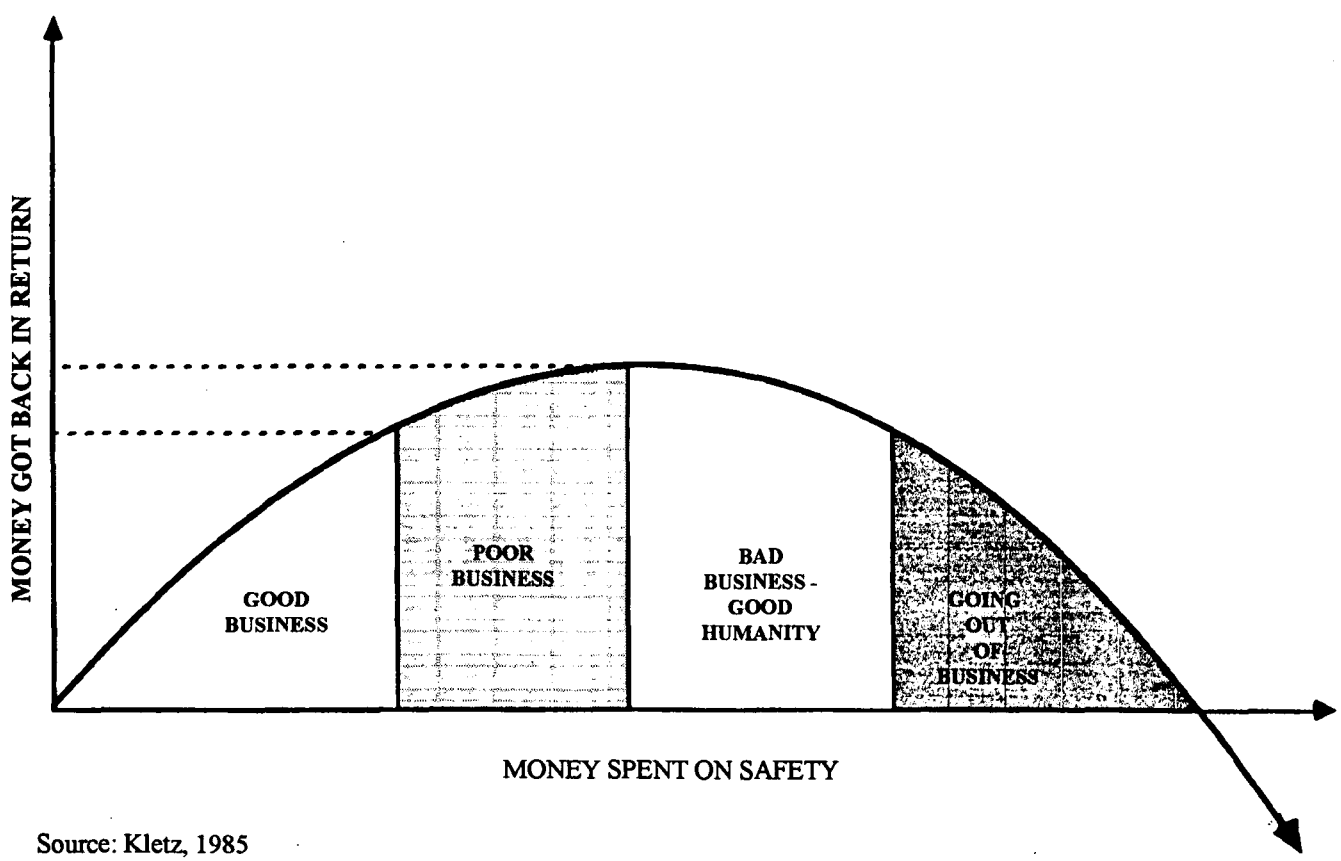
Relocation cost £1 M	
Working lifetime Payback period Rate of discount	25 years 10 years 8% pa
Annual cost £60,000 per year (£1 M x $(1.08)^{10/2}$/25)	

Training cost for 10 staff, duration 1 week per year	
Salary Employment cost factor	£15,000 pa 2.0
Annual Cost £6,000 per year (£15,000 x 1/52 x 10 x 2.0)	

Table 8. Example of a cost-benefit analysis of risk reduction measures for a basic risk of 1 x 10^{-2} fatalities per year

	Risk reduction measure	
	Relocation	Safety training
Reduction in risk (%)	90	20
Reduction in risk (fatalities per year)	9×10^{-3}	2×10^{-3}
Value of life	£2 million	
Total accident cost per fatality	£4 million	
Value of risk reduction (£ per year)	36,000	8,000
Cost of meassure (£ per year)	60,000	6,000
Conclusion	Reject	Adopt

Figure VI. Effects of increasing expenditures on safety



Source: Kletz, 1985

Examples of techniques that are relatively easy to administer are:

- The International Safety Rating System (ISRS) or "five-star system" (Bond, 1989). This consists of an extensive question set and points-scoring system, after which an appropriate star rating may be awarded. Its advantages are that it provides an objective evaluation of safety management and provides clear goals for improvement of performance. It is relatively well established and is applicable to many different activities (from chemical plants to underground railways). Its disadvantages are its comprehensive bureaucratic approach, the lack of a theoretical basis to the questions and scoring, its focus on occupational safety and health issues and its focus on measurement and control rather than the complete management systems approach advocated in the CCPS guidelines, for example.
- The MANAGER technique (Pitblado et al., 1990). This consists of a question set and points-scoring system, intended to audit safety management and produce a "management factor" which allows the results to be linked to a quantitative risk assessment. This, together with a relatively clear theoretical basis, is its main advantage. Its disadvantages are its focus on the chemical industry and the need for judgment of performance relative to US/West European chemical industry norms.

IV. SAFETY RISKS MANAGEMENT UNDER VARYING STAGES OF INDUSTRIAL DEVELOPMENT

Safety risks are determined by the manner in which hazardous substances are handled, now and in the future. This distinction in terms of time- frame is trivial. Yet it is of particular relevance when addressing situations where comprehensive regulatory regimes have not yet been crystallized. This is the case, by definition, in many developing countries.

As discussed earlier and illustrated in figure IV, unexpected changes can occur at all links of the causal hazard chain. They can be endogenous or can arise from external impacts. The complexity of major hazard industries requires a general systems approach to management, with a central role of feedback and feedforward (planning) mechanisms. Profitable system operation will then depend on continuous adaptation to change, based upon a general framework that enables managers at lower levels to develop their own detailed rules of conduct (see Rasmussen and Batstone, 1991). In this sense, disciplined control of changes is the key to effective risk management.

With this perspective of change or development in mind, here five levels or stages of industrial development could be distinguished. To a certain extent, these conditions succeed each other when developing industrial activities. Below, for each of these stages a number of risk-control measures are highlighted. Although many measures to identify, to assess and to reduce safety risks are relevant at all stages of industrial development, some are particularly suitable at one particular stage. This is expressed in a clear way by table 9 (Inter-Agency Project, 1992) for the various techniques of hazard assessment.

Typically, most attention is being devoted to the stages of design and operation. However, some of the most serious industrial accidents were catastrophic because insufficient attention was paid both by public authorities and industries to the other stages of industrial safety.

A. Design

It is a common understanding that, by and large, risks are determined by the level of attention paid to the various risk factors during the design process. However valid this belief, it only holds in practice if, in fact, the design allows the management to operate the plant with the necessary flexibility to respond to both on-site and off-site changes. Therefore, when designing a given level of industrial safety, both technical (engineering) and organizational measures should be considered.

Illustrative measures *:

- Apply the appropriate standard techniques for assessing the major hazards.
- Check layout preferences against requirements to separate adequately inherent reactive functions or items of equipment. Include zoning requirements in project proposals if necessary.
- Identify those operational tasks that, because of their relationship to the prevention of accidents, should be subject to specific management controls.
- Compare designed operation with existing public (legal) and private (corporate) standards and anticipate significant future changes towards stricter norms.
- Evaluate demands from other areas, in particular ecology, and assess their simultaneous impact on the cost-effectiveness of technologies that reduce safety risks (principle of integrated environmental planning).
- Against the background of the expected lifetime of the plant, consider the various alternatives of in-process vs. end-of-pipe solutions to reduce safety (and environmental) risks.
- Communicate with financial institutions which (ought to) take into account the amount of resources needed to comply with public safety requirements as well as corporate safety policy.
- Submit the application for a license according to national and corporate requirements. To facilitate understanding and increased commitment, distinguish as much as possible between basic information (simplified reporting) and technical detail (appendixes).

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* The measures listed do not represent any preferred order of application.

In addition, anticipate measures of chapter IV.D.

B. Construction, start-up and operation

A great number of measures must be taken to assess whether the proposed industrial facility can be operated at the required levels of safety. They range from the testing of components to the idle operation and, finally, to the operation of the entire plant under full load. Although at this stage technical measures are paramount, organizational provisions have to be made as well in order to establish the proper foundation for continuing safe performance.

- Purchase certified equipment when critical to the safety of the plant.
- During construction, conduct tests of all components, controls and safety devices considered crucial to achieve safe operation.
- Develop explicit operating procedures, including how to behave with respect to foreseeable emergencies (for example, shut-down).
- Establish internal quality assurance system, extending from product quality to the quality control of the manufacturing processes. Identify possible trade-offs between workers' safety and consumer/customer product demands.
- Draw up an emergency plan and establish the necessary personal links with relevant institutions (police, fire, medical, transport, nearby hazardous installations, media etc.)
- Develop a financial policy (for example, insurance) to account for any claims following major accidents.
- Implement "workers right to know" and "workers need to know" programmes. A special safety officer or safety committee should be assigned with the proper responsibility (for example, the power to block proposed operations for safety reasons) and should be protected against prejudice.
- Incorporate safe behaviour into all employees' performance reviews.

In addition, anticipate measures of chapter IV.D.

C. Transport to and from the premises

No single plant or operation stands on its own. Each is linked to its surroundings, and each of these off-site links may contribute to the on-site safety behaviour. Not only the transportation of materials and equipment to and from the plant (as in the case

Table 9. Range of applications of hazard/risk assessment techniques in process industries

	Site selection/early design stage	Design stage of new plants	Operational stage of new and existing plants	Modification to existing plants
Process system check-list	B	B	A	B
Safety audit/review	C	C	A	C
Dow and Mond hazard indices	C	B	A	C
Preliminary hazard analysis	A	C	C	A
Hazard operability studies	C	A	B	A
"What if" analysis	A	C	B	A
Failure mode and effect analysis	C	A	A	B
Fault tree analysis	C	A	A	B
Event tree analysis	C	A	A	B
Cause-consequence analysis	C	B	A	B
Human reliability analysis	C	A	A	B

Note: A = Best suited C = Could be used D = Least suited

Source: Inter-agency Project, 1992

of hazardous waste removal) establish such links, but there is often a steady flux of (sub)contractors who are commissioned to work at the plant. A number of measures exist which should reduce and limit the risks originating from these links with "outside" sources.

Illustrative Measures:

- Select only (sub)contractors with good performance records who adhere to prescribed safety requirements.
- Communicate precautionary and preparedness measures on a standard basis to (sub)contractors and visitors who may come near hazardous processes.
- Establish a clear-cut liability between company and (sub)contractor/supplier for damage in case an accident occurs.
- Develop a system of product stewardship stimulating the transfer of safety information throughout the chain of suppliers/customers.

In addition, anticipate measures of chapter IV.D.

D. Aging and shut-down

In general, the management of safety risks during the aging stage of industrial activity boils down to the updating and/or repeating of the steps described in chapter IV, A-C. However, as aging often goes unnoticed, the implications of major changes in the plant design go unheeded and attention to safety is likely to fade away. Such major changes are, for example, the extension of a facility with new units; the repair and/or modification of existing equipment; the operation of a plant at loads exceeding the designed capacity, e.g. during periods of high stress due to special production demands; and, not least important, major changes may occur in the organizational structure of the operations.

Illustrative Measures:

- Keep good records of plant performance in general and of the handling of hazardous substances in particular.
- Adopt strict incident reporting rules and guarantee that it is followed by proper investigations.
- Allow regular inspections and testing of components, especially those that are critical to safety.
- Carry out maintenance programmes.
- Periodically review safety performance (auditing).
- Cooperate with the licensing authorities when deciding about which modifications require notification or renewing of permits.
- Provide adequate training and education to company personnel on safety and emergency matters. Cross-posting of line managers to HSE staff should be implemented to the extent possible.
- Support the "right-to-know" of surrounding communities; communicate on behaviour to adopt in case of an emergency and approach residents as true neighbours.
- Contribute to the firm establishment of institutions, professionally or otherwise, that are devoted to the cause of safe operation.

In addition, anticipate measures of chapter IV.D.

E. Altering surroundings

More often than not the physical surrounding will gain a completely different appearance during the lifetime of a plant. For example, housing may have encroached on the facility's boundary (which behaviour, for example, was at the root of the disasters in Mexico City, 1984 and Bhopal, 1984). The direct consequence of such indirect off-site changes is that with no technical changes at the plant site (and often with not much company input in those off-site developments!) the safety risks of the plant operation will have increased considerably.

Illustrative Measures:

- Formulate a corporate zoning policy. Anticipate relocation if off-site developments appear to be beyond influence.
- Stimulate the establishment of the necessary infrastructure and, to that end, share responsibilities with the public authorities.
- Communicate actively with local authorities and media on the dangers of uncontrolled physical planning (that is,the necessity of zoning distances).
- Develop community awareness programmes and actively provide access to safety information: Comprehensive, Correct, Clear, Credible and Consistent (the traditional 5 C's).

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Annex

MAJOR INTERNATIONAL PROGRAMMES ON THE ASSESSMENT AND MANAGEMENT OF INDUSTRIAL RISK*.

OECD: High Production Volume Chemicals Programme (in collaboration with the European Commission, UN International Programme on Chemicals Safety, UNEP and the International Register of Potentially Toxic Chemicals - IRPTC).

This programme is based upon joint research by governments and industries in 24 OECD member countries.

Objective: Assessing available information and, wherever necessary, conducting additional research to develop SIDS (Screening Information Data Sets) on potential hazards of about 1500 chemicals that are produced in high volumes (1000 tonnes/year globally or 10 tonnes/year nationally).

Contact: OECD, Chemicals Division.
2 Rue André Pascal, 75775 PARIS Cedex 16. France.

OECD, Guiding Principles for Accident Prevention, Preparedness and Response (1992)

These guidelines will be the basis of Recommended Actions to the 24 member states on the prevention of accidents etc., including special issues of investments and aid programmes related to hazardous installations in non-OECD countries.

Objective: To provide a comprehensive description of the roles and responsibilities of parties concerned with the prevention of risks of major industrial accidents, that is,government authorities, management of hazardous installations, workers at the installation and the potentially affected public.

Contact: OECD, Chemicals Division.
2 Rue André Pascal, 75775 PARIS Cedex 16. France.

UNEP: International Register of Potentially Toxic Chemicals (IRPTC; established in 1976).

IRPTC is covering data from well over 100 countries. A PC-version to access the register is in preparation.

Objective: To provide easy access to carefully scanned information on effects of chemicals on man's health and his environment (a.o., pathways into the environment; eco- and zootoxicity; waste management; (inter)national recommendations and legal mechanisms for the control of chemicals).

Contact: UNEP/IRPTC, Palais des Nations, 1211 GENEVA, Switzerland.

UNEP: Awareness and Preparedness for Emergencies at the Local Level (APELL, launched 1987).

Objective: To provide a detailed and stepwise guidance at the community level to contingency planning and emergency response concerning industrial accidents.

Contact: UNEP-Industry and Environment Office, Tour Mirabeau, 39-43 Quai André Citroën, 75739 PARIS Cedex 15, France.

ILO: Prevention of Major Industrial Accidents. An ILO Code of Practice (first published in 1991).

If this Code of Conduct is approved at the 1992-ILO convention, ratification by ILO member countries should follow. This ILO Code has been developed in parallel to the OECD Guiding Principles. They are similar in scope and consistent with each other. Only minor differences exist in the subjects covered. The ILO Code has as its clear focus the concrete major hazard control system at the works level: what are its components and what is needed to make it work? In turn, the OECD Principles pay greater attention to indirect conditions such as R&D, international investment and transfer of technology.

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* For information on international programmes established by industry contact: For USA: Chemical Manufacturers Association (CMA), 2501 Str. NW, WASHINGTON (D.C.) 20037, USA. For Europe: Conseil Europeen des Federatioins des Industries Chimiques (CEFIC), Avenue E. van Nieuwenhuyse 4, 1160 BRUSSELS, Belgium.

Objective: To provide guidance in the setting up of an administrative, legal and technical system for the control of major hazard installations.

Contact: International Labour Office, CH 1211 GENEVA,Switzerland.

WHO, ILO, UNEP: International Programme on Chemical Safety (IPCS)

Objective: To strengthen the national capabilities for safer use of chemicals.

Contact: WHO (Attn. Mr. Mercier), Div. of Environmental Health, 20 Avenue Appia, 1211 GENEVA 27, Switzerland

UNEP, WHO, IAEA, UNIDO: Procedural Guide for Risk Management for Large Industrial Areas Involving Complex Energy Systems.

Objective: To provide a compilation of procedures and techniques with which to address both health, safety and environ mental aspects in an integrating manner when developing industrial activities at regional scales. This Inter-Agency project offers a practical guide to regional planning bodies when setting priorities regarding the construction of facilities, waste disposal, transportation of hazardous waste etc.

Contact: IAEA. (Attn: Mr. S. Haddad) PO Box 100, 1400 VIENNA, Austria.

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Multi-national producer of salt, chlorine and chlorine based products, especially chemicals, paints and varnishes, pharmaceuticals, polymers and manmade fibres. Within the industry/environment sector, offers specialized competence in industrial safety, risk analysis and combustion of chemical waste.

BCIRA: Environmental Consultancy Services
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United Kingdom
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Research centre providing advice to members on all aspects of the working environment in foundries and of external pollution arising from metal casting. Also undertakes tasks on a consulting basis.

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Phone: (081)3975141, Telex: 929612 BORAXC G, Fax: (081)3915744
Consulting firm undertaking research on general inorganic chemistry with particular reference to: boron; ceramics and glass; corrosion inhibition; fire prevention; agro-chemicals; mineral processing; mineralogy; nonferrous metals; wood preserving.

British Steel plc
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9 Albert Embankment
London SE1 7SN
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Phone: NA
Commercial firm involved in all process stages of iron and steel production. Industry and environment concerns include: reduction of benzol emissions; coke production; waste utilization; dust pollution from steel making and coke processing; biological effluent treatment; energy saving; recycling; research and development related to pollution control, waste management and industrial safety.

British Textile Technology Group (BTTG)
Shirley Towers
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United Kingdom
Phone: (061)4458141, Telex: 668417, Fax: (061)4349957
Consulting firm undertaking studies related to: manmade fibres, polymers, textiles, clothing (including protective clothing); gas and liquid filtering; water management; effluent treatment; dust and noise pollution and reduction; industrial safety especially with regard to chemicals, microbial contamination and geo-textiles.

Centre Technique du Bois et de l'Ameublement (CTBA)
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Research centre specialized in the area of wood and wood products technology with experience on industrial safety, product safety and toxicity.

Centro Nacional de Informacion y Documentacion
C/Dulcet s/n
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Collects and disseminates information. Topics include: security standards in work-places; industrial security; industrial health; ergonomy; toxicology; labor psycho-sociology; training; legislation; sanitation.

Chemical Industry Institute of Toxicology
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Research centre studying toxicological problems related to industrial safety and product safety. Involved in the manufacture, handling, use and disposal of chemicals, pharmaceuticals and consumer goods.

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Federal research and test centre which carries out (mostly as contractual work) materials testing and research. Consists of a large number of departments and sub-departments with specialized competence in: metallurgy; building materials; plastics; textiles; leather; industrial safety engineering; wood technology; transport of hazardous goods; fire prevention; noise. Has a major publications programme, including seven journals.

Hazelton UK
Otley Road
Harrogate
North Yorkshire HG3 1PY
England
Phone: 0423500011, Telex: 57735, Fax: 0423525620
Consulting firm offering laboratory services and analysis of pharmaceuticals, agro-chemicals and other industrial chemicals, consumer goods and other potentially hazardous substances. Undertakes residue analysis of pesticides, pharmaco-kinetic studies, environmental fate studies and other studies and analyses related to industrial safety and product safety.

Industrial Toxicology Research Centre
Mahatma Gandhi Marg
P.O. Box 80
Lucknow, 226001
Uttar Pradesh
India
Phone: 241856/248227, Telex: 0535-456 ITRC IN
Research centre studying industrial toxicological hazards, including environmental effects of industrial toxins in agriculture, mining and industry. Undertakes safety evaluation of chemicals.

Institution of Chemical Engineers (ICHEME)
Davis Building
165-171 Railway Terrace
Rugby CV21 3HQ
United Kingdom
Phone: 78857214, Telex: 311780, Fax: 788560833
Professional organization and learned society working to develop the chemical engineering profession, including industrial safety and environmental concerns. Offers training programmes, publishes journals and books and maintains information centre. Publishes Safe Handling of LPG: No. 1: Pressurized Bulk Storage and Road and Rail Loading.

International Labour Organization (ILO/CIS)
4 route des Morillons
CH-1211 Geneva 22
Switzerland
Phone: 996111, Telex: 22271 BIT CH
Provides information on occupational safety and health in working conditions. Topics include: occupational medicine; ergonomics; safety; safety education; toxicology; air pollution; noise abatement; wastes; risks; pathology; industrial toxicology; accident prevention; fires and explosions; chemicals; statistics; legislation; control; industries and professions.

National Institute of Hygiene
00-791 Warszawa
ul. Chocimska 24
Poland
Phone: NA, Telex: t816712 PZH pl
Research centre on: pollution effects; environmental degradation; environmental impact assessment; health; formulation of environmental standards; industrial safety; product safety; environmental effects of pesticides.

Technica Ltd.
Lynton House
7/12 Tavistock Square
London WC1H 9LT
United Kingdom
Phone: 44713882684, Telex: 22810 TECNIC G, Fax: 44713873550
Consulting firm specialized in: major hazards; industrial safety assessment; risk management; reliability studies; marine safety; transportation studies; environmental auditing; noise and vibration studies; nuclear safety; safety training.

2978 AROMATIC AMINES IN THE WORKPLACE ATMOSPHERE OF AN ALUMINUM SMELTER. [BIB-199201-23-0048]

Recently, there was an increased interest in the incidence of bladder cancer in the Al industry. A study was made to verify if aromatic amines, known to be bladder carcinogens, such as beta -naphthylamine, are present in the workplace atmosphere of a Soderberg smelter. A new and sufficiently sensitive method was developed to measure personal exposures to beta -naphthylamine. It is based on a 5% sulfuric acid impregnated filter to collect the amines and analysis by gas chromatography with mass selective detection after derivatization with pentafluoropropionic acid anhydride (PFPAA). Using this method, it was shown that coal tar pitch and pitch volatiles contain 3-30 ppm of beta -naphthylamine and therefore act as the source of amines. It was also shown for the first time that aromatic amines are present in the workplace atmosphere of Soderberg potrooms. Eight (8) h TWA concentrations ranged 1-410 ng/m^3 for beta -naphthylamine. Average ambient air concentrations varied from 1 up t0 23 ng/m^3. Graphs, Spectra. 12 ref. (Roussel, R.; Gaboury, A.; Lariviere, C.; LIGHT METALS 1991, New Orleans, Louisiana, USA, 17-21 Feb. 1991, Publisher: THE MINERALS, METALS & MATERIALS SOCIETY, 420 Commonwealth Dr., Warrendale, Pennsylvania 15086, USA, (1991), (Met. A., 9201-72-0039), pp. 503-507 [in English].)

2979 ZR_2 FE TRITIUM SCAVENGER BEDS. REPORT NO. 89-199-K. [BIB-199201-34-0056]

Tritium handling systems housed within secondary enclosures usually impose a chronic and an acute T load on the secondary treatment. This tritiated atmosphere requires a T scavenging treatment to ensure safe working conditions and to minimize T emissions to the outside environment. One viable and attractive option is to utilize a regenerable metal getter, Zr-Fe alloy (Zr_2Fe), to scavenge the T directly from the secondary atmosphere. This report documents the key aspects of 800 g and 5 kg Zr-Fe T scavenger beds, briefly describing them and their operating characteristics. (Kherani, N.P.; Shmayda, W.T.; Government Research Announcements and Index, (1990), MIC-91-04549/XAB, Pp 30 [in English]. ISSN 0097-9007)

2980 INTRODUCTION OF A NEW GENERATION OF POTROOM MOBILE EQUIPMENT AND THE EFFECTS ON WORKER EXPOSURE. [BIB-199201-42-0060]

Alcan's Kitimat smelter is a 268 000 MT/year vertical stud Soderberg operation situated on the north coast of British Columbia. Built in the 1950s and 1960s, it has cells of both Electrochemisk and Pechiney modified design running at 106 and 125 kA, respectively. In the early 1970s, the smelter was experiencing an annual turnover rate in its workforce of 80-90%. Working conditions were one factor in high turnover rates. The jobs were hot and physically demanding. Exposure to "tar" on a time weighted 8 h average was 0.5-0.8 mg/m^3 vs. a TLV of 0.2 mg/m^3. Dust exposures were 5-20 mg/m^3, generally below the TLV, but far exceeding the expectations of the workforce. Productivity overall was below industry norms and fluoride losses were such that anticipated permit levels for external emissions were being exceeded by 50%. The focus here is on the evolution of mobile equipment and what can be realized in reduced worker exposure to potroom contaminants. (Burton, D.; Schooling, B.; LIGHT METALS 1991, New Orleans, Louisiana, USA, 17-21 Feb. 1991, Publisher: THE MINERALS, METALS & MATERIALS SOCIETY, 420 Commonwealth Dr., Warrendale, Pennsylvania 15086, USA, (1991), (Met. A., 9201-72-0039), pp. 517-519 [in English].)

2981 REGULATORY IMPEDIMENTS TO THE USE OF THE BENEFICIAL VALUES OF SPENT POTLINER FROM ALUMINUM REDUCTION FACILITIES. [BIB-199201-42-0061]

The US Envornmental Protection Agency (EPA) listed spent potliner, a byproduct of primary Al production, as a hazardous waste under provisions of the Resource Conservation and Recovery Act (RCRA) in September 1988. Virtually all of the technologies utilized by the industry to reclaim and reuse spent potliner ceased as a result of the hazardous listing. Instead, spent potliner is being landfilled and/or stored in buildings. Valuable resources are being squandered—the energy and material values of spent potliner, and hazardous waste landfill capacity. Some of the regulations that serve as disincentives to recycling a byproduct, such as spent potliner, which has valuable energy and material values, are examined. 47 ref. (Goldman, J.H.; LIGHT METALS 1991, New Orleans, Louisiana, USA, 17-21 Feb. 1991, Publisher: THE MINERALS, METALS & MATERIALS SOCIETY, 420 Commonwealth Dr., Warrendale, Pennsylvania 15086, USA, (1991), (Met. A., 9201-72-0039), pp. 521-526 [in English].)

2982 HYGIENE EVALUATION OF FOUNDRY DUST EMISSION. [BIB-199201-51-0069]

Previously abstracted from original as item 9102-51-0323. Dust content at various operations of casting production was determined. The dust at various plant locations was analyzed for free SiO_2, Al_2O_3, MnO, CaO, FeO and carbon. (Ermolenko, A.E.; Gladkova, L.S.; Kravchenko, O.K.; Soviet Castings Technology, (May 1990), (5), pp. 33-35 [in English]. ISSN 0891-0316)

2983 901 LIQUID CARBURIZING AGENT AND ITS APPLICATION EFFECTS. [BIB-199201-56-0051]

Recently developed 901 liquid carburizing agent is a new carburizer. By the production test for parts of bicycles, sewing machines, chains, etc. made from B2, B3, 20 steels, the results proved that 901 liquid carburizing agent has many advantages, such as nonpoisonous, nonpolluting, less slag, high efficiency, energy saving, easy for operation and low cost, so it can be substituted for the cyanide salt and 603 liquid carburizing agent. Graphs, Photomicrographs. 4 ref. (Zhang, S.; Yang, G.; Dai, R.; Lin, Y.; Zhao, J.; Heat Treatment of Metals (China), (Oct. 1990), (10), pp. 17-19 [in Chinese]. ISSN 0254-6051)

2984 CORROSION PREVENTION AND CHROMATES, THE END OF AN ERA? [BIB-199201-57-0080]

The aircraft industry, one of the world's largest metal finishing industries, provides a good example of the impact metal finishing can have on the environment with the contaminants it produces—Cr, Ni, Cu, Pb, Zn, EDTA, phosphate and ammonia. The chromate ion is an excellent corrosion inhibitor, and it is used as a paint pigment, in chromate conversion coatings (CCC), for etchants and wash primers, and in sealing anodized and phosphate coatings. The chromates are both highly toxic and carcinogenic. Because of the health risks and inevitable government legislation associated with the application of chromate containing solutions and paints and their disposal, many changes will need to be made by the metal finishing industry during the 1990s. Options considered in the chromate usage include: introduction of safer work and handling procedures; reducing Cr_{6+} to Cr_{3+} for disposal; using application techniques which eliminate chromate containing waste such as a dry-in-place technology; and alternatives to chromate usage including molybdate conversion coatings and pigments, permanganate conversion coatings, and rare earth metal salts. The alternative coatings are reviewed in terms of their use for Al alloys (e.g. 7075); however, the concepts involved are applicable to a wide range of metals and alloys. Graphs. 47 ref. (Hinton, B.R.W.; Metal Finishing, (Sept. 1991), 89, (9), pp. 55-61 [in English]. ISSN 0026-0576)

2985 EXPOSURE TO MERCURY VAPOR DURING SETTING, REMOVING, AND POLISHING AMALGAM RESTORATIONS. [BIB-199202-34-0123]

The level of Hg vapors in the oral cavity was determined by analyzing 242 samples of intra-oral air before and after removing, setting, and polishing Dispersalloy dental amalgam. The analysis was effected using atomic absorption spectrometry in cold vapors with the detection limit of 6 μg/m^3. A score of one to three was assigned to each restoration to adjust the differences of the amalgam sizes. It was shown that the vapor was released during any procedure: removing, setting, and polishing amalgam. The mean levels were 85-326 μg/m^3. However, before the restorative procedures, no Hg vapors had been detected in the oral cavity. A significant direct correlation between Hg vapor concentrations in intra-oral air and the sizes of amalgam restorations during each procedure (removing, setting, and polishing) was demonstrated. The statistic analysis showed no significant difference of Hg vapors in the oral cavity between the use or nonuse of water coolant during amalgam polishing. Graphs. 21 ref. (Haikel, Y.; Gasser, P.; Salek, P.; Voegel, J.C.; Journal of Biomedical Materials Research, (Nov. 1990), 24, (11), pp. 1551-1558 [in English]. ISSN 0021-9304)

2986 METAL SPLASH: A MAJOR HAZARD IN DIE CASTING AND FOUNDRIES. [BIB-199202-51-0317]

Working with molten metal (e.g. Al) in a die casting shop or foundry is serious business and involves many hazards. By being aware of the dangers and taking appropriate steps, managers can reduce risks associated with foundry work. The

three primary ways to protect workers from molten metal are distance, protective barriers, and safety clothing. The protective measures are discussed. (Turner, R.; McKelvie, J.; Die Casting Management, (Aug. 1991), 9, (4), pp. 23-25 [in English]. ISSN 0745-449X)

2987 HOW ENVIRONMENTAL AND WASTE DISPOSAL ISSUES INFLUENCE FORMULATION OF FORMING LUBRICANTS. [BIB-199202-52-0341]

Hazardous waste characteristics include ignitability (flash point 60 °C), corrosivity (pH 12.5), reactivity (potential for forming harmful vapors or for explosion), and toxicity (capability to leach hazardous material into the water table). Chlorine in the form of chlorinated paraffin is a widely used extreme pressure lubricant additive. The Cl in the wax, under the heat and pressure of the forming or stamping operation, reacts with metal surfaces to form iron chloride which acts as a physical barrier to prevent metal-to-metal contact. Chlorinated paraffin is not currently listed or considered a hazardous material by the US EPA. In November of 1985, the EPA had proposed to list all used oil, including used lubricants, as hazardous waste, but reconsidered and currently classifies used oils as nonhazardous. If and when the EPA changes its classification of used oils, synthetic stamping and forming fluids may become alternatives. Systems which split waste into a solid which can go to an approved landfill and water which is acceptable to public operated treatment works and ultrafilter wastes to concentrate them reduce waste disposal costs. (Klann, R.; WORLD-CLASS PRODUCTIVITY. VOL. 1, NO. 2, Chicago, Illinois, USA, 10-13 Mar. 1991, Publisher: PRECISION METALFORMING ASSOCIATION, 27027 Chardon Rd., Richmond Heights, Ohio 44143, USA, (1991), (Met. A., 9202-72-0086), pp. 529-537 [in English].)

2988 THE COST OF LEAD PAINT REMOVAL: ACHIEVING REALISTIC BID PRICES. [BIB-199202-57-0301]

Often during the bidding for Pb paint removal, the cost of the new systems is not fully understood by the estimating engineer, resulting in inadequately funded projects and rejected bids. At other times, the contractor who lacks sufficient experience in the work grossly underestimates the project costs and is forced to default or attempts to perform the project and fails, leaving the industry with a bad mark. A review analyzes the costs of the new Pb paint removal systems by examining the blasting, priming, and containment aspects of painting bridges. The calculation of costs involves a model that uses the size and type of crew, numerous other factors such as equipment and material costs, and the productivity that will apply to the work. A review of the model covers a productivity graph, productivity limits, and recyclable vs. conventional abrasive. A consensus guide for specifying containment complied by the SSPC is covered. Graphs. (Lyras, L.G.; Journal of Protective Coatings & Linings, (July 1991), 8, (7), pp. 56-63 [in English]. ISSN 8755-1985)

2989 MULLITE WHISKER FELT AND ITS APPLICATION IN COMPOSITES. [BIB-199202-62-0224]

The Naval Surface Warfare Center has developed a process for the in situ preparation of 80% porous mullite whisker felt which consists of randomly oriented whiskers mutually intergrown, forming a rigid structure. The felt can be used as pre-forms for the preparation of metal and ceramic matrix composites. The patented process involves mixing and shaping the powdered precursors followed by firing to form in situ the mullite whisker felt. The powders can be shaped by any conventional process. An advantage of the process is the elimination of health hazards associated with loose respirable whiskers. The low dimensional changes of the final felt compared with the green shapes are a valuable feature for the preparation of near-net shape composite preforms. Methods for infiltration of the felt with cast Al alloy A356 and properties of the composites will be discussed. Graphs, Photomicrographs. 7 ref. (Haught, D.; Talmy, I.; Divecha, D.; Karmarkar, S.; INNOVATIVE INORGANIC COMPOSITES SYMPOSIUM, Detroit, Michigan, USA, 8-11 Oct. 1990, Materials Science and Engineering A, (1 Oct. 1991), A144, pp. 207-214 [in English]. ISSN 0921-5093)

2990 OSHA RELEASES GUIDELINES FOR WORKING WITH LEAD. [BIB-199202-71-0042]

The text is a reprint of a booklet entitled "Working with Lead in Construction", published in April 1991 by the Occupational Safety and Health Administration (OSHA) and the National Institute for Occupational Safety and Health. The booklet offers guidance on proper measures to be taken to protect painters, blasters, welders, iron workers, plumbers, electricians, carpenters, and other construction workers when working with or near Pb. The booklet provides guidelines for proper engineering controls, work practices, and administrative controls to protect workers from the hazards of exposure to Pb. A review of guidelines for working with Pb in the construction industry covers: health effects of Pb, exposure monitoring, engineering and work practice controls, respiratory protection, protective equipment, safe work practices, training, hazard communication, multi-employer worksites, medical monitoring, medical evaluations, periodic exams and/or biological monitoring, job transfer or termination, medical removal and chelation, and related OSHA requirements. 5 ref. (Journal of Protective Coatings & Linings, (July 1991), 8, (7), pp. 44-55 [in English]. ISSN 8755-1985)

2991 INDUSTRIAL ROBOT WITH TWO ARMS IN PYROMETALLURGY PROCESS. [BIB-199203-42-0236]

An industrial robot which has two arms and is used for the operation of pyrometallurgy process for beryllium alloy production has been developed. The robot can grasp tools to simulate the worker's hands to agitate high temperature smelting copper beryllium alloy and scoop up the slag from the surface of alloy. Workers are released from the high temperature and poisonous dusty working environment by using the robot. This is one of the industrial robots which work in a hazardous environment. 5 ref. (Li, T.; Li, Y.; JOURNAL OF CENTRAL-SOUTH INSTITUTE OF MINING AND METALLURGY (CHINA), (26 AUG. 1991), 22, (4), pp. 437-447 [in Chinese]. ISSN 0253-4347)

2992 VENTILATION AND AIR POLLUTION CONTROL. [BIB-199203-58-0374]

The purpose of exhaust systems is discussed. The nature of contaminants which emanate from open surface metal finishing tanks and the types of exhaust systems which are available for use in this industry are reviewed. Air contaminants fall into three categories—gases, vapors, and mists. These include hoods, duct systems, and exhaust fans. The primary function of the system is to protect workers against potentially toxic and irritating airborne contaminants generated in the workplace. In addition, a properly functioning exhaust system will also prolong the life of corrosion susceptible plant components and equipment. Permissible exposure limit (PEL) levels mandated by the US Occupational Safety and Health Administration (OSHA) and threshold limit values (TLV) recommended by the American Conference of Governmental Industrial Hygienist (ACGIH) are noted. A table listing OSHA and ACGIH PELs and TLVs for substances that could potentially be emitted from metal finishing open surface tank operations is provided. Tables commonly employed in the design of exhaust systems for new installations are also included. (METAL FINISHING, (MID-JAN. 1991), 89, (1A), (Guidebook Directory), pp. 685-686, 688-698, 700-704, 706-710, 712-720 [in English]. ISSN 0026-0576)

2993 ZINC RECOVERY IN THE STEEL INDUSTRY: NEW PROCESS DEVELOPED IN OHIO. [BIB-199204-42-0264]

Armco Steel Company, Middletown, Ohio, and Honda of America Manufacturing, Marysville, Ohio, have been cooperating in experiments to remove Zn from galvanized steel scrap. The initial results of the research effort show promise in a method of reducing hazardous wastes, promoting recycling, and protecting limited natural resources in the steel industry. Experiments using compacted bales of Zn coated scrap steel from Honda's stamping operations have been underway at a pilot plant at Armco's research and technology center. There, researchers have successfully removed 80% of the Zn from the scrap steel bales, using the proprietary process. The steel is "clean" enough to be recycled, but the goal is to remove up to 90% of the Zn. The companies are investigating the elevated levels of Zn and other materials associated with galvanized coatings, such as Pb and Cd, that can cause the normally non-hazardous dust produced while recycling the coatings on steel to be classified as hazardous under EPA guidelines. (PLATING AND SURFACE FINISHING, (MAY 1991), 78, (5), pp. 104-105 [in English]. ISSN 0360-3164)

2994 STOP METAL DERMATITIS BEFORE IT STARTS. [BIB-199204-53-0225]

During machining, increasingly higher concentrations of very fine metal particles accumulate in working coolants. Continuous exposure to these cutting fluids can produce sensitivity to specific metals. Three common causes of dermatitis

are given, including Cr, Ni, and cobalt. Prevention tips are given. (Bennett, E.O.; MANUFACTURING ENGINEERING, (AUG. 1991), 107, (2), pp. 36-37 [in English]. ISSN 0361-0853)

2995 EVALUATION OF ATMOSPHERE AT OPERATORS' POSITION WHEN GAS METAL ARC WELDING, GAS TUNGSTEN ARC WELDING AND PLASMA ARC CUTTING SELECTED ALUMINUM ALLOYS. [BIB-199204-55-0550]

Investigations of atmospheric emissions generated during gas metal arc (GMA) welding, gas tungsten arc (GTA) welding and plasma arc cutting (PAC) of selected Al alloys were conducted in a non-ventilated work area employing an instrumented mannequin in a typical operator's position. One wrought alloy, 2090 (Cu,Li) and one cast alloy, A356.0 (containing various levels of beryllium and one containing Sb) were welded with 2319, 1100, and 4043 filler wire, respectively. 2090 plate was selected for the plasma arc cutting study. GMA welding of 2090 alloy with 2319 and 1100 filler wire resulted in outside the helmet welding fume exposure of 42.0 mg/m^3 and 27.4 mg/m^3, respectively. GTA welding of 2090 alloy with 2319 filler wire yielded an outside the helmet welding fume exposure of 0.57 mg/m^3. The maximum ozone level for the above three combinations was 0.22 ppm at the outside helmet location. Oxides of nitrogen, in general, were not detected. For GMA welding of A356.0 cast alloy plate, three levels of Be (0.008, 0.006, and 0.002%) were investigated. Using a 4043 alloy filler wire, the level at which Be ceases to be emitted into the atmosphere is approx 0.002% in the base plate as evidenced by sets O and P. Antimony emission was also investigated by adding 0.19% to the A356.0 casting containing the least amount of Be. No Sb was detected following analysis of the fume generated during this GMA welding process. Total fume for this particular series (A356/4043) ranged from 2.9-14.5 mg/m^3 at the outside helmet location, while a maximum ozone level of 5.75 ppm was observed, also at the outside sampler location. Again, no significant (detectable) levels of nitrogen oxides were observed. Plasma arc cutting of 0.5 in. 2090 plate produced similar fume levels inside and outside of the helmet (approx 3.4 mg/m^3). Ozone levels were 0.79 ppm inside the helmet and 2.03 ppm outside the helmet. Extremely high amounts of nitrogen oxides were generated during this process. Inside the helmet, 54.5 ppm nitrous oxide and 17.5 ppm NO_2 was detected while 68.5 ppm NO and 25.5 ppm NO_2 was detected outside of the helmet. In all the studies involving 2090 alloy, the presence of Li or Cu in the atmosphere does not appear to be significant when compared to the amount of total fume evolved. In all cases studied, aluminum oxide comprised major portions of the total fume. Graphs. 5 ref. (Grimm, R.E.; Milito, R.A.; Publisher: ALCOA TECHNICAL CENTER, Alcoa Center, Pennsylvania 15069, USA, (15 OCT. 1990), Pp 101 [in English].)

2996 ETCHING OF IRON WITH FERRIC CHLORIDE SOLUTION AS A MODEL FOR A TECHNICAL AND ECONOMIC COMPARISON OF THREE SPENT ETCHANT REGENERATION SYSTEMS. [BIB-199204-57-0532]

Compliance with environmental legislation and recycling of waste products are now extremely important aspects of manufacturing, especially in the field of chemical machining. Aqueous ferric chloride solution is the most frequently used etchant in photochemical machining as it is versatile, cheap and relatively innocuous. Three methods of chemically regenerating waste ferric chloride solution that has been used to etch Fe are compared and contrasted from both economic and technical viewpoints. Important parameters that determine the most economic regeneration method are the amount of metal dissolved, the cost of electrical power, and the cost of waste disposal. This last parameter is predicted to increase considerably over the next few years and is therefore of paramount importance in choosing a regeneration system that will be cost-effective in the future. Graphs. 17 ref. (Allen, D.M.; PROCESSING OF ADVANCED MATERIALS, (JUNE 1991), 1, (2), pp. 69-75 [in English]. ISSN 0960-314X)

2997 USING FLUORINATED SURFACE-ACTIVE COMPOUNDS FOR PROTECTING THE ENVIRONMENT AGAINST HARMFUL EMISSIONS IN CHROME PLATING. [BIB-199204-58-0574]

Previously abstracted from original as item 9202-58-0215. Application of surfactants for environmental protection from toxic substances evolved during Cr plating was studied. Effectiveness in reduction of chromium oxide emissions into the atmosphere was determined. The most effective conditions for reduction in toxic compounds release were determined. Graphs. 5 ref. (Plaskeev, E.V.; Ovsyannikova, L.V.; Bezhanova, V.V.; Kurdykova, E.A.; Mikheeva, N.I.; PROTECTION OF METALS (USSR), (MAR.-APR. 1991), 27, (2), pp. 266-268 [in English]. ISSN 0033-1732)

2998 THE ALUMINAS AND HEALTH. [BIB-199205-45-0556]

Since most sites of absorption from the gastrointestinal tract exist at a near-neutral pH range, aluminas usually are poorly absorbed after oral ingestion. However, under appropriate conditions, inhalation of fine particulate forms may potentially present a relatively more significant site of absorption and/or local damage. Nevertheless, numerous studies of occupational exposures to aluminas in Al refining, smelting, and the pottery industry repeatedly indicate that all the aluminas per se are essentially inert in the lungs; but, because several experimental studies in animals have indicated that specific aluminas may produce lung damage, there have been some continuing health concerns. A critical examination of these data indicates that there had been inconsistent physical characterization and identification of the these aluminas; this reflects, in part, earlier confusion among physical scientists revolving about the identification of " gamma " aluminas. The other factors contributing to this confusion stem from the use of differing types of experimental models which hold differing implications. When a catalytically active, ultrafine (0.02-0.04 μm) alumina, probably the low-temperature range eta transitional Al_2O_3 (identified erroneously as gamma Al_2O_3) is administered directly into the lungs of animals, it produces severe fibrosis. Similarly, when extremely fine (0.02 μm), gelatinous boehmite particulate possessing no catalytic activity is administered directly into lungs of animals, it too causes slightly less serious lung damage than does the similar size low-temperature (eta ?) transitional Al_2O_3. When alpha Al_2O_3 ground to submicrometer size is placed in the lung, it produces a mild degree of lung fibrosis. Finally, when well-crystallized boehmite (gamma -AlOOH) with a small surface area is administered similarly, it is inert in the lung. It would appear in the direct lung insufflation experimental model that lung damage is a function of (1) surface area and surface thermodynamic instability and (2) catalytic reactivity associated with the transitional aluminas. But it is also apparent that the confusion regarding the implications of the " gamma " designation has contributed to doubts regarding alumina's bioreactivity. By contrast, it has now become apparent that when a catalytically active chi -transitional form is administered to animals by inhalation no pulmonary damage occurs. Further, when massive doses of gamma transitional alumina were administered by inhalation, a nonspecific response occurred characteristic of such large doses; however, this differed qualitatively from the nonreversible, more serious fibronodular pathology associated with the intratracheal insufflation studies. Finally, on the basis of specific human exposures to transitional aluminas produced as catalysts or adsorbents, to mixtures of higher temperature transitional aluminas increasingly used in modern smelters, and on the basis of exposure to alpha aluminas used in potteries, it appears that this full range of aluminas has little, if any, bioreactivity. Ultimately, evaluation of the human toxicity potential of environmental agents must consider both the experimental model systems and their limitations and human experience with similar agents. When considered in this fashion, it would appear that concerns revolving around alumina's pulmonary damage potentials are misplaced, since human exposure and models which more directly reflect such exposures do not result in the consequences seen with animal models associated with the artificial loading conditions. Graphs. 28 ref. (Dinman, B.D.; Publisher: THE AMERICAN CERAMIC SOCIETY, INC., 757 Brooksedge Plaza Dr., Westerville, Ohio 43081, USA, ALUMINA CHEMICALS: SCIENCE AND TECHNOLOGY HANDBOOK, (1990), (Met. A., 9205-72-0248), pp. 533-543 [in English].)

2999 THE MANAGEMENT OF OCCUPATIONAL HEALTH AND SAFETY PROBLEMS IN THE STEEL INDUSTRY. (RETROACTIVE COVERAGE). [BIB-199205-45-0564]

The influence which management should have to ensure a safe and healthy working environment is examined. Management initiatives should consider annual objectives, identify the safety responsibilities of individuals and create audit systems. Principle factors which affect management attitudes to occupational health and safety are social or personal, legal or quasi-legal, and economic. International organizations active in the field are identified. (Catton, J.A.; IISI-ILAFA-IBS SEMINAR ON OCCUPATIONAL SAFETY AND HEALTH IN THE STEEL INDUSTRY, RIO DE JANEIRO, BRAZIL, 19-21 APR. 1989, Publisher: INSTITUTO LATINOAMERICANO DEL FIERRO Y EL ACERO,

Casilla 16065, Santiago 9, Chile, (1989), (Met. A., 9205-72-0256), pp. 1/1-1/10 [in English].)

3000 ACTIVITIES FOR SECURING WORK SAFETY IN THE JAPANESE STEEL INDUSTRY. (RETROACTIVE COVERAGE). [BIB-199205-45-0565]

The Japanese steel industry's safety record during the past ten years is examined. To promote work safety, top management must maintain a strict attitude toward elimination of accidents. Second, safety and health should be incorporated into production activities. Third, workers should take the safety and health problem seriously and promote activities by the joint effort of the shop group. Specific safety practices at the Yawata Works of Nippon Steel are described. Graphs. (Isayama, T.; IISI-ILAFA-IBS SEMINAR ON OCCUPATIONAL SAFETY AND HEALTH IN THE STEEL INDUSTRY, RIO DE JANEIRO, BRAZIL, 19-21 APR. 1989, Publisher: INSTITUTO LATINOAMERICANO DEL FIERRO Y EL ACERO, Casilla 16065, Santiago 9, Chile, (1989), (Met. A., 9205-72-0256), pp. 2/1-2/11 [in English].)

3001 CONCEPTION OF SUCCESSFUL OCCUPATIONAL PLANT SAFETY. (RETROACTIVE COVERAGE). [BIB-199205-45-0566]

Mannesmann's occupational health and safety plan starts from the legal regulations which make the employers and the management responsible for industrial safety in the plants and obliges them to use safety personnel. The specialist requirements of safety personnel and strategies for converting operational results into decisions on measures to be taken are described. Accident prevention and risk evaluation are examined. Operational results concerning industrial accidents at Mannesmann are discussed. Graphs. (Schneider, B.; IISI-ILAFA-IBS SEMINAR ON OCCUPATIONAL SAFETY AND HEALTH IN THE STEEL INDUSTRY, RIO DE JANEIRO, BRAZIL, 19-21 APR. 1989, Publisher: INSTITUTO LATINOAMERICANO DEL FIERRO Y EL ACERO, Casilla 16065, Santiago 9, Chile, (1989), (Met. A., 9205-72-0256), pp. 3/1-3/16 [in English].)

3002 SELF-REGULATION AND PARTICIPATIONISM IN ARGENTINIAN STEEL COMPANIES. (RETROACTIVE COVERAGE). [BIB-199205-45-0567]

Because of the different sizes of Argentinian companies, their different production and technological systems and various organizations, the policy for carrying out diverse plans for the improvement of working conditions and environments is participative self-regulation. Study of international experience revealed that various forms of codetermination by way of official regulation were conditioned by the matters with which they dealt with and there was not one particular form of codetermination that can successfully solve all studied matters. For successful self-regulation, a break-even point between number of internal regulations and benefits must be determined. A company's management must identify opportunities for improvement and advance by practical formulas. (Mantilla, E.; IISI-ILAFA-IBS SEMINAR ON OCCUPATIONAL SAFETY AND HEALTH IN THE STEEL INDUSTRY, RIO DE JANEIRO, BRAZIL, 19-21 APR. 1989, Publisher: INSTITUTO LATINOAMERICANO DEL FIERRO Y EL ACERO, Casilla 16065, Santiago 9, Chile, (1989), (Met. A., 9205-72-0256), pp. 4/1-4/11 [in English].)

3003 GAS SAFETY IN THE STEEL INDUSTRY—AN OVERVIEW. (RETROACTIVE COVERAGE). [BIB-199205-45-0568]

The hazardous gas of primary concern in steel manufacturing is carbon monoxide. Coke ovens, blast furnaces, and most fuels can produce it. Oxygen deficient atmospheres may be caused when CO or inert gases such as nitrogen displace the O, when an operation involving the burning of some fuel consumes the O, or when biological decay consumes O. Other gases and vapors that may be encountered in steel manufacturing include SO_2, NO_2, hydrogen sulfide, benzene, toluene, and xylene. The basic elements of a gas safety program should include employee training and education, measurement and evaluation, development of detailed work practices, use of personal protective equipment, an emergency response plan, and a program audit. (Toca, F.M.; IISI-ILAFA-IBS SEMINAR ON OCCUPATIONAL SAFETY AND HEALTH IN THE STEEL INDUSTRY, RIO DE JANEIRO, BRAZIL, 19-21 APR. 1989, Publisher: INSTITUTO LATINOAMERICANO DEL FIERRO Y EL ACERO, Casilla 16065, Santiago 9, Chile, (1989), (Met. A., 9205-72-0256), pp. 5/1-5/9 [in English].)

3004 OTHER OCCUPATIONAL HEALTH PROBLEMS IN THE STEEL INDUSTRY. (RETROACTIVE COVERAGE). [BIB-199205-45-0569]

Hazards associated with asbestos include asbestosis, lung cancer, and mesothelioma. Cigarette smoking is felt to be the greatest preventable health risk and BHP, Australia, has introduced a strategy which aims to prohibit smoking at the workplace. Significant hazards are posed by alloy age, solvents, welding fumes, ionizing radiation, PCBs, and heat. Key health concerns associated with shiftwork are sleep disorders and gastrointestinal problems. Existing diseases such as diabetes mellitus, epilepsy, depressive disorders, and thyrotoxicosis are exacerbated by shiftwork. (Hart, R.W.; IISI-ILAFA-IBS SEMINAR ON OCCUPATIONAL SAFETY AND HEALTH IN THE STEEL INDUSTRY, RIO DE JANEIRO, BRAZIL, 19-21 APR. 1989, Publisher: INSTITUTO LATINOAMERICANO DEL FIERRO Y EL ACERO, Casilla 16065, Santiago 9, Chile, (1989), (Met. A., 9205-72-0256), pp. 6/1-6/10 [in English].)

3005 APPLICATION OF ERGONOMIC PRINCIPLES IN THE STEEL INDUSTRY. (RETROACTIVE COVERAGE). [BIB-199205-45-0570]

Ergonomics is concerned with the capabilities and limitations of human behavior in relation to design of machines, jobs, and other modifications of man's physical and organizational environment. It uses engineering concepts to analyze how people receive information through vision, hearing, touch, and other senses. A simplified model of a man-machine unit is described. Integration of occupational health services and ergonomics at Hoogovens IJmuiden is outlined. Ergonomics at the company is applied to installations and work stations in accordance with the physical dimensions of 95% of its working population. (Schinkel, H.; IISI-ILAFA-IBS SEMINAR ON OCCUPATIONAL SAFETY AND HEALTH IN THE STEEL INDUSTRY, RIO DE JANEIRO, BRAZIL, 19-21 APR. 1989, Publisher: INSTITUTO LATINOAMERICANO DEL FIERRO Y EL ACERO, Casilla 16065, Santiago 9, Chile, (1989), (Met. A., 9205-72-0256), pp. 7/1-7/13 [in English].)

3006 DEFINITION AND FOLLOW-UP OF THE OCCUPATIONAL CONDITIONS AND ENVIRONMENT IN ELECTRIC FURNACES. (RETROACTIVE COVERAGE). [BIB-199205-45-0571]

Conditions to which EAF operators are subjected to are variable throughout time, and the tasks to be performed are sometimes exchanged among some of the workers. Analysis of working conditions must be made considering lengths of time as short as necessary to take into account the changing conditions to which each of the operators is subject. Knowledge of the tasks to be performed when combined with the environmental conditions can be used to determine the thermal and load noise each operator is receiving. Medical parameters that can be monitored are cardiac rhythm, blood pressure, sublingual temperature, weight, liquid ingestion, and diuresis. A relief chart can schedule staff changes between positions or places. (Mentruyt, J.J.; IISI-ILAFA-IBS SEMINAR ON OCCUPATIONAL SAFETY AND HEALTH IN THE STEEL INDUSTRY, RIO DE JANEIRO, BRAZIL, 19-21 APR. 1989, Publisher: INSTITUTO LATINOAMERICANO DEL FIERRO Y EL ACERO, Casilla 16065, Santiago 9, Chile, (1989), (Met. A., 9205-72-0256), pp. 8/1-8/14 [in English].)

3007 OCCUPATIONAL NOISE IN THE STEEL INDUSTRY: GENERAL NOISE PROBLEMS AND NOISE CONTROLS. (RETROACTIVE COVERAGE). [BIB-199205-45-0572]

The main sources of noise in iron and steel plants arise from the handling of raw materials and products. Further sources of noises are generated by flowing and compressed media, such as gas pipelines. Electric arc furnaces can expose workers to 8 h noise levels of 90 dB(A). Ultra-high power furnaces can generate time-weighted average noise levels of up to 110 dB(A). Noise assessment and control measures are illustrated with examples of noise attenuation in a finishing and dressing plant. Graphs. (Spee, W.G.; IISI-ILAFA-IBS SEMINAR ON OCCUPATIONAL SAFETY AND HEALTH IN THE STEEL INDUSTRY, RIO DE JANEIRO, BRAZIL, 19-21 APR. 1989, Publisher: INSTITUTO LATINOAMERICANO DEL FIERRO Y EL ACERO, Casilla 16065, Santiago 9, Chile, (1989), (Met. A., 9205-72-0256), pp. 9/1-9/12 [in English].)

3008 MONITORING, PERSONAL PROTECTION, AND TRAINING AS PART OF A NOISE CONTROL PROGRAM. (RETROACTIVE COVERAGE). [BIB-199205-45-0573]

The standard sound level meter is the essential piece of equipment used for area or static noise monitoring in steel plants. It consists of a microphone, an amplifier with a calibrated attenuator, and an indicating meter which reads out sound levels in decibels. The personal dosimeter is a simple sound level recording device which records sound pressure levels at predetermined intervals, usually four times/s. Hearing protection is provided by ear muffs or ear plugs. To encourage their use, hearing protection devices should be comfortable to wear, not over-protective so that the worker feels isolated, and easily maintained hygienically, and a choice should be provided so that the worker does not feel pressured into wearing a specific unit. Graphs. (Eisler, H.H.; IISI-ILAFA-IBS SEMINAR ON OCCUPATIONAL SAFETY AND HEALTH IN THE STEEL INDUSTRY, RIO DE JANEIRO, BRAZIL, 19-21 APR. 1989, Publisher: INSTITUTO LATINOAMERICANO DEL FIERRO Y EL ACERO, Casilla 16065, Santiago 9, Chile, (1989), (Met. A., 9205-72-0256), pp. 10/1-10/11 [in English].)

3009 ISOLATION OF THE CONTROL CABIN OF A STEEL FOUNDRY ELECTRIC FURNACE. (RETROACTIVE COVERAGE). [BIB-199205-45-0574]

Guidelines are given for the design of an acoustic cabin for the protection of personnel working on the platform of an electric steelmaking furnace. A magnetic and graphic record of the noise level of an EAF at another plant location was made and then regulated according to the power of the furnace to be installed at the chosen site. Acoustic isolation properties of the materials to be used for the walls, door, and windows are described. Glass used was laminated with polyvinyl butyral and the total glass area of the cabin was 12 m^2. A floating cabin floor that was elastically separated from its supports was constructed. The roof of the cabin was mostly made of concrete. Damping achieved with the cabin amounted to 50 dB(A). Graphs. 4 ref. (Roldan, C.; IISI-ILAFA-IBS SEMINAR ON OCCUPATIONAL SAFETY AND HEALTH IN THE STEEL INDUSTRY, RIO DE JANEIRO, BRAZIL, 19-21 APR. 1989, Publisher: INSTITUTO LATINOAMERICANO DEL FIERRO Y EL ACERO, Casilla 16065, Santiago 9, Chile, (1989), (Met. A., 9205-72-0256), pp. 12/1-12/16 [in English].)

3010 HEARING PROTECTION PROGRAMME: ACHIEVEMENTS AND EXPERIENCES. (RETROACTIVE COVERAGE). [BIB-199205-45-0575]

Siderurgica del Orinoco, Venezuela, has combined the activities of evaluation, medical surveillance, control and training into a systemized programme that correlates environmental and does-received parameters with health parameters to provide noise protection for its workers. Acoustic insulation of the worker and greater process automation were found to be the most feasible ways to carry-out noise control. Motivational activities are combined with personal ear protection to encourage positive attitudes toward the equipment's use. Environmental assessment, noise level measurement, and periodical medical checkups complete the company's hearing protection programme. (Rosal, R.; IISI-ILAFA-IBS SEMINAR ON OCCUPATIONAL SAFETY AND HEALTH IN THE STEEL INDUSTRY, RIO DE JANEIRO, BRAZIL, 19-21 APR. 1989, Publisher: INSTITUTO LATINOAMERICANO DEL FIERRO Y EL ACERO, Casilla 16065, Santiago 9, Chile, (1989), (Met. A., 9205-72-0256), pp. 13/1-13/10 [in English].)

3011 NOISE—ITS CONTROL IN THE BRAZILIAN STEEL INDUSTRY. (RETROACTIVE COVERAGE). [BIB-199205-45-0576]

A noise control study conducted at a plant of the Companhia Siderurgica Belgo Mineira is described. The study concluded that noise reduction should be carried out at the source. Purchase specifications for equipment should include maximum noise pressure level equal to the tolerance limit. Brazil currently works on 85 dB(A) over an 8 h work day exposure. It is recommended that staff teams prepared to handle noise in the workplace be maintained. 8 ref. (Miranda, F.; IISI-ILAFA-IBS SEMINAR ON OCCUPATIONAL SAFETY AND HEALTH IN THE STEEL INDUSTRY, RIO DE JANEIRO, BRAZIL, 19-21 APR. 1989, Publisher: INSTITUTO LATINOAMERICANO DEL FIERRO Y EL ACERO, Casilla 16065, Santiago 9, Chile, (1989), (Met. A., 9205-72-0256), pp. 14/1-14/7 [in English].)

3012 NOISE IN THE IRON AND STEEL INDUSTRY. (RETROACTIVE COVERAGE). [BIB-199205-45-0577]

Control of noise and its effects on workers at SICARTSA with respect to Mexican legislation, labor, and economic aspects are described. A noise study identified the concentrator, pelletizing, coke plant, BOF shop, wire rod and bar rolling, oxygen plant, power plant direct reduction, and EAF shop as the areas of highest noise. Noise control was effected by modifying, changing, or attenuating the sources and isolating the sources and workers. Maximum permissible exposure times/workday as a function of the continuous equivalent sound level for stable noise are tabulated. Graphs. (Riojas, R.; IISI-ILAFA-IBS SEMINAR ON OCCUPATIONAL SAFETY AND HEALTH IN THE STEEL INDUSTRY, RIO DE JANEIRO, BRAZIL, 19-21 APR. 1989, Publisher: INSTITUTO LATINOAMERICANO DEL FIERRO Y EL ACERO, Casilla 16065, Santiago 9, Chile, (1989), (Met. A., 9205-72-0256), pp. 15/1-15/23 [in English].)

3013 HEALTH RISKS IN THE COKE OVEN AND BY-PRODUCTS PLANT OPERATIONS AND THEIR CONTROL. (RETROACTIVE COVERAGE). [BIB-199205-45-0578]

Coke oven emissions consist of at least 80 compounds. The benzene-soluble fraction of total particulate matter is used as the measure of contamination related to potential health effects. Work practices and methods to improve the occupational environment include defined operating, maintenance and personal hygiene procedures, pressurized cabs with filtered air, rest stations, relief periods, improved seals at doors and lids, automation of standpipe functions, and vacuum cleaners for oven tops. Standards concerning benezene exposure and sources of benzene are described. Benzene exposure can be controlled through covers on storage and reaction vessels, indirect cooling of the recirculating medica and vapor collection and suppression. 11 ref. (Eisler, H.H.; IISI-ILAFA-IBS SEMINAR ON OCCUPATIONAL SAFETY AND HEALTH IN THE STEEL INDUSTRY, RIO DE JANEIRO, BRAZIL, 19-21 APR. 1989, Publisher: INSTITUTO LATINOAMERICANO DEL FIERRO Y EL ACERO, Casilla 16065, Santiago 9, Chile, (1989), (Met. A., 9205-72-0256), pp. 16/1-16/11 [in English].)

3014 HEALTH PROBLEMS IN COKE OVEN AND SUBPRODUCTS PLANT, ESPECIALLY BY BENZENE. (RETROACTIVE COVERAGE). [BIB-199205-45-0579]

Somisa operates 169 coke ovens. During the coking process, 65 000 m^3/h of gas are produced and processed at the Byproducts Plant to obtain 180 t/day of tar, 60 t/day of ammonium sulfate, and 60 t/day of benzol. Crude benzol consists of 68% benzene, 20% xylene, 10% toluene, and 2% of other components, such as anthracene, naphthalene, and phenol. In-plant uses of the benzol byproduct, control of leakages and pollution levels, periodical worker medical check ups, and eventual occupational health problems are described. Studies to remove and/or minimize benzene pollution are discussed. (Sanchez, J.C.; IISI-ILAFA-IBS SEMINAR ON OCCUPATIONAL SAFETY AND HEALTH IN THE STEEL INDUSTRY, RIO DE JANEIRO, BRAZIL, 19-21 APR. 1989, Publisher: INSTITUTO LATINOAMERICANO DEL FIERRO Y EL ACERO, Casilla 16065, Santiago 9, Chile, (1989), (Met. A., 9205-72-0256), pp. 18/1-18/16 [in English].)

3015 BENZENE—THE SITUATION IN THE BRAZILIAN STEEL INDUSTRY. (RETROACTIVE COVERAGE). [BIB-199205-45-0580]

Distillation of hard coke in coke ovens and use of coke oven gas to make fuel create benzene exposure in steel plants. Eleven specific recommendations for controlling health risks of coke plant workers are made. Benzene sampling and analysis are conducted by activated charcoal absorption, retaining gas containers, portable gas chromatography, and colorimetric tubes. Medical testing of employees consists of complete blood exams and analysis for phenol in the urine every six months. (Azevedo, C.A.; IISI-ILAFA-IBS SEMINAR ON OCCUPATIONAL SAFETY AND HEALTH IN THE STEEL INDUSTRY, RIO DE JANEIRO, BRAZIL, 19-21 APR. 1989, Publisher: INSTITUTO LATINOAMERICANO DEL FIERRO Y EL ACERO, Casilla 16065, Santiago 9, Chile, (1989), (Met. A., 9205-72-0256), pp. 19/1-19/5 [in English].)

3016 POSTCOMBUSTION IN SMELT REDUCTION. [BIB-199205-45-0597]

Smelt reduction offers the way ahead for ironmakers in the medium and long term. There are many variations under development, with varying degrees of efficiency, raw materials requirements and environmental impact. The importance of post-combustion as a means of achieving maximum heat output from the available fuel, thereby reducing overall CO_2 emissions is discussed. Graphs. (Brotzman, K.; STEEL TIMES INTERNATIONAL, (JAN. 1992), 16, (1), pp. 26-28 [in English]. ISSN 0143-7798)

3017 CHARACTERISTICS OF LABOUR CONDITIONS UNDER MODERN TECHNOLOGICAL PROCESSES IN THE POWDER METALLURGY. [BIB-199205-54-0514]

Health and safety hazards in powder metallurgy associated with production of Fe powders, powders of refractory compounds, ferrites, and high-speed steels are presented. Some data on the effect of the production conditions on the workers are given. 39 ref. (Brakhnova, I.F.; POROSHKOVAYA METALLURGIYA, (DEC. 1991), (12), pp. 82-91 [in Russian]. ISSN 0032-4795)

3018 PARTICULATE FUME GENERATION DURING GMAW AND GTAW. [BIB-199205-55-0726]

For the past five or six years, BOC Limited has carried out a series of investigations into particulate fume generated during welding. Various gas shielded processes were studied (e.g. wires of mild steel, 309L stainless, Al 5356, Al 4043, and Al- and Si-bronzes) and the amount of fume emitted and its chemical composition were analysed. The results and the significance of the findings are discussed. Graphs. 1 ref. (Hilton, D.E.; Plumridge, P.N.; WELDING AND METAL FABRICATION, (DEC. 1991), 59, (10), pp. 555-560 [in English]. ISSN 0043-2245)

3019 A SYSTEMATIC APPROACH TO LEAD PAINT REMOVAL OPERATIONS. [BIB-199205-57-0638]

A five-step guideline is given for the safe removal of Pb-based paint from industrial structures. Laboratory testing is required first to determine whether a paint system contains Pb 0.06 wt.%. Lead exposure monitoring methods and respiratory protection measures must be implemented as respirable Pb dust is normally created when removing Pb paint from a structure. A Steel Structures Painting Council guide is being developed that identifies paint removal methods, containment materials, and containment methods. Steps must be taken to verify compliance with environmental protection regulations. Finally, samples of removed debris must be tested to determine if the debris is a hazardous waste requiring proper disposal. 6 ref. (Trimber, K.A.; SSPC 90: SIGHTS, SOUNDS & VISIONS OF THE FUTURE, NASHVILLE, TENNESSEE, USA, 3-7 DEC. 1990, Publisher: STEEL STRUCTURES PAINTING COUNCIL, 4400 Fifth Ave., Pittsburgh, Pennsylvania 15213-2683, USA, (1990), (Met. A., 9205-72-0214), pp. 74-85 [in English].)

3020 HEALTH CONCERNS FROM CADMIUM. (RETROACTIVE COVERAGE). [BIB-199205-71-0091]

Concerns about possible health effects from Cd are discussed. Questions about risks of Cd induced nephropathy, the role of Cd binding protein metallothionein and factors affecting reversibility of Cd induced nephropathy are addressed. Concerns related to the carcinogenicity of Cd and transplacental transport of Cd and fetal effects are also covered. It is indicated that the suspicions about the carcinogenicity of Cd have been reduced in terms of carcinoma of the prostate. Concerns have, however, become more perplexing regarding inhalation and lung tumors. An increasing awareness that the unborn infant is protected to some degree from transplacental transfer from the mother by mechanisms involving metallothionein synthesis in cells of the placenta is noted. Mechanisms for this protection may also impact on the transport of essential trace metals such as Zn and Cu and effect fetal weight. Graphs. 50 ref. (Goyer, R.A.; CADMIUM 89. SIXTH INTERNATIONAL CADMIUM CONFERENCE, PARIS, FRANCE, 19-21 APR. 1989, Publisher: CADMIUM ASSOCIATION, 42 Weymouth St., London W1N 3LQ, UK, (1989), (Met. A., 9205-72-0217), pp. 11-15 [in English].)

3021 SOURCES, PATHWAYS, AND TRANSFER OF CADMIUM IN THE ENVIRONMENT: PRACTICAL POSSIBILITIES OF CONTROLLING ITS DISPERSION. (RETROACTIVE COVERAGE). [BIB-199205-71-0092]

Means to limit the transfer of Cd in food chains are reviewed. Situations with increased risk of dispersion are described. These include industrial zones, especially areas where nonferrous metals are being extracted or processed, urban zones where emissions from fossil fuels are heavy and rural zones exposed to atmospheric fall out from the enters of emission of metallic particles. Means for monitoring of Cd contamination and analysis of samples to determine Cd content are covered. Insight is also provided into mechanisms of transfer of Cd in plants. It is concluded that the cycle of accumulation in the environment will be broken if emissions are reduced at the source and dissemination is reduced through effective treatment of wastes. Definition of objective standards based on experiments will be useful for providing a framework for these measures. Various techniques for immobilizing Cd in situations where Cd is already present can be utilized to limit its access to the food chain. Graphs. 13 ref. (Impens, R.A.; Delcarte, E.; Fagot, J.; CADMIUM 89. SIXTH INTERNATIONAL CADMIUM CONFERENCE, PARIS, FRANCE, 19-21 APR. 1989, Publisher: CADMIUM ASSOCIATION, 42 Weymouth St., London W1N 3LQ, UK, (1989), (Met. A., 9205-72-0217), pp. 20-25 [in English].)

3022 REGULATING CADMIUM IN THE WORK-PLACE—SOME OBSERVATIONS ON THE BACKGROUND AND CURRENT POSITION IN EUROPE. (RETROACTIVE COVERAGE). [BIB-199205-71-0094]

The background to and the current position of European Regulations related to Cd are briefly outlined. The clinical aspects are reviewed historically and an attempt is made to relate some of these with biological and environmental changes over the past 40 years. The information presented is based largely on alkaline (Ni—Cd) battery manufacture. Graphs. (Adams, R.; CADMIUM 89. SIXTH INTERNATIONAL CADMIUM CONFERENCE, PARIS, FRANCE, 19-21 APR. 1989, Publisher: CADMIUM ASSOCIATION, 42 Weymouth St., London W1N 3LQ, UK, (1989), (Met. A., 9205-72-0217), pp. 43-46 [in English].)

3023 AN APPRAISAL OF THE HEALTH OF RETIRED CADMIUM WORKERS. (RETROACTIVE COVERAGE). [BIB-199205-71-0098]

The results of a study of the residual effects of long term exposure to airborne Cd by Cd smelter and refinery workers are presented. The workers were retired and had experienced exposure to airborne concentrations of Cd up to 1.5 mg/m. Over the history of their employment, airborne concentration ranged from between 0.04-0.61 mg/m^3 to 1.5 mg/mm^3. Urinary Cd excretion had been measured over the history of their employment and ranged from approx 200 μg/l in 1950 to 30.1 μg/l in 1975. The study was controlled by measuring a group of health indicators in this population as compared with a non-exposed retired group of approximately the same age. The exposed group consisted of 38 males who had worked in the Cd environment for at least 25 years. Their current age ranged from 65-89 years. Based on the findings of the study, it was concluded that there does not appear to be any significant effect on the health of persons previously working at high levels of exposure to Cd as measured by the numbers of symptoms related to their general health. The respiratory history is also essentially negative insofar as significant respiratory symptoms such as shortness of breath, frequent colds, cough and wheezing are concerned. There was, however, an increase in the amount of morning phlegm produced. Physical examination did ot show an increase in mean blood pressure or greater need for dental repair. Clinical laboratory findings were also reassuring, with the exception of mild glomerular and tubular dysfunction. There were no findings of significance as regards the production of blood or of the type and numbers of cells in either the white or red blood cell series. 22 ref. (Hine, C.H.; Silva, U.; CADMIUM 89. SIXTH INTERNATIONAL CADMIUM CONFERENCE, PARIS, FRANCE, 19-21 APR. 1989, Publisher: CADMIUM ASSOCIATION, 42 Weymouth St., London W1N 3LQ, UK, (1989), (Met. A., 9205-72-0217), pp. 101-104 [in English].)

3024 IN VIVO MEASUREMENTS OF A CADMIUM SMELTER POPULATION. (RETROACTIVE COVERAGE). [BIB-199205-71-0099]

The latest observations obtained in a follow-up study at a Cd production plant that was first visited in 1979 are reported. The primary biological monitoring technique that is unique to these studies is the direct in vivo measurement of kidney and liver Cd levels in the individual worker. The major issues addressed were: examination of the relative changes in body burden associated with current exposure levels for seven years; estimation of the cumulative exposure level at its production site; rates of organ uptake relative to the exposure index; and estimates of half-life Cd in the human body. The basic findings of the study showed that a significant loss of Cd from the liver on the part of retired workers was accompanied by only a slight to moderate decrease for the kidney Cd level. There were no significant changes during seven years in the observed organ burdens for the group of non-production workers or the control subjects. A number of the non-production workers had kidney and liver Cd levels that were within the normal range expected for the general US adult male population. Estimates of the half-life of Cd in the liver ranged from 7-11 years, with a best estimate of 8.3 years. An average air exposure limit was also determined. Graphs. 11 ref. (Ellis, K.J.; CADMIUM 89. SIXTH INTERNATIONAL CADMIUM CONFERENCE, PARIS, FRANCE, 19-21 APR. 1989, Publisher: CADMIUM ASSOCIATION, 42 Weymouth St., London W1N 3LQ, UK, (1989), (Met. A., 9205-72-0217), pp. 130-135 [in English].)

3025 CADMIUM AND CANCER: REVIEW OF CURRENT EVIDENCE. (RETROACTIVE COVERAGE). [BIB-199205-71-0100]

The more relevant and interesting aspects of evidence for the carcinogenicity of Cd and the more recent data which have been obtained are reviewed. Likely avenues for future research which are considered likely to be most effective in providing a solution to the enigma of Cd and cancer are also indicated. Studies on genotoxicity and molecular mechanisms, animal studies and epidemiologial studies are covered. In addition, some problems in the interpretation of epidemiological evidence are discussed. 26 ref. (Kazantzis, G.; CADMIUM 89. SIXTH INTERNATIONAL CADMIUM CONFERENCE, PARIS, FRANCE, 19-21 APR. 1989, Publisher: CADMIUM ASSOCIATION, 42 Weymouth St., London W1N 3LQ, UK, (1989), (Met. A., 9205-72-0217), pp. 136-140 [in English].)

3026 CADMIUM 89. SIXTH INTERNATIONAL CADMIUM CONFERENCE. (RETROACTIVE COVERAGE). [BIB-199205-72-0217]

Conference co-sponsored by Cadmium Association (UK), Cadmium Council, Inc. (US), and International Lead Zinc Research Organization, Inc. 17 papers selected and abstracted. (Hiscock, S.A.; Volpe, R.A.; Publisher: CADMIUM ASSOCIATION, 42 Weymouth St., London W1N 3LQ, UK, (1989), Pp 187, 81/4 x 113/4 in., Illustrated [in English].)

3027 IISI-ILAFA-IBS SEMINAR ON OCCUPATIONAL SAFETY AND HEALTH IN THE STEEL INDUSTRY. (RETROACTIVE COVERAGE). [BIB-199205-72-0256]

17 papers selected and abstracted. (Publisher: INSTITUTO LATINOAMERICANO DEL FIERRO Y EL ACERO, Casilla 16065, Santiago 9, Chile, (1989), Pp 219, 81/4 x 113/4 in., Illustrated [in English].)

3028 ADVANCES IN BROMIDE GOLD LEACHING TECHNOLOGY. [BIB-199206-44-0066]

The adsorption kinetics of $AuBr_4^-$ on Dowex-21K ion-exchange resin were studied and found to be independent of the initial Au, Br, and base metals concentrations. A commercially-available undivided hypochlorite generating cell was used to generate Br from simulated mixed halide (Br^-/Cl^-) solutions. Electrolyses were performed with solutions containing very low Br^- ion concentrations. The current efficiencies were 80-90%, and Br^- ion utilization was maximized. A detailed economic assessment was made considering the capital and the operating costs for a 1000 mt/day Au ore processing plant. The toxicity and discharge levels of bromide, Br, and cyanide were compared from a detailed analysis of the published literature data. Comparing Br vapor with hydrogen cyanide gas for a given length of exposure, the lethal concentration of Br is about three times less than hydrogen cyanide. The toxicity of sodium bromide is similar to that of sodium chloride. Acute poisoning to bromides and chlorides is rare because of their low toxicities. The allowed discharge levels of Br^-, Br_2, and CN^- in fresh water are 250, 0.1, and 0.005 mg/dm^{-3}, respectively. Graphs. 20 ref. (Dadgar, A.; Howarth, J.; EPD CONGRESS 1992, SAN DIEGO, CALIFORNIA, USA, 1-5 MAR. 1992, Publisher: THE MINERALS, METALS & MATERIALS SOCIETY, 420 Commonwealth Dr., Warrendale, Pennsylvania 15086, USA, (1991), (Met. A., 9206-72-0283), pp. 123-136 [in English].)

3029 HEALTH HAZARDS OF SHIPBUILDING AND SHIP REPAIRING. [BIB-199206-55-0784]

The basic construction of a ship's hull is accomplished by measuring, cutting, assembling, and welding steel plates. Each of these tasks is performed by a different trade or set of trades, each with a unique set of hazards. Shipbuilding health hazards posed to welders, machinists, pipefitters and insulators, shipfitters, electricians, painters, material handlers, sheet metal workers, shipwrights and riggers are identified. Hazards posed by asbestos and man-made mineral fibers are assessed. Physical shipbuilding hazards include vibration, noise, temperature, confined and enclosed spaces and ionizing radiation. 64 ref. (Hunting, K.L.; Welch, L.S.; Publisher: WILLIAMS & WILKINS, 428 East Preston St., Baltimore, Maryland 21202, USA, HAZARDOUS MATERIALS TOXICOLOGY: CLINICAL PRINCIPLES OF ENVIRONMENTAL HEALTH, (1992), (Met. A., 9206-72-0272), pp. 634-641 [in English].)

3030 TOXICOLOGY OF METAL OXIDES. [BIB-199206-55-0785]

Metal oxides produce four types of lung disease: metal fume fever, chemical pneumonitis, hypersensitivity pneumonitis and occupational asthma. Metal fume fever, a common acute industrial disease, is caused by the inhalation of oxides of metal, especially Zn. It occurs most commonly among welders. however, it also may occur among Zn smelters, brass solderers, brass foundry workers, chrome electroplaters, chrome welders (from hexavalent chromic oxide fumes), iron galvanizers, molten metal fabricators, metal grinders, manufacturers of steel alloys and those who work near electric furnaces which are used to melt metals. Onset of metal fume fever occurs after the exposure and usually lasts 48 h. Initial presenting symptoms are a metallic or sweet taste in the mouth, frequently accompanied by drynesss and thirst. Treatment is supportive, intravenous steroids may be given in severe cases, and/or intravenous theophylline and inhaled bronchodilators for wheezing. The exact cause of metal fume fever is unknown. 57 ref. (Farrell, F.J.; Publisher: WILLIAMS & WILKINS, 428 East Preston St., Baltimore, Maryland 21202, USA, HAZARDOUS MATERIALS TOXICOLOGY: CLINICAL PRINCIPLES OF ENVIRONMENTAL HEALTH, (1992), (Met. A., 9206-72-0272), pp. 921-927 [in English].)

3031 SEMICONDUCTOR MANUFACTURING HAZARDS. [BIB-199206-63-0374]

Potential health risks in semiconductor manufacturing occur from the manufacture of substrate through the completed chip. Three broad areas of concern for occupational exposures are the clean room environment, the manufacturing process and tools and the selected chemicals used. Manufacture of substrate wafers, with the exception of GaAs, is relatively safe. Chemical use is less intensive than other parts of semiconductor manufacture, and control engineering is better understood because the processes are not in the clean room environment. Other processes in device manufacture that need to be understood from the health hazard standpoint are CVD processes including epitaxy, oxidation, photoresist application, exposure, development, wet and dry etching, wet and dry stripping, doping by either diffusion or implantation and metallization. Particular hazards posed from glycol ethers, GaAs, gases, photoresists and hydrofluoric acids are addressed. 131 ref. (Harrison, M.; Publisher: WILLIAMS & WILKINS, 428 East Preston St., Baltimore, Maryland 21202, USA, HAZARDOUS MATERIALS TOXICOLOGY: CLINICAL PRINCIPLES OF ENVIRONMENTAL HEALTH, (1992), (Met. A., 9206-72-0272), pp. 472-504 [in English].)

3032 TOXICOLOGY OF INTERMETALLIC SEMICONDUCTORS AND INORGANIC HYDRIDES. [BIB-199206-63-0375]

The most commonly used intermetallic semiconductors are gallium arsenide, gallium phosphide, and indium phosphide. The chemical form of the intermetallic does not appear to be as important for toxicology as the chemical forms of its dissolution products. Inorganic hydrides include some of the group III and

group V elements because these elements are used as dopants for Si-based semiconductors. Clinical toxicology of arsine, phosphine, stibine, diborane and silane is described. Toxic effects from intermetallic semiconductors appear too occur primarily after inhalation exposure, although oral exposure to high doses may also result in some toxicity. There are no well-characterized biologic monitors which are specific for any of these compounds. No specific exposure limits have been formulated for any of the III-V intermetallic compounds. 28 ref. (Carter, D.E.; Sullivan, J.B.; Publisher: WILLIAMS & WILKINS, 428 East Preston St., Baltimore, Maryland 21202, USA, HAZARDOUS MATERIALS TOXICOLOGY: CLINICAL PRINCIPLES OF ENVIRONMENTAL HEALTH, (1992), (Met. A., 9206-72-0272), pp. 916-920 [in English].)

3033 TOXICOLOGY OF MANMADE MINERAL FIBERS. [BIB-199206-71-0115]

The three general types of manmade mineral fibers (MMMF) are fibrous glass, mineral wool and refractory ceramic fibers. MMMF do not burn, rot, or absorb moisture or odors. Under normal conditions, they do not support the growth of mildew, mold, or bacteria. MMMF may irritate the skin of some workers in manufacturing facilities and some people who fabricate or install MMMF-containing materials. Unprotected exposures to high concentrations of airborne MMMF may produce a nonspecific, transitory lung condition, usually manifested by coughing or wheezing. Epidemiologic studies of MMMF are reviewed. Experimental toxicologic studies of MMMF have been conducted both in vitro and in vivo . A number of studies have shown that fiber length and diameter are important in determining the toxicity of mineral fibers of various chemical compositions to cells grown in culture. Animal inhalation studies involving fibrous glass, mineral wool and refractory ceramic fibers are summarized. Evidence from animal experiments indicates that glass fibers are attacked by fluids normally present in the lung. This can cause fragmentation to shorter fibers that are biologically less active and are more readily removed from the lungs by clearance mechanisms, or can even lead to the total dissolution of fine fibers. The mechanisms whereby inhaled fibers result in pathologic changes in the respiratory tract and lining surfaces of the chest and abdominal cavities are not completely understood. Certain principles of biologic activity have been elucidated which appear to explain the differing responses to fibers on the basis of size, geometry, durability and, to a lesser extent, chemical composition. Currently, there are no specific regulations which govern exposure to MMF. In the USA, OSHA considers these fibers to be nuisance dusts. Photomicrographs. 59 ref. (Bun, W.B.; Chase, G.R.; Hesterberg, T.W.; Versen, R.A.; Anderson, R.; Publisher: WILLIAMS & WILKINS, 428 East Preston St., Baltimore, Maryland 21202, USA, HAZARDOUS MATERIALS TOXICOLOGY: CLINICAL PRINCIPLES OF ENVIRONMENTAL HEALTH, (1992), (Met. A., 9206-72-0272), pp. 1139-1150 [in English].)

3034 TOXICOLOGY OF ORGANOMETALS AND REACTIVE METALS. [BIB-199206-71-0116]

Metals that are combustion hazards in a solid state are Cs, Rb, Na, Li and potassium. Metals that are explosive and combustible when mixed with air as adust include Al, beryllium, Ti, magnesium, and Cd. Hazards related to organometallic compounds and reactive metals derive from their inherent toxicity, high degree of explosivity, and flammability when exposed to water or air and toxic byproducts of their reactions. Organometals are used in a variety of chemical reactions in synthetic procedures and in polymerization reactions. Clinical toxicology and management of organolead, organomercury, organoaluminum, organoarsenic nickel carbonyl, iron pentacarbonyl and organotin compounds are described. An extensive table lists the physiochemical properties and reactivity of the reactive metals. 34 ref. (Siegers, C.-P.; Sullivan, J.B.; Publisher: WILLIAMS & WILKINS, 428 East Preston St., Baltimore, Maryland 21202, USA, HAZARDOUS MATERIALS TOXICOLOGY: CLINICAL PRINCIPLES OF ENVIRONMENTAL HEALTH, (1992), (Met. A., 9206-72-0272), pp. 928-936 [in English].)

3035 TOXICOLOGY OF SODIUM AND POTASSIUM. [BIB-199206-71-0119]

Burns are the primary sequelae associated with exposure to elemental Na and potassium. Most commonly, the alkali react with moisture to produce a pronounced exothermic reaction and the evolution of either sodium or potassium hydroxide. The basic management of all poisoning emergencies rests on the foundation of providing life support measures and decontamination of the patient. Guidelines are given for dermal and ocular exposures. 13 ref. (Krenzelok, E.P.; Publisher: WILLIAMS & WILKINS, 428 East Preston St., Baltimore, Maryland 21202, USA, HAZARDOUS MATERIALS TOXICOLOGY: CLINICAL PRINCIPLES OF ENVIRONMENTAL HEALTH, (1992), (Met. A., 9206-72-0272), pp. 797-799 [in English].)

3036 TOXICOLOGY OF ARSENIC. [BIB-199206-71-0120]

The most toxic form of arsenic is arsine gas (AsH_3). This is followed in generally decreasing order by inorganic trivalent As compounds, organic trivalent compounds, inorganic pentavalent compounds, organic pentavalent compounds and elemental As. Over 90% of an ingested dose of inorganic trivalent or pentavalent As is absorbed. Systemic absorption after dermal exposure has been reported and usually documented with elevated urinary As levels. Acute injury usually involves the blood, brain, heart, kidneys and gastrointestinal tract. Bone marrow, skin and the peripheral nervous system may develop chronic toxicity after acute or chronic exposure. Clinical management of ingestion, prevention of absorption and inhalation is described. Basic treatment for ingestion, inhalation and dermal exposures is discussed. Once the diagnosis of As poisoning is made, effective therapy exists with new dimercapto chelating agents. 65 ref. (Dart, R.C.; Publisher: WILLIAMS & WILKINS, 428 East Preston St., Baltimore, Maryland 21202, USA, HAZARDOUS MATERIALS TOXICOLOGY: CLINICAL PRINCIPLES OF ENVIRONMENTAL HEALTH, (1992), (Met. A., 9206-72-0272), pp. 818-823 [in English].)

3037 TOXICOLOGY OF MERCURY. [BIB-199206-71-0121]

Approximately 70 000 US workers are exposed to Hg yearly. The general population is exposed to Hg mainly via food such as fish. Release of Hg into the environment from human-related activities is estimated to be 2000 metric tons/year, mainly from mining and ore smelting. Mercury and Hg-containing compounds are on the list of toxic chemicals in Section 313 of the US Emergency Planning and Community Right-to-Know Act of 1986. The element is a general protoplasmic poison whose general mode of toxicologic action involves the covalent binding of Hg to sulfhydryl groups, inactivating enzymes of cellular function and metabolism of carbohydrates at the pyruvic acid level. Mercury toxicology is described in terms of elemental, inorganic and organic poisoning. The central nervous system is the primary target organ in chronic exposure to Hg vapor. All forms of Hg cross the placenta into the fetal circulation. Management of Hg toxicity through means of clinical examination, laboratory diagnostic and biologic monitoring is described. 23 ref. (Campbell, D.; Gonzales, M.; Sullivan, J.B.; Publisher: WILLIAMS & WILKINS, 428 East Preston St., Baltimore, Maryland 21202, USA, HAZARDOUS MATERIALS TOXICOLOGY: CLINICAL PRINCIPLES OF ENVIRONMENTAL HEALTH, (1992), (Met. A., 9206-72-0272), pp. 824-833 [in English].)

3038 TOXICOLOGY OF LEAD. [BIB-199206-71-0122]

Regulations have reduced Pb poisoning in major Pb-using industries such as pigment manufacture and battery production but have had little impact in other areas such as demolition, scrap recovery, radiator repair and home remodeling, which are characterized by smaller, unorganized workforces. As fume or fine particulate, Pb is readily absorbed through the lunas. It is relatively less well-absorbed from the gastrointestinal tract in adults (20-30%), but children absorb as much as 50% of dietary Pb. Inorganic Pb is not absorbed through intact skin, but organic Pb compounds can be. Lead crosses the blood—brain barrier and concentrates in the gray matter of the brain. Under conditions of extremely high respiratory exposure or with intravenous use of contaminated solutions, Pb poisoning can manifest itself acutely. Absorbed Pb is toxic to a variety of enzyme systems and tends to have a particular affinity for sulfhydryl groups and may be particularly toxic to enzyme systems that are Zn-dependent. Central nervous system effects can develop after a brief intense exposure or more gradually with lower levels of exposure. Acute encephalopathy, characterized by diffuse pathologic changes and cerebral edema, is usually associated with high blood lead levels (150 μg/dl). In the peripheral nervous system, Pb causes a neuropathy which primarily affects the motor nerves and which appears to be principally axonal. Anemia in Pb poisoning results from both impairment of hemoglobin production and from changes in red cell membranes. For centuries, Pb exposure has been associated with the development of hypertension, renal failure and gout. The OSHA Lead Standard sets a permissible exposure level of 50 $\mu g/m^3$ air for an 8 h time-weighted average. Guidelines are given for management of Pb toxicity in children and adults. 64 ref. (Keogh, J.P.; Publisher: WILLIAMS &

WILKINS, 428 East Preston St., Baltimore, Maryland 21202, USA, HAZARDOUS MATERIALS TOXICOLOGY: CLINICAL PRINCIPLES OF ENVIRONMENTAL HEALTH, (1992), (Met. A., 9206-72-0272), pp. 834-844 [in English].)

3039 TOXICOLOGY OF CADMIUM. [BIB-199206-71-0123]

Cadmium has been shown to have effects on a variety of tissues and biologic systems and has been associated with such maladies as hypertension and carcinogenesis. Most of the Cd produced comes from Zn smelters and from sludge obtained from electrolytic refining of Zn. Estimates indicate that approx 1.5 million workers are potentially exposed to Cd in the workplace in the US. Whereas the gastrointestinal tract only absorbs approx 5% of the Cd presented to it, depending on the in vivo solubility of the ingested compound, 90% of the Cd deposited deep in the lung can be absorbed. Once absorbed, Cd is bound to red blood cells and serum albumin. Serum Cd is very rapidly taken up by soft tissues, primarily liver and kidney. Once absorbed, Cd is very poorly excreted, an observation consistent with the very long biological half-life of Cd, estimated at between 25-30 years in humans. Acute Cd exposure is typically most toxic to the tissue to which it is initially exposed. Renal and hepatic involvement, however, can occur from either route of Cd exposure. The chronic toxic (noncarcinogenic) effects most clearly associated with Cd exposure occur in the pulmonary system and in the kidney. Cadmium intoxication can have dramatic effects on Ca homeostasis and metabolism and can increase Ca excretion. Management of Cd toxicity through means of clinical examination, treatment and laboratory diagnostics is described. Threshold limit values for Cd in the US are set at 50 $\mu g/m^3$. The World Health Organization has proposed a health-based permissible level of 10 $\mu g/m^3$. 50 ref. (Waalkes, M.P.; Wahba, Z.Z.; Rodriguez, R.E.; Publisher: WILLIAMS & WILKINS, 428 East Preston St., Baltimore, Maryland 21202, USA, HAZARDOUS MATERIALS TOXICOLOGY: CLINICAL PRINCIPLES OF ENVIRONMENTAL HEALTH, (1992), (Met. A., 9206-72-0272), pp. 845-852 [in English].)

3040 TOXICOLOGY OF COBALT. [BIB-199206-71-0124]

Vitamin B-12 (cyanocobalamin) is the only form of cobalt known to be biologically active in higher animals. In terms of numbers of individuals exposed, greatest toxicologic importance can be attached to inhalation of Co fumes and Co-containing dusts and to skin sensitization from contact with Co-containing materials. Questionable analyses of natural levels obscure the details of Co homeostasis. From animal studies it was learned that parenteral toxicity is greater than oral, and increased water solubility enhances toxicity. Repetitive doses of Co metal or salts given to animals by various routes are often more toxic than a single dose, even when the latter is larger than the cumulative dose, suggesting cumulative toxicity. From the moderate toxicity demonstrated in acute animal experiments, it is to be expected that acute Co poisoning in humans seldom if ever occurs. Numerous studies have demonstrated an increased prevalence of respiratory pathology in hard metal workers. This may take the form of obstructive disease or interstitial lung disease. Consistent with immunologic modes of action, allergic dermatitis has been reported in workers in numerous Co-related industries, including those in hard metal and Co alloy, paint, cement and rubber industries. Threshold limit values for metallic Co and Co dusts are 50 $\mu g/m^3$ in most countries. The US value of 100 mu g/m^3 is being revised downward to this standard. 53 ref. (Templeton, D.M.; Publisher: WILLIAMS & WILKINS, 428 East Preston St., Baltimore, Maryland 21202, USA, HAZARDOUS MATERIALS TOXICOLOGY: CLINICAL PRINCIPLES OF ENVIRONMENTAL HEALTH, (1992), (Met. A., 9206-72-0272), pp. 853-859 [in English].)

3041 TOXICOLOGY OF COPPER. [BIB-199206-71-0125]

Copper is an essential element in mammalian systems. Illness occurs when diet is deficient or intake is excessive. The principal route of exposure is through ingestion, but inhalation of Cu dusts and fumes occurs in industrial settings. The principal pathway for Cu elimination is through the feces via excretion into the bile. Acute Cu toxicity is rare and usually not serious. Contact dermatitis due to Cu is rare while chronic exposure to Cu dusts and fumes in the industrial setting can lead to upper respiratory complaints and physical findings in workers. The predominant findings of acute copper sulfate poisoning are gastrointestinal. These include nausea, vomiting, diarrhea, hematemesis, melena and jaundice. Acquired chronic Cu toxicity, with the exception of vineyard sprayers lung, has not been firmly established. Copper ions cause irreversible immobilization of sperm in vitro and intrauterine devices increase endometrial Cu concentrations. The OSHA permissible exposure limit and the American Congress of Government Industrial Hygienist threshold limit value are 1 mg/m^3 for Cu dusts and mists. The PEL and TLV for Cu fume are 0.1 and 0.2 mg/m^3, respectively. Clinical examination, treatment and laboratory diagnostic techniques for Cu toxicity management are described. 45 ref. (Fisher, D.; Publisher: WILLIAMS & WILKINS, 428 East Preston St., Baltimore, Maryland 21202, USA, HAZARDOUS MATERIALS TOXICOLOGY: CLINICAL PRINCIPLES OF ENVIRONMENTAL HEALTH, (1992), (Met. A., 9206-72-0272), pp. 860-864 [in English].)

3042 TOXICOLOGY OF ZINC. [BIB-199206-71-0126]

The most common route of Zn exposure is through diet. Inhalation of Zn fume and dust occurs in some industrial settings. Absorption occurs across broken epithelium when zinc oxide is applied to treat burns or wounds. Acute symptoms of oral Zn poisoning are primarily gastrointestinal. Symptoms include nausea, vomiting, abdominal pain, diarrhea and hematemesis. Exposure to freshly-generated zinc oxide fumes, usually from welding galvanized iron, commonly leads to metal fume fever. Other than corneal and lens opacities after ocular Zn salt injury and anemia from Zn-induced Cu deficiency, there are no known chronic effects of Zn toxicity. Zinc toxicity appears not to be teratogenic, although Zn deficiency is. Zinc chromate is a suspect human carcinogen due to hexavalent Cr, there is no evidence for Zn carcinogenicity in humans. OSHA permissible exposure limits for zinc chloride, zinc chromate, Zn dust and fume and Zn stearate dust and fume are listed. Clinical examination, treatment and laboratory diagnostic techniques for Zn toxicity management are described. 29 ref. (Fisher, D.; Publisher: WILLIAMS & WILKINS, 428 East Preston St., Baltimore, Maryland 21202, USA, HAZARDOUS MATERIALS TOXICOLOGY: CLINICAL PRINCIPLES OF ENVIRONMENTAL HEALTH, (1992), (Met. A., 9206-72-0272), pp. 865-868 [in English].)

3043 TOXICOLOGY OF NICKEL. [BIB-199206-71-0127]

Nickel exists in five major forms: elemental Ni and its alloys, inorganic, water-soluble Ni compounds; inorganic, water-insoluble Ni compounds; organic, water-insoluble Ni compounds; and nickel carbonyl $Ni(CO)_4$. The respiratory exposure route is of parmount importance in Ni carcinogenesis. Inhaled Ni refinery dust is retained in the nasal sinuses and lungs for years after the cessation of exposure; some of the Ni is slowly absorbed. A two-component toxicokinetic model can explain metabolism and distribution of Ni^{2+} in humans. Urine is the major route for elimination of absorbed Ni. Acute Ni toxicity is explained for cases involving inhalation of $Ni(CO)_4$ and toxicity from oral or parenteral exposures to Ni^{2+}. Chronic effects of exposures to Ni compounds primarily affect the immune system and the respiratory tract. Diagnostic and clinical treatment techniques of Ni toxicity management are described. 52 ref. (Sunderman, F.W.; Publisher: WILLIAMS & WILKINS, 428 East Preston St., Baltimore, Maryland 21202, USA, HAZARDOUS MATERIALS TOXICOLOGY: CLINICAL PRINCIPLES OF ENVIRONMENTAL HEALTH, (1992), (Met. A., 9206-72-0272), pp. 869-873 [in English].)

3044 TOXICOLOGY OF PLATINUM AND RELATED METALS: PALLADIUM, IRIDIUM, OSMIUM, RHODIUM, AND RUTHENIUM. [BIB-199206-71-0128]

The most common complex salts of the Pt metals are platinum chloride, platinum dichloride, platinum dioxide and platinum sulfate. Most unintentional exposure to platinoid metals is due to poor industrial and occupational hygiene. Oral absorption of the platinoids is very low. Following inhalation, a majority of the dose of platinoid metals and salts is retained in the lungs and respiratory tract. After intravenous injection, most platinoids distribute to soft tissues, mainly kidney, liver, muscle and spleen. Excretion of the platinoid salts after i.v. injection is mainly in urine. After inhalation and dermal exposures, platinum oxides and soluble Pt salts can act as irritants or sensitizers (allergens). Symptoms of exposure by the inhalation and dermal routes after sensitization has occurred are conjunctivitis, urticaria, dermatitis and eczema. Chronic occupational exposure to Pt compounds may exacerbate Pt hypersensitivity reactions, especially in atopic individuals. The platinoids are not known to be teratogenic in humans or in experimental animal models. There are no reports of increased cancer risk from occupational exposure to Pt compounds. Management of toxicity via clinical examination, treatment and laboratory diagnostics is described. Current threshold limit values-time-weighted averages for metallic Pt dusts and soluble Pt salts are 1.0 and 0.002 mg/m^3, respectively. 52 ref. (Goering,

P.L.; Publisher: WILLIAMS & WILKINS, 428 East Preston St., Baltimore, Maryland 21202, USA, HAZARDOUS MATERIALS TOXICOLOGY: CLINICAL PRINCIPLES OF ENVIRONMENTAL HEALTH, (1992), (Met. A., 9206-72-0272), pp. 874-881 [in English].)

3045 TOXICOLOGY OF BERYLLIUM. [BIB-199206-71-0129]

Beryllium particles obey the basic principles of particle deposition in the lung but the toxicity of Be is influenced also by the form in which it is inhaled. Critical properties include particle size, crystalline structure and solubility. The major conclusion of animal and human studies has been that Be induces a cellular immune response in which there is activation of Be-specific T-lymphocytes. These T-cells accumulate and proliferate in the lung following inhalation exposure in Be-sensitized dogs and rats, among other species. A test of T-lymphocyte response to Be has become a key tool in the diagnosis of human disease. Inhalational effects of Be exist on a continuum from an acute chemical pneumonitis to a chronic granulomatous process of insidious onset. Photomicrographs. 6 ref. (Newman, L.S.; Publisher: WILLIAMS & WILKINS, 428 East Preston St., Baltimore, Maryland 21202, USA, HAZARDOUS MATERIALS TOXICOLOGY: CLINICAL PRINCIPLES OF ENVIRONMENTAL HEALTH, (1992), (Met. A., 9206-72-0272), pp. 882-890 [in English].)

3046 TOXICOLOGY OF CHROMIUM. [BIB-199206-71-0130]

Metallic Cr, chromous or chromic salts (valences 0, +2, +3) are minimally absorbed following inhalation. Inhalation of highly water-soluble hexavalent Cr salts, such as chromic acid, sodium dichromate, and potassium dichromate, may result in systemic absorption. Trivalent Cr salts are absorbed following ingestion, but only 1-25% of the dose ingested is absorbed. Hexavalent salts are converted by gastric juices to the trivalent form prior to absorption. Trivalent salts are generally poorly absorbed through intact skin but hexavalent salts are generally topically well absorbed. Following oral or dermal exposure, hexavalent Cr compounds are potentially the most toxic of the Cr compounds encountered. Acute renal failure is common following large oral ingestions of hexavalent Cr compounds and following dermal exposures. Chronic inhalation of hexavalent Cr presents an increased of lung cancers, with the degree of risk varying depending on the particular salt(s) and their solubility under biologic conditions, the circumstances of exposure, and concomitant risk factors such as cigarette smoking. Guidelines for clinical management of Cr toxicity are given for ingestion, inhalation and dermal absorption routes. OSHA permissible exposure limits are listed for various Cr compounds. 35 ref. (Geller, R.J.; Publisher: WILLIAMS & WILKINS, 428 East Preston St., Baltimore, Maryland 21202, USA, HAZARDOUS MATERIALS TOXICOLOGY: CLINICAL PRINCIPLES OF ENVIRONMENTAL HEALTH, (1992), (Met. A., 9206-72-0272), pp. 891-895 [in English].)

3047 TOXICOLOGY OF MANGANESE AND MAGNESIUM. [BIB-199206-71-0131]

As an essential trace element, Mn is necessary for the functioning of many enzyme systems. The average adult ingests between 4-10 mg/day. The most common sources of Mn exposure are dust from steel manufacturing, welding, mining and ore-extracting facilities. Acute exposure to Mn may produce a collection of flu-like symptoms, termed metal fume fever or Mn pneumonitis. Because of poor solubility characteristics, the occurrence of acute central nervous system toxicity has not been reported. Manganese appears to be the least acutely CNS toxic of the metals requiring long-term, continuing exposure for CNS toxicity. There is, however, no effective treatment for chronic CNS Mn poisoning. The OSHA established permissible exposure limit for inhalation exposure to Mn compounds measured as Mn is 5 mg/m^3. Magnesium is the second most plentiful intracellular fluid divalent cation in both plants and animals involved in a number of enzymatic reactions that entail protein synthesis and carbohydrate metabolism. It is also an essential cofactor for neuromuscular transmission. The major source of occupational exposures is via inhalation of MgO dusts. Acute Mg CNS toxicity is manifested as depression progressing to lethargy and coma. Inhalation may produce local pulmonary irritation resulting in pulmonary edema and respirator paralysis due to primary muscle paralysis. Abnormalities associated wi systemic hypermagnesemia have not been documented to persist after the hypermagnesemic state has been corrected. 73 ref. (Gilmore, D.A.; Bronstein, A.C.; Publisher: WILLIAMS & WILKINS, 428 East Preston St., Baltimore, Maryland 21202, USA, HAZARDOUS MATERIALS TOXICOLOGY: CLINICAL PRINCIPLES OF ENVIRONMENTAL HEALTH, (1992), (Met. A., 9206-72-0272), pp. 896-902 [in English].)

3048 TOXICOLOGY OF VANADIUM, TITANIUM, AND MOLYBDENUM. [BIB-199206-71-0132]

Vanadium is one of the most common trace elements in nature, found as relatively insoluble salts, usually in the trivalent state. Exposure to vanadium pentoxide is the most common form of V exposure studied. Acute exposure to vanadium oxide dusts is associated with acute upper and lower airway irritation. Conjunctivitis, rhinitis and pharingitis commonly occur within 0.5 h of exposure and up to 12 h after the exposure. Cough, wheezing, dyspnea and substernal soreness occur with more severe exposure. No chronic pulmonary effects have been demonstrated to date. Vanadium is both mutagenic and clastogenic in animal studies, although no human effect has been shown. Titanium dioxide inhalation is the most common route of Ti exposure. The compound is an irritant to the upper airway and there is no evidence that it induces an acute inflammatory reaction at exposure concentrations commonly seen. While TiO_2 dust is retained in the lungs, there is little evidence that it promotes a chronic inflammatory reaction in the lungs. Exposure to Mo may occur during the liberation of dusts from mining and the processing of ore, the grinding of metals or alloys, in oxyacetylene cutting, and from dusts of its various compounds. Molybdenum products may cause acute toxicity in humans, but adequate studies are lacking. Data are extremely limited on chronic toxicity from Mo and its compounds. Guidelines are given for management of toxicity for V, Ti, and Mo. 26 ref. (Benitez, J.G.; Publisher: WILLIAMS & WILKINS, 428 East Preston St., Baltimore, Maryland 21202, USA, HAZARDOUS MATERIALS TOXICOLOGY: CLINICAL PRINCIPLES OF ENVIRONMENTAL HEALTH, (1992), (Met. A., 9206-72-0272), pp. 903-907 [in English].)

3049 TOXICOLOGY OF THALLIUM. [BIB-199206-71-0133]

Thallium is a byproduct of Cd production and is recovered from Pb and Zn flue dust smelting. The main sites for Tl environmental contamination are cement factories, coal-burning power plants and smelters. The public is exposed to Tl via coal-burning power plant emissions, Cu, Zn, Cd and Pb smelters. Thallium is absorbed by the intact skin, by inhalation and by the gastrointestinal route. It is a potent neurotoxin. Following acute exposure, usually by the oral route, the initial manifestations are nausea and vomiting. These symptoms may subside and be followed in approx 7-14 days by further gastrointestinal disturbances such as pain, constipation, bloating sensation and bleeding. Coma, delirium, hallucinations, gastrointestinal bleeding and seizures may occur early if the exposure is severe. Recovery from thallotoxicosis can require many months and residual neuropathy can occur. There is no effective chelating agent for Tl. Current therapy for thallotoxicosis involves a combination of the oral administration of potassium chloride plus activated charcoal. Prussian blue also acts as an ion exchange medium for Tl. 15 ref. (Sullivan, J.B.; Publisher: WILLIAMS & WILKINS, 428 East Preston St., Baltimore, Maryland 21202, USA, HAZARDOUS MATERIALS TOXICOLOGY: CLINICAL PRINCIPLES OF ENVIRONMENTAL HEALTH, (1992), (Met. A., 9206-72-0272), pp. 908-910 [in English].)

3050 TOXICOLOGY OF SELENIUM. [BIB-199206-71-0134]

Selenium is an essential element for mammals; it is a modifier of the response to a number of toxins. However, Se is acutely and chronically toxic. Sources and distribution of Se in the biosphere are described and cases of chronic Se poisoning and intoxication are summarized. Mechanisms of gastrointestinal and respiratory absorption are discussed. Animal studies indicating teratogenicity, mutagenicity and carcinogenicity of Se are noted. A table summarizes the course, treatment and outcome of cases of acute or chronic Se intoxication. 70 ref. (Thomas, D.J.; Publisher: WILLIAMS & WILKINS, 428 East Preston St., Baltimore, Maryland 21202, USA, HAZARDOUS MATERIALS TOXICOLOGY: CLINICAL PRINCIPLES OF ENVIRONMENTAL HEALTH, (1992), (Met. A., 9206-72-0272), pp. 911-915 [in English].)

3051 TOXICOLOGY OF PHOSPHORUS AND PHOSPHORUS COMPOUNDS. [BIB-199206-71-0135]

Phosphorus is a compound whose toxicity is manifested by elemental and various inorganic forms, including white or yellow elemental P; phosphoric acid; chloro and sulfide compounds of P; phosphine and metal sulfides. Exposure can

occur via several routes: burns to skin and mucuous membranes; inhalation of fumes released by contact of P with air; or inhalation of fumes released in the workplace from P-containing compounds. Ocular, oral and parenteral exposure remain as other mechanisms of contact. The element is regarded as a general protoplasmic poison. Burns represent a special problem as they can be deep and painful with vesiculation and necrosis. Burning will progress until all the P is consumed and its progression is halted by the deprivation of oxygen, such as immersion in water. Liver and kidney failure may ensue from absorption from the burn site. Chronic inhalation of P and chloro compounds of P causes damage to bony tissue. Guidelines are given for the management of toxicity. 11 ref. (Desai, H.; Publisher: WILLIAMS & WILKINS, 428 East Preston St., Baltimore, Maryland 21202, USA, HAZARDOUS MATERIALS TOXICOLOGY: CLINICAL PRINCIPLES OF ENVIRONMENTAL HEALTH, (1992), (Met. A., 9206-72-0272), pp. 937-939 [in English].)

3052 THE PROCESSING OF MATERIALS CONTAINING NICKEL: INDUSTRIAL HYGIENE ASPECTS. [BIB-199207-71-0160]

The industrial hygiene aspects of the processing of nickeliferous materials are considered. Proven or possible risks associated with the use of processing of Ni are described. These include possible carcinogenic effects, sensitizing (i.e. the allergenic effect of Ni) and acute breathing difficulties upon inhaling nickel carbonyl. The presentation then focuses on emission of Ni in the manufacture of gas turbines. Processes during which Ni can be emitted to the ambient air are listed and four are described in detail. The four are: thermal spraying; welding processes; electric discharge machining; and grinding and polishing. 6 ref. (Gross, H.; Publisher: INTERNATIONAL IRON AND STEEL INSTITUTE, 120, Rue Col. Bourg, B-1140 Brussels, Belgium, ENVIRONMENTAL CONTROL IN THE STEEL INDUSTRY, (1992), (Met. A., 9207-72-0323), pp. 535-545 [in English].)

3053 PROTECTIVE MEASURES FOR COOLING LUBRICANTS—ERADICATE THE TROUBLE. (DAS UBEL AN DER WURZEL PACKEN—SCHUTZMASSNAHMEN BEI KUHLSCHMIERSTOFFEN.) [BIB-199208-53-0474]

Measures to prevent health endangering conditions caused by cooling lubricants must be taken at the technical, organizational and personal levels. Cooling lubricants may contain up to 60 additives, some of which cause skin and respiratory reactions. In addition, they can carry health endangering metals from the cutting process. Precautions for workers are discussed, with citations of relevant German regulations. G24 is discussed. (Wettberg, W.; INDUSTRIE-ANZEIGER, (28 MAY 1991), 113, (43), pp. 126, 129 [in German]. ISSN 0019-9036)

3054 CHARACTERIZING THE STRUCTURE OF ABRASIVE FINEPARTICLES. [BIB-199208-54-0758]

A new computer-aided image analysis procedure for characterizing the number and sharpness of potential cutting facets on the profiles of the image of an abrasive fineparticle is described. In the method, the digitized profile is explored by a running chord generating procedure which generates what is described as the facet signature of the profile. This signature can be processed at different threshold levels to recognize facets of the profile having different levels of sharpness as defined by the acute angle of the facet. Several different ways in which data from the procedure could be used to describe a population of polishing powder fineparticles are outlined. The potential use of a new descriptive characterization procedures for following the physical changes in the powder corresponding to the degeneration in performance of a polishing powder during use is outlined. The possible use of the new methodology to describe the health hazards of angular shaped dust fineparticles and flake type fillers (such as mica) in composite material technology is outlined. Photomicrographs, Spectra, Graphs. 20 ref. (Kaye, B.H.; Clark, G.G.; PARTICLE & PARTICLE SYSTEMS CHARACTERIZATION, (MAR. 1992), 9, (1), pp. 1-8 [in English]. ISSN 0934-0866)

3055 ARC WELDERS' RESPIRATORY HEALTH EVOLUTION OVER FIVE YEARS. [BIB-199208-55-1100]

The respiratory health of 138 arc welders and 106 control subjects in the same company was studied in 1981 and 1986. Most of the subjects welded mild steel using the metal inert gas (MIG) process. The controls were workers in the same company, not exposed to any known pulmonary risk. The welders and controls in the analysis had not changed their professional activity nor their smoking habits during these five years. The examinations consisted of a questionnaire on respiratory symptoms, a thoracic auscultation, a chest X-ray and lung function tests: flow-volume curve and steady state carbon monoxide transfer test. The examinations in 1986 confirmed the risk of nonspecific radiological impairment (pulmonary reticulo-micronodulation) and of obstruction in the small bronchi which had already been observed in 1981 in the arc welders in this company. These impairments did not seem to have evolved more than in the controls, but do however justify regular surveillance of the respiratory health of arc welders. Graphs. 34 ref. (Mur, J.M.; Pham, Q.T.; Teculescu, D.; Massin, N.; Meyer-Bisch, C.; Moulin, J.J.; Wild, P.; Leonard, M.; Henquel, J.C.; Baudin, V.; Betz, M.; Fontana, J.M.; Joamain, J.P.; WELDING IN THE WORLD, (JAN.-FEB. 1992), 30, (1-2), pp. 20-25 [in English]. ISSN 0043-2288)

3056 HEALTH-RELATED CHARACTERISTICS OF ELECTRODES FOR THE ARC WELDING OF STEELS. I. ELECTRODES FOR THE WELDING OF CARBON AND LOW-ALLOY STRUCTURAL STEELS. [BIB-199208-55-1127]

The health-related characteristics of currently used electrodes for the welding of carbon and low-alloy steels are reviewed with emphasis on the amounts of the released aerosols and gases, such as HF, Cl, and N_2O_5. An analysis of the results obtained emphasizes the need for correcting the existing Health Standards and using a unified system for the quantitative analysis of the contents of aerosols and gases released during welding. Graphs. 18 ref. (Zaks, I.A.; SVAROCHNOE PROIZVODSTVO, (AUG. 1991), (8), pp. 31-33 [in Russian]. ISSN 0491-6441)

3057 CAPTURING FUMES FROM WELDING ROBOTS. [BIB-199208-55-1181]

Welding fumes consist of particulate and gases generated by the interaction of the base metal, electrode, flux, and shielding gas. Metallic oxides produced by the condensation of melted metals are the prime constituents of the visible plume of ultra-fine particulate matter. Most of the metal oxides, such as Fe, Sn and Ti, are electrical conductors. The welding fumes are collected at the point of generation or through the use of general ventilation techniques. Bag-type collectors, cartridge filters, and electronic air cleaners can be used to efficiently capture welding fumes. Graphs. (Ashe, J.T.; Hostettler, R.A.; PLANT ENGINEERING, (6 FEB. 1992), 46, (2), pp. 67-70 [in English]. ISSN 0032-082X)

3058 NIOSH: GUIDELINES ON SAFETY DURING LEAD PAINT OPERATIONS. [BIB-199208-57-1008]

In response to an increase in the incidence of Pb poisoning among construction workers, including blasters and painters, the National Institute for Occupational Safety and Health (NIOSH) issued a NIOSH Alert entitled "Request for Assistance in Preventing Lead Poisoning in Construction Workers" in the fall of 1991. Workers are potentially exposed to Pb during work on bridges or other steel structures such as water and fuel storage tanks. Airborne Pb concentrations are reported during operations on bridges and other painted steel structures. A review covers health effects of Pb exposure; relevant exposure criteria and regulations; six case studies of Pb exposure; NIOSH-recommended respiratory protection for workers exposed to inorganic Pb; actions required by the OSHA general industry standard for various Pb concentrations in blood; and state agencies that require the reporting of individuals with elevated Pb concentrations in blood. A review of recommendations by NIOSH for reducing Pb exposure and preventing Pb poisoning among workers covers: air monitoring; engineering controls including surface preparation, work inside containment structures, contact specifications, and welding, cutting or burning; personal hygiene practices; warning signs; personal protective equipment including protective clothing and respiratory protection; medical surveillance including monitoring, protection and reporting; and training. 54 ref. (JOURNAL OF PROTECTIVE COATINGS & LININGS, (JAN. 1992), 9, (1), pp. 40-54 [in English]. ISSN 8755-1985)

3059 ENVIRONMENT CONSIDERATIONS FOR ADVANCED MATERIALS. [BIB-199208-57-1112]

Three lists of toxic or mutagenic materials issued since 1986 are quoted and attention is drawn to the accelerating research into replacements for these materials over a wide range of applications, including organic solvents for primers, coatings, paints and mould releases. Hexavalent Cr (chromates) is being

eliminated in corrosion resistant primers and treatments for paint bonding coatings on Al. The almost complete decline in the use of asbestos is reported and efforts are underway to eliminate methylene dianiline as a curing agent in adhesives and high temperature materials such as polyimides. (Teschendorf, A.F.; ADVANCED MATERIALS TECHNOLOGY INTERNATIONAL, (1992), pp. 13-14 [in English]. ISSN 0957-4778)

3060 POTENTIOSTATIC CADMIUM ELECTRODEPOSITION FROM DILUTED SOLUTIONS. [BIB-199208-58-1161]

Cadmium, being a toxic element, must be removed from liquid effluents prior to disposal. An electrostatic method is described for meeting the allowable threshhold of 0.5 mg/m^3. It uses an anionic semipermeable membrane in a flow reactor operating at 27 °C in acid or alkaline solutions. After 3 h, residual concentrations registered 5 ppm. Photomicrographs, Graphs. 19 ref. (Bartoluzzi, M.; Biagi, A.; OBERFLACHE SURFACE, (OCT. 1991), 32, (10), pp. 13-15 [in English]. ISSN 0048-1270)

3061 ZINC AND HEALTH. [BIB-199208-71-0192]

The causes and effects of Zn deficiency in people, animals and crops, and remedies for Zn deficiency in people are discussed. A daily intake of 15 mg of Zn is recommended for the average individual person. Intake is via food, water and air. Its absorption is equal when taken as oxide, carbonate, sulfate or metal, but as sulfide and as mixed Fe—Zn—Mn oxide, it is excreted practically unaltered. Common signs of Zn deficiency in people are white flecks on the fingernails and, in more severe cases, this is sometimes accompanied by horizontal ridges. Stretch marks may be another sing since Zn is vital to keep tissue elastic. Intake of foods rich in Zn and use of Zn supplements are two possible ways of correcting the deficiency. Symptoms of Zn deficiency disease in animals (mice, rats, swine, birds and poultry, cattle, dogs and squirrel monkey) are shown in tabular form. Zinc is one of the 16 elements essential for crop growth. Zinc can cause harm to living matter through two main distinct processes: ingestion of toxic amounts with food or drink; and inhalation of fairly high concentrations of freshly formed zinc oxide fumes. 23 ref. (Publisher: MARCEL DEKKER, INC., 270 Madison Ave., New York, New York 10016, USA, ZINC HANDBOOK: PROPERTIES, PROCESSING, AND USE IN DESIGN, (1991), (Met. A., 9208-72-0369), pp. 603-613 [in English].)

3062 PLANNING YOUR UST MANAGEMENT STRATEGY. [BIB-199209-35-1701]

The management of underground storage tanks is discussed. This is critical because of new government regulations that acknowledge and correct long-standing environmental hazards, reduce chances for future spills, provide quick containment, establish liability, and protect public health. Corrosion protection is one of the most important considerations and any unprotected steel tanks are banned. Preventative measures do not always work on leak detection methods that have been developed that are also required under the new regulations. Finally, controls must be in place to prevent overfills. (Reeves, T.S.; Bacon, P.A.; POLLUTION ENGINEERING, (1 MAR. 1992), 24, (5), pp. 44-46 [in English]. ISSN 0032-3640)

3063 LABOR SAFETY AND ENVIRONMENT PROTECTION IN LARGE IRON FOUNDRIES. [BIB-199209-51-1321]

Emission of hazardous substances in casting with gasified patterns is discussed. A reactor for complete neutralization of these substances was developed. 2 ref. (Shitsman, E.B.; Larichev, O.A.; Shchigol'-Shendelis, L.E.; Chumachenko, V.A.; Lugovskii, V.I.; LITEINOE PROIZVODSTVO, (SEPT. 1991), (9), pp. 14-15 [in Russian]. ISSN 0024-449X)

3064 LABOR SAFETY AND ENVIRONMENT PROTECTION IN LARGE IRON FOUNDRIES. [BIB-199209-51-1322]

See preceding abstract. Emission of hazardous substances in casting with gasified patterns is discussed. A reactor for complete neutralization of these substances was developed. (Shitsman, E.B.; Larichev, O.A.; Shchigol'-Shendelis, L.E.; Chumachenko, V.A.; Lugovskii, V.I.; SOVIET CASTINGS TECHNOLOGY, (1991), (9), pp. 16-17 [in English]. ISSN 0891-0316)

3065 CLEANING UP THE ENVIRONMENT. [BIB-199209-52-1312]

Environmental considerations in machining materials and processes must consider impact on human operator and environment whether inside or outside the manufacturing facility. The Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA) increased monitoring and enforcement on small- and medium-sized companies dealing with regulations aimed at cleaning up (1) ambient in-plant air and exhaust air and (2) fluids used in processes and outfall whenever runoff leaves a manufacturing site. Once subject to compliance, emissions must be reduced by 90%. Material management is the goal of compliance by controlling processes or changing materials. Total quality management and statistical process control techniques are suggested for fluids management because each process has its own set of problems. To stay informed on environmental regulations, metal processing operations should work closely with trade organizations and have a preliminary environmental audit done on their plant operations. (Loincz, J.A.; TOOLING AND PRODUCTION, (FEB. 1992), 57, (11), pp. 31-32, 36, 38, 40 [in English]. ISSN 0040-9243)

3066 GETTING THE SAFETY MESSAGE ACROSS. [BIB-199209-54-0820]

The "green" credentials of manufacturing companies will be under the microscope in 1992 as part of the European Year of Health and Safety. This will include PM companies. The message the industry must get across to the public is that metal powders can be used safely and effectively. Beryllium is discussed. 2 ref. (Williams, B.; METAL POWDER REPORT, (MAR. 1992), 47, (3), pp. 24-27 [in English]. ISSN 0026-0657)

3067 CLASSIFYING NICKEL POWDER. [BIB-199209-54-0821]

Government bodies and other organizations around the world have been devoting considerable effort to examining the effects of a wide range of possibly hazardous substances on the environment, in the workplace and even in the home. A steady flow of legislation governing the handling of these materials is now beginning to emerge. Among the many substances covered by directives recently issued by the EEC are Ni metal and Ni compounds. Why has Ni been included? What do users need to know about the new legislation? The decisions made by the EEC in respect of the labelling of Ni powders is reviewed. The actions suppliers need to take to comply with the forthcoming legislation are explained. (Flint, G.N.; Morgan, L.; METAL POWDER REPORT, (MAR. 1992), 47, (3), pp. 28-30 [in English]. ISSN 0026-0657)

3068 DEBRIS-MEDIATED OSTEOLYSIS—A CASCADE PHENOMENON INVOLVING MOTION, WEAR, PARTICULATES, MACROPHATE INDUCTION, AND BONE LYSIS. [BIB-199210-31-3323]

The spectrum of effects leading to the bone loss observed around failing implants is explained by means of a wear-debris-activated, macrophagic osteolytic mechanism. This concept is presented as the universal failure mechanism for all anthroplasty components, irrespective of fixation mode. The early descriptions of this bone-destruction process can be traced back to various clinical reports in the early 1950s which described failure of polymeric hemiarthroplasty implants, such as nylon and polyethylene cup arthroplasties, and the early polymethyl methacrylate, short-stem, Judet implants. Thus, polymeric debris and macrophages appear to be particularly reactive agents in the bone lysis phenomenon seen around contemporary total hip designs, but any particulate material small enough to be phagocytosed may contribute to this mechanism (metallics or ceramics). In addition to wear at the articulating surfaces, micromotion at any interface also has the potential to produce wear particles, thereby adding to the osteolytic process. Thus, the three potential sources of wear debris in contemporary total joints are (1) metal/ultrahigh-molecular-weight polyethylene (UHMWPE) joint articulation, (2) implant/coating interfaces, and (3) implant/bone interfaces. Graphs. 136 ref. (Clarke, I.C.; Campbell, P.; Kossovsky, N.; PARTICULATE DEBRIS FROM MEDICAL IMPLANTS: MECHANISMS OF FORMATION AND BIOLOGICAL CONSEQUENCES, SAN ANTONIO, TEXAS, USA, 31 OCT. 1990, Publisher: ASTM, 1916 Race St., Philadelphia, Pennsylvania 19103, USA, (1992), STP 1144, (Met. A., 9210-72-0407), pp. 7-26 [in English].)

3069 HISTOPATHOLOGICAL EFFECTS OF ULTRAHIGH-MOLECULAR-WEIGHT POLYETHYLENE AND METAL WEAR DEBRIS IN POROUS AND CEMENTED SURFACE REPLACEMENTS. [BIB-199210-31-3324]

The replacement of cement with biological ingrowth systems for fixation has not resolved the problem of aseptic loosening nor that of osteolysis in association with metal and polyethylene wear debris. To investigate the role of wear debris in the failure of surface replacements, a histopathological study of ten Ti alloy (Ti—6Al—4V) porous-coated (PSR) and ten cobalt—chrome (Co—Cr) alloy cemented components was conducted. Wear-debris-laden histiocytes (metal and polyethylene) were associated with massive osteolysis in several of the PSR components, but bone loss in the cemented Co—Cr components was confined to localized areas adjacent to the cement membrane. The results suggest that histiocytes activated by the ingestion of fine wear debris are reponsible for bone loss. The mechanism of bone loss shown by this "model" is applicable to all joint replacement implant systems where wear debris is generated. Photomicrographs. 15 ref. (Campbell, P.; Amstutz, H.C.; Nasser, S.; Kossovsky, N.; PARTICULATE DEBRIS FROM MEDICAL IMPLANTS: MECHANISMS OF FORMATION AND BIOLOGICAL CONSEQUENCES, SAN ANTONIO, TEXAS, USA, 31 OCT. 1990, Publisher: ASTM, 1916 Race St., Philadelphia, Pennsylvania 19103, USA, (1992), STP 1144, (Met. A., 9210-72-0407), pp. 38-51 [in English].)

3070 PARTICULATE-ASSOCIATED ENDOSTEAL OSTEOLYSIS IN TITANIUM-BASE ALLOY CEMENTLESS TOTAL HIP REPLACEMENT. [BIB-199210-31-3325]

Fourteen cases of diaphyseal endosteal erosions adjacent to the femoral stem have been identified in a patient population of 308 primary cementless Ti alloy (Ti—6Al—4V) total hip replacements at minimum two-year follow-up. Three of these cases were associated with unstable prostheses that resulted in revision surgery. Eleven cases were associated with radiographically stable prostheses, one of which was revised. Capsular tissue and interfacial membrane tissue were harvested from the four cases that were revised. All the tissues were analyzed histologically, and selected tissues were analyzed with electron microprobe analysis (EMA), analytic electron microscopy (AEM), and Fourier transform infrared spectroscopy (FTIR). Standard hematoxylin and eosin sections demonstrated histiocytic infiltration of the capsular and interfacial membrane tissue. These cells were laden with fine intracellular birefringent material. EMA revealed the presence of Ti alloy particles and AEM documented Ti alloy particles and silicate particles. FTIR positively identified polyethylene-like particles, but this technique was not able to identify particles 10 μm in diameter. Femoral endosteal osteolysis appears to be mediated by histiocytes containing both metallic and polymeric wear debris. Photomicrographs. 15 ref. (Jacobs, J.J.; Urban, R.M.; Schajowicz, F.; Galante, J.O.; Gavrilovic, J.; PARTICULATE DEBRIS FROM MEDICAL IMPLANTS: MECHANISMS OF FORMATION AND BIOLOGICAL CONSEQUENCES, SAN ANTONIO, TEXAS, USA, 31 OCT. 1990, Publisher: ASTM, 1916 Race St., Philadelphia, Pennsylvania 19103, USA, (1992), STP 1144, (Met. A., 9210-72-0407), pp. 52-60 [in English].)

3071 ENDOSTEAL OSTEOLYSIS AROUND WELL-FIXED POROUS-COATED CEMENTLESS FEMORAL COMPONENTS. [BIB-199210-31-3326]

Seventeen cases of focal endosteal femoral osteolysis around cementless porous-coated femoral components of total hip replacements that were judged not to be loose on the radiographs were identified and analyzed. Fourteen of these cases were from a retrospective review of 474 cementless total hip replacements with a minimum two-year follow-up. The incidence of the osteolysis was approx 3% for femoral components made of both Ti-based alloys and cobalt-chrome-based alloys. Four of the patients underwent reoperations for osteolysis. All four femoral components were found to be rigidly fixed to the skeleton at surgery. Three of these showed extensive bony ingrowth into the porous coatings on histology. The tissue in the region of osteolysis had a fibrous stroma. However, it contained focal aggregates of macrophages and rare giant cells. On light microscopy, evidence of fine intracellular particulate polyethylene and metallic debris was found in three of the cases. In the fourth, there was a fine fibrous membrane lining a cystic cavity. Although the tissue in the fourth case contained occasional macrophages, foreign material could not be identified on light microscopy. On electron microscopy, however, fine electron-dense particles consistent with metal were noted within the macrophages of this case. Although these findings represent a small number of cases, they caution against the assumption that femoral osteolysis can be eliminated by using uncemented components. Photomicrographs. 20 ref. (Jasty, M.; Harris, W.H.; Maloney, W.J.; Galante, J.O.; Callaghan, J.J.; PARTICULATE DEBRIS FROM MEDICAL IMPLANTS: MECHANISMS OF FORMATION AND BIOLOGICAL CONSEQUENCES, SAN ANTONIO, TEXAS, USA, 31 OCT. 1990, Publisher: ASTM, 1916 Race St., Philadelphia, Pennsylvania 19103, USA, (1992), STP 1144, (Met. A., 9210-72-0407), pp. 61-67 [in English].)

3072 PHOTON CORRELATION SPECTROSCOPY ANALYSIS OF THE SUBMICROMETRE PARTICULATE FRACTION IN HUMAN SYNOVIAL TISSUES RECOVERED AT ARTHROPLASTY OR REVISION. [BIB-199210-31-3327]

Data on the size and mass of submicrometre human synovial-derived arthroplasty wear debris have been obtained. The particulates extracted from both tissues and isolated macrophages recovered at revision surgery were relatively monodispersed, with a mean diameter of 425 nm, and constituted approx 1.8% of the tissue mass. In a hypothetical example involving debris from a sample of ASTM F 75 alloy in a 6 g sample of synovium, these numbers translate to 2.9×10^{11} particles, with a combined surface area of 1600 cm^2. These findings suggest that particulates 500 nm may have an effect on material biocompatibility in arthroplasty. Graphs. 11 ref. (Kossovsky, N.; Gelman, A.; Amstutz, H.C.; Finerman, A.M.; Thomas, B.J.; Liao, K.; Campbell, P.A.; Nasser, S.; PARTICULATE DEBRIS FROM MEDICAL IMPLANTS: MECHANISMS OF FORMATION AND BIOLOGICAL CONSEQUENCES, SAN ANTONIO, TEXAS, USA, 31 OCT. 1990, Publisher: ASTM, 1916 Race St., Philadelphia, Pennsylvania 19103, USA, (1992), STP 1144, (Met. A., 9210-72-0407), pp. 68-74 [in English].)

3073 SAFETY AND HEALTH ISSUES IN SCRAP CHARGING. [BIB-199210-51-1494]

The growing emphasis on recycling of all materials, including Al, will continue to increase because of new government regulations, higher landfill costs and changing American attitudes. Processing this recycled scrap is a growing challenge to an extrusion plant because of the moisture and contamination it can contain. There has been an increase in accident, injury and death caused by this moisture and contamination. The Aluminum Association has formed a task force on safe scrap charging. Presentations have been made to various industry organizations to describe some of the background on the ways that moisture and contamination get into scrap. Reviewed are the types of moisture and contamination and what the results can be. Efforts are continuing to develop ways to identify and eliminate the safety hazards caused by this moisture and contamination in Al scrap. Guidelines are developed for inspection of scrap by receiving personnel. Plans are made to implement a scrap rejection system for use when unsafe scrap is received. Many melting facilities are installing scrap preparation equipment. Training aids are being developed for both the collectors and the melters of scrap. Communications are being increased between suppliers and melters of scrap. 1 ref. (Pierce, D.C.; Hubbard, F.R.; 5TH INTERNATIONAL ALUMINUM EXTRUSION TECHNOLOGY SEMINAR. VOL. I, CHICAGO, ILLINOIS, USA, 19-22 MAY 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9210-72-0444), pp. 103-105 [in English].)

3074 COSHH REGULATIONS AND CHEMICAL HAZARDS ASSOCIATED WITH METAL-WORKING FLUIDS. [BIB-199210-53-0535]

Although the introduction of the COSHH regulations will have been greeted by some sections of industry with dismay as yet another example of bureaucratic interference adding to the workload of already over-loaded individuals and departments (and there is no denying that at least initially complying with COSHH is a time-consuming business), it should be evident that making assessments and implementing controls on metal-working fluids will, in the long term, not only improve the prospects for safer working practices but will also bring other benefits by increasing coolant life, reducing down-time, aiding cutting performance and minimizing wastage. These are all desirable consequences. 11 ref. (Hodges, A.; TRIBOLOGY INTERNATIONAL, (1992), 25, (2), pp. 135-139 [in English]. ISSN 0301-679X)

3075 COSHH REGULATIONS AND MICROBIAL HAZARDS ASSOCIATED WITH METAL-WORKING FLUIDS. [BIB-199210-53-0536]

Micro-organisms in metal-working fluids are discussed. The Control of Substances Hazardous to Health (COSHH) regulations define micro-organisms as "any microscopic biological entity capable of replication". Note particularly that this does not limit the potential hazard to disease producing (pathogenic) organisms. All are embraced and must be considered. There is some guidance in the classification used to denote microbial hazards devised by the Advisory Committee on Dangerous Pathogens (ACDP) in 1990. Microbes are classified in numerical groups according to the hazards they produce. Most microbes found as spoilage microbes in mwf will fall into Group 1, and are no more hazardous than those in milk, yoghurt and cheese. A few, unfortunately, fall into Group 2 defined as "an organism that may cause human disease...but is unlikely to spread in the community". In general, Group 2 consists of "opportunistic" pathogens; these are environmental and spoilage organisms that can adapt to an infective, disease producing role in humans. Large numbers are normally necessary, the exposed population must be particularly susceptible and there must be an easy transmission route into the body. AS COSHH state, (section 2c) "...creates a hazard to the health of any person" the susceptible host must be considered as the basis for the assessment. The word "creates" is also of prime importance; a disease process is not necessary—indirect hazards are more insidious and probably more important. 6 ref. (Hill, E.C.; TRIBOLOGY INTERNATIONAL, (1992), 25, (2), pp. 141-143 [in English]. ISSN 0301-679X)

3076 GAS SELECTION FOR INCREASED PRODUCTIVITY. [BIB-199210-55-1485]

The increased use of gas metal arc welding using solid wire in recent years has meant that the choice of shielding gas has gained in significance. The effects that shielding gas composition has upon the arc and the final weld quality and shape are discussed. Productivity and welder health are also examined. A shielding gas with 8% CO_2 and 92% Ar allows short arc, spray arc/pulsed arc and rotating arc modes of welding to be carried out just by increasing the wire feed speed and voltage. A deposition rate from 0.5-25 kg/h is possible. For short arc welding at low currents, 50-100 A, the optimal flat weld bead profile is easier to obtain using an Ar/CO_2 mixture with 25% CO_2. Graphs. (Olsson, R.; Persson, K.-A.; MacKay, L.; WELDING AND METAL FABRICATION, (NOV. 1991), 59, (9), pp. 502, 504, 506 [in English]. ISSN 0043-2245)

3077 WHAT SAFETY EQUIPMENT OFFERS YOU PROTECTION AGAINST WELDING FUMES? (QUE SEGURIDAD OFRECE SU PROTECCION CONTRA HUMOS DE SOLDADURA?) [BIB-199210-55-1547]

The risk to a welder's health depends on fume composition, fume concentration, and period of exposure. Symptoms that the welder may experience are: irritation of the respiratory system, fever, poisoning, and long term or chronic effects. The Omni-Comercial produced automatic mask, Speedglass Fresh-Air, protects the eyes and lungs, and seems to be the solution for the welder. (METALURGIA Y ELECTRICIDAD, (SEPT. 1991), 55, (636), pp. 169-171 [in Spanish]. ISSN 0026-0991)

3078 HEAT TREATERS' GUIDE TO EPA COMPLIANCE. [BIB-199210-56-1285]

Environmental regulations that industry—specifically heat treating—is faced with today are discussed. The Love Canal tragedy, the situation that dramatizes the danger of environmentally unsound hazardous waste disposal, is reviewed. Also discussed is the SARA-Title III, Emergency Planning and Community Right-to-Know Act of 1988, requiring reporting of extremely hazardous substances to the state Emergency Response Commission (SERC) and Local Emergency Planning Committee. The Resource Conservation and Recovery Act (RCRA) mandates cradle-to-grave management of hazardous waste. Enforcement, penalties, base-line audits, and corrective action plan are reviewed. (Schneider, H.E.; McIntosh, D.C.; HEAT TREATING, (MAR. 1992), 24, (3), pp. 28-31 [in English]. ISSN 0017-9345)

3079 CHEMICAL COMPATIBILITY OF CARTRIDGE MATERIALS. [BIB-199211-34-1213]

The objectives were to determine the chemical compatibility of Ti—Zr—Mo (TZM) with GaAs and CdZnTe, and Inconel with HgCdTe and HgZnTe. At the present time, no other studies regarding the compatibility of these crystal components and their respective cartridge materials have been performed. This study was to identify any possible problems between these materials to insure proper containment of possibly hazardous fumes during crystal growth experiments. The reaction zone between the materials was studied and the amount of degradation to the system was measured. Detailed results are presented. (Ambrose, B.; Wilcox, R.C.; Zee, R.H.; GOVERNMENT RESEARCH ANNOUNCEMENTS AND INDEX, (1992), N92-23555/5/XAB, Pp 36 [in English]. ISSN 0097-9007)

3080 PROCESS FOR DETOXIFYING LEAD CONTAMINATED MATERIALS. [BIB-199211-43-0332]

A novel chemical extraction/washing process is described for detoxifying Pb contaminated materials, and in particular, for detoxifying broken Pb/acid storage battery casings made from ebonite. In particular, the preferred process of the invention enables the Pb content of broken ebonite battery casing material to be reduced to the point that the processed ebonite is no longer a potential hazardous waste by any EPA definition. In the preferred embodiment, the novel process of the invention makes use of the chemical leaching capabilities of nitric acid, and the water solubility of lead nitrates, to dissolve and then wash away the combined Pb compounds that contaminate and render hazardous broken ebonite battery casing material, leaving a clean and usable ebonite product for recycling. (Hartup, G.R.; Leonard, J.E.; (7 JULY 1992), [in English]., Patent no.: US5127963 (USA) Convention date: 21 Mar. 1991)

3081 WASTE MINIMIZATION ASSESSMENT FOR A MANUFACTURER OF ALUMINUM EXTRUSIONS. [BIB-199211-57-1441]

The US Environmental Protection Agency (EPA) has funded a pilot project to assist small- and medium-size manufacturers who want to minimize their generation of hazardous waste but who lack the expertise to do so. Waste Minimization Assessment Centers (WMACs) were established at selected universities and procedures were adapted from the EPA Waste Minimization Opportunity Assessment Manual (EPA/625/7-88/003, July 1988). The WMAC team at the University of Louisville performed an assessment at a plant manufacturing Al extrusions— 10 million lb/year. Aluminum parts are extruded and tempered followed by electrostatic painting, anodizing, or shipping. The team's report, detailing findings and recommendations, indicated that the most waste was generated by the painting process and that the greatest savings could be obtained by replacing the currently used paints with electrostatic powder coatings. (Kirsch, F.W.; Looby, G.P.; GOVERNMENT RESEARCH ANNOUNCEMENTS AND INDEX, (1992), PB92-192137/XAB, Pp 6 [in English]. ISSN 0097-9007)

3082 BENEFICIAL PROCRASTINATION: DELAYING LEAD PAINT REMOVAL PROJECTS BY UPGRADING THE COATING SYSTEM. [BIB-199211-57-1481]

Upgrading a coating system can extend the life of Pb-based protective paints until more cost effective methods for their disposal can be developed. Upgrading refers to the application of a barrier coat to increase the protective life of the existing coating. Three techniques can be used: upgrading the coating system, inspection and repair, and partial removal to restore the protective layer. Techniques for inspection and removal are given so as to assist in the most cost effective approach to upgrading. The typical steps include physical testing of the coating for adhesion, thickness and integrity. This is followed by selection of the correct coating for the particular application. Finally, several case histories (including steel-girder bridges) are given to illustrate this process. Graphs. 17 ref. (Kline, E.S.; Corbett, W.D.; JOURNAL OF PROTECTIVE COATINGS & LININGS, (MAR. 1992), 9, (3), pp. 48-56 [in English]. ISSN 8755-1985)

3083 NONCYANIDE CADMIUM PLATING BATHS. [BIB-199211-58-1491]

One approach to minimizing toxic wastes is to eliminate the use of cyanide plating baths. Non-cyanide Zn plating baths have been successfully developed and have found widespread use. An investigation was conducted in an attempt to accomplish similar results with Cd plating baths. The focus was on additives to a near neutral Cd bath, free of complexing agents. A Hull cell was used to enable visualization of deposits over a broad range of cathode current densities. Experimental design (Taguchi Method) was used to optimize bath parameters

and constituent concentrations. Baths have been developed which indicate promise for producing dense deposits with good covering power, and relatively low tendency for hydrogen embrittlement. (Pearlstein, F.; Agarwala, V.S.; GOVERNMENT RESEARCH ANNOUNCEMENTS AND INDEX, (1991), AD-A250 610/3/XAB, Pp 28 [in English]. ISSN 0097-9007)

3084 EVALUATION OF ALUMINUM ION VAPOR DEPOSITION AS A REPLACEMENT FOR CADMIUM ELECTROPLATING AT ANNISTON ARMY DEPOT. FINAL REPORT, MAY 1989-APRIL 1992. [BIB-199211-58-1492]

The US Army Toxic and Hazardous Materials Agency (USATHAMA) conducts research and development projects with the objective of minimizing hazardous waste generation at Army Depots. During one such project, USATHAMA evaluated the feasibility of an Al ion vapor deposition system as an alternative to Cd electroplating. The Al ion vapor deposition system, referred to herein as an Ivadizer, provides corrosion resistance to metal parts by depositing a thin Al film (typically 1 mil or 0.001 in.) on the parts. As a replacement for Cd electroplating, the Ivadizer has the advantage of generating minimal quantities of hazardous wastes; whereas Cd plating generates significant quantities of listed hazardous waste, and Cd is toxic (and possibly carcinogenic). (Ressl, R.; Spessard, J.; GOVERNMENT RESEARCH ANNOUNCEMENTS AND INDEX, (1992), AD-A250 063/5/XAB, Pp 128 [in English]. ISSN 0097-9007)

3085 ADVANCED CERAMIC MATRIX, METAL MATRIX AND CARBON—CARBON COMPOSITES: THE CURRENT AND POTENTIAL MARKETS. [BIB-199211-62-1218]

Ongoing development and commercialization of three classes of inorganic fiber and whisker reinforced materials are described. Current and projected applications in aerospace, automotive, cutting tool and wear part markets are identified. Market forecasts for US and Western Europe are made to the year 2000. Fabrication trends, property data and health aspects of the materials are discussed. Major companies involved with the materials are profiled and industrial and academic research and development programs are identified. A directory of companies and research centers is provided. Graphs. (Briggs, J.; Publisher: MATERIALS TECHNOLOGY PUBLICATIONS, 40 Sotheron Rd., Watford, Herts, WD1 2QA, UK, (1990), (Met. A., 9211-72-0477), Pp 177 [in English].)

3086 PAINTING ACTIVE PRODUCTION AREAS IN CHEMICAL PLANTS: COATING IN ADVERSE CONDITIONS. [BIB-199211-71-0279]

Key concerns that must be considered when painting in or near active production areas are: safety of personnel in adjacent areas; the presence of toxic or flammable chemicals in the production area; safety of equipment and the production process; and the ability to clean the surfaces to be painted. Each of these concerns are discussed in detail to show that painting in active production areas is possible if the proper precautions are taken. To illustrate this, several case histories are given. (Kapsanis, K.A.; JOURNAL OF PROTECTIVE COATINGS & LININGS, (MAR. 1992), 9, (3), pp. 58-62 [in English]. ISSN 8755-1985)

3087 HERE TODAY, GONE TOMORROW: REPLACING METHYL CHLOROFORM IN THE PENETRANT PROCESS. [BIB-199212-22-0896]

Methyl chloroform (1,1,1,-trichloroethane) is scheduled for elimination as an ozone layer depleting compound. Today, it is widely used as a precleaning agent for fluid penetrant testing of metals and will not be easily replaced. The replacement must be non-toxic, non-flammable, have high volatility, a potent solvent of organics, and have low residuals. HCFC-123 has all the necessary properties to replace 1,1,1 except for a low level potential to cause cancer. Alternate methods include mild alkaline cleaners, caustic alkaline cleaners, and steam cleaners. All have sufficient disadvantages as to make it necessary to continue the search for replacements for methyl chloroform. (Robinson, S.J.; MATERIALS EVALUATION, (AUG. 1992), 50, (8), pp. 936, 938-940, 942-943, 945-946 [in English]. ISSN 0025-5327)

3088 PULMONARY EFFECTS OF INHALED ZINC OXIDE IN HUMAN SUBJECTS, GUINEA PIGS, RATS, AND RABBITS. [BIB-199212-23-0914]

Occupational exposure to freshly formed zinc oxide (ZnO) particles (1.0 μm aerodynamic diameter) produces a well-characterized response known as metal fume fever. An 8 h threshold limit value (TLV) of 5 mg/m^3 has been established to prevent adverse health effects because of exposure to ZnO fumes. Because animal toxicity studies have demonstrated pulmonary effects near the current TLV, the time course and dose-response of the pulmonary injury produced by inhaled ZnO in guinea pigs, rats, rabbits, and human volunteers was examined. The test animals were exposed to 0, 2.5, or 5.0 mg/m^{3}ZnO for up to 3 h and their lungs lavaged. Both the lavage fluid and recovered cells were examined for evidence of inflammation or altered cell function. The lavage fluid from guinea pigs and rats exposed to 5 mg/m^3 had significant increases in total cells, lactate dehydrogenase, beta -glucuronidase, and protein content. These changes were greatest 24 h after exposure. Guinea pig alveolar macrophage function was depressed as evidenced by in vitro phagacytosis of opsonized latex beads. Significant changes in lavage fluid parameters were also observed in guinea pigs and rats exposed to 2.5 mg/m^{3}ZnO. In contrast, rabbits showed no increase in biochemical or cellular parameters following a 2 h exposure to 5 mg/m^{3}ZnO. Differences in total lung burden of ZnO, as determined in additional animals by atomic absorption spectroscopy, appeared to account for the observed differences in species responses. Although the lungs of guinea pigs and rats retained approx 20 and 12% of the inhaled dose, respectively, rabbits retained only 5%. Adverse responses to ZnO inhalation were also observed in human subjects (n (Gordon, T.; Chen, L.C.; Schlesinger, R.B.; Su, W.Y.; Kimmel, T.A.; Amdur, M.O.; Fine, J.M.; AMERICAN INDUSTRIAL HYGIENE ASSOCIATION JOURNAL, (AUG. 1992), 53, (8), pp. 503-509 [in English]. ISSN 0002-8894)

3089 USE OF FLUIDIZING BED AEROSOL GENERATORS TO ESTABLISH A DUST MIXTURE OF TWO SUBSTANCES AT A FIXED RATIO FOR INHALATION TOXICITY STUDIES. [BIB-199212-23-0915]

A method was developed to use two fluidizing bed generators to deliver a mixture of 1 mg cobalt + 15 mg tungsten carbide/m^3 to an inhalation exposure chamber with the output from the Co generator split to provide the same Co concentration to a Co-only chamber. To provide a more uniform delivery of material and to minimize the amount of starting dust needed, a subsystem that produced timed bursts of compressed air was used to prevent the accumulation of dust along the aerosol transport tubes. The addition of an electrostatic precipitator placed in the exhaust lines reduced the amount of dust delivered to the high-efficiency particulate air filters, thereby reducing the number of filter changes. 6 ref. (Shiotsuka, R.N.; Kutzman, R.S.; Firriolo, J.M.; Drew, R.T.; AMERICAN INDUSTRIAL HYGIENE ASSOCIATION JOURNAL, (AUG. 1992), 53, (8), pp. 510-513 [in English]. ISSN 0002-8894)

3090 LEACHING OF SIMULATED HEAVY METAL WASTE STABILIZED/SOLIDIFIED IN DIFFERENT CEMENT MATRICES. [BIB-199212-23-0918]

Leaching experiments have been carried out on samples of ordinary portland cement (OPC), sulphate-resistant portland cement (SRPC) with fly ash (FA) added and an alumina cement (AC), with each receiving various concentrations (0.1-1.0M) of Cr^{6+}, V^{5+} and Cd^{2+}. The samples were prepared and evaluated with a statistical experimental matrix corresponding to a Box—Behnken fractional factorial design. Leaching was done in PTFE vessels using the standard TCLP (toxicity characteristic leaching procedure of the US Environmental Protection Agency). Analyses of the leachates were carried out for elements Cr, Cd, vanadium, Si, Al, Ca and Fe by inductively coupled plasma spectroscopy. Selected solid samples were investigated before and after leaching by scanning electron microscopy, in conjunction with energy dispersive X-ray spectrometry, and by scanning transmission electron microscopy on thinned specimens. The normalized mass losses of Cr varied between 3.3 10^{-2} -3.5 10^{-1} kg/m^2. Calculated maximum release was found for a hypothetical cement with approx 20% alumina, while minimum release was found for AC with 36.7% alumina.

The normalized mass losses of V varied between 1 10^{-3} -8 10^{-2} kg/m^2. Calculated maximum release was found for a hypothetical cement with approx 25% alumina and minimum release was found for OPC. All samples of the Cd series except three showed solution concentrations below the detection limit (0.1 ppm), suggesting very effective retention of this element by all three cement matrices investigated. Graphs, Photomicrographs, Spectra. 15 ref. (Heimann, R.B.; Conrad, D.; Florence, L.Z.; Neuwirth, M.; Ivey, D.G.; Mikula, R.J.; Lam, W.W.; JOURNAL OF HAZARDOUS MATERIALS, (JUNE 1992), 31, (1), pp. 39-57 [in English]. ISSN 0304-3894)

3091 EFFECTS OF LEACHING ON PORE SIZE DISTRIBUTION OF SOLIDIFIED/STABILIZED WASTES. [BIB-199212-34-1400]

Chemical solidification/stabilization processes are commonly used to immobilize metals in fly ash and flue gas desulfurization (FGD) sludges and to convert these wastes into monolithic or granular materials with better handling properties and reduced permeabilities. The role of pore structure of solidified materials during leaching was evaluated. The solidified material's initial pore structure, changes in the pore structure which result during leaching, and the effects of pore structure on leaching are discussed. It was found that pore structures varied depending upon the wastes used and the solidification mix formulations tested. After acetic acid leaching, the pore structures of samples changed remarkably. Total pore volumes and pore sizes increased. The percentage of larger pores (diameter 6000 nm) increased from 5% for before-leaching samples to 23% for after-leaching samples. The higher the alkalinity in a sample, the greater the change of pore structure due to leaching. Changes in pore structure were primarily due to leaching of calcium hydroxide. Graphs. 5 ref. (Bishop, P.L.; Gong, R.; Keener, T.C.; JOURNAL OF HAZARDOUS MATERIALS, (JUNE 1992), 31, (1), pp. 59-74 [in English]. ISSN 0304-3894)

3092 DETERMINATION OF VOLATILE ORGANIC COMPOUNDS IN COKE OVEN EMISSIONS. [BIB-199212-45-1349]

A new sampling device has been constructed for measuring occupational exposure to airborne organic compounds. The sampler enables the simultaneous determination of mono- and polycyclic aromatic hydrocarbons. Where these compounds are associated with dust particles, the sampler can collect both the inhalable and respirable portion of these particles. The sampler comprises three sections in series: a Teflon filter and two adsorbents, graphitised carbon and activated charcoal. The compounds trapped in each section are desorbed with small volumes of carbon disulphide and the hydrocarbons and other organics determined by gas chromatography, using either flame ionisation or mass spectrometric detection. The sampler design and performance were optimised using a suite of reference compounds chosen from the analysis of coal tar. The sampler was then used for the determination of more than 200 compounds in coke oven emissions from BHP Steel's plants at Port Kembla and Whyalla (Australia). The new sampler overcomes a major deficiency of the conventional BSF test (evaporative loss of a major portion of PAH) and also traps benzene and other mono-aromatics which in standard procedures requires a second sampling device. The carcinogen benzene was found to be a major component of coke oven emissions and is not detected by the conventional BSF test. Limited testing of environmental tobacco smoke and of emissions from bitumen manufacture and Al smelting suggests that the new sampler will be suitable for monitoring personal exposure to organic compounds (both particulate and vapour) in a wide variety of industries. (Kirton, P.J.; DISSERTATION ABSTRACTS INTERNATIONAL, (AUG. 1992), 53, (2), N.P. [in English]. ISSN 0419-4217)

3093 TOXICITY OF METALWORKING FLUIDS: MYTHS AND REALITY—A CHEMIST'S PERSPECTIVE. [BIB-199212-53-0754]

A review covers physiological action and results on toxicological tests of ethanolamine, formaldehyde and N-nitrosodiethanolamine with respect to health and safety at workplace. The exposure levels for an operator typically weighing 75 kg and breathing metalworking fluids at a rate of 10 m^3/eight working hours are estimated to be at least two orders of magnitude below the threshold limits for adverse effect on health. The reason for such low values could be related to body's own mechanism of producing toxic chemicals at levels higher than that produced from exposure to metalworking fluids. 19 ref. (Lucke, W.E.; 45TH ANNUAL MEETING OF THE SOCIETY OF TRIBOLOGISTS AND LUBRICATION ENGINEERS, DENVER, COLORADO, USA, 7-10 MAY 1990, LUBRICATION ENGINEERING, (MAY 1992), 48, (5), pp. 425-429 [in English]. ISSN 0024-7154)

3094 PRELIMINARY STUDY OF THE QUANTITATIVE DETERMINATION OF THE TOTAL WELDING FUME PRODUCTION. (STUDIO PRELIMINARE SULLA DETERMINAZIONE QUANTITATIVA DEI FUMI TOTALI PRODOTTI DALLA SALDATURA.) [BIB-199212-55-1872]

The composition of the fumes generated during welding depends chiefly on base and filler metal nature. Knowledge of quality and quantity of the fumes released by a welding operation can be useful for the disposition of preventive procedures to adopt to control workers' exposure. The validity of a method to determine the total fumes released by welding operations is examined and the system characteristics are reported, together with a discussion on defects and possible improvements. The main limit of the method is the poor repeatability that can be obviated with a statistical and comparative analysis. The aim of a possible standardization of such a methodology is the feasibility of a comparative evaluation of new materials or different welding techniques. Graphs. (Balossino, A.; Picollo, P.; Valente, T.; RIVISTA ITALIANA DELLA SALDATURA, (NOV.-DEC. 1991), 43, (6), pp. 531-535 [in Italian]. ISSN 0035-6794)

3095 VACUUM HEAT TREATING FURNACES. (HORNOS DE TRATAMIENTO TERMICO AL VACIO.) [BIB-199212-56-1582]

The advantages of choosing a vacuum furnace rather than a salt bath furnace for treating steels are presented with respect to their effects on the metallurgical properties of the treated objects, the operating costs of the furnaces, maintenance requirements, and occupational safety and health. (METALURGIA Y ELECTRICIDAD, (DEC. 1990), 54, (628), pp. 120-123 [in Spanish]. ISSN 0026-0991)

3096 LOW PRESSURE PLASMA—AN ALTERNATIVE MEDIUM FOR SURFACE TREATMENT. (NIEDERDRUCK-PLASMA—EIN ALTERNATIVES MEDIUM ZUR OBERFLACHENBEHANDLUNG.) [BIB-199212-57-1496]

Low pressure plasma using a 2.45 GHz microwave can be used to react with organic surface material to prepare the surface for coating applications. Even narrow slots and holes are cleaned. The low pressure plasma operates between 60-200 °C and pressures of 1 mbar, and uses common gases such as oxygen for a carrier. The process is automated and poses no health risk, as it is carried out in a hermetically enclosed environment. (Mohl, W.; WERKSTATTSTECHNIK, (NOV. 1991), 81, (11), pp. 661-662 [in German]. ISSN 0340-4544)

3097 QUANTITATION OF TOTAL MERCURY VAPOR RELEASED DURING DENTAL PROCEDURES. [BIB-199212-57-1543]

An in vitro method is described in which measurements were made of the total amount of Hg vapor released from three types of amalgam (e.g. Spheraloy, Sybralloy and Tytin) during routine dental procedures. It was found that the greatest amount of Hg was released during dry polishing of one amalgam (44 μg). Removal of amalgam from a Class I cavity under water spray and high volume evacuation also generated large amounts of Hg as expected (15-20 mu g). However, under the more clinically relevant conditions of extending evacuation for 2 min to remove residual amalgam and Hg after cutting, this value was reduced by approx 90%. The total amount of Hg generated during placement (6-8 μg), wet polishing (2-4 μg) and trituration (1-2 μg) were also measured. It is shown that dental procedures associated with amalgam do potentially expose the patient and operator to Hg vapor. However, the total amount of Hg released during any procedure was far below the total exposure level calculated from the daily threshold limits established by regulatory agencies for occupational exposure. Graphs. 26 ref. (Engle, J.H.; Ferracane, J.L.; Wichmann, J.; Okabe, T.; DENTAL MATERIALS, (MAY 1992), 8, (3), pp. 176-180 [in English]. ISSN 0109-6541)

3098 CHLORINATED SOLVENTS VS. AQUEOUS SYSTEMS IN THE DEGREASING OF METALS. (DISOLVENTES CLORADOS VS. SISTEMAS ACUOSOS EN EL DESENGRASE DE METALES.) [BIB-199212-57-1618]

The difference between degreasing systems based on chlorinated solvents and those based on aqueous solutions are examined with respect to the composition and action of the components of the degreasing medium, the equipment generally used, possible damage to the surface being cleaned, efficiency of cleaning, post-degreasing treatment, relative costs of energy, reactants, and initial investment in equipment, recycling of components of the solutions, handling of residues and effluents, environmental problems, and health and safety in the workplace. (Barrenechea, I.; METALURGIA Y ELECTRICIDAD, (DEC. 1990), 54, (628), pp. 82-87 [in Spanish]. ISSN 0026-0991)

3099 THE ELECTRONIC PLASMA GUN. [BIB-199212-57-1631]

The need for a plasma torch which produces high power and the desire to simplify the arc gas requirements has led to the development of an alternate method of torch power control. The electronic plasma gun (EPG) uses a novel electrode configuration and high-current electronic switching of the arc column to rapidly control torch power with a single plasma gas and no moving torch parts. The basic principle of the EPG is outlined and initial results for yttria-stabilized zirconia coatings on cold-rolled steel substrates produced by an experimental EPG system are presented. Potential sound and magnetic field radiation safety concerns are also explored. Graphs, Photomicrographs. 11 ref. (Vollrath, J.D.; Doolette, A.; Ramakrishnan, S.; THERMAL SPRAY: INTERNATIONAL ADVANCES IN COATINGS TECHNOLOGY, ORLANDO, FLORIDA, USA, 28 MAY-5 JUNE 1992, Publisher: ASM INTERNATIONAL, Materials Park, Ohio 44073-0002, USA, (1992), (Met. A., 9212-72-0549), pp. 117-121 [in English].)

3100 REMOVING CADMIUM FROM WASTE WITHOUT GENERATING BY-PRODUCTS. (ENTFERNUNG VON CADMIUM AUS ABWASSERN OHNE ERZEUGUNG VON NEBENPRODUKTEN.) [BIB-199212-58-1598]

Cadmium in waste water is black-listed as a highly toxic environmental hazard because this heavy metal deposits in the organisms of all living beings. Nevertheless, Cd plating has not been eliminated, because it affords outstanding corrosion protection. Cadmium removal from wastes of electrolytic solutions, rinses, Cd removal solutions, etching and passivation baths is therefore essential. The treatment consists of collecting the Cd in an absorption medium, electrolysis of the regeneration liquor to recover Cd, reuse of the liquor for future regeneration, return of the rinsed absorption medium to the recovery point of origin. This treatment results in a Cd loss of 0.02 ppm. Graphs. 5 ref. (der Vlist, E.; GALVANOTECHNIK, (MAR. 1992), 83, (3), pp. 942-945 [in German]. ISSN 0016-4232)

3101 COBALT IN HARDMETALS: HEALTH AND SAFETY. [BIB-199212-62-1485]

Hardmetals, and the cobalt used in their production, have benefited industry considerably. But the mixture of materials in hard metal dust can cause health problems. Problems and relevant legislation are discussed. The real answer, is it contended, is to ensure cleanliness all round. Graphs. 6 ref. (Clark, B.; METAL POWDER REPORT, (APR. 1992), 47, (4), pp. 18-21 [in English]. ISSN 0026-0657)

3102 SAFEGUARDING HEARING IN THE STEEL INDUSTRY. [BIB-199212-71-0302]

Exposure to occupationally related noise has been a major topic in occupational health and safety matters for employers and for employees and their representatives over the last two decades. The steel industry has been paying increasing attention to the protection of hearing of its employees: increasingly stringent controls are being implemented by legal requirements specific to individual countries, and employees generally are showing greater interest in the subject. In addition to the in-house problem relating to employees, the industry is, in common with other industries, also subject to concern expressed by those who live outside but who are exposed to works related noise, i.e. neighbourhood noise. This document does not address that particular aspect, although many of the measures taken to control noise emissions for the purposes of reducing the occupational exposure of employees will of course have a major impact on environmental noise. The steel industry has a key interest in this matter because of the nature of its processes and the levels of noise which are generated by some of its activities. As a result, some years ago the International Iron and Steel Institute published a document "Noise and the Steel Industry" which highlighted among other issues the widespread nature of the problem of noise in the industry; the deafness which can arise from exposure to noise; and the standards which had been or were being established by national legislation. This has been reviewed and partially revised and now forms Part 1 of this document. Much of the deafness brought about by noise at work in the industry can be prevented, and in the initial publication the intention of developing a further document outlining the action which could be and was being taken by many companies in the industry was stated. Such actions are frequently referred to as "Hearing Conservation Programmes" and they are dealt with in Part 2 of this document. This publication deals with the commonly accepted items which are an integral part of such "Programmes". It draws its examples from experience within the steel industry in many parts of the world. The purpose of such Programmes is to analyse and identify the problems in particular departments or works and to use that assessment as the basis for action to reduce or control exposure to noise, thereby protecting the workforce. Graphs. (Publisher: INTERNATIONAL IRON AND STEEL INSTITUTE, Rue Colonel Bourg, 120, B-1140 Brussels, Belgium, (1992), Pp 84 [in English].)

3103 HYDROGEN PROTECTS STEAM CIRCULATORS FROM CORROSION. (WASSERSTOFF SCHUTZT DAMPFKREISLAUFE VOR KORROSION.) [BIB-199301-35-0108]

Water used for steam production must be free of elements which cause deposits and other damage. Oxygen induces corrosion and can be removed with hydrazine, a toxic, explosive and noxious material. By means of Pd catalysts the O can be reacted with hydrogen and reduced to 20 ppb without need for prior degassing. Proposed installations are discussed and illustrated. (Matt, K.; CHEMIE-TECHNIK, (OCT. 1991), 20, (10), pp. 44-45 [in German]. ISSN 0340-9961)

3104 CUPOLA EMISSION—ON THE STATUS IN THE NEW FEDERAL STATES. (KUPOLOFENEMISSIONEN—ZUR SITUATION IN DEN NEUEN BUNDESLANDERN.) [BIB-199301-45-0059]

Many cupolas in the former East Germany exceed limits for environmental pollution and must make adjustments to fully conform with regulations concerning emissions of Zn, Pb, Cr, Cd, Ni, arsenic, carbon monoxide, SO_2, and NO_x by July 1999. This may require modifications of existing facilities and providing them with Venturi wash devices and CO afterburners. 6 ref. (Ruschitzka, L.; Neumann, G.; Helfgen, P.; GIESSEREI, (26 MAY 1992), 79, (11), pp. 436-438 [in German]. ISSN 0016-9765)

3105 HAZARDOUS AIR POLLUTANTS: A CHALLENGE TO THE METALCASTING INDUSTRY. [BIB-199301-51-0039]

The identification, quantification and control of air emissions from the metalcasting industry has become a significant environmental issue over the last decade. The focus during the 1970s and early 1980s was on reducing workplace exposure to foundry emissions by increasing air exchange rates and venting the emissions to the outdoor environment. However, over the last ten years, a greater focus has been placed on the identification and quantification of foundry emissions into the environment. State and local hazardous air pollutant programs and the 1990 Clean Air Act Amendments (CAAA) have the potential to significantly impact foundry operations by requiring detailed emission assessments and emission control strategies. Foundries face a two-step permitting strategy depending on whether they are assessing the regulatory requirements of state/local hazardous air pollutant programs (which are typically health- or risk-based) or the 1990 Clean Air Act Amendments (primarily technology-based). In either case, it is imperative for the foundry to develop a detailed and accurate emission profile. Once emissions are identified and quantified, the foundry can compare emission levels and appropriate emission thresholds to acceptable ambient concentrations and determine what, if any, emission reductions may be required. If a reduction in the emissions of hazardous air pollutants is required, the foundry may be able to accomplish this through changing its process or product usage. While this may be a viable and effective solution in some instances, it is unlikely that these changes will provide a comprehensive,

industry-wide solution. In this case, the foundry may have to install pollution control equipment. There are several pollution control technologies that have potential application to the foundry industry including incineration, carbon adsorption, scrubbers and condensers. 9 ref. (Allen, G.R.; Archibald, J.J.; Keenan, T.; NINETY-FIFTH ANNUAL MEETING AMERICAN FOUNDRYMEN'S SOCIETY, BIRMINGHAM, ALABAMA, USA, 5-9 MAY 1991, Publisher: AMERICAN FOUNDRYMEN'S SOCIETY, INC., Des Plaines, Illinois 60016-8399, USA, (1991), (Met. A., 9301-72-0001), pp. 585-593 [in English].)

3106 IS THE AIR CHANGE A DESIGN PARAMETER FOR VENTILATION AND AIR CONDITIONING SYSTEMS IN PRODUCTION HALLS? (IST DER LUFTWECHSEL EINE AUSLEGUNGSGROSSE FUR RLT-ANLAGEN IN PRODUKTIONSHALLEN?) [BIB-199301-51-0130]

Many standards and directives refer to the air change as a design parameter for the determination of air currents when designing ventilation and air conditioning systems. The question is whether or not parameters such as the air change and other defined air flows can be considered for the design of ventilation and air conditioning systems in contaminated production halls and which solution is to be preferred. A critical discussion of design approaches based on experimental values is included. A design procedure is presented that—instead of referring to experimental values—takes account of the thermal-and pollutant situation, likely to occur. Graphs. 39 ref. (Brunk, M.F.; Dittes, W.; Pfeiffer, W.; STAUB-REINHALTUNG DER LUFT, (SEPT. 1992), 52, (9), pp. 331-337 [in German]. ISSN 0039-0771)

3107 THE RISK OF SILICOSIS IN WELDING. (RISCHIO SILICOTIGENO E SALDATURE.) [BIB-199301-55-0135]

Welding electrode fluxes have a Si content of 6-20%, but investigations have shown only traces of free crystalline Si compounds in both slag and fumes. Risk of silicosis presumes generally the presence of 1% quartz in the powder in suspension (respectively 0.1 mg/m^3 free crystalline silica). Remarks on SiO_2 content in waste during processing different materials are presented, as well as on granulometric conditions for the risk of silicosis. 6 ref. (RIVISTA ITALIANA DELLA SALDATURA, (JAN.-FEB. 1991), 43, (1), pp. 21-22 [in Italian]. ISSN 0035-6794)

3108 CERAMIC WHISKERS AS REINFORCEMENTS FOR COMPOSITES IN AUTOMOTIVE INDUSTRIES. [BIB-199301-62-0045]

Ceramic whiskers offer the potential to formulate polymer, metal, or ceramic matrix composite materials which meet the demands of automotive applications as well as the economic constraints of this industry. Both commercially available and developmental ceramic whiskers are described. These low cost whiskers are carbides, such as SiC, and nitrides, such as titanium nitride. Properties, economics, and applications in the automotive industry are discussed. Graphs, Photomicrographs. 2 ref. (Bray, D.J.; Nixdorf, R.D.; Hauth, W.E.; NEW AND ALTERNATIVE MATERIALS FOR THE AUTOMOTIVE INDUSTRIES, FLORENCE, ITALY, 1-5 JUNE 1992, Publisher: AUTOMOTIVE AUTOMATION LIMITED, 42 Lloyd Park Ave., Croydon CR0 5SB, UK, (1992), (Met. A., 9301-72-0009), pp. 125-132 [in English].)

3109 SELECTIVE SAMPLING AND CHEMICAL SPECIATION OF AIRBORNE DUST IN FERROUS FOUNDRIES. [BIB-199302-23-0107]

Airborne dust was selectively sampled in three ferrous foundries. Granulometric fractions were analyzed by using standard methods of industrial hygiene to determine the concentrations of dust, crystalline silica, and metal fumes. Physicohemical techniques such as secondary ion mass spectrometry (SIMS), electron spectroscopy for chemical analysis (ESCA), and electron microscopy were used to probe the heterogeneity of the dust particles. The trend in airborne dust concentrations seemed to be explainable by the extent of natural or mechanical ventilation in the foundries, although the differences between foundries were generally not statistically significant. Quartz was present in large and medium-size particles and absent in small (0.5 μm) particles. Lead was always concentrated in the small particle fraction and was preponderant in the foundry where untreated scrap metal was used. Clustering and multivariate analysis of metallic element relative concentrations were consistent with the model of low-boiling-temperature metals covering high-boiling-temperature metals. The complexity in particle composition increases as the average aerodynamic diameter of the particle decreases. The metallic content of small particles was higher than that of large particles and was related to casting operations. Medium-size and large particles seemed to come mainly from the sand and other ingredients used in the molding operations. Graphs, Spectra. 47 ref. (Perrault, G.; Dion, C.; Ostiguy, C.; Michaud, D.; Baril, M.; AMERICAN INDUSTRIAL HYGIENE ASSOCIATION JOURNAL, (JULY 1992), 53, (7), pp. 463-470 [in English]. ISSN 0002-8894)

3110 MEASUREMENTS IN FOUNDRIES—CONTINUOUS MEASURING SYSTEMS PROVIDING DIRECT READINGS FOR DETERMINING THE CONCENTRATIONS OF SILICOGENIC FINE DUSTS. (MESSUNGEN IN GIESSEREIEN—EINSATZ VON DIREKTANZEIGENDEN, KONTINUIERLICHEN MESS-SYSTEMEN ZUR BESTIMMUNG DER FEINSTAUBKONZENTRATION VON SILIKOGENEN STAUBEN.) [BIB-199302-23-0108]

Comparative measurements using the gravimetric dust sampling systems MPG II and VC 25, and the tyndallometric fine dust samplers of TM-data type and, finally, the stationary fine dust sampler FMA-TMS 1 were implemented in a selected working area of a foundry. The investigation was aimed at verifying the suitability of continuous measuring methods, providing direct readings, in conformity to annex 2 of TRGS 402 on silicogenic dusts. To this end the various methods were applied simultaneously at identical places, to obtain the relevant conversion factors. From the results of that investigation can be derived the suitability of the tyndallometric method for fine dust measurement in conformity with TRGS 402. Graphs, Spectra. 9 ref. (Bockler-Klusemann, M.; Armbruster, L.; Neulinger, G.; Rosen, N.; STAUB-REINHALTUNG DER LUFT, (JULY-AUG. 1992), 52, (7-8), pp. 2732-277 [in German]. ISSN 0039-0771)

3111 ECOLOGICAL ASPECT OF PRODUCING MOLDS FOR TITANIUM ALLOY CASTINGS. [BIB-199302-51-0302]

More than 80% of Ti alloy castings are produced using graphite molds. The graphite dust presents a significant health and ecological hazard. The resin binders used in the molds evolve significant amounts of CO_2 and carbon monoxide. Analysis of the options available for making the process more ecologically safe leads to the conclusion that molds must be replaced with ceramic preheated molds which do not react with Ti, e.g. yttria. (Atashov, V.G.; Trunov, A.I.; Chernikov, V.A.; LITEINOE PROIZVODSTVO, (MAR. 1992), (3), pp. 26-27 [in Russian]. ISSN 0024-449X)

3112 CHLORINE REGENERATION OF FERRIC CHLORIDE SOLUTIONS USED FOR PHOTOCHEMICAL MACHINING OF IRON. [BIB-199302-53-0113]

In photochemical machining, spent etchants can be oxidized back to a reusable form by various regeneration processes. The use of Cl as a means of regenerating spent aqueous ferric chloride solution that has been used to etch Fe is discussed. A technical description of the process is given and the relevant legislation behind the use of Cl gas in the UK is highlighted. Through an economic assessment, a comparison is made with three alternative regeneration methods, sodium chlorate/hydrochloric acid, electrolysis and ozonolysis. The level at which it becomes economical to regenerate using chlorine is shown to be when the amount of Fe etched/year 1.6 tonnes. Graphs. 6 ref. (Allen, D.M.; White, H.J.A.; PROCESSING OF ADVANCED MATERIALS, (MAR. 1992), 2, (1), pp. 19-24 [in English]. ISSN 0960-314X)

3113 THE SOURCE AND CONTROL OF WELDING FUME. [BIB-199302-55-0306]

As a result of recent legislation an employer must ensure the health and safety of his workforce. With regard to welding, one of the aspects to be considered is fume. The effects to health of welding fume are discussed, and the amount generated by different welding processes is illustrated. The methods of controlling fume such as extraction systems are briefly discussed together with personal protection equipment such as individual face masks and respirators. MIG welding of stainless steels and Al, TIG welding and flux core wire welding are included. (Hobbs, P.; WELDING AND METAL FABRICATION, (AUG.-SEPT. 1992), 60, (7), pp. 316, 318 [in English]. ISSN 0043-2245)

3114 DEVELOPMENT OF CHROMIUM-FREE, VANADIUM BASED PRIMERS. (RETROACTIVE COVERAGE). [BIB-199302-57-0131]

Conventional etching primers contain poisonous Cr(IV). Therefore, several primers containing V instead of Cr were developed. Ammonium vanadate or vanadium pentaoxide was used in these primers. The adhesion and corrosion resistance effect of these primers were tested. When the base metal is Al, primers containing 3 wt.% V showed corrosion resistance better than that of chromate-based primers. Even when the base metal is a steel sheet or a galvanized steel sheet, some V-based primers showed corrosion resistance similar to that of Cr-based primers. (Mochizuki, Y.; Ishii, T.; 77TH CONFERENCE OF THE JAPAN LIGHT METAL ASSOCIATION, TOKYO, JAPAN, 16-17 NOV. 1989, Publisher: JAPAN LIGHT METAL ASSOCIATION, Nihonbashi Asahiseimei Bldge, 1-3 Nihonbashi 2-chome, Chuo-ku, Tokyo 103, Japan, (1989), (Met. A., 9302-72-0073), pp. 149-150 [in Japanese].)

3115 ASSESSMENT OF INTERMITTENT TRICHLOROETHYLENE EXPOSURE IN VAPOR DEGREASING. [BIB-199302-57-0184]

To validate various sampling strategies in assessment of trichlorethylene (TCE) exposure, urine and air samples were obtained from 29 metal workers involved in vapor degreasing. Urinary trichloroacetic acid and trichloroethanol were useful metabolites to estimate TCE exposure on a group basis, but the predictive value of a single urine sample was low when related to the air concentration. With intermittent TCE exposure, the best information is obtained by analyzing both metabolites. Graphs. 5 ref. (Ulander, A.; Selden, A.; Ahlborg, G.; AMERICAN INDUSTRIAL HYGIENE ASSOCIATION JOURNAL, (NOV. 1992), 53, (11), pp. 742-743 [in English]. ISSN 0002-8894)

3116 TGIC-FREE COATINGS. [BIB-199302-57-0209]

The use of thermosetting powder coatings for the protection and decoration of architectural metalwork has grown rapidly worldwide since their introduction in the early 1970s. Organic powder finishes based on carboxy functional polyesters, cured with triglycidyl isocyanurate (TGIC), have become widely used and this is a well-proven exterior durable combination. However, recent toxicological information has become available, indicating that both TGIC and powder containing TGIC, when eaten or inhaled in sufficient quantities, is toxic and can cause mutations in the male mouse reproductive system. Courtaulds Coatings has developed "Interpon" TGIC-free systems. Using its own proprietary polymer/co-reactant approach, it has overcome the problems inherent in the other available chemistries. These new Interpon products possess similar or superior performance when compared with conventional powder coatings. Graphs. (Osmond, M.F.; Steele, G.D.; FINISHING, (JUNE 1992), 16, (6), pp. 50-52 [in English]. ISSN 0309-3109)

3117 FLUORIMETRIC DETERMINATION OF TRACE AMOUNTS OF ALUMINIUM AND GALLIUM WITH SALICYLALDEHYDE-1-PHTHALAZINOHYDRAZONE. [BIB-199304-23-0224]

Fluorimetric determinations of Al and Ga, based on the formation of fluorescence complexes between Al(III) or Ga(III) and salicylaldehyde-1-phthalazinohydrazone, SAPhH, are proposed. The Al(III)—SAPhP complex exhibits fluorescence with maximum emission at 475 nm when excited at 414 nm; the Ga(III)—SAPhH chelate has emission and excitation maxima at 480 and 410 nm, respectively. For both determinations the range of application is 10-100 ng/ml. Aluminium has been determined in waters, and Ga in Al and Ni alloys. Spectra, Graphs. 37 ref. (Gallego, M.C.; Mochon, M.C.; Rodriguez, M.T.; Perez, A.G.; Mikrochimica Acta, (1992), 109, (5-6), pp. 301-309 [in English]. ISSN 0026-3672)

3118 ESTIMATION OF THE LIMITING OXYGEN CONCENTRATION OF EXPLOSIBLE DUST/AIR MIXTURES. (RECHNERISHCHE UND GRAPHISCHE BESTIMMUNG DER SAUERSTOFFGRENZKONZENTRATION EXPLOSIONSFAHIGER STAUB/LUFT-GEMISCHE.) [BIB-199304-34-0479]

The limiting oxygen concentration of an explosible dust/air mixture is an important parameter for hazard evaluation if a technological equipment is to be protected by inertisation. The determination of this quantity by experiments, however, is fairly time-consuming and expensive. A simple computational method allowing the estimation of the limiting O concentration is introduced. A comparison with corresponding experiments shows sufficient accuracy, and the computational values are always lower than the experimental ones for 20 explosible dusts of several kinds. A diagram is presented which allows determining the limiting O concentration directly from the chemical composition of the combustible dust and its caloritic value. Materials discussed include: Al, magnessium, polyacrylonitriles, polyamide resins, polybutadienes, and polyethylenes. Graphs. 9 ref. (Krause, U.; Weinert, D.; Wohrn, P.; Staub-Reinhaltung der Luft, (Oct. 1992), 52, (10), pp. 361-368 [in German]. ISSN 0039-0771)

3119 LEACHING OF NICKEL, CHROMIUM, AND BERYLLIUM IONS FROM BASE METAL ALLOY IN AN ARTIFICIAL ORAL ENVIRONMENT. [BIB-199304-34-0489]

The use of base metal alloys in dentistry has gained wide popularity in recent years. However, claims of their safety have not been universally accepted. An artificial oral environment capable of reproducing three-dimensional force-movement cycles of human mastication was used to determine whether Ni, Cr, and beryllium ions were leached from base metal alloy (Rexillium III Ni—Cr alloy). Twelve pairs of crowns were articulated in the following combinations: metal vs. metal, metal vs. enamel, metal vs. porcelain, and metal vs. metal without chewing as a control. In a simulated one-year period of mastication, the results showed that Ni and Be metals were released both by dissolution and occlusal wear. These findings suggest that if these conditions occur in the oral cavity, the stability of base-metal alloys is subject to question. Further studies are needed to determine whether the leaching reported has long-term consequences for patients receiving base metal restorations. Graphs. 19 ref. (Tai, Y.; Long, R.D.; Goodkind, R.J.; Douglas, W.H.; Journal of Prosthetic Dentistry, (Oct. 1992), 68, (4), pp. 692-697 [in English]. ISSN 0022-3913)

3120 MINERALOGY OF ELECTRIC ARC FURNACE (EAF) DUSTS. [BIB-199304-45-0376]

The mineralogical, chemical, microtextural, and particle size characteristics of electric arc furnace (EAF) dusts are being studied by reflected light microscopy, scanning electron microscope-energy dispersive spectroscopic analysis (SEM-EDS), and electron probe microanalysis (EPMA). The dusts consist predominantly of metallic Fe, iron oxide, and calcium—iron—manganese silicate phases, together with smaller amounts of iron—manganese—zinc—calcium, iron—calcium—zinc—manganese, and calcium—iron—manganese silicates. The samples vary in their Zn contents. Chlorine occurs in phases containing Fe, Pb, Zn, Mn, and Ca. The dust particles range greatly in size from 1 to 300 μ, but most particles are approx 1-6 μ. Larger particles, approx 20-50 mu across, also are present. They are predominantly spherical in shape, but some are cenospheres, and others are more angular particles, some of which are broken spheres and cenospheres. Their internal microtextures exhibit evidence of liquid immiscibility, exsolution, skeletal crystal growth, and oxidation reaction rims. Because EAF dusts have been classified by EPA as hazardous wastes, there is heightened interest in the treatment of these dusts to render them non-hazardous. The mineralogy of products of pyrometallurgical treatment of EAF dusts by flash furnace and pyrohydrolysis is currently under study. Photomicrographs. (Hagni, A.M.; Demars, C.; Hani, R.D.; EPD CONGRESS 91, NEW ORLEANS, LOUISIANA, USA, 17-21 FEB. 1991, Publisher: THE MINERALS, METALS & MATERIALS SOCIETY, 420 Commonwealth Dr., Warrendale, Pennsylvania 15086, USA, (1991), (Met. A., 9304-72-0187), pp. 801-809 [in English].)

3121 WELDERS' EYE INJURIES. [BIB-199304-55-0680]

During 1985, welders submitted to the Workers' Compensation Board of Alberta (Canada) 21% of all claims for eye injuries. Since then the proportion of similar claims has remained high. A descriptive study of welder eye injury claims reveals that, although most injuries are reversible (55% of workers return to work in less than two days and 95% in less than seven days), some workers sustain permanent visual impairment. Eye injuries occur most frequently in metalwork industries, and cold particles, very often metal, are the most common source of injury. Preventive measures should stress the importance of wearing eye protection constantly while working with metal and in metal industries. Goggles probably should not be removed upon extinguishing the welding torch. Graphs. 6 ref. (Reesal, M.R.; Dufresne, R.M.; Suggett, D.; Alleyne, B.C.; Welding in the

World, (Nov.-Dec. 1992), 30, (11-12), pp. 316-318 [in English]. ISSN 0043-2288)

3122 METHOD FOR SAMPLING AIRBORNE PARTICULATES GENERATED BY WELDING AND ALLIED PROCESSES. [BIB-199304-55-0696]

This standard prescribes a procedure for sampling fumes generated by welding and allied processes. Because it is limited to health hazard evaluation, the standard is primarily concerned with sampling at the worker's breathing zone. It also prescribes procedures for general area sampling of fumes. However, the sampling methods described by this standard apply only to the sampling of solid particulate matter. (Publisher: AMERICAN WELDING SOCIETY, 550 N.W. LeJeune Rd., P.O. Box 351040, Miami, Florida 33135, USA, (1992), ANSI/AWS F1.1-92, (Met. A., 9304-72-0199), Pp 6 [in English].)

3123 PREDICTING SOLVENT CONCENTRATIONS FROM COATING THE INSIDE OF BULK STORAGE TANKS. [BIB-199304-57-0428]

A technique is presented to assess health risks associated with coating the inside surface of a bulk storage tank. The technique uses a sequential box model to predict the time-varying solvent concentrations at arbitrary points inside the vessel during an ongoing coating process. Input parameters include volumetric flow rates of exhaust and makeup air, solvent threshold limit values and evaporation rates, and a set of exchange coefficients that characterize air circulation inside the vessel. This technique enables engineers to rate quantitatively the anticipated health risks of applying a combination of coatings. The technique also provides engineering managers a predictive tool to organize work schedules so that health and safety can become input parameters to an engineering enterprise. Graphs. 21 ref. (Haberlin, G.M.; Heinsohn, R.J.; American Industrial Hygiene Association Journal, (Jan. 1993), 54, (1), pp. 1-9 [in English]. ISSN 0002-8894)

3124 REDUCING EMISSIONS FROM PLATING BATHS. (EMISSIONSMINDERUNG BEI GALVANIKBADERN.) [BIB-199304-58-0393]

It is now regarded as correct practice to provide fresh air feed, air extraction, and air cleaning facilities as part of a plating line. This serves not only the well-being of personnel, but acts to protect the environment and the surrounding plant. A summary of legislative requirements is presented and an overview of air management strategies for metal finishing lines is given. Counter-current flow gas washing plant is described and some case studies are given. Samples of clean air and MAK measurements at a Cr plating line gave values significantly lower than the minima prescribed by TA Luft and TRK-required levels. (Mesitschek, V.; Galvanotechnik, (Dec. 1992), 83, (12), pp. 4243-4248 [in German]. ISSN 0016-4232)

3125 COOPERATION BETWEEN SUPPLIER AND CUSTOMER IN DEVELOPING NEW PRETREATMENT PROCESSES WITH HIGHER ENVIRONMENTAL COMPATIBILITY. [BIB-199304-58-0436]

The pretreatment processes which are currently used have achieved a satisfactory quality level. The aspects of protection of the environment and safety at work demand further developments and enforced work in the fields of reduction of process water consumption as well as replacement of heavy metals and chemicals which are environmentally detrimental and a workshop hazard. The pretreatment systems to be developed must exhibit at least the same quality level as the processes currently used. In close cooperation including planning of decisive test series, joint verification and evaluation, it would be possible to shorten the period for the development of such a new product from four to seven years to two to three years. Nickel, Cr(VI), and nitrite or chlorate/organic accelerators are successfully replaced. The Cr-free inorganic agent is now being marketed. Graphs. (Gehmecker, H.; Kurzmann, P.; GALVATECH '92: 2ND INTERNATIONAL CONFERENCE ON ZINC AND ZINC ALLOY COATED STEEL SHEET, AMSTERDAM, NETHERLANDS, 8-10 SEPT. 1992, Publisher: VERLAG STAHLEISEN MGH, Postfach 105164, Dusseldorf D-4000, Germany, (1992), (Met. A., 9304-72-0205), pp. 227-230 [in English].)

3126 STUDIES RELATED TO GASTROINTESTINAL ABSORPTION OF ALUMINUM. [BIB-199304-71-0093]

At least four factors influence Al absorption: the dose administered, solubility of the Al compound, the uremic state, and the concomitant administration of Al compounds with citrate. Citrate appears to be the most important clinical modulator of Al absorption. Findings indicate that citrate, unlike lactate, enhances Al transport by opening the paracellular pathway in the small intenstine by chelating Ca. Graphs. (Alfrey, A.C.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 5-6 [in English].)

3127 ALUMINUM UPTAKE THROUGH THE OLFACTORY SYSTEM: POTENTIAL IMPLICATIONS FOR NEURODEGENERATIVE DISEASES. [BIB-199304-71-0095]

Distribution of neurofibrillary tangles encountered in cases of Alzheimer's disease shows a striking propensity for involvement of regions associated with the olfactory system, which suggests that affected cortical areas are governed in sequence through their neuroanatomic connections. It was proposed that the neurofibrillary tangle may represent a pathologic response to the intraneuronal presence of certain neurotoxins which interfere with cytoskeletal metabolism and that these neurotoxins are of exogenous origin and enter the central nervous system by way of the olfactory system. It has been shown that exposure to intranasal Al in rabbits leads to direct uptake into the brain and distribution of the element within the cytoplasm of macrophages in granulomatous lesions seen along olfactory pathways. The epidemic of neurodenerative disease seen among the Guam native Chamorro population can be used as a rich model for environmental factors in the induction of neurodegenerative disease. 16 ref. (Perl, D.P.; Good, P.F.; Katz, R.N.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 11-13 [in English].)

3128 ALUMINUM-BINDING PROTEIN IN PLASMA AND BRAIN OF DIALYSIS DEMENTIA PATIENTS. [BIB-199304-71-0096]

Several essential and toxic metallic elements have previously been demonstrated to have specific binding proteins in plasma and tissue. The principal Al-binding protein in the plasma of dialysis dementia patients is an 8000 dalton protein, which is found to only a very limited degree in normal subjects. In the present study, the plasma Al-binding protein is related to a similar protein liberated in vitro from brains of dialysis dementia patients after incubation with the Al chelator, desferrioxamine. Graphs. 10 ref. (Gonick, H.C.; Khalil-Manesh, F.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 15-21 [in English].)

3129 ALUMINUM IS ASSOCIATED WITH TWO PROTEIN SPECIES, OTHER THAN FERRITIN OR TRANSFERRIN, IN THE CYTOSOL FRACTION OF THE RAT DUODENAL MUCOSA. [BIB-199304-71-0097]

Aluminum can enter the body by absorption through the gastrointestinal tract and current evidence suggests that both passive and active processes are involved. Where aluminum citrate is present, uptake by diffusion is particularly effective. Movement of hydroxylated Al ion species into the mucosa also appears likely though whether this results in delivery into the plasma is uncertain. It is probable that Al can be sequestered in the cell to retard uptake or to neutralize its potential toxicity there. This was investigated by identifying Al-rich fractions in the rat duodenal mucosa, with particular regard to the cytosol. (Cochran, M.; Vahaviolos, J.; Marshall, J.H.; Dilena, B.; Ramm, G.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 23-24 [in English].)

3130 THE METTLESOME EFFECTS OF ALUMINUM ON BONE. [BIB-199304-71-0098]

Renal osteodystropy is a common complication in patients with chronic renal failure. Although the pathogenesis of disease subtypes remains uncertain, in recent years a role for Al in their genesis has become accepted. Recent studies have, however, raised significant doubt regarding the pathogenesis of dialysis-dependent bone diseases. Conflicting data include the investigations of Al effects on bone in animals with remodelling dynamics similar to that in man. Studies have indicted that dialysis-dependent diseases occur independent of, or secondary to, the interaction of Al with any one of a number of the abnormalities that characterize the permuted metabolic milieu in patients with uremia. 6 ref. (Drezner, M.K.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 25-26 [in English].)

3131 ALZHEIMER'S DISEASE AND EXPOSURE TO ALUMINIUM. [BIB-199304-71-0101]

Previous studies using a variety of metholodologies for estimating rates of disease have shown a positive association between concentrations of Al in drinking water and rates of Alzheimer's disease or dementia generally. The majority of case-control studies that have included an inquiry about antacid use have demonstrated no associated increase in risk of Alzheimer's disease but the statistical power of those studies has been low. Industrial cohort studies of workers in the Al industry have relied largely on mortality data, which are valuable in estimating risks of lung cancer and cancer of the haemopoetic system but not a reliable indicator of dementia. 14 ref. (Martyn, C.N.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 51-52 [in English].)

3132 PRELIMINARY RESULTS OF THE IMAGE PROJECT ON THE GEOGRAPHICAL STUDY OF ALZHEIMER'S DISEASE IN SAGUENAY (QUEBEC, CANADA). [BIB-199304-71-0102]

An Al industrial complex is located in the Chicoutimi-Jonquiere urban area of Saguenay-Lac-Saint-Jean (SLSJ) area of the province of Quebec. The current study considers whether Alzheimer-affected individuals are distributed randomly or not in the different parts of the Chicoutimi-Jonquigere area, whether a specific spatial pattern for this disease can be observed across the socio-economic zones of the area, and whether there is a link between the spatial distribution of AD cases in SLSJ and the location of the Al industry. Results showed that there is no socio-economic differentiation pattern for AD in the Saguenay urban population. The presence of an Al industry did not seem to be associated with the distribution of AD cases. 19 ref. (Gauvreau, D.; Emard, J.F.; Perron, M.; Veillette, S.; Thouez, J.P.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 79-85 [in English].)

3133 EVIDENCE INDICATING THAT ALUMINUM IS NECESSARY BUT NOT SUFFICIENT IN THE ALZHEIMER DEGENERATIVE PROCESS. [BIB-199304-71-0103]

To evaluate the potential toxicity of Al in Alzheimer's disease (AD), the following three steps are believed to be necessary: (1) Al must be identified at a potentially toxic site in AD-affected tissues; (2) a biochemical defect must be identified in AD related to the toxic site at which Al accumulated in AD; and (3) laboratory models must then be able to reproduce the biochemical defect at the Al concentrations found in AD. Evidence which implicates Al in a cytotoxic role in AD is reviewed. Graphs. 21 ref. (McLachlan, D.R.; Lukiw, W.J.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 87-90 [in English].)

3134 ON THE INTERACTION OF METAL IONS WITH THE BETA A4 AMYLOID PROTEIN PRECURSOR IN ALZHEIMER'S DISEASE. [BIB-199304-71-0104]

Metal ions may alter the aggregability of the beta A4 monomer itself, affect a wide variety of post-translational modifications which occur on the amyloid protein precursor (APP), alter APP's normal function and contribute to its aberrant catabolism, be responsible for various forms of membrane cleavage, releasing the C-terminus of beta A4 for further processing, and cause mutations that may influence transciptional regulation or alternative splicing. (Masters, C.L.; Beyreuther, K.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 91 [in English].)

3135 ALUMINUM NEUROTOXICITY. [BIB-199304-71-0105]

The study of Al neurotoxicity is of interest because it produces a distinct disorganization of the neuronal cytoskeleton and because of its putative role in neurological disorders. To avoid difficulties inherent to working with rabbits as an animal model, fetal rat tissue culture systems have been used to explore certain aspects of Al neurotoxicity. Abnormal phosphorylation of neurofilament accumulations (NF), impaired axonal transport of NF, decreased levels of mRNA for NP polypeptides, and Al and NF interactions in vitro are considered. In concert with experimental results, a pathogenesis is proposed for the accumulation of NF in neurons exposed to the toxic effects of Al salts. 18 ref. (Tronsoco, J.C.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 93-95 [in English].)

3136 NATURAL AND EXPERIMENTAL MODELS OF CHRONIC ALUMINUM INTOXICATION. [BIB-199304-71-0106]

A model of chronic Al intoxication that produces a spastic myelopathy in New Zealand white rabbits has been developed. Using in vitro studies, an attempt was made to verify the concept of neuron-specific sensitivities to Al observed in the chronic rabbit model. Studies have demonstrated that the course of Al-induced neurodegeneration is dependent upon a temporal sequence, a dose-response sequence and a differential neuronal susceptibility sequence that ultimately leads to a different disease outcome based on these factors. New experimental models have been developed to examine chronic Al toxicity in fresh-water fish. The fish models, both chronic and acute, provide the opportunity to understand the probable site of primary Al toxicity (the gills) and to investigate the physiological (including olfaction), morphological, biochemical and molecular effects of Al on the nervous system. Photomicrographs, Graphs. 39 ref. (Garruto, R.M.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 97-101 [in English].)

3137 EFFECTS OF ALUMINUM ON SYNAPTIC TRANSMISSION. [BIB-199304-71-0107]

The possibility that the neurotoxic effects of Al may involve excitotoxicity was explored by conducting rat experiments. The effects of varying doses of two species of Al dissolved in distilled water on striatal field potentials evoked by electrical stimulation of the somatosensory cortex were studied. The initial effect of $AlCl_3$ at high dosages (1 and 2 mg/kg) was augmentation of the positive component of the field potential. A single infusion of $AlCl_3$ at 1 mg/kg produced a long-lasting increase in glutamate efflux as measured with microdialysis. The effects of Al species on an in vitro model of the blood—brain barrier established from small vessel endothelial cells isolated from ovine grain were examined also. It was concluded that the blood—brain barrier can be mechanically opened by only one species of Al, aluminum maltol. 3 ref. (Faso, L.; Lidsky, T.I.; Banerjee, S.P.; Wisniewski, H.M.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 103-05 [in English].)

3138 ALUMINUM AND THE BLOOD—BRAIN BARRIER. [BIB-199304-71-0108]

It has been postulated previously that Al can act as a membrane toxin affecting the function of the plasma membranes at the blood—brain barrier. To test this hypothesis, an in vitro blood—brain barrier model system consisting of cultured sheep brain microvascular endothelial cells was examined. It was found that by affecting the activity of Ca^{2+} -ATPase, aluminum maltolate can impair the structural integrity of intercellular junctions, the formation of which depends on the presence of Ca ions. Also, Al affects the anionic domains on the cell surface, inducing their lateral migration and changing the distribution of sialoc acid residues in the glycoprotein surface coat. Photomicrographs. (Vorbrodt, A.W.; Trowbridge, R.S.; Dobrogowska, D.H.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 107-109 [in English].)

3139 ALUMINUM ACCESS TO THE BRAIN VIA THE IRON DELIVERY SYSTEM. [BIB-199304-71-0109]

The affinity of the brain transferrin receptor for the transferrin—Fe complex is compared to its affinity for the transferrin—Al complex. Results demonstrated a high affinity of the transferrin receptor for the transferrin—Fe complex and a physiologically significant affinity for the transferrin—Al complex. Results are interpreted to indicate that Al complexed to transferrin can access the cells in the brain via the system developed for iron delivery. This nullifies a major criticism of the "Al hypothesis" in neurodegenerative diseases such as Alzheimer's disease by demonstrating the ability of Al to enter the brain without a disruption in the blood—brain barrier. 6 ref. (Connor, J.R.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 111 [in English].)

3140 MICROPROBE STUDIES OF ALUMINUM IN NEUROFIBRILLARY TANGLES. [BIB-199304-71-0110]

Results of microprobe studies indicate that Al and Fe selectively bind to the neurofibrillary tangles of Alzheimer's disease and that this occurs at some point in the biologic progression of the disease. The nature of the binding of these elements to this critical pathologic structure remains unknown. It is suggested that Al plays an active role in the pathogenesis of neurofibrillary tangle formation and the possibility is raised that the cross-linking properties of the highly reactive metal may stabilize the constitutent cytoskeletal proteins which comprise this pathologic structure. 8 ref. (Good, P.F.; Perl, D.P.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 113-114 [in English].)

3141 ALUMINUM AND BETA -AMYLOID DEPOSITION. [BIB-199304-71-0111]

Aluminum may be associated with beta -amyloid deposition through the presence of increased immunocytochemical staining for beta -amyloid precursor protein and extracellular deposits of beta -amyloid in some patients with chronic renal failure who are exposed to high serum levels of Al, the presence of focal deposits of Al in the form of aluminosilicate in the central core region of mature senile plaques, and evidence that aluminosilicates in vitro can modify the formation of fibrillary aggregates of 1-42 beta -amyloid peptide, producing a characteristic "star-burst" array which resembles the pattern of beta -amyloid deposition in the senile plaque core. 16 ref. (Edwardson, J.A.; Candy, J.M.; Oakley, A.E.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 115-119 [in English].)

3142 IDENTIFICATION AND ANALYSIS OF NEURITIC PLAQUES. [BIB-199304-71-0112]

Microanalytical investigations of Al-containing pathological lesions in Alzheimer's disease (AD) have proven to be contradictory. The new technique of nuclear microscopy has been used to provide unambiguous identification of core-containing neuritic plaques in un-immunohistochemically-stained tissue. Nuclear microscopy describes a combination of techniques which use the interaction between a focused high-energy proton beam and a sample. In proton induced X-ray emission, characteristic X-rays emitted from an atom following the removal of an inner shell electron are measured. In Rutherford backscattering, protons backscattered from nuclear collisions are detected, and measurement of the energy of the backscattered proton gives analytical information on the matrix elements such as carbon, nitrogen, and oxygen. Scanning transmission ion microscopy allows density and structural information to be obtained by detecting the energy loss of the protons as they pass through the sample. Photomicrographs, Graphs, Spectra. 5 ref. (Landsberg, J.P.; McDonald, B.; Watt, F.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 121-127 [in English].)

3143 ELECTRON PROBE MICROANALYSIS OF ALUMINUM AND SILICON IN ALZHEIMER'S DISEASE SENILE PLAQUES USING UNFIXED, UNSTAINED TISSUE. [BIB-199304-71-0113]

To determine whether measured accumulations of Al and Si in senile plaques and neurofibrillary tangle-bearing neurons in fixed, stained postmortem brain tissue from patients with Alzheimer's disease are artifacts of tissue fixation or staining procedures, wavelength-dispersive, electron beam X-ray microanalysis was used to measure plaque concentrations of Al, Si, and Ca in unstained, unfixed AD grain tissue. Results did not support the hypothesis that dense accumulations of Al and Si occur routinely in the senile plaques. It is possible that high levels of Al and Si occur only in a small fraction of plaques or only in a small portion of the central plaque core, which was routinely missed in this study. Graphs. 5 ref. (Smith, Q.R.; Mori, H.; Swyt, C.; Atack, J.; Rapoport, S.I.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 129-131 [in English].)

3144 ALUMINUM LEVELS IN SERUM AND URINE OF WORKERS IN THE ALUMINUM INDUSTRY. [BIB-199304-71-0114]

Average preshift differences in serum Al levels for the exposed group compared to the controls was 1.32 μg/L (p 0.01) and for post-shift values the difference was 0.96 μg/L (p 0.08). The correlation of serum Al to total particulate Al was small but of borderline statistical significance. There was no difference in exposed and controls with regard to the change of serum Al levels during the work shift. In contrast, the difference in urine levels of Al between exposed and control workers was highly significant. Average preshift differences between exposed and controls for Al/creatinine ratios was 5.67 μg/g (p 0.001) and for postshift values the difference was 8.01 (p 0.001). The correlation of the Al/creatinine ratio to either total particulate Al or respirable Al was in the range of 0.4-0.5 (p 0.001). Urinary Al/creatinine ratios did not change significantly during the workshift. Data indicate that urinary levels of Al are a more sensitive index of exposure than serum levels. Graphs. 6 ref. (Rockette, H.E.; Gitelman, H.J.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 147-152 [in English].)

3145 STUDIES AT A POWDER PRODUCING PLANT IN SWEDEN. [BIB-199304-71-0115]

Blood and urine samples from workers at the Al flake and atomized powder production plant of Carlfors Bruk, Jonkoping, Sweden, were analyzed to evaluate the possible uptake of Al. Studies have clearly indicated that the exposed workers have elevated values of Al in blood and urine compared to controls. Elimination was measureable as a group of individuals even during the relatively short annual holiday period. A study on previously exposed, retired workers showed that the metal is stored and excreted slowly over many years. Graphs. 2 ref. (Ljunggren, K.G.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washing-

ton, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 153-155 [in English].)

3146 UPTAKE AND EXCRETION OF ALUMINIUM IN WORKERS EXPOSED TO ALUMINIUM FLUORIDE AND ALUMINIUM OXIDE. [BIB-199304-71-0116]

Occupational exposure to various Al-containing particles results in increased amounts of Al in human body fluids, with highest concentrations having been found among welders and cryolite workers. Groups of workers exposed to Al-containing aerosols present in the air during the production of AlF_3 and of primary Al metal were subjects of monitoring programs for measuring respiratory exposure and urinary excretion of Al. This study demonstrated that Al is absorbed in the lungs when workers were exposed to Al compounds present in the workroom atmosphere in the Al primary metal industry, enhancing urinary Al excretion. Graphs. 4 ref. (Drablos, P.A.; Hetland, S.; Thomassen, Y.; Schmidt, F.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 157-160 [in English].)

3147 NEUROPSYCHOLOGICAL EFFECTS FROM LONG OCCUPATIONAL EXPOSURE IN ALUMINUM PRODUCTION. [BIB-199304-71-0117]

Different aspects of mental capacity which might be affected early in a process of mental deterioration as a result of occupational exposure to Al were studied. Subjects were 79 male workers offered early retirement benefits in 1991 from the Norwegian Al plant situated on the island of Karmoy. The exposed group consisted of workers with at least 10 years occupational exposure in the production of primary Al, either in the smelter plant or in the foundry and the control group consisted of blue-collar workers with manual work from departments other than the smelting plant or foundry. Assessed were neuropsychiatric symptoms, motoric function, reaction time, psychomotor tempo/efficiency, intelligence, and memory. 5 ref. (Pettersen, R.B.; Goffeng, L.O.; Drablos, P.A.; Torres, C.G.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 161-165 [in English].)

3148 LIMITATIONS OF BIOLOGICAL MONITORING OF ALUMINIUM EXPOSURE. [BIB-199304-71-0118]

Kinetic parameters of Al were investigated to develop criteria for biological monitoring of the metal. Aluminum was analyzed in urine and plasma samples by flameless atomic absorption spectroscopy. It was found that biological monitoring was complicated because of contamination due to sampling and blood plasma levels reflected the exposure more adequately. Differences in blood Al levels between persons occupationally exposed in modern Al reduction plants and non-exposed control persons were small, usually two to three times of the control Al-values in the plasma. Current knowledge does not yet allow implementation of biological exposure indices. Graphs. 16 ref. (Schlatter, C.; Steinegger, A.F.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 167-172 [in English].)

3149 SOCIOPOLITICAL FACTORS AFFECTING STUDIES OF ALUMINUM EXPOSURE IN THE WORKPLACE. [BIB-199304-71-0119]

A health issue involving alledged neurological and respiratory disease from Al exposure among workers in two Toronto aircraft plants is documented. It is shown that reported health effects may more likely be the somatized consequences of sociopolitical factors (or psychosocioeconomic factors) in the working environment, including its organization, disharmonious industrial relations and the threat of unemployment. (Heller, J.G.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 173-175 [in English].)

3150 COGNITIVE DEFICIT AFTER EXPOSURE TO MCINTYRE POWDER: EXPOSURE EFFECT OR ARTIFACT? [BIB-199304-71-0120]

McIntyre powder consists of elemental Al and Al_2O_3 particles 2 μm in diameter that was used as a respirable prophylaxis for silicotic lung disease as faced by hardrock miners. A previous morbidity survey of Northern Ontario miners found that there were no significant differences between McIntyre powder exposure groups in the proportions traced, in compliance, nor in prevalence of self-reported neurodegenerative diagnoses. There were, however, significant differences between and across exposure groups in performance on cognitive state screening tests and a summary measure of these scores. The differences between and across exposure groups may have been due to a neurotoxic effect from McIntyre powder; however, there was no evidence from the collected data that the examined miners, at a mean age of 64, were at increased risk for diagnosed DAT or other defined neurological disorder. It was possible that neurotoxic effects from chronic, low-dose Al exposures were expressed as subtle increases in risk or rate of cognitive decline. 1 ref. (Rifat, S.L.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 177-181 [in English].)

3151 ALUMINUM IN THE WORKPLACE. [BIB-199304-71-0121]

Thirty-one patients who had worked in an environment exposed to high levels of Al dust were investigated for neurological complaints. Major cognitive deficits found involving concentration, attention, and memory were associated with slow learning curves and deficits attributed to frontal executive functions. Tremors were observed in 23% of the workers. 60% of individuals had some neurological sign which could not be attributed to their general medical status. Of the 31 workers, two have come to autopsy and both exhibited classical Alzheimer's disease with the unusual finding of numerous neocortical Lewy bodies. (McLachlan, D.R.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 183 [in English].)

3152 EPIDEMIOLOGICAL ISSUES IN ASSESSING THE NEUROTOXIC EFFECTS OF OCCUPATIONAL EXPOSURE TO ALUMINIUM. [BIB-199304-71-0122]

Increasing concern about the possible role of Al in Alzheimer's disease points to an urgent need for convincing epidemiological studies. All epidemiological studies need valid, unbiased estimates of exposure, of outcome, and of potential confounders. Studies of cognitive impairment, involving assessment on psychometric tests, are singularly prone to problems of bias. It is stressed that clinical estimates of impairment must be made by comparing past history of achievement with present performance. 7 ref. (Cherry, N.M.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 185-187 [in English].)

3153 A FURTHER EVALUATION OF THE ALUMINUM HYPOTHESIS OF ALZHEIMER'S DISEASE. [BIB-199304-71-0123]

Though evidence from several lines of research has been put forward supporting the hypothesis that Al is in some way linked to the pathogenesis of Alzheimer's disease, the foundation of the hypothesis comes principally from studies reporting abnormal accumulations of Al in Alzheimer's disease brain tissue. There is no clear evidence at the present time for a marked imbalance in brain Al in Alzheimer's disease. Although some changes have been reported, none have been definitively confirmed at the bulk tissue or cellular level. Because contamination is a major problem in Al studies, postulation of a relation between Al and Alzheimer's disease is premature until unequivocal evidence of an imbalance exists. 20 ref. (Smith, Q.R.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 189-192 [in English].)

3154 DIFFERENCES BETWEEN ALUMINUM ENCEPHALOPATHY AND ALZHEIMER DISEASE. [BIB-199304-71-0124]

Major differences between Alzheimer's disease and Al encephalopathy are the absence of formation of beta -amyloid neuritic or senile plaques and the differences in the morphology and biochemistry of neurofibrillary tangles in AD and those induced by Al. Clinical symptoms of the two conditions are different also. In dialysis dementia, intermittent speech difficulties and changes in EEG precede the onset of other clinical manifestations by several months. In AD, forgetfulness and difficulties with orientation in space and time are among the first symptoms. Arguments presented for a cause—effect relationship between Al and AD are summarized and critiqued. 5 ref. (Wisniewski, H.M.; Rabe, A.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 193-194 [in English].)

3155 THE SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH MEETING IN RETROSPECT. [BIB-199304-71-0125]

Conclusions from papers presented at a February 1992 conference regarding Al and health are summarized. A large number of different biological effects continue to be ascribed to Al. There is still some uncertainty whether brain Al accumulates in Alzheimer's disease and there is also uncertainty concerning the neurological effects of exposure to environmental Al, as judged by epidemiological studies. Molecular biology of familial Alzheimer's disease is beginning to be clarified and the intrinsic neurotoxic potential of Al continues to be studied. Observations have been presented which may alter ideas concerning the physiology of Al. (Gitelman, H.J.; SECOND INTERNATIONAL CONFERENCE ON ALUMINUM AND HEALTH, TAMPA, FLORIDA, USA, 2-6 FEB. 1992, Publisher: THE ALUMINUM ASSOCIATION, 900 19th St., N.W., Washington, D.C. 20006, USA, (1992), (Met. A., 9304-72-0177), pp. 195-196 [in English].)

3156 THE USE OF WASTE CARBON DIOXIDE FOR NEUTRALIZATION OF EFFLUENTS FROM BOF SHOPS. [BIB-199306-45-0597]

Neutralization of alkaline effluents by means of waste carbon dioxide is highly effective and economical owing to the final pH value, salts balance and elimination of auxiliary materials. Studies were made to use this method for neutralization of troublesome waters in "dirty" circuit of BOF steel shop in Huta Katowice works with waste gases containing approx 15% CO_2 from local lime kilns. Kinetic simulation experiments were carried out to obtain data for selection of parameters for the process. Two possible flowsheets were suggested with utilization of existing dirty circuit equipment as reaction chambers and separators for calcium carbonate suspension. Graphs. 15 ref. (Kozik, C.; Sobota, J.; Prace Instytutu Metalurgii Zelaza, (1992), (3-4), pp. 31-37 [in Polish]. ISSN 0137-9941)

3157 SEPARATION OF ZINC FROM STEEL MILL EFFLUENTS BY MEANS OF ALKALINE EFFLUENTS. [BIB-199306-45-0598]

On the basis of laboratory and pilot tests, a method was developed for removal of zinc from steel mill effluents by precipitation of ionic Zn and coagulation of Zn compounds by means of alkaline process waters, mill effluents or lime water. A conical reactor with suspended solid phase layer was found to be satisfactory for this purpose. The process makes it possible to remove simultaneously Zn, lead, iron, and after addition of suitable reagents, cyanides. Efficiency of the removal was studied in relation to process conditions, i.e. pH, method and time of mixing and time of sedimentation. Two variants of the flowsheet were suggested. The method provides a simple way to remove Zn and certain heavy metals from steel mill effluents in accordance with the requirements of environmental protection. Graphs. 21 ref. (Szostak, K.; Sobota, J.; Mazurek, S.; Prace Instytutu Metalurgii Zelaza, (1992), (3-4), pp. 38-44 [in Polish]. ISSN 0137-9941)

3158 MINIMIZING HEALTH HAZARDS. (MINIMIERUNG ANSTREBEN.) [BIB-199306-53-0357]

In water soluble coolant-lubricatns used in machining, a buildup of nitrosamines can occur. In animal tests, approx 90% of these compounds proved carcinogenic. Nitrosamines develop when agents like sodium nitrite or nitric oxide interact with amines. All of these compounds can be found in water soluble coolant-lubricants. The available coolants are examined to determine the specific compounds they include. The factors leading to the formation of nitrosamines are determined. The danger levels of various concentrations are also determined and, finally, procedures to avoid the buildup are recommended. 1 ref. (Daude, N.; Maschinenmarkt, (24 Sept. 1991), 97, (39), pp. 68-70, 72 [in German]. ISSN 0341-5775)

3159 NON-TOXIC MIG/MAG AND TIG WELDING. (SOLDADURA TIG, MIG/MAG SIN TOXICIDAD PARA EL SOLDADOR.) [BIB-199306-55-1062]

In the workplace, an ozone concentration of 0.1 ppm is recommended as safe. MIG welding of aluminum was found to produce unacceptable levels of ozone in unventilated areas. When dust is the principle contaminant, ventilation and/or extraction are considered to be the most effective remedies. Graphs. (Gornes, F.S.; Deformacion Metalica, (Mar. 1992), 18, (188), pp. 15-17 [in Spanish]. ISSN 0210-685X)

3160 LEAD-PAINT REMOVAL FROM STEEL STRUCTURES. [BIB-199306-57-0769]

Owners and engineers of steel structures need to be aware of regulations and liabilities associated with projects that require lead-paint abatement. This overview outlines some of the considerations necessary in testing, specifications, monitoring, and disposal in a lead-paint abatement project. (Roetter, S.P.; Materials Performance, (Mar. 1993), 32, (3), pp. 40-43 [in English]. ISSN 0094-1492)

3161 PROBLEMS AND BENEFITS ASSOCIATED WITH RESTORATIVE MATERIALS: SIDE-EFFECTS AND LONG-TERM COST. [BIB-199306-61-0704]

Data on biological side-effects of dental materials on patients and also on personnel who routinely handle the materials are reviewed. The incidence of adverse effects is low—in one study it was 1:700 for all types of treatments. For individual types of materials, it will be significantly lower, and for restorative materials, probably in the 1:10 000-1:20 000 range. Allergic reactions are the most common type of adverse effect of dental materials. Lichenoid reactions on the oral mucous membrane adjacent to amalgam restorations are the most frequently encountered side-effects for a specific group of restorative materials. Cost analyses were based on reports of longevity of different restorations and the cost of restorations at the time of placement. Mercury amalgam restorative therapy was more cost-effective than composite restorations and gold castings. Graphs. 59 ref. (Mfor, I.A.; EFFECTS AND SIDE-EFFECTS OF DENTAL RESTORATIVE MATERIALS, BETHESDA, MARYLAND, USA, 26-28 AUG. 1991, Advances in Dental Research, (Sept. 1992), 6, pp. 7-16 [in English]. ISSN 0895-9374)

3162 TOXICOLOGY VS. ALLERGY IN RESTORATIVE DENTISTRY. [BIB-199306-61-0705]

The frequency of side-effects among dental patients is very low and is seen mostly as mild allergic reactions. Among the dental staff, contact allergic eczema is occasionally seen, induced by certain metals, i.e. palladium- nickel-, cobalt-based alloys, and mercury amalgams and various organic materials. 43 ref. (Munksgaard, E.C.; EFFECTS AND SIDE-EFFECTS OF DENTAL RESTORATIVE MATERIALS, BETHESDA, MARYLAND, USA, 26-28 AUG. 1991, Advances in Dental Research, (Sept. 1992), 6, pp. 17-21 [in English]. ISSN 0895-9374)

3163 PRINCIPLES OF RISK ASSESSMENT. [BIB-199306-61-0706]

This review discusses the basic principles of risk assessment as used in general toxicology and in monitoring side-effects of therapeutic treatments. It also

outlines how these principles may apply to assessment of biological reactions to dental restorative materials. Mercury exposure from amalgam fillings is used as an example. The calculations performed are intended only as illustrations, and many other factors must be taken into account. Thus, the calculations are not intended as the last word in risk assessment of amalgam fillings. Graphs. 13 ref. (Clarkson, T.W.; EFFECTS AND SIDE-EFFECTS OF DENTAL RESTORATIVE MATERIALS, BETHESDA, MARYLAND, USA, 26-28 AUG. 1991, Advances in Dental Research, (Sept. 1992), 6, pp. 22-27 [in English]. ISSN 0895-9374)

3164 CASTING ALLOYS: SIDE-EFFECTS. [BIB-199306-61-0708]

Side-effects from dental materials are a minor problem, but should be recognized. In recent questionaire surveys about side-effects, the incidence was estimated to be 1:300 in periodontics and 1:2600 in pedodontics. None of these reactions was related to dental casting alloys. In prosthodontics, the incidence was calculated to be approx 1:400, and approx 27% were related to base-metal alloys for removable partial dentures (cobalt, chromium, nickel) and to noble/gold-based alloys for porcelain-fused-to-metal restorations. The complaints consisted of intra-oral reactions (such as redness, swelling, and pain of the oral mucosa and lips), oral/gingival lichenoid reactions, and a few instances of systemic reactions. In orthodontics, the incidence was 1:100, and most reactions (85%) were related to metal parts of the extra-oral anchorage devices. 88 ref. (Hensten-Pettersen, A.; EFFECTS AND SIDE-EFFECTS OF DENTAL RESTORATIVE MATERIALS, BETHESDA, MARYLAND, USA, 26-28 AUG. 1991, Advances in Dental Research, (Sept. 1992), 6, pp. 38-43 [in English]. ISSN 0895-9374)

3165 SIDE-EFFECTS: MERCURY CONTRIBUTION TO BODY BURDEN FROM DENTAL AMALGAM. [BIB-199306-61-0709]

The purpose is to examine and report on studies that relate mercury levels in human tissues to the presence of dental amalgams, giving special attention to autopsy studies. Until recently, there have been few published studies examining the relationship between dental amalgams and tissue Hg levels. Improved and highly sensitive tissue analysis techniques have made it possible to measure elements in the concentration range of ppb. The fact that Hg can be absorbed and reach toxic levels in human tissues makes any and all exposure to that element of scientific interest. Dental amalgams have long been believed to be of little significance as contributors to the overall body burden of Hg, because the elemental form of Hg is rapidly consumed in the setting reaction of the restoration. Studies showing measurable elemental Hg vapor release from dental amalgams have raised renewed concern about amalgam safety. Mercury vapor absorption occurs through the lungs, with approx 80% of the inhaled vapor being absorbed by the lungs and rapidly entering the bloodstream. Following distribution by blood circulation, Hg can enter and remain in certain tissues for longer periods of time, since the half-life of excretion is prolonged. Two of the primary target organs of concern are the central nervous system and kidneys. 6 ref. (Reinhardt, J.W.; EFFECTS AND SIDE-EFFECTS OF DENTAL RESTORATIVE MATERIALS, BETHESDA, MARYLAND, USA, 26-28 AUG. 1991, Advances in Dental Research, (Sept. 1992), 6, pp. 110-113 [in English]. ISSN 0895-9374)

3166 TERATOLOGICAL ASPECTS OF DENTAL AMALGAM. [BIB-199306-61-0710]

The teratogenic effect is determined by four factors: the agent; the dose; the stage of embryonic development; and the genetic constitution of the embryo. The first two factors are of particular interest and warrant further comment. It should be emphasized that the mercury released from dental amalgam is mainly metallic Hg vapor. The dose of Hg vapor from dental amalgam fillings in the order of 5 μg/day is very low compared with the doses in a teratological study and is not likely to exceed the threshold necessary for a teratogenic effect to occur. 46 ref. (Larsson, K.S.; EFFECTS AND SIDE-EFFECTS OF DENTAL RESTORATIVE MATERIALS, BETHESDA, MARYLAND, USA, 26-28 AUG. 1991, Advances in Dental Research, (Sept. 1992), 6, pp. 114-119 [in English]. ISSN 0895-9374)

3167 ORAL MUCOSA AND SKIN REACTIONS RELATED TO AMALGAM. [BIB-199306-61-0711]

Documented cases of oral mucosa and skin affections related to amalgam restorations are rare, although the exact incidence is unknown. Lesions of the oral mucosa may be due to specific immunologic or non-specific toxic reactions toward products generated from restorations. The immunologic reaction most probably involved in mucosal affections related to amalgam is the delayed or cell-mediated (type IV) reaction. Such reactions are seen in contact allergy, and the term "contact lesions of the oral mucosa" has been used. There is a much lower tendency of sensitization through mucous membranes than through skin, and it is questionable whether mercury released from amalgam restorations is able to sensitize a patient. A chronic toxic reaction may be established due to repeated or constant influence to toxic agents in low concentrations over long periods. Such reactions are most frequently localized to the contact zone with the toxic agent. Chronic toxic reactions may possibly be seen in areas of the oral mucosa in direct contact with amalgam fillings. Since the clinical features of these lesions do not differ from those of lesions due to contact hypersensitivity, the diagnosis is obtained by exclusion based on a negative patch test. 46 ref. (Holmstrup, P.; EFFECTS AND SIDE-EFFECTS OF DENTAL RESTORATIVE MATERIALS, BETHESDA, MARYLAND, USA, 26-28 AUG. 1991, Advances in Dental Research, (Sept. 1992), 6, pp. 120-124 [in English]. ISSN 0895-9374)

3168 DOCUMENTED CLINICAL SIDE-EFFECTS TO DENTAL AMALGAM. [BIB-199306-61-0713]

Since all dental restorative materials are foreign substances, their potential for producing adverse health effects is determined by their relative toxicity and bioavailability, as well as by host susceptibility. Adverse health effects to dental restoratives may be local in the oral cavity or systemic, depending on the ability of released components to enter the body and, if so, on their rate of absorption. The medical scientific community is now in general agreement that patients with dental amalgam fillings are chronically exposed to Hg, that the average daily absorption of Hg from dental amalgam is from 3-17 μg/day, and that the amalgam Hg absorption averages 1.25-6.5 times the average Hg absorption from dietary sources (World Health Organization, 1991). The health significance of this chronic Hg exposure is now being investigated by several medical research groups. 31 ref. (Ziff, M.F.; EFFECTS AND SIDE-EFFECTS OF DENTAL RESTORATIVE MATERIALS, BETHESDA, MARYLAND, USA, 26-28 AUG. 1991, Advances in Dental Research, (Sept. 1992), 6, pp. 131-134 [in English]. ISSN 0895-9374)

3169 BIOLOGICAL AGGRESSIVITY OF WELD DUSTS WITH HIGH CONTENT OF SILICON AND ALKALI METALS. [BIB-199305-34-0641]

Experiments on white male rats have shown that weld dusts combining high concentrations of Si, potassium and Mn in their composition are distinguished by high biological aggressivity. 14 ref. (Geleskul, Y.F.; Voitkevich, V.G.; Borisenko, S.N.; Troitsky, G.V.; Dopovidi Akademii Nauk Ukraini, Matematika, Prirodoznavstvo, Teknichni Nauki, (1992), (4), pp. 121-124 [in Ukrainian]. ISSN 0868-8052)

3170 THE MECHANISM OF SULFIDE DEPRESSION WITH FUNCTIONALIZED SYNTHETIC POLYMERS. [BIB-199305-42-0555]

Polymeric depressants offer several advantages over the inorganic and organic depressants commonly used in sulfide mineral flotation. Their current use in industry is, however, limited to a few applications and are restricted to the naturally-occurring polysaccharides. Several functionalized synthetic polymeric depressants for sulfide depression have been developed recently by American Cyanamid Company. The efficacy of one such polymer, an acrylamide—allylthiourea copolymer, in Cu—Mo separation is shown in tests conducted on actual plant samples. The redox potential, as modified by NaHS, is found important in achieving selectivity of the depressant action of this polymer. Voltammetry and FTIR spectroscopy data indicate that the adsorption of this polymer is stronger than that of xanthate. Spectra. 19 ref. (Nagaraj, D.R.; Basilio,

C.I.; Yoon, R.-H.; Torres, C.; ELECTROCHEMISTRY IN MINERAL AND METAL PROCESSING III, ST. LOUIS, MISSOURI, USA, 17-22 MAY 1992, Publisher: THE ELECTROCHEMICAL SOCIETY, INC., 10 South Main St., Pennington, New Jersey 08534-2896, USA, (1992), PV-92-17, (Met. A., 9305-72-0280), pp. 108-128 [in English].)

3171 MINIMIZING HEAT STRESS IN SODERBERG POTROOM. [BIB-199305-42-0610]

Elkem Aluminium ANS has made a determined effort over the last ten years to improve potroom working conditions in its two VS Soderberg smelters. The two oldest potrooms have been converted to prebake, while the internal environment in the remaining Soderberg rooms has been considerably improved through programs involving a close co-operation between technical and medical personnel. Described is the work carried out to investigate heat stresses. Examples of procedures and the instrumentation used to measure heat stress during various potroom operations, and of technical solutions adopted to reduce this particular environmental problem are given. Graphs. 6 ref. (Austerheim, A.; Malterud, D.; Syrdal, A.K.; LIGHT METALS 1993, DENVER, COLORADO, USA, 21-25 FEB. 1993, Publisher: THE MINERALS, METALS & MATERIALS SOCIETY, 420 Commonwealth Dr., Warrendale, Pennsylvania 15086, USA, (1992), (Met. A., 9305-72-0288), pp. 419-423 [in English].)

3172 CLOSE YOUR NOSE, CLOSE YOUR MOUTH AND LET'S GO—EMISSION OF HARMFUL MATERIALS IN LASER PROCESSING. (NASE ZU, MUND ZU UND DURCHSTARTEN—SCHADSTOFFEMISSION BEI DER MATERIALBEARBEITUNG MIT LASERN.) [BIB-199305-53-0302]

While material processing with lasers has become increasingly important, very little attention has been paid to understand potentially harmful side effects. Most work was done in shielding the operator from the direct or indirect radiation. However, even hear the effects of the different laser types (CO_2, Nd:YAG, Excimer, etc.) on the shielding materials is not taken into consideration. Much less is known about the delayed effects of particles released during laser machining. In cutting steels vapors of alloying elements, such as chromium and nickel can be inhaled by the operator. Among the plastics, acrylics release hydrocarbons, while PVC liberates chlorine vapor. Other harmful materials are probably released in processing ceramics, and glasses. The enormous number of factors involved makes research very difficult at best, yet virtually nothing has been done. One test showed that 70-90% of the particles released cutting metals with a CO_2 laser are 0.18 mu m and are therefore penetrating the lung. 3 ref. (Herzog, H.H.; Technische Rundschau, (15 Mar. 1991), 83, (11), pp. 42-45 [in German]. ISSN 0040-148X)

3173 CONTROLLING WELDING FUME: A DESIGN APPROACH. [BIB-199305-55-0906]

Welding fumes cause health problems and plant and equipment maintenance problems. OSHA regulations were established in 1989 with overall permissible exposure limits of 5 mg/m^3 and much lower limits on many individual components of the welding fume. These limits have been successfully challenged in a federal appeals court but OSHA is expected to take other action. The regulations required that controls be exercised through administrative controls (limiting the exposure time of workers), personnel controls (respirators and helmets), and engineering controls (fans and/or fume collection systems). Engineering controls which must be complied with are discussed. Graphs. (Reding, L.; Welding Journal, (Sept. 1992), 71, (9), pp. 61-64 [in English]. ISSN 0043-2296)

3174 CONCERNING POWDER PAINT WITHOUT TGIC. (A PROPOS DES PEINTURES EN PUDRE SANS TGIC.) [BIB-199305-57-0640]

TGIC, a hardener for polyester, when present as dust in amounts 0.025 mg/m^3, may potentially cause genetic mutations after daily exposures of 8 h. It has not been determined whether other components of the dust may be equally harmful. Proper warning labels are recommended. No adequate substitutes for TGIC exist as yet, because all other candidate materials also have deficiencies. (Galvano-Organo-Traitements de Surface, (Apr. 1992), (625), pp. 365-366 [in French]. ISSN 0302-6477)

3175 CONTINUOUS NICKEL MATTE CONVERTING. [BIB-199307-41-0249]

A continuous process is proposed for the conversion of solid mattes formed during the melting of oxidized nickel ores in a shaft furnace. It is shown that the process is particularly efficient when low-grade mattes are converted to Ni-rich mattes containing 55-60% Ni. The process also allows for the efficient utilization of sulfur, which is used to produce sulfuric acid. This provides ecological benefits, since no S-containing gases are released into the atmosphere. Graphs. 5 ref. (Tsemekhman, L.Sh.; Ryabko, A.G.; Khokhlov, O.I.; Lundin, L.M.; Shustitskii, V.D.; Tsvetnye Metally, (Dec. 1992), (12), pp. 11-12 [in Russian]. ISSN 0372-2929)

3176 SULFUR DIOXIDE UTILIZATION OUT OF LOW-GRADE GASES WITH HYDROMETALLURGICAL PRODUCTS. [BIB-199307-41-0250]

A method for the extraction of sulfur dioxide from low-grade gases if proposed whereby the absorbents used are based on byproducts of the hydrometallurgical processing of sulfide materials. In particular, experimental results are presented to demonstrate the possibility of using byproducts of the hydrometallurgical processing of pyrrhotite for the recovery of S from low-concentration gases (1-10% SO_2). The method proposed makes it possible to utilize practically all (90%) low-concentration gases released by Cu—Ni metallurgical plants. Graphs. 10 ref. (Erokhin, B.I.; Tsvetnye Metally, (Dec. 1992), (12), pp. 21-23 [in Russian]. ISSN 0372-2929)

3177 LEAD CONTAMINATION AT AN OLD SMELTER SITE AT SOCORRO, NEW MEXICO: I. PARTICLE SIZE AND DEPTH OF CONTAMINATION. [BIB-199307-42-0829]

Soil next to a smelter abandoned approx 100 years ago near Socorro, New Mexico, USA, was found, by the US Environmental Protection Agency (EPA), to contain high lead concentrations. Detailed characterization of the soil by the New Mexico Bureau of Mines and Mineral Resources shows that the highest Pb concentration is in the clay-size fraction, although this fraction accounts for only 1-3 wt.% of the soil. The depth of contamination, determined in areas relatively undisturbed since the smelter was abandoned, is not 76 mm (3 in.). Because of the soil's alkalinity, the Pb mobility is dominated by the movement of Pb-bearing particles, as opposed to chemical transport in solution. Maps, Graphs. 2 ref. (Austin, G.S.; Brandvold, L.A.; Hawley, J.W.; Renault, J.; SME ANNUAL MEETING, PHOENIX, ARIZONA, USA, 24-27 FEB. 1992, Mining Engineering (Colorado), (Apr. 1993), 45, (4), pp. 389-395 [in English]. ISSN 0026-5187)

3178 LEAD CONTAMINATION AT AN OLD SMELTER SITE AT SOCORRO, NEW MEXICO. II. LABORATORY TESTS. [BIB-199307-42-0830]

A series of tests were run on soil samples collected near the site of a Socorro, New Mexico, USA, smelter that was abandoned 98 years ago. Three 30.5 x 30.5 m (100 x 100 ft^2) provided 13 samples each. As described previously, each sample was divided into seven splits according to particle size. A mineralogical examination of the fine-size fraction of Pb contaminated soils failed to reveal crystalline Pb compounds. Lead is present as amorphous phases or is adsorbed on the surfaces of soil particles. Site vegetation contained elevated Pb levels that increased with increasing Pb amounts in the soil. However, the biological absorption coefficient (BAC) indicates that some of the site's Pb is unavailable, or the plants are able to limit their uptake. Of the vegetation tested, rabbit bush showed the greatest increase of Pb levels in its roots, whereas levels in creosote were highest in the foliage. In cactus, the Pb levels varied. The amount of Pb due to dust incorporated in plant tissue is almost negligible compared to the amount absorbed through the plant vascular system. Maps, Graphs. 9 ref. (Austin, G.S.; Brandvold, L.A.; Renault, J.; SME ANNUAL MEETING, PHOENIX, ARIZONA, USA, 24-27 FEB. 1992, Mining Engineering (Colorado), (Apr. 1993), 45, (4), pp. 396-401 [in English]. ISSN 0026-5187)

3179 A CONCEPTUAL MODEL FOR THE INTEGRAL APPROACH TO INDUSTRIAL RISKS. (MODELO CONCEPTUAL PARA EL TRATAMIENTO INTEGRAL DE LOS RIESGOS INDUSTRIALES.) [BIB-199307-45-0761]

Traditionally, the prevention of accidents and occupational illnesses has been based on what would be called a "work centered" approach in which risk

analysis, industrial hygiene and establishment of practices and enforcement are all considered as of prime importance. A model is presented which proposes an integral approach for risk control. In this approach each element of the productive system (people—equipment—materials—environment) as well as the developed interface are considered for their effect and influence. A pilot study which included the key elements was carried out to test the model. The results (measured in terms of accident occurrence), show the effectiveness of a prevention and risk control program based on an integral approach. Graphs. 3 ref. (Orta, D.; Sidor Hoy, (Nov. 1992), 14, (43), pp. 17-23 [in Spanish]. ISSN 0798-1163)

3180 LASER WELDING OF ALLOY STEEL TUBING—REACHING A HIGHER PERFORMANCE LEVEL. (EDELSTAHLROHRE MIT DEM LASER SCHWEISSEN—HOHERES LEISTUNGNIVEAU ERREICHEN.) [BIB-199307-55-1233]

Transversal electromagnetic mode (TEM_{01} *) high frequency excited CO_2 lasers operate at a higher efficiency than multimode lasers. Their greater focal length produces a highly concentrated working focus, which results in a narrow weld seam. The greater focal distance also protects the optics from smoke and splatters, and the relatively low operating potential of 1 kV conserves cover gases and presents no significant safety hazard. Weld in 1.4571 alloy steel is illustrated. Photomicrographs. (Trotha, L.; Kaupp, P.; Industrie-Anzeiger, (31 May 1991), 113, (44), pp. 16-18 [in German]. ISSN 0019-9036)

3181 WELDING SANITARY PIPE AND TUBE ON-SITE. [BIB-199307-55-1292]

To keep pace with stricter standards, advancing technologies, and more competitive markets, exacting tube and pipe cutting and prepping machines have been developed. Topics discussed include: sanitary standards, inconsistent fit-up, recommendations from welding equipment manufacturers, weld prep guideline, portable cutting and prepping methods, orbital milling, OD-mounted lathe, OD-mounted squaring, ID-mounted beveling and facing, minimized reworker time, reduced fit-up time, increased work efficiency, and investment in the future. Stainless steel pipe was used. (Fennig, J.D.; TPQ, The Tube and Pipe Quarterly, (Fall 1992), 3, (3), pp. 16, 18-22 [in English].)

3182 GLUEING METALS IS ENVIRONMENT FRIENDLY. (UMWELTFREUNDLICH METALL KLEBEN.) [BIB-199307-55-1306]

Anaerobic adhesives are environment-friendly because they contain no solvents. However, solvents are used for cleaning the parts to be joined and replacing the organic chemicals containing chlorine and fluorine with highly-flammable ones is not a safe alternative. For such cases Loctite 603 should be considered. This adhesive is capable of penetrating the thin surface contaminants that remain after wiping and still produce a strong joint. Test results are shown for joints of metal surfaces covered with Aral SAE-80 oil, Ancorit 611/36, and Cimplus M27. Graphs. (Industrie-Anzeiger, (27 Jan. 1992), 114, (5), pp. 42, 45 [in German]. ISSN 0019-9036)

3183 IRON, MANGANESE, COPPER, AND TITANIUM IN WELDING FUME DUST ON FILTERS FOR INTERNAL AND EXTERNAL QUALITY ASSURANCE. [BIB-199307-55-1348]

Filters charged with welding fume dust were developed and produced for internal and external quality assurance to evaluate and improve the performance of analytical methods used for monitoring iron, manganese, copper, and titanium in the working environment. The filters were simultaneously loaded, using a Sputnic air sampling unit containing 100 cellulose nitrate filters. The welding fume dust was collected in industrial working conditions where metal inert gas welding in construction steel was being carried out. The metal concentrations on the filters were close to the metal concentrations from environmental and industrial exposure. The homogeneity of the filter materials was evaluated to document the suitability of the air sampler in producing quality control materials. The filters were homogeneous within 5.0-12.7% according to the amount of metal. The welding fume dust loaded on the filters was (0.2021 plus/minus 0.0093 mg/filter) and the amounts of metals loaded on the filters were (34.6 plus/minus 6.4 μg/filter, 16.0 plus/minus 0.8 μg/filter, 2.4 plus/minus 0.1 μg/filter) for Fe, Mn and Ti, respectively. Normalizing the amount of metal according to the welding fume dust improved the homogeneity. The most satisfactory results were obtained for Mn and Ti, for which within batch variation was 6.3%. The Sputnic air sampler was shown to be suitable in preparing quality control materials, although a few improvements are needed for future experiments, such as the method of charging the dust and rules for outlier exclusion. 11 ref. (Anglov, J.T.B.; Holst, E.; Dyg, S.; Christensen, J.M.; Fresenius' Journal of Analytical Chemistry, (1993), 345, (2-4), pp. 335-339 [in English]. ISSN 0937-0633)

3184 AIRBORNE EMISSIONS IN GAS SHIELDED WELDING. [BIB-199307-55-1354]

The MIG and MAG shielded gas welding process produces dust (solids 1 μm), fumes (solids 1 μm), and gases. Weld spatter causes dust. The fumes are condensed metal vapor which is usually oxidized. The arc energy density and arc length control the amount of dust and fumes. The arc ultraviolet radiation transforms oxygen to ozone and oxidized nitrogen to form nitric oxide. Also, carbon monoxide is formed by decomposition of carbon dioxide shield gas. Adding nitric oxide to shield gas will reduce the ozone to diatomic O. Tables summarize health risks for metal fumes, coating fumes, and gases. Graphs. 4 ref. (Driscoll, S.; Suckling, P.; Welding and Metal Fabrication, (June 1992), 60, (5), pp. 227-229 [in English]. ISSN 0043-2245)

3185 METAL AS AN ALLERGEN. CONSIDERATION OF THE PROBLEMS OF PRECIOUS METALS ALLERGY. (METALL ALS ALLERGEN. BETRACHTUNGEN ZUM PROBLEMFELD: EDELMETALL-ALLERGIE.) [BIB-199307-61-0806]

Metal allergens can be induced via soluble and chemically reactive salts forming metal-albumen compounds with which the immune system reacts. The law already restricts the use of Ni in consumer goods, because of Ni allergy, which is also a factor in precious metal allergies through association of, e.g. gold with nickel, cobalt, etc. Similarly hexachloroplatinate allergy is exclusively a platium-salts processing industry problem which is resolved by works medicine and works hygiene measures. Although palladium has not been shown to have significant toxicological effects, further research is necessary to clarify the potential allergenic effects of this precious metal. (Breitstadt, R.; Metalloberflache, (Jan. 1993), 47, (1), pp. 16-19 [in German]. ISSN 0026-0797)

3186 SYNERGISTIC COMBINATION OF SODIUM SILICATE AND ORTHOPHOSPHATE FOR CONTROLLING CARBON STEEL CORROSION, INHIBITING PRECIPITATION OF DISSOLVED MANGANESE AND IRON AND REDUCING SOLUBLE LEAD IN POTABLE WATER. [BIB-199308-35-1418]

An orthophosphate salt and sodium silicate, when used in a 3:1 ratio by weight, and in a concentrate of 0.1-100 mg.l, are found to have a synergistic effect in controlling the corrosion of carbon steel in an aqueous system, e.g. a municipal water supply system. The synergistic combination is also useful in reducing lead solubility and leaching, and in stabilizing soluble iron and manganese and their reaction products. (Boffardi, B.P.; Auszuge aus den Europaischen Patentanmeldungen, Teil I, (28 Oct. 1992), [in English]., Patent no.: EP0510989 (European Patent) Convention date: 24 Apr. 1992)

3187 CONTROLLED PIG IRON TAPPING AT RAUTARUUKI BLAST FURNACES. [BIB-199308-42-0885]

The principal features of the plant and its performance are briefly described. Some measures which were implemented when the plant was modernized are briefly mentioned. These measures improved the working conditions and ecological conditions in the casting shop, and virtually eliminated the harmful emissions. Graphs. (Pisilya, E.; Kallo, S.; Stal', (Oct. 1992), (10), pp. 8-11 [in Russian]. ISSN 0038-920X)

3188 INVESTIGATING THE RECYCLING OF NICKEL HYDRIDE BATTERY SCRAP. [BIB-199308-43-0235]

New nickel hydride alloys have been developed to replace the cadmium-containing negative electrodes of Ni-Cd batteries. The new, C-free alloys promise enhanced electrochemical properties as well as reduced environmental toxicity. Rechargeable batteries using nickel hydride electrodes are strong candidates for electric vehicle applications. The US Bureau of Mines is investigating hydrometallurgical technology that separates and recovers purified metallic components present in nickel hydride battery scrap. A preliminary investigation of acid dissolution and metal recovery techniques using whole batteries and electrode rolls has shown potential options that will allow the successful recycling of much

of the battery fabrication scrap. 19 ref. (Lyman, J.W.; Palmer, G.r.; JOM, (May 1993), 45, (5), pp. 32-35 [in English]. ISSN 0148-6608)

3189 WELDING AS A TRADE VIS-A-VIS NEUROTOXITY, A CASE STUDY. [BIB-199308-55-1693]

In recent years there has been a growing interest among safety engineers and biomedical specialists about the possible neuronal toxic effects on humans. In India a serious neurological disorder has been reported among the labourers employed in Mn mines. Manganese being a common constituent in many types of welding electrodes, the present study was undertaken to investigate the Indian welders from health and safety viewpoints. The welders taking part in the present study were subjected to different kinds of tests during the investigation. Results indicated that the welding environment led to exposing the workers to statistically significant levels of toxic fumes and gases. The findings of this study elucidated a definite involvement of the higher mental functions. Implications of the findings and futures direction of research are discussed. 7 ref. (Aliul, S.; Rizvi, H.; Farooquie, J.A.; SIXTH INTERNATIONAL CONFERENCE ON THE JOINING OF MATERIALS (JOM-6), Helsingor, Denmark, 5-7 Apr. 1993, Publisher: JOM-INSTITUTE, INGENIORHOJSKOLEN HELSINGOR TEKNIKUM, Rasmus Knudsens Vej 50, DK-3000 Helsingor, Denmark, (1993), (Met. A., 9308-72-0423), pp. 581-586 [in English].)

3190 HOST OF NEW LEAD-FREE SOLDERS INTRODUCED. [BIB-199308-55-1697]

Copper plumbing systems have traditionally been installed using a 50Cu—50Pb alloy solder, but in 1986 Congress passed the Federal Hazardous Substances Act which limits the lead content of solder in potable water systems to 0.2% maximum. There are three standard Sn—Ag alloy solders which contain no Pb. The high cost of these silver-containing solders has spurred the development of a variety of new alloys by a number of US companies such as Englehard, Harris, Fry Metals, Taracorp, Lukens Metal, and Canfield Metals. There is also a new interest in the use of brazing alloys for these applications. Graphs. (Irving, R.; Welding Journal, (Oct. 1992), 71, (10), pp. 47-49 [in English]. ISSN 0043-2296)

3191 AQUEOUS CLEANERS CHALLENGE CHLORINATED SOLVENTS. [BIB-199308-57-1045]

The use of aqueous alkaline cleaners via immersion or spray method would provide effective job cleaning without the hazardous waste and work health concerns of vapor degreasers using chlorinated solvents. The new technology cleaners contain water conditioners, corrosion inhibitors, varying amounts of alkaline builders and organic surfactants to provide optimum foaming, wetting and soil removal properties. The bath is to be filtered periodically to remove contaminants. A comparative study of cleaning tests showed that within the same treatment time of 10 min the solvent dissolved the soils while the aqueous cleaners either emulsified or saponified the soils. The aqueous cleaners can be used in the existing vapor degreaser tank with some modifications which involve disconnecting the chiller coils, raising the fluid level for easy immersion and introducing air tube for agitation of the bath. (Quitmeyer, J.A.; Pollution Engineering, (Dec. 1991), 23, (13), pp. 88-91 [in English]. ISSN 0032-3640)

3192 INTRA- AND EXTRAORAL PROSTHESES USING OSSEOINTEGRATED IMPLANTS AFTER MAXILLO-FACIAL SURGERY. [BIB-199308-61-0925]

Maxillary and orbital defects due to the resection of maxillary tumors in six cases were treated utilizing maxillofacial prostheses employing pure titanium osseointegrated implants (Branemark system). A total of 17 fixtures were installed in the maxillary region, and 16 achieved osseointegration. For the orbital region, nine fixtures were installed, and all fixtures integrated well. Using these fixtures as anchors, four maxillary prostheses and three orbital prostheses were set. The stability of the prostheses were improved by anchors, and the prostheses were highly satisfactory to the patients. 14 ref. (Ueda, M.; Niimi, A.; Kaneda, T.; Journal of Long-Term Effects of Medical Implants, (1993), 3, (1), pp. 41-56 [in English]. ISSN 1050-6934)

3193 THE INFLUENCE OF METALLIC SURFACE WETTABILITY ON BACTERIAL ADHESION. [BIB-199309-32-0466]

The wettability of AISI 304 stainless steel with 2B and 2RB surface finishes expressed in terms of the solid surface free energy ($gamma_s$) was investigated with respect to the cleaning process. It was shown that cleaning affects the wettability of a solid surface. Depending on the cleaning method, $gamma_s$ ranged from 43.4-277.8 mJ/m^2 for the 2RB surface and from 34.4-122.8 mJ/m^2 for the 2B surface. There was no direct relationship between the number of adhering bacteria and $gamma_s$ or the wettability of solids. However, it was found that the adhesion of Streptococcus thermophilus was driven by a balance between $gamma^d_s$ and $gamma^p_s$. The experimental results are as expected based on thermodynamic predictions when the spreading pressure (pi_e) is accounted for in the surface free energy of bacteria, $gamma_B$, determination. Graphs. 33 ref. (Boulange-Petermann, L.; Bellon-Fontaine, M.-N.; Baroux, B.; Journal of Adhesion Science and Technology, (1993), 7, (3), pp. 221-230 [in English]. ISSN 0169-4243)

3194 REMOVING THE RISERS AND GATES FROM THE HIGH STEEL CASTINGS. [BIB-199309-51-1398]

The castings from austenitic manganese steel are the assortment that is always in demand for its specific properties. But removing the gates and risers is problematic both from the point of view of production, and from the point of view of working environment. Design of the new plant with an exhausting wall solves the hygienic problems and makes it possible to decrease to a great extent the concentrations of harmful substances containing Mn. Steel 120Mn13CrV was analyzed. 5 ref. (Dorda, J.; Kubiczek, J.; Slevarenstvi, (1992), 40, (6), pp. 230-232 [in Czech]. ISSN 0037-6825)

3195 EPA/OSHA GOVERNMENT REGULATIONS SUMMARY FOR THE FINISHING INDUSTRY. [BIB-199309-58-1094]

There are a number of regulations promulgated by EPA and OSHA that directly affect the finishing industry. An overview is given of the applicable regulations for electroplating, metal-products-finishing, and paint-spraying facilities. The information that is presented summarizes the major points of each regulation and provides references on where to obtain more detailed information. Numerical data is given on the pollutant limits (metals, organics, cyanides) in effluents from electroplating works. (Mabbett, A.N.; Products Finishing (Cincinnati), (Oct. 1992), 57, (1-A), pp. 281-290, 292-294 [in English]. ISSN 0032-9940)

3196 COATED DENTAL ARTICLE. [BIB-199309-71-0263]

A dental article is coated with a hard carbon coating of polycrystalline diamond, diamond-like amorphous hydrogen-free C, diamond-like hydrogenated amorphous C, or combinations thereof. The hard C coating presents a barrier to nickel and chromium that might otherwise diffuse from an underlying metal substrate, and as such is useful for patients exhibiting sensitivity to Ni and Cr. (Nikutowski, E.A.; Adam, R.E.; O'Neill, D.G.; (20 Apr. 1993), [in English]., Patent no.: US5203804 (USA) Convention date: 18 July 1991)

3197 METHODS FOR CONTROLLING AIRBORNE DISSEMINATION OF LEAD AND LEAD-CONTAMINATED FINES DURING THE STORAGE AND PROCESSING OF LEAD-CONTAMINATED MATERIALS. [BIB-199309-71-0265]

The present invention is directed to improved methods for processing battery wastes, batter casing debris and other Pb contaminated materials. The improved processes of the present invention provide less environmentally stressful methods for recovering Pb from such materials while at the same time producing scrap or recyclable ebonite and plastics having reduced and environmentally acceptable Pb and leachable Pb levels. Most of the Pb is first removed by trommel scrubbing. In another aspect of the present invention, ebonite and other hard surface materials to which are adhered Pb contaminants are mixed with water and abraded in a high energy scrubber to remove the adhered contaminants prior to separation of the cleaned ebonite from solution. This simple and environmentally preferred hydromechanical process provides clean scrap or recyclable ebonite. In another aspect of the present invention, plastic and other soft materials contaminated with Pb are mixed with a solution having a pH approx 7, preferably approx 1-5 wt.% alkali hydroxide solution, to dissolve Pb contaminants. Separation of particulates produces clean scrap or recyclable plastic while carbonation of the wash water permits recovery of Pb carbonate. Finally, the present invention provides methods for controlling dust contamination prior to and during processing by spraying the fine, raw materials with an aqueous solution of a wetting agent, preferably approx 2 wt.% alkali carbonate, bicarbonate or sesquicarbonate in water. (Montgomery, A.H.; Kube, W.H.; (27 Apr. 1993), [in English]., Patent no.: US5205952 (USA) Convention date: 16 Sept. 1991)

3198 WORK SAFETY BY WELL CHOSEN PROTECTIVE EQUIPMENT. (ARBEITSSICHERHEIT DURCH GEZIELTE AUSTWAHL VON KORPERSCHUTZMITTELN.) [BIB-199310-51-1577]

The use of chain gloves (as used by butchers) rather than leather-and-fabric gloves reduced hand injuries for casting cleaners and reduced cost. Grip was improved by silicon pads. Panorama safety glasses reduced eye injuries, by improving view and providing side protection. (Hoppe, B.; Schiller, K.; Giesserei, (9 Nov. 1992), 79,(22), pp. 954-956 [in German]. ISSN 0016-9765)

3199 SUBSTITUTION OF ORGANIC SOLVENTS AND HAZARDOUS BINDERS BY BONDING WITH ADHESIVES IN THE MANUFACTURE OF FABRICATED METAL PRODUCTS, MACHINERY AND EQUIPMENT. [BIB-199310-55-2089]

By bonding with adhesives, the use of organic solvents and hazardous binders can be substituted by using (1) less hazardous types of adhesives (water-based adhesives, hot-melt or silicone adhesives); (2) adhesive films or double-sided adhesive tape; (3) mechanical joining or (4) a design or construction which avoids joining. Examples of substitution are given. Organic solvents can be avoided through pretreatment using water-based degreasing agents, and by cleaning after bonding using mechanical methods. Bonding with adhesives makes repair and recycling of items and materials difficult. 10 ref. (Sorensen, F.; Petersen, H.J.S.; Staub-Reinhaltung der Luft, (June 1993), 53, (6), pp. 251-254 [in English]. ISSN 0039-0771)

3200 HOW TO BE SOLVENT-FREE IN 1993. [BIB-199310-57-1297]

The Environmental Protection Agency (EPA) is black-listing chlorinated solvents for cleaning parts. Chlorinated solvents initially replaced hydrocarbon solvents that were fire- and explosive hazards. Now, the cleaning methods remaining are solvent methods and aqueous methods. The solvent methods must be carried out in sealed systems. When the recycled solvent is contaminated beyond usable levels, it is returned to the suppliers. The units meet the EPA release limit of 25 ppm of solvent. These systems can cost $150 000-200 000. Water-based cleaning systems need caustic solutions, multiple rinse tanks, and drying sections. The water may need additional purification to prevent deposits on the parts. Hence, "cleanability" is becoming a part design consideration. (Sprow, E.E.; Manufacturing Engineering, (Feb. 1993), 110, (2), pp. 37-45 [in English]. ISSN 0361-0853)

3201 COPPER WATER TUBE VS POLYBUTYLENE PLASTIC PIPE: ISSUES AND ANSWERS. [BIB-199310-61-1352]

The technical factors to be considered when choosing materials for a potable water distribution system are examined. These include reliability, strength, corrosion resistance, oxidation resistance, permeability and health, noise and vibration, joints and fittings, and installation and reliability. It is noted that, although plastic is selected by contractors in geographical areas where the installed cost is perceived to be lower than for copper, it remains to be established whether plastic is less costly in the long run. Also, serious questions regarding the durability and health issues associated with the use of polybutylene plastic pipes are yet to be resolved. (Canadian Copper, (123), pp. 7-10 [in English, French]. ISSN 0008-3291)

3202 ENVIRONMENTAL THREATS OF DISCARDED PICTURE TUBES AND PRINTED CIRCUIT BOARDS. [BIB-199310-63-0703]

Scrap picture tubes (television and monitor tubes) and printed circuit boards were investigated for their potential threat to the environment. First, a qualitative analysis of samples was carried out by atomic emission spectrophotometry. In addition, U.S. EPA Method 3050 (SW-846) and atomic absorption spectrophotometry (AAS) were employed to determine the total contents of heavy metals of interest. Finally TCLP and AAS were used to evaluate the leaching toxicity of the samples. All color and amber picture tubes tested were found to be hazardous; whereas the green, white and paper-white picture tubes were not. For color picture tubes, lead and zinc concentrations of TCLP are greater than the current regulatory thresholds in Taiwan; while the amber one is hazardous because of its cadmium concentration. The environmental threats of those hazardous picture tubes are ascribed to leaching of heavy metals from the phosphors that are deposited on the inner side of the viewing screen of each picture tube. All tested printed circuit boards also were found to be hazardous as evidenced by their TCLP lead, Zn and Cd concentrations. Disposal of discarded TV sets, personal computers, video-game sets, etc., should be managed properly to avoid contamination of soil and groundwater. Several recommendations were made in this regard. Nickel and chromium recovery are also discussed. 4 ref. (Yang, G.C.C.; Journal of Hazardous Materials, (June 1993), 34, (2), pp. 235-243 [in English]. ISSN 0304-3894)

3203 SURFACE CHEMISTRY AND BEAM—SOLID INTERACTIONS. [BIB-199201-G2-Z-0024]

Materials Research Society Symposium Proceedings, Vol. 201. 9 papers selected and abstracted. (Atwater, H.A.; Publisher: Materials Research Society, 9800 McKnight Rd., Pittsburgh, Pennsylvania 15237, USA, (1991), Pp 636, 61/4 x 91/4 in., Illustrated [in English]. ISBN 1-55899-093-3)

3204 ENVIRONMENTALLY HARMLESS PRE-TREATMENT PRIOR TO CEMENTING. (VOR DEM KLEBEN: UMWELTFREUNDLICH VORBEHANDEIN.) [BIB-199203-E5-P-0106]

Many plastics, such as polyolefins, cannot be cemented until after appropriate pre-treatment. Wet chemical process often present ecological and economical problems and are, therefore, increasingly replaced by environmentally harmless methods. These include those using low-pressure plasma, conventional corona, free jet corona, spray corona, thermocorona, plasma gun, and excimer laser which are all presented in a survey. In English p. 12-14. Graphs, Photomicrographs. 10 ref. (Dorn, L.; Eurobond '91, 26-28 Feb. 1991, Kunststoffe German Plastics, (Sept. 1991), 81, (9), pp. 764-767 [in German]. ISSN 0723-0192)

3205 THE ROLE OF ANSI/NSF STANDARD 61 AND THIRD-PARTY CERTIFICATION IN PROVIDING SAFE DRINKING WATER. [BIB-199203-G1-P-0012]

The NSF Drinking Water Additives Program is the model for health effects evaluation of products and materials in contact with drinking water, including buried plastics pipe. One of the standards developed by the program, ANSI/NSF Standard 61 (Drinking Water System Components—Health Effects), covers the toxicology of indirect additives to drinking water for all types of potable water contact products and materials, including plastics pipe. For many years, NSF Standard 14 (Plastics Piping Components and Related Materials) has been the model toxicological and performance standard for plastics pipe, serving regulators, users, industry, and the public. Although it remains a viable standard, health effects in NSF Standard 14 are now addressed by reference to ANSI/NSF Standard 61. How these standards address potential health effects of plastics pipe and their impacts on specifiers, users, and designers is addressed. Extraction testing and toxicology requirements are provided special emphasis. NSF's product certification (listing) program for plastics is explained, along with a discussion of the problems and opportunities presented by consensus standards and third-party product certification programs. 8 ref. (Gregorka, D.A.; Buried Plastic Pipe Technology, 10-13 Sept. 1990, Publisher: ASTM, 1916 Race St., Philadelphia, Pennsylvania 19103, USA, (1990), STP 1093, (Eng. Mat., 9203-G2-Z-0115), pp. 79-91 [in English].)

3206 THE ALUMINAS AND HEALTH. [BIB-199204-C4-C-0140]

Since most sites of absorption from the gastrointestinal tract exist at a near-neutral pH range, aluminas usually are poorly absorbed after oral ingestion. However, under appropriate conditions, inhalation of fine particulate forms may potentially present a relatively more significant site of absorption and/or local damage. Nevertheless, numerous studies of occupational exposures to aluminas in Al refining, smelting, and the pottery industry repeatedly indicate that all the aluminas per se are essentially inert in the lungs; but, because several experimental studies in animals have indicated that specific aluminas may produce lung damage, there have been some continuing health concerns. A critical examination of these data indicates that there had been inconsistent physical characterization and identification of these aluminas; this reflects, in part, earlier confusion among physial scientists revoling about the identifiation of the " gamma " aluminas. The other factors contributing to this confusion stem from the use of differing types of experimental models which hold differing implications. When a catalytically active, ultrafine (0.02-0.04 μm) alumina, probably the low-temperature range eta transitional Al_2O_3 (identified erroneously as gamma Al_2O_3) is administered directly into the lungs of animals, it produces severe fibrosis. Similarly, when extremely fine (0.02 μm), gelatinous boehmite particulate possessing no catalytic activity is administered directly into lungs of animals, it too causes slightly less serious lung damage than does the similar size low-temperature (eta ?) transitional Al_2O_3. When alpha Al_2O_3 ground to submicrometer size is placed in the lung, it produces a mild degree of lung fibrosis. Finally, when well-crystallized boehmite (gamma -AlOOH) with a small surface area is administered similarly, it is inert in the lung. It would appear in the direct lung insufflation experimental model that lung damage is a function of (1) surface area and surface thermodynamic instability and (2) catalytic reactivity associated with the transitional aluminas. But it is also apparent that the confusion regarding the implications of the " gamma " designation has contributed to doubts regarding alumina's bioreactivity. By contrast, it has now become apparent that when a catalytically active chi -transitional form is administered to animals by inhalation no pulmonary damage occurs. Further, when massive doses of gamma transitional alumina were administered by inhalation, a nonspecific response occurred characteristic of such large doses; however, this differed qualitatively from the nonreversible, more serious fibronodular pathology associated with the intratracheal insufflation studies. Finally, on the basis of specific human exposures to transitional aluminas produced as catalysts or adsorbents, to mixtures of higher temperature transitional aluminas increasingly used in modern smelters, and on the basis of exposure to alpha aluminas used in potteries, it appears that this full range of aluminas has little, if any, bioreactivity. Ultimately, evaluation of the human toxicity potential of environmental agents must consider both the experimental model systems and their limitations and human experience with similar agents. When considered in this fashion, it would appear that concerns revolving around alumina's pulmonary damage potentials are misplaced, since human exposure and models which more directly reflect such exposures do not result in the consequences seen with animal models associated with the artificial loading conditions. Graphs. 28 ref. (Dinman, B.D.; Publisher: The American Ceramic Society, Inc., 757 Brooksedge Plaza Dr., Westerville, Ohio 43081, USA, Alumina Chemicals: Science and Technology Handbook, (1990), (Eng. Mat., 9204-G2-C-0120), pp. 533-543 [in English].)

3207 ENVIRONMENTALISM IN THE COMPOSITES INDUSTRY. [BIB-199205-E3-D-0079]

Increasing environmental awareness presents a challenge and an opportunity to the composites industry. Responses can determine the future of the industry. Du Pont's Composites Division's response is examined as is the importance of effectively communicating with customers and the public. Issues discussed include personnel safety and health concerns such as acceptable exposure limits and absorption of chemicals through skin. Problems presented due to machining of composites are also touched on. (Aldrich, D.C.; Composites in Manufacturing. X, 7-10 Jan. 1991, Publisher: Society of Manufacturing Engineers, One SME Dr., P.O. Box 930, Dearborn, Michigan 48121, USA, (1991), EM91-107, (Eng. Mat., 9205-G2-D-0156), Pp 16 [in English].)

3208 TOXICOLOGY OF MANMADE MINERAL FIBERS. [BIB-199206-D1-D-1186]

The three general types of manmade mineral fibers (MMMF) are fibrous glass, mineral wool and refractory ceramic fibers. MMMF do not burn, rot, or absorb moisture or odors. Under normal conditions, they do not support the growth of mildew, mold, or bacteria. MMMF may irritate the skin of some workers in manufacturing facilities and some people who fabricate or install MMMF-containing materials. Unprotected exposures to high concentrations of airborne MMMF may produce a nonspecific, transitory lung condition, usually manifested by coughing or wheezing. Epidemiologic studies of MMMF are reviewed. Experimental toxicologic studies of MMMF have been conducted both in vitro and in vivo . A number of studies have shown that fiber length and diameter are important in determining the toxicity of mineral fibers of various chemical compositions to cells grown in culture. Animal inhalation studies involving fibrous glass, mineral wool and refractory ceramic fibers are summarized. Evidence from animal experiments indicates that glass fibers are attacked by fluids normally present in the lung. This can cause fragmentation to shorter fibers that are biologically less active and are more readily removed from the lungs by clearance mechanisms, or can even lead to the total dissolution of fine fibers. The mechanisms whereby inhaled fibers result in pathologic changes in the respiratory tract and lining surfaces of the chest and abdominal cavities are not completely understood. Certain principles of biologic activity have been elucidated which appear to explain the differing responses to fibers on the basis of size, geometry, durability and, to a lesser extent, chemical composition. Currently, there are no specific regulations which govern exposure to MMF. In the USA, OSHA considers these fibers to be nuisance dusts. Photomicrographs. 59 ref. (Bun, W.B.; Publisher: Williams & Wilkins, 428 East Preston St., Baltimore, Maryland 21202, USA, Hazardous Materials Toxicology: Clinical Principles of Environmental Health, (1992), (Eng. Mat., 9206-G2-Z-0196), pp. 1139-1150 [in English].)

3209 TOXIC HAZARDS OF PLASTIC MANUFACTURING. [BIB-199206-D1-P-1226]

Most polymerization processes take place enclosed systems so the health hazards of resin manufacture are similar to those of the petrochemical industry. Handling of resins, intermediates and additives may result in worker exposure. Overheating of plastic materials during manufacture may expose workers to thermal decomposition products and grinding may generate polymer dust. Specific hazards posed from PE and PP, PVC, polystyrene, acrylics, fluoro- and chloropolymers, phenolic resins, polyurethanes and urethanes, amino resins, polyesters, epoxy resins, nylon and cellulosics are described. Graphs. 21 ref. (Lewis, R.; Publisher: Williams & Wilkins, 428 East Preston St., Baltimore, Maryland 21202, USA, Hazardous Materials Toxicology: Clinical Principles of Environmental Health, (1992), (Eng. Mat., 9206-G2-Z-0196), pp. 505-515 [in English].)

3210 TOXICOLOGY OF BENZENE AND OTHER HEMOTOXINS. [BIB-199206-D1-P-1227]

Benzene remains the only major industrial chemical for which a clear causal relationship with leukemia has been established. A number of agents have been reported to produce anemia, cytopenias, leukemia or lymphoma for which the quality and quantity of supporting evidence varies widely. Among these are Pb, arsenic, radium, ethylene oxide, pesticides, ethylene glycol, trinitrotoluene, and 1,3-butadiene. Occupational exposure to benzene has been associated with its production and use as a synthetic intermediate and as a solvent. Acute toxicity associated with high concentrations of benzene involves the central nervous system and is manifested by excitement, convulsions, CNS depression and death from cardiovascular collapse. Toxicity arising from subacute of chronic exposure to benzene is limited to the hemopoietic and immune systems. Benzene toxicology is described via absorption, metabolic and distributive mechanisms. Guidelines are given for surveillance and monitoring of workers for hematologic disease. 165 ref. (Irons, R.D.; Publisher: Williams & Wilkins, 428 East Preston St., Baltimore, Maryland 21202, USA, Hazardous Materials Toxicology: Clinical Principles of Environmental Health, (1992), (Eng. Mat., 9206-G2-Z-0196), pp. 718-731 [in English].)

3211 TOXICOLOGY OF POLYCHLORINATED BIPHENYLS AND OTHER POLYHALOGENATED AROMATIC HYDROCARBONS. [BIB-199206-D1-P-1238]

Polychlorinated biphenyls (PCBs) were manufactured in the US from 1929-1977 and used in the electrical utility industry as coolants for transformers and capacitors, extenders in paints and pesticides, lubricants in gas turbines, in hydraulic systems, textiles, sealants, carbonless copy paper, fluorescent light ballast, air conditioners and television products. A description of PCB pharmokinetics in animals and humans is given. Polybrominated biphenyls (PBBs) have been used primarily as flame retardants. Their structure is similar to PCBs but Br, rather than Cl, is substituted for hydrogen. In 1974, PBBs were accidentally mixed into livestock feed because of confusion with magnesium oxide. No human clinical illness has been causally linked to this PBB exposure. Chlorinated benzenes are a group of compounds that have been used as solvents, pesticides, herbicides, fungicides and in a number of organic chemical syntheses. The major known health effect of chlorinated benzenes is the development of porphyria cutanea tarda. An epidemiologic association between chlorinated benzenes and human cancer has not been established. 141 ref. (Shields, P.G.; Publisher: Williams & Wilkins, 428 East Preston St., Baltimore, Maryland 21202, USA, Hazardous Materials Toxicology: Clinical Principles of Environmental Health, (1992), (Eng. Mat., 9206-G2-Z-0196), pp. 748-755 [in English].)

3212 TOXICOLOGY OF ACRYLAMIDE. [BIB-199206-D1-P-1239]

Acrylamide is a vinyl monomer produced from the hydration of acrylonitrile and sulfuric acid, followed by neutralization. The compound is very soluble in water and easily absorbed following all routes of administration, except inhalation, which has not been closely examined. The monomer has been recognized as a potent neurotoxin since the 1950s, when it was first produced commercially. It is best known for its peripheral motor and sensory polyneuropathy; however, it also affects the central and autonomic nervous systems. Both human and animal experimental cases of acute and chronic toxicity are described. Examination of acrylamide analogues found several to be neurotoxic, but none more so than acrylamide. The current OSHA permissable exposure limit is an 8 h time weighted average of 0.03 mg/m^3 with skin notation. 57 ref. (Cloeren, M.; Publisher: Williams & Wilkins, 428 East Preston St., Baltimore, Maryland 21202, USA, Hazardous Materials Toxicology: Clinical Principles of Environmental Health, (1992), (Eng. Mat., 9206-G2-Z-0196), pp. 940-945 [in English].)

3213 TOXICOLOGY OF ISOCYANATES. [BIB-199206-D1-P-1240]

Toluene diisocyanate is required for the manufacture of flexible foam used in mattresses, upholstery cushions, automobile seats and packaging materials. Methylene diphenyl diisocyanate has replaced TDI in the production of rigid foams because it is less hazardous owing to its lower volatility. Isocyanates are also used as adhesives and as elastomers in automobile bumpers, printing rolls, liners for mine and grain elevator chutes, shoe soles, coated fabric and spandex fibers. The compounds are readily reactive because of their chemical configuration. They contain —NCO groups, which react with active hydrogens in compounds such as water, acids, and alcohols but can also react with themselves to form dimers or other polymers. It is estimated that between 50 000-100 000 workers in the USA are regularly exposed to diisocyanates at any one time. Inhalation of isocyanates as vapors or aerosols is the main risk to the health of the worker. Principal patterns of respiratory response to TDI are: chemical bronchitis (following high doses); isocyanate asthma and nonspecific bronchial hyperreactivity; acute nonspecific airway disease; chronic nonspecific airways disease; and hypersensitivity pneumonitis. Direct exposure to solutions of isocyanates is irritating to the skin and mucous membranes and may cause contact dermatitis. Erythema, edema and blistering are possible. It was determined that there is sufficient evidence for the carcinogenicity of TDI to experimental animals but inadequate evidence to determine its carcinogenicity to humans. Management of toxicity through means of clinical examination, laboratory diagnostics and biologic and environmental monitoring is described. Current OSHA permissable exposure limit for TDI is 0.005 ppm as an 8 h time weighted average with a short-term exposure limit of 0.02 ppm for and 15 min period. 27 ref. (Phillips, K.K.; Publisher: Williams & Wilkins, 428 East Preston St., Baltimore, Maryland 21202, USA, Hazardous Materials Toxicology: Clinical Principles of Environmental Health, (1992), (Eng. Mat., 9206-G2-Z-0196), pp. 946-951 [in English].)

3214 TOXICOLOGY OF ACRYLATES AND METHACRYLATES. [BIB-199206-D1-P-1241]

The term acrylates includes the derivatives of acrylic acid and methacrylic acid. Exposure to acrylate and methacrylate monomers and polymers occurs in plastics manufacturing, printing, dentistry, surgery and, when considering implants, patients' bodies. Exposure routes consist of skin absorption and inhalation. Acrylates and methacrylates cause a contact irritant dermatitis and an allergic dermatitis. No case reports to date have implicated any acrylate as a cardiovascular toxin in any occupationally-exposed population. Several reports in the Russian literature suggest that MMA causes vague central nervous system symptoms such as fatigue, headache, and loss of apetite but these studies did not involve a control group. There are no case reports or epidemiology studies on humans which address the issue of acrylates as teratogens. Polymerized acrylates and methacrylates are presumed to innocuous materials except for any residual monomer. The one exception is the possible oncogenic role of PMMA when used in implants. A table summarizes the limits recommended by the American College of Industrial Hygienists in terms of threshold limit values based on an 8 h day, 40 h work week for common acrylates and mandated by OSHA in terms of permissible exposure limits. Newer multifunctional acrylates and ethyl acrylate have been implicated as causing cancer in some rodent tests. 61 ref. (Scolnick, B.; Publisher: Williams & Wilkins, 428 East Preston St., Baltimore, Maryland 21202, USA, Hazardous Materials Toxicology: Clinical Principles of Environmental Health, (1992), (Eng. Mat., 9206-G2-Z-0196), pp. 952-957 [in English].)

3215 TOXICOLOGY OF ALKYLBENZENE SOLVENTS AND AROMATIC COMPOUNDS. [BIB-199206-D1-P-1242]

Most aromatic solvents are benzene derivatives with attached alkyl or hydroxy groups. They are used as starting chemicals or intermediate chemicals for synthesis of other compounds. The concept of the vapor pressure of a solvent as it relates to hazards and toxic health effects is described. The main target organs for toxicity are the central and peripheral nervous system, liver, kidneys and skin. Most of the aromatic and alkylbenzene solvents are readily absorbed by

lungs and skin. Absorption, metabolism and excretion of toluene are explained and the compound's neurotoxic, hepatotoxic, renal toxic, teratogenic, genotoxic and carcinogenic qualities are considered. Other compounds addressed include xylene, phenol, styrene, chlorobenzene, ethylbenzene, hydroquinone, naphthalene and creosote. Work conducted to evaluate solvent-associated neurotoxicity is summarized. 90 ref. (Sullivan, J.B.; Publisher: Williams & Wilkins, 428 East Preston St., Baltimore, Maryland 21202, USA, Hazardous Materials Toxicology: Clinical Principles of Environmental Health, (1992), (Eng. Mat., 9206-G2-Z-0196), pp. 1086-1104 [in English].)

3216 TOXICOLOGY OF OXYGENATED COMPOUNDS: ALCOHOLS, GLYCOLS, KETONES, AND ESTERS. [BIB-199206-D1-P-1243]

Alcohols, glycols, ketones, ethers, and esters are oxygenated compounds primarily used as solvents or intermediate chemicals in the synthesis of other compounds. Three of the more commonly recognized toxic alcohols are ethyl alcohol, isopropyl alcohol, and methyl alcohol. Glycols are alcohols containing two hydroxyl (-OH) groups and include such compounds as ethylene glycol, diethylene glycol, propylene glycol, and glycerol. Esters are compounds that are prepared by the reaction of an alcohol or phenol with acids or derivative of acid. The most common esters are those prepared by carboxylic acids and the reactions of alcohols. Ketones are organic compounds containing a carbonyl (C O) group attached to two carbon atoms (R—CO—R'). Examples include acetone and methyl n-butyl ketone. Glycol ethers are general solvents, also known as cellosolves. The physical properties of these compounds and the extent of exposure are the major determinants of the biologic hazard. Extensive tables list the various alcohols, glycols, ketones, ethers and esters and their toxicologic qualities. 24 ref. (Spyker, D.A.; Publisher: Williams & Wilkins, 428 East Preston St., Baltimore, Maryland 21202, USA, Hazardous Materials Toxicology: Clinical Principles of Environmental Health, (1992), (Eng. Mat., 9206-G2-Z-0196), pp. 1105-1116 [in English].)

3217 TOXICOLOGY OF ORGANOMETALS AND REACTIVE METALS. [BIB-199206-D1-Z-1360]

Metals that are combustion hazards in a solid state are Cs, Rb, Na, Li and potassium. Metals that are explosive and combustible when mixed with air as a dust include Al, beryllium, Ti, magnesium, and Cd. Hazards related to organometallic compounds and reactive metals derive from their inherent toxicity, high degree of explosivity, and flammability when exposed to water or air and toxic byproducts of their reactions. Organometals are used in a variety of chemical reactions in synthetic procedures and in polymerization reactions. Clinical toxicology and management of organolead, organomercury, organoaluminum, organoarsenic nickel carbonyl, iron pentacarbonyl and organotin compounds are described. An extensive table lists the physiochemical properties and reactivity of the reactive metals. 34 ref. (Siegers, C.-P.; Publisher: Williams & Wilkins, 428 East Preston St., Baltimore, Maryland 21202, USA, Hazardous Materials Toxicology: Clinical Principles of Environmental Health, (1992), (Eng. Mat., 9206-G2-Z-0196), pp. 928-936 [in English].)

3218 QUANTITATIVE IDENTIFICATION OF ANTIMONY, BARIUM, CADMIUM, AND TIN DURING CONTROLLED COMBUSTION OF PLASTICS. [BIB-199208-B3-P-0084]

Controlled burning of a range of PVC goods as well as various consumer container plastics revealed that all of the PVCs and most of the container plastics contained toxic heavy metals, including Cd, Pb, and Sb. Furthermore, the PVC goods emitted significant levels of respirable smoke particles. Measurements were conducted using an Arapahoe smoke chamber fitted with a cascade impactor and filters for collection of samples. Heavy metals were detected by emission spectroscopy. In addition, neutron activation analysis was carried out for heavy metals determination on the unburned plastics. Graphs, Numeric Data. 21 ref. (Wagner, J.P.; Polymer-Plastics Technology and Engineering (incorporated Polymer Process Engineering), (Jan.-Feb. 1991), 31, (1-2), pp. 73-101 [in English]. ISSN 0360-2559)

3219 DEBRIS-MEDIATED OSTEOLYSIS—A CASCADE PHENOMENON INVOLVING MOTION, WEAR, PARTICULATES, MACROPHAGE INDUCTION, AND BONE LYSIS. [BIB-199208-C1-P-1746]

The spectrum of effects leading to the bone loss observed around failing implants is explained by means of a wear-debris-activated, macrophagic osteolytic mechanism. This concept is presented as the universal failure mechanism for all arthroplasty components, irrespective of fixation mode. The early descriptions of this bone-destruction process can be traced back to various clinical reports in the early 1950s which described failure of polymeric hemiarthroplasty implants, such as nylon and polyethylene cup arthroplasties, and the early polymethyl methacrylate, short-stem, Judet implants. Thus, polymeric debris and macrophages appear to be particularly reactive agents in the bone lysis phenomenon seen around contemporary total hip designs, but any particulate material small enough to be phagocytosed may contribute to this mechanism (metallics or ceramics). In addition to wear at the articulating surfaces, micromotion at any interface also has the potential to produce wear particles, thereby adding to the osteolytic process. Thus, the three potential sources of wear debris in contemporary total joints are (1) metal/ultrahigh-molecular-weight polyethylene (UHMWPE) joint articulation, (2) implant/coating interfaces, and (3) implant/bone interfaces. Graphs. 136 ref. (Clarke, I.C.; Particulate Debris From Medical Implants: Mechanisms of Formation and Biological Consequences, 31 Oct. 1990, Publisher: ASTM, 1916 Race St., Philadelphia, Pennsylvania 19103, USA, (1992), STP 1144, (Eng. Mat., 9208-G2-Z-0225), pp. 7-26 [in English].)

3220 CLINICAL AND EXPERIMENTAL STUDIES IN THE BIOLOGY OF ASEPTIC LOOSENING OF JOINT ARTHROPLASTIES AND THE ROLE OF POLYMER PARTICLES. [BIB-199208-C1-P-1747]

Aseptic loosening is the most common cause of failure of joint arthroplasties. Although the exact pathogenesis of the loosening process is not completely understood, particles of polymethyl methacrylate and polyethylene appear to play a crucial role. Past and current clinical and experimental research on the biology of aseptic loosening of joint arthroplasties is summarized and the important role of particulate polymeric debris is discussed. Photomicrographs. 95 ref. (Goodman, S.B.; Particulate Debris From Medical Implants: Mechanisms of Formation and Biological Consequences, 31 Oct. 1990, Publisher: ASTM, 1916 Race St., Philadelphia, Pennsylvania 19103, USA, (1992), STP 1144, (Eng. Mat., 9208-G2-Z-0225), pp. 27-37 [in English].)

3221 HISTOPATHOLOGICAL EFFECTS OF ULTRAHIGH-MOLECULAR-WEIGHT POLYETHYLENE AND METAL WEAR DEBRIS IN POROUS AND CEMENTED SURFACE REPLACEMENTS. [BIB-199208-C1-P-1748]

The replacement of cement with biological ingrowth systems for fixation has not resolved the problem of aseptic loosening nor that of osteolysis in association with metal and polyethylene wear debris. To investigate the role of wear debris in the failure of surface replacements, a histopathological study of ten Ti alloy (Ti—6Al—4V) porous-coated (PSR) and ten Ci—Cr-alloy cemented components was conducted. Wear-debris-laden histiocytes (metal and polyethylene) were associated with massive osteolysis in several of the PSR components, but bone loss in the cemented Co—Cr components was confined to localized areas adjacent to the cement membrane. The results suggest that histiocytes activated by the ingestion of fine wear debris are responsible for bone loss. The mechanism of bone loss shown by this "model" is applicable to all joint replacement implant systems where wear debris is generated. Photomicrographs. 15 ref. (Campbell, P.; Particulate Debris From Medical Implants: Mechanisms of Formation and Biological Consequences, 31 Oct. 1990, Publisher: ASTM, 1916 Race St., Philadelphia, Pennsylvania 19103, USA, (1992), STP 1144, (Eng. Mat., 9208-G2-Z-0225), pp. 38-51 [in English].)

3222 REGULATORY SCENE FOR SELECTED DIISOCYANATES. [BIB-199208-C4-P-0350]

There is a multitude of governmental activities with regard to osicyanates and diisocyanates in general. For example, the US Environmental Protection Agency

(EPA), under the Toxic Control Substance Administration (TSCA), has both a testing requirement and a risk management process underway on the two major isocyanates, toluene diisocyanate (TDI), and methylene diisocyanate (MDI). Recently, the US National Toxicology Program (1989) listed TDI as a substance which may reasonably be anticipated to be carcinogenic, leading to the listing under Proposition 65 in California. Both TDI and MDI are listed by the EPA under SARA 313 requiring annual reports on emissions. In addition, there is an EPA health effects data call-up in place on 43 separate isocyanates and diisocyanates. The listing of TDI by the International Agency for Research on Cancer (IARC) as a 2(b) carcinogen and the incorporation of both TDI and MDI in the "Seveso" list has taken place. These activities are a result of concerns regarding (1) toxicological data published over the last few years, (2) increased public and governmental chemical awareness and phobias, and (3) finally, in part due to the Bhopal catastrophe involving methyl isocyanate. Activities to put perspective on the chemical class, particularly with regard to TDI and MDI, are discussed. 29 ref. (Doe, J.E.; Progress in Rubber and Plastics Technology, (1992), 8, (1), pp. 15-27 [in English]. ISSN 0266-7320)

3223 ENVIRONMENTAL ASPECTS OF TDI. [BIB-199208-C4-P-0351]

The environmental consequences of man's activities are subject not only to extensive public debate, but also to wide-ranging regulatory activities: The USA and Western Europe are taking lead rolls. The changing regulatory scene and the likely demands on those producing, transporting, storing and using TDI are reviewed. There are two main themes. First, regulators will require that real or potential environmental exposure is reduced. Second, further data will have to be generated to allow the consequences of environmental exposure to be understood better, and risk assessments to be prepared. Other themes are notification and labelling. The numerous studies carried out TDI, in terms of observed or likely fate and effects in air, water and soil, are received. Current levels of environmental exposure, the containment or natural destruction of released TDI, and the ecotoxicity of TDI and/or its reaction products are discussed. Taken together, these indicate that the current environmental impact is likely to be very low. However, more data need to be generated to improve the understanding, and to conform to regulatory requirements. A strategy of studies to fulfil both objectives is suggested. A number of studies are already well advanced or currently being implemented. The proposed studies reflect a changing emphasis, from studies designed to investigate actual or simulated emission or spillage scenarios with commercial (mixed isomer) TDI, toward studies designed to understand fundamental aspects of TDI fate and effects in the environment. New test procedures may need to be developed to yield data for modelling and risk assessment. 24 ref. (Bailey, R.E.; Progress in Rubber and Plastics Technology, (1992), 8, (1), pp. 28-48 [in English]. ISSN 0266-7320)

3224 A VERSATILE SYSTEM FOR CHEMICAL AND TOXICOLOGICAL EVALUATION OF PLASTIC PROCESSING FUMES. [BIB-199208-E1-P-0514]

A highly versatile and flexible system has been designed to generate and deliver plastic processing fumes which simulate workplace environments. Analysis of the fume composition during transport from the extruder head and throughout the delivery system and the inhalation chamber indicate that an efficient fume capture and transport system has been designed. Several studies performed in this facility have demonstrated the feasibility of generating plastic processing fumes for animal studies and for chemical characterization under controlled conditions. Results from some of these studies will be published at later dates. On the basis of workplace evaluations, appropriate concentrations of fume components are targeted. These concentrations can then be delivered to the animal chambers for toxicological evaluations and for physical and chemical characterization. Using this comprehensive approach, this facility can provide detailed evaluation of the potential health effects and risks associated with worker exposures to plastic processing fumes. 6 ref. (Bonilla, J.V.; ANTEC 92—Shaping the Future. Vol. I, 3-7 May 1992, Publisher: Technomic Publishing Co., Inc., 851 New Holland Ave., P.O. Box 3535, Lancaster, Pennsylvania 17604, USA, (1992), (Eng. Mat., 9208-G2-Z-0230), pp. 204-208 [in English].)

3225 CHARACTERIZATION OF THERMAL DECOMPOSITION PRODUCTS IN POLYETHYLENE FABRICATION PLANTS. [BIB-199208-E2-P-0411]

Workplace exposure to thermal degradation products (TDP) of polyethylene can occur in plastic fabrication plants during the production of plastic films, such as polyethylene bags. Anticipated sources of emissions are the extruder (approx 300 °F , 150 °C) and seal bar (approx 700-800 °F , 370-430 °C). Very little published information was available on the composition of TDP. A group of European workers found hydrocarbon vapors, aldehydes, organic acids, and an aerosol. Therefore, the first objective was to characterize the TDP physically and chemically. Samples of TDP were taken over six years in ten polyethylene fabrication plants which made products such as trash bags, laundry bags, and bread wrappers. These samples were often collected during trips to monitor other specific materials. A second objective was to determine whether individual compounds in TDP might serve as markers or readily measured indices of overall TDP, thus simplfying the task of monitoring TDP. 9 ref. (Dalbey, W.E.; ANTEC 92—Shaping the Future. Vol. I, 3-7 May 1992, Publisher: Technomic Publishing Co., Inc., 851 New Holland Ave., P.O. Box 3535, Lancaster, Pennsylvania 17604, USA, (1992), (Eng. Mat., 9208-G2-Z-0230), pp. 202-203 [in English].)

3226 SENSORY IRRITATION IN MICE DURING EXPOSURE TO THERMAL DECOMPOSITION PRODUCTS OF POLYETHYLENE. [BIB-199208-E2-P-0412]

Thermal decomposition products (TDP) arise from polyethylene (PE) during extrusion and heat-sealing in fabrication plants. The objective was to reproduce TDP in the laboratory and to use these "artificial" TDP to investigate potential health effects. It was recognized that the concentrations of individual compounds which had been measured in the plants were well below threshold limit values and that no significant health problem was apparent in the plants. However, no applicable information on inhalation exposures to the total mixture of compounds in TDP was found in published literature. The sensory irritation assay reported was one of the first steps in the process of developing such background information on TDP. 7 ref. (Dalbey, W.E.; ANTEC 92—Shaping the Future. Vol. I, 3-7 May 1992, Publisher: Technomic Publishing Co., Inc., 851 New Holland Ave., P.O. Box 3535, Lancaster, Pennsylvania 17604, USA, (1992), (Eng. Mat., 9208-G2-Z-0230), pp. 209-210 [in English].)

3227 LEAD STABILIZED UPVC POTABLE PIPE: EXTRACTION RESULTS UNDER NSF STANDARD NUMBER 61. [BIB-199208-E2-P-0448]

Lead stabilized uPVC potable water pipe was successfully formulated and produced to comply with the health effects criteria established by the National Sanitation Foundation (NSF). The maximum allowable level (MAL) of Pb extraction, from products that come in contact with drinking water, is specified in the new NSF Standard Number 61 as 5.0 μm/l (or, 5 ppb). Samples of uPVC pipe stabilized with 0.3 phr (parts per hundred parts of resin) of tribasic lead sulfate stabilizer were tested in accordance with the procedures of NSF STandard Number 61, and the extraction results were all 2 ppb Pb at both pH 5 and pH 10. Continued, daily extractions showed that the amount of Pb released into drinking water fell below quantitation levels within one week, in agreement with previous findings reported in the scientific literature. Thus, Pb stabilized uPVC potable water pipe has been shown to be safe and in compliance with established health effects criteria. 9 ref. (Mitchener, G.R.; Journal of Vinyl Technology, (Mar. 1992), 14, (1), pp. 16-19 [in English]. ISSN 0193-7197)

3228 USE OF ORGANOTIN STABILIZERS—RISK ASSESSMENT ANALYSIS. [BIB-199209-D2-P-1384]

Proper risk assessment for the use of organotin mercaptide stabilizers in PVC requires careful evaluation of every aspect of how these chemicals will be used and the fate of the PVC goods produced with them. The data included in this report provide a sound basis for minimal risk from the use of organotin stabilizers for processing PVC owing to: low oral toxicity combined with minimal exposure risk; low dermal toxicity combined with minimal exposure risk; low inhalation toxicity combined with low volatility; minimal leaching or migration from PVC

finished goods; and very low ecotoxicity owing to rapid dealkylation to inorganic Sn. Toxicity issues range far beyond knowing only the oral LD_{50} of any chemical. Implementing the toxicity equation to fully evaluate all potential hazards is the only realistic approach to a fully informed risk assessment. 20 ref. (Mesch, K.A.; ANTEC 92—Shaping the Future. Vol. II, 3-7 May 1992, Publisher: Technomic Publishing Co., Inc., 851 New Holland Ave., P.O. Box 3535, Lancaster, Pennsylvania 17604, USA, (1992), (Eng. Mat., 9209-G2-Z-0254), pp. 1942-1945 [in English].)

3229 THE SAFETY OF BERYLLIUM COPPER MOLDS. [BIB-199209-E1-P-0627]

Beryllium copper is a commonly used mold material in the plastic injection and blow molding industries. Use of beryllium copper is based on its unique combination of properties including thermal conductivity and hardness. As with many industrial materials, Be-containing alloys present a potential health hazard if mishandled. Tests, although limited by the small sample size, indicate that beryllium copper can be used without exposing workers to Be levels greater than that which is recognized to be safe. Beryllium is but one of the thousands of materials that possess toxic properties. However, the most important question to be asked is do these toxic materials in the form and concentration used pose a hazard to their users, i.e. does the mere presence of a toxic material constitute a hazard. The answer to this question is always no, if properly controlled. A hazard only exists when high level overexposures occur. Because the Be content in all mold material is 2% and may be as low as 0.2%, the potential Be exposure while removing metal is greatly reduced from the exposure levels which would be expected during machining of pure Be metal. The data also confirm that the use of engineering controls, such as local exhaust ventilation, is extremely effective in controlling the release of Be dust into the operator's breathing zone. Operations which use liquid coolant/lubricant have the added benefit of reducing airborne Be levels if the Be content of the coolant is not allowed to build up. Graphs. (Foley, E.D.; ANTEC 92—Shaping the Future. Vol. II, 3-7 May 1992, Publisher: Technomic Publishing Co., Inc., 851 New Holland Ave., P.O. Box 3535, Lancaster, Pennsylvania 17604, USA, (1992), (Eng. Mat., 9209-G2-Z-0254), pp. 2004-2006 [in English].)

3230 CONFIDENCE IN THE FABRICATION OF COMPOSITES BASED ON TOXIC MINERAL FIBERS. (LA SECURITE DANS LES FABRICATIONS DE COMPOSITES A BASE DE FIBRES MINERALES NOCIVES.) [BIB-199210-C4-D-0431]

Recent research has resulted in the development of very attractive fibre composite materials. Their high performances are mainly due to the exceptional properties of the new mineral fibres used in their fabrication. Unfortunately, several kinds of fibres present potential health hazards that call for the assessment of safety regulations for their preparation, packaging and use. Many aspects of this problem are discussed and current state of knowledge regarding testing of fibre toxicity and an efficient preventive health strategy is presented. 19 ref. (Renard, J.; Silicates Industriels, (Nov.-Dec. 1991), 56, (11-12), pp. 205-214 [in French]. ISSN 0037-5225)

3231 TOXIC PROPERTIES OF POLYMERS AND ADDITIVES. [BIB-199210-C4-P-0435]

Information on the toxic properties of polymeric materials and their components is presented. Since the toxic properties of materials are determined by the toxic properties of the substances released by them, a significant proportion of the book deals with monomers, plasticizers, stabilizers, and other additives. Each entry gives brief information about the main physicochemical properties of the material of substance. Other information includes levels of migration of particular components into liquid media, toxic characteristics of substances or extracts from the materials, information on the cumulative properties of substances, and the sizes of average lethal doses. Original in Russian. Numerous ref. (Sheftel', V.O.; Publisher: Rapra Technology Ltd., Shawbury, Shrewsbury, Shropshire SY4 4NR, UK, Toxic Properties of Polymers and Additives, (1990), (Eng. Mat., 9210-G2-P-0267), Pp 486 [in English].)

3232 USE OF ORGANOTIN STABILIZERS—RISK ASSESSMENT ANALYSIS. [BIB-199212-C2-P-0664]

Organotin compounds have long been known in the PVC industry for their excellent performance properties in almost every application. Over the past several years, a wide variety of health and environmental studies have been conducted which demonstrate the safe use of these performance chemicals as PVC heat stabilizers. The "risk equation" is introduced and then this equation is applied to the foreseeable exposure risks involved with the use of organotin stabilizers during PVC processing. Further, migration of organotin species from PVC end-use articles is discussed with comparison to established long-term no-effect levels for these chemicals. The environmental fate of organotin compounds and their effects on some species of microorganisms is also addressed. The risk equation is used to fully evaluate all potential hazards to provide a fully informed risk assessment for the use of organotin stabilizers in PVC. 20 ref. (Mesch, K.A.; Journal of Vinyl Technology, (Sept. 1992), 14, (3), pp. 131-134 [in English]. ISSN 0193-7197)

3233 RECENT DEVELOPMENTS IN UNDERSTANDING THE TOXICITY OF PTFE THERMAL DECOMPOSITION PRODUCTS. [BIB-199212-C2-P-0676]

Fluoropolymers, especially polytetrafluoroethylene (PTFE), have good fire-resistance properties, but their application is limited by concern over the toxicity of their thermal decomposition products. In experiments using a tube furnace system similar to the DIN 53 436 method, the 30 min (+14 days observation) LC_{50} in mass loss terms was found to be 2.9 mg l^{-1} (standard error 0.40) under non-flaming conditions, approximately ten times as toxic as wood and most other materials. Toxicity was due to upper respiratory tract and airway irritation, and was consistent with the known effects of carbonyl fluoride and hydrogen fluoride. When decomposed in the NBS cup furnace test under non-flaming conditions, PTFE evovled extreme-toxicity products with an LC_{50} of approx 0.05 mg l^{-1} (mass loss), approx 1000 times as toxic as wood and most other materials. Toxicity was due to deep lung irritation and oeddema. Investigations of the range of conditions under which the extreme toxicity of PTFE products occurs in both small-scale (200 l) and intermediate-scale (6 m^3) experiments have shown that the highest toxicity occurs when PTFE is decomposed under non-flaming conditions over a temperature range of 400-650 ° C, and when the primary decomposition products are subjected to continuous secondary heating. At higher or lower temperatures, when the sample is flaming, when decomposition products from wood are also present in the chamber, when secondary heating is curtailed, or when the molecule contains hydrogen and fluorine, the toxicity of the products is greatly reduced, tending toward the region of ten times the potency of most other materials. Extreme toxicity is associated with a particulate, but the particulate atmosphere is not always extremely toxic, the potency decreasing as the fumes age. 22 ref. (Purser, D.A.; Fire and Materials, (Apr.-June 1992), 16, (2), pp. 67-75 [in English]. ISSN 0308-0501)

3234 SAFE PROCESSING OF PU SYSTEMS. [BIB-199212-C4-P-0561]

The number of companies which process PU raw materials into finished products is increasing. The frequent use of the isocyantates, in particular, may lead to careless handling. Processors must always be aware that these raw materials involve health hazards and that these must be anticipated early enough by preventive measures and with prudence. In English p. 7-9 . 12 ref. (Goebell, J.; Kunststoffe German Plastics, (Aug. 1992), 82, (8), pp. 641-644 [in German]. ISSN 0723-0192)

3235 ANALYSIS AND INTERPRETATION OF THE PLUMBING MATERIALS FILE OF THE NYS COMBUSTION TOXICITY DATA BANK. [BIB-199212-C4-P-0580]

New York State's Building and Fire Prevention Code includes a requirement that combustible materials used in electrical, plumbing and finishing systems be tested by the University of Pittsburgh protocol and that particular data from that testing be reported on standard forms to the Office of Fire Prevention and Control. The plumbing file in this data bank contains data on 41 products, excluding minor usages. These data plus the data on Douglas fir are reported and analyzed. LC_{50} was found to have significant correlations with indices of thermal instability, of rate of mass loss, and of corrosive irritants. The most parsimonious model developed with stepwise regression correlated LC_{50} with three factors: wt.% loss per degree of temperature rise; temperature at the beginning of rapid weight loss—temperature at which 1% of the sample weight was lost; and temperature at the end of rapid weight loss—temperature at which 1% of the sample weight was lost. LC_{50} was weakly correlated with maximum carbon monoxide concentration and in the "wrong" direction (high CO concentrations were associated with low toxicity). Log LC_{50} was significantly corre-

lated with Log CO_{max}, but also in the "wrong" direction. LC_{50} was correlated with minimum oxygen concentration with a small R-squared and also in the "wrong" direction. The question of the relevance of these results to smoke exposures in real fires is discussed. Graphs. 18 ref. (Wallace, D.; Fire and Materials, (Apr.-June 1992), 16, (2), pp. 77-94 [in English]. ISSN 0308-0501)

3236 PRODUCTION OF ACETAL, AMINO, AND PHENOLIC RESINS. [BIB-199301-D1-P-0101]

Information was obtained on the manufacturing processes of three formaldehyde-based resins—phenolic, amino, and acetal resins. Information is provided on the companies that produce these resins, and those facilities that are major sources of hazardous air pollutants (HAPs) based on their controlled emission data are determined. A major source is defined as any source or group of stationary sources located within a contiguous area and under common control that emits or has the potential to mit considering controls, in the aggregate, 10 tons/year of any HAP or 25 tons/year or more of any combination of HAPs. The information reported was gathered to support the development of a potential National Emission Standard for Hazardous Air Pollutants for the manufacture of these formaldehyde-based resins. (GOVERNMENT RESEARCH ANNOUNCEMENTS AND INDEX, (1992), Pp 151 [in English]. ISSN 0097-9007)

3237 AN INDUSTRIAL HYGIENE METHODOLOGY DEVELOPED IN SUPPORT OF A RETROSPECTIVE MORBIDITY CASE-CONTROL STUDY. [BIB-199301-D1-P-0119]

An industrial hygiene methodology that was developed in support of an epidemiologic case-control study is described. The study was conducted to investigate a potentially increased incidence of colorectal cancer among employees who worked at a unit that manufactured polypropylene by a heavy diluent process. Retrospective epidemiologic case-control studies typically have exposure assessment problems because industrial hygiene monitoring data are often not available. Misleading job titles are another problem that can provide a poor framework for estimating exposures. In addition, a job title-based exposure assessment assumes individual work patterns are not important in assessing worker exposures, although this is contradictory to industrial hygiene experience. The design of the case-control study provided an innovative industrial hygiene approach to circumvent these typical exposure estimating problems. The industrial hygiene methodology of the case-control study included assessing historical exposures, developing an exposure estimating matrix, selecting candidate etiologic agents based on a joint toxicologic and industrial hygiene review, administering a work activity questionnaire, calculating exposure scores, and conducting a statistical analysis. The study design also provided an additional exposure measurement independent of the toxicologic and industrial hygiene reveiw. This provided an opportunity to compare the liklihood of exposure misclassification and, as expected, showed that a more detailed exposure estimate resulted in less misclassification. 29 ref. (Owen, C.V.; Acquavella, J.A.; Bird, M.G.; Lynch, J.; AMERICAN INDUSTRIAL HYGIENE ASSOCIATION JOURNAL, (SEPT. 1992), 53, (9), pp. 540-547 [in English]. ISSN 0002-8894)

3238 CERAMIC WHISKERS AS REINFORCEMENTS FOR COMPOSITES IN AUTOMOTIVE INDUSTRIES. [BIB-199301-D2-D-0024]

Ceramic whiskers offer the potential to formulate polymer, metal or ceramic matrix composite materials which meet the demands of automotive applications as well as the economic constraints of this industry. Both commercially available and developmental ceramic whiskers are described. These low cost whiskers are carbides such as SiC, and nitrides such as titanium nitride. Properties, economics, and applications in the automotive industry are discussed. Graphs, Photomicrographs. 2 ref. (Bray, D.J.; Nixdorf, R.D.; Hauth, W.E.; NEW ALTERNATIVE MATERIALS FOR THE AUTOMOTIVE INDUSTRIES, 1-5 JUNE 1992, Publisher: AUTOMOTIVE AUTOMATION LIMITED, 42 Lloyd Park Ave., Croydon CR0 5SB, UK, (1992), (Eng. Mat., 9301-G2-Z-0019), pp. 125-132 [in English].)

3239 MEASUREMENT OF EMISSIONS DURING MACHINING FIBRE-REINFORCED PLASTICS (FRP'S) AND DEVELOPMENT PRECAUTIONARY MEASURES FOR EMISSION REDUCTION. FINAL REPORT. (MESSUNG DER SCHADSTOFFBELASTUNG BEI DER BEARBEITUNG VON FASERVERSTAERKTEN KUNSTSTOFFEN (FVK) UND ENTWICKLUNG VON MASSNAHMEN ZUR MINDERUNG DER SCHADSTOFFEMISSION. SCHLUSSBERICHT.) [BIB-199301-E3-D-0007]

The aim was the characterization of emissions during laser beam cutting and milling of glass and aramid fibre reinforced epoxy and phenolic resin. Machining of fibre reinforced plastics causes high emissions of smoke and dust. For laser beam cutting the health risk is mainly determined by the very fine dust concentrations (MMD approx 0.15 μm), which are completely respirable. Also, the emissions of benzene as well as hydrogen cyanide represent a problem in correlation to their low MAK-values. For milling the health risks are caused by the generation of respirable dust but also by dust which may deposit in the trachea region. It has been found that the fraction of respirable dust is between 0.1-0.5% of the total dust. For milling of aramide reinforced plastics a high hazard consists in the emission of respirable fibres. (Hollaender, W.; Levsen, K.; Busch, H.; Neder, L.; Rummenhoeller, S.; GOVERNMENT RESEARCH ANNOUNCEMENTS AND INDEX, (1991), TIB/A92-01123/XAB, Pp 109 [in German]. ISSN 0097-9007)

3240 AERODYNAMIC SIZE MEASUREMENT OF AIRBORNE FIBERS AND HEALTH EFFECTS IMPLICATIONS. [BIB-199303-C4-D-0114]

The constituent particles of many ambient and workplace aerosols of health effects concerns are of fibrous and aggregate geometric shapes. Although the deposition sites of particles in the human respiratory system are primarily related to their aerodynamic diameters, for rod-like and branching forms the dominant deposition mechanism may be interception. A theoretical model has been developed which predicts that natural and synthetic fibers may be preferentially deposited at lung airway bifurcations. Therefore, to assess potential exposure hazards it is necessary to have accurate kinetic classifications of airborne particulate matter. Centrifugal spectrometers can give direct and continuously graded measures of the aerodynamic size distributions of sampled aerosols. mathematical description of centrifuge operation is refined to permit the characterization of irregularly shaped particles, with specific application to fibers. Aerosol centrifuge performance, therefore, can be customized to specific applications and be integrated into health effects studies. Graphs. 22 ref. (Martonen, T.B.; ADVANCED POWDER TECHNOLOGY, (1992), 3, (4), pp. 311-321 [in English]. ISSN 0921-8831)

3241 ESTIMATION OF THE LIMITING OXYGEN CONCENTRATION OF EXPLODABLE DUST/AIR MIXTURES. (RECHNERISCHE UND GRAPHISCHE BESTIMMUNG DER SAUERSTOFFGRENZKONZENTRATION EXPLOSIONSFAHIGER STAUB/LUFT-GEMISCHE.) [BIB-199303-C4-P-0125]

The limiting oxygen concentration of an explodable dust/air mixture is an important parameter for hazard evaluation if technological equipment is to be protected by inertisation. The determination of this quantity by experiments, however, is fairly time-consuming and expensive. A simple computational method allowing the estimation of the limiting O concentration is introduced. A comparison with corresponding experiments shows sufficient accuracy, and the computational values are always lower than the experimental ones for 20 explodable dusts of several kinds. A diagram is presented which allows determining of the limiting O concentration directly from the chemical composition of the combustible dust and its caloritic value. Materials discussed include Al, magnesium, polyacrylonitriles, polyamide resins, polybutadienes, and polyethylenes. Graphs. 9 ref. (Krause, U.; Weinert, D.; Wohrn, P.; STAUB-REINHALTUNG DER LUFT, (OCT. 1992), 52, (10), pp. 361-368 [in German]. ISSN 0039-0771)

3242 HUMAN EXPOSURE TO ARAMID FIBRILS WHEN MACHINING ARAMID COMPOSITES. [BIB-199303-E3-D-0037]

Para-aramid, a man made organic fiber, is an extremely strong durable aromatic polyamide with a fibrous structure. The fibers are cleavable, so fibrils can be generated with the so-called Stanton dimensions, which implies they have a carcinogenic potency when inhaled. Recently the Dutch authorities were the first to establish an interim occupational threshold limit value for aramid fibrils of 2.5 fibrils/cm^3. Aramid airborne fiber measurement surveys in European manufacturing locations generally show low concentrations of airborne aramid fibers (0.4 fibers/cm^3). As in many aircraft, parts of the Fokker aircraft are made of aramid reinforced composites. The exposure to aramid fibrils when machining the cured composites has been surveyed. Surprisingly, water-jet-cutting, in comparison with other evaluated machining operations, produced many fibrils, emitted mainly in unrespirable drops of processed water. The fibrils in the drops do not form a health-hazard, but when the water evaporates, hazardous dry aramid fibrils remain. To avoid sedimentation, accumulation and spreading of fibrils, precautions have to be taken. Graphs, Photomicrographs. 7 ref. (Flameling, M.E.; ENVIRONMENT IN THE 1990'S—A GLOBAL CONCERN, 21-23 MAY 1991, Publisher: SOCIETY FOR THE ADVANCEMENT OF MATERIAL AND PROCESS ENGINEERING, P.O. Box 2459, Covina, California 91722, USA, (1991), (Eng. Mat., 9303-G2-Z-0086), pp. 43-53 [in English].)

3243 CHARACTERIZATION OF LOW AND NON-VOLATILE ORGANIC COMPOUND CONTAINING CLEANERS FOR CLEANROOM WORK SURFACES. [BIB-199303-E7-Z-0075]

This report presents an evaluation of low and non volatile organic compound (VOC) containing cleaners intended to be used as replacements for high VOC containing cleaners and solvents currently being used for bench top and work station wipe down in many cleanrooms and clean areas. The evaluation looked at cleaner residue, cleaner chemistry, and cleaner efficacy, including the cleaners' ability to remove particles. Fifteen cleaners were selected for the evaluation, seven of which were specifically designed for use in cleanrooms. Isopropyl alcohol, methanol, and deionized water were included to provide a baseline for comparison. The cleaner evaluation was performed on coupons made from five different materials (PP, PVC, glass, Formica, and Ni) representative of those typically used for work surfaces in Hughes Aircraft Company (Hughes) cleanrooms. Nine different contaminants representative of those expected to be found in Hughes' cleanrooms were used in the cleaner efficacy portion of the evaluation. Cleaner chemistry was determined by experimental methods as well as from MSD's. Cleaner residue was evaluated by ESCA, FTIR, conductivity, and surface resistivity. Field testing was carried out at several Hughes sites representing a variety of classes of cleanrooms. Methodology developed to evaluate bench top cleaners in the course of this study is presented. Although some generalizations were made, this report intentionally makes no recommendations as to which cleaners should be used for a particular application. The results of the testing are presented in tables such that persons responsible for cleanrooms and clean areas can select the best cleaner for their application. This report does not address the use of the cleaners on tooling, parts, floors, or walls. (Allison, D.U.; Gill, C.; Pachiano, G.J.; ENVIRONMENT IN THE 1990'S—A GLOBAL CONCERN, 21-23 MAY 1991, Publisher: SOCIETY FOR THE ADVANCEMENT OF MATERIAL AND PROCESS ENGINEERING, P.O. Box 2459, Covina, California 91722, USA, (1991), (Eng. Mat., 9303-G2-Z-0086), pp. 321-334 [in English].)

3244 STATEMENT: EFFECTS AND SIDE-EFFECTS OF DENTAL RESTORATIVE MATERIALS. [BIB-199306-F1-C-0327]

Current dental restorative materials, i.e. mercury amalgams, glass ceramics, can be used effectively for restoring teeth for functional or esthetic reasons. Virtually all restorative materials have components with potential health risks. However, there is no scientific evidence that currently used restorative materials cause significant side-effects. Available data do not justify discontinuing the use of any currently available dental restorative materials or recommending their replacement. (McHugh, W.D.; EFFECTS AND SIDE-EFFECTS OF DENTAL RESTORATIVE MATERIALS, 26-28 AUG. 1991, Advances in Dental Research, (Sept. 1992), 6, pp. 139-142 [in English]. ISSN 0895-9374)

3245 SIDE-EFFECTS OF DENTAL CERAMICS. [BIB-199306-F1-C-0330]

Evaluation of side-effects to low-dose exposure of any agent is difficult, especially if the agent exhibits a low toxicity. The most common way to approach such evaluation is to define special groups which are exposed more than others. Studies of such risk groups may facilitate interpretation of information related to those exposed to a low dose. For dental materials, dentists, dental assistants, and laboratory technicians represent typical risk groups. In addition to receiving dental treatments and having restorations like anyone else, they handle the materials in their daily work. The exposure to the materials occurs more frequently and at a higher dose for these groups than for the patient receiving dental treatment. Thus, the possibilities for side-effects are greater. Some materials are handled more closely by laboratory technicians than by other members of the dental team, e.g. dental ceramics. 47 ref. (Mackert, J.R.; EFFECTS AND SIDE-EFFECTS OF DENTAL RESTORATIVE MATERIALS, 26-28 AUG. 1991, Advances in Dental Research, (Sept. 1992), 6, pp. 90-93 [in English]. ISSN 0895-9374)

3246 ANALYSIS OF TOXIC ELEMENTS IN PLASTIC COMPONENTS FOR TOYS. MULTI-ELEMENTAL DETERMINATION BY X-RAY FLUORESCENCE. [BIB-199307-B3-P-0064]

An X-ray fluorescence method is proposed for the multi-elemental determination of toxic elements in plastic articles for children, Sb(III), barium, cadmium, Cr(III), mercury, lead and As(III). Mineralization is achieved by using molten sodium hydroxide to decompose the organic matrix, with sodium nitrate as auxiliary oxidant. Stable solutions containing the chemical species for analysis are obtained. The species are separated from the solution by (co)precipitation, in a medium of NH^+_4 —NH_3 buffer (pH 8.5) with sodium diethyldithiocarbamate, sodium rhodizonate and Fe^{3+}, which acts as a carrier. The precipitates deposited on filter-paper are placed in the X-ray spectrometer in fine layer morphology. The method was applied to several plastics of different characteristics, all components of children's toys. The suggested method is statistically comparable to the method that includes a reference destruction of organic matter for each element studied and subsequent determination by atomic absorption spectrometry. 19 ref. (Adelantado, J.V.G.; Martinez, V.P.; Reig, F.B.; Carbo, M.T.D.; Mossi, F.B.; Analytica Chimica Acta, (15 Apr. 1993), 276, (1), pp. 39-45 [in English]. ISSN 0003-2670)

3247 THE FLUE GAS TOXICITY OF PLASTICS INCINERATION AND LOW TEMPERATURE CARBONIZATION PRODUCTS. [BIB-199304-C4-P-0193]

The acute inhalation toxicity of products resulting from low temperature carbonization by incineration of plastics was investigated by animal experiments. The obtained results demonstrated that the regulative and normative approaches to this problem which are based on the chemical nature of the investigated substances as well as on the analytically determined concentration data of the primary flue gas components are unable to meet the standards of research and development, as defined by TR 9122 of ISO TC92 SC3. The results of animal experiments make it possible to estimate the toxic potential of relevant fire risk situations. Data are presented for filled and unfilled grades of Apec and Makrolon polycarbonates, Durethane polyamide, Pocan PBT, Novodur ABS, Tedur PPS, and Bayblend. Graphs. In English p. 11-14. 39 ref. (Kimmerle, G.; Pauluhn, J.; Wuppertal; Prager, F.H.; Kunststoffe German Plastics, (Dec. 1992), 82, (12), pp. 1175-1180 [in English, German]. ISSN 0723-0192)

3248 LOW STYRENE EMISSION UNSATURATED POLYESTER RESINS. [BIB-199305-E2-D-0189]

The reduction of styrene emissions during lamination with unsaturated polyester resins and the measurement of such emissions are discussed. Emission can be minimized by the use of three types of low styrene resins (LSE-resins): resins containing additives such as paraffin to suppress emission; resins with reduced styrene content (high solid resins); and new monomer resins in which styrene is totally or partly substituted with another monomer (p-methylstyrene, vinyltoluene). Of these, the third method appears the best but price, availability and toxicology have still to be properly evaluated. A method for measuring styrene emission rates during lamination by infrared spectroscopy is claimed to give

better correlation with actual plant practice than the commonly-used gravimetric method. The parameters affecting styrene emission in each of the five phases—spraying, rolling, setting, gelling, curing—are examined. It is concluded that at present the use of additive based LSE-resins coupled with proper ventilation offers the best protection. Graphs. (Skrifvars, M.; Johansson, M.; Blomqvist, T.; Keinanen, K.; Composites (France), (May-June 1992), 32, (3), pp. 42-45 [in English]. ISSN 0754-0876)

3249 WASTE GAS CLEANING IN CERAMICS PRODUCTION BY MEANS OF CATALYTIC POSTCOMBUSTION. (ABLUFTREINIGUNG IN DER KERAMIKPRODUKTION MITTELS KATALYTISCHER NACHVERBRENNUNG.) [BIB-199305-E4-C-0186]

The bonding agents, released when firing advanced ceramics, can burden the environment extremely; for neighbouring people this may become annoying because of bad odour; it can be detrimental to the staff's health, or even destroy the ecological balance of the environment. The functioning and advantages of a catalytic postcombustion plant are discussed. Problem solutions are discussed and important fundamentals of this topic are pointed out. Graphs. (Becker, R.; Keramische Zeitschrift, (Sept. 1992), 44, (9), pp. 606-608 [in German]. ISSN 0023-0561)

3250 INCREASED TOXICITY OF CONFLAGRATION GASES DUE TO FLAME PROTECTION IN THE CASE OF PLASTICS. (TOXIZITATSZUNAHME BEI KUNSTSTOFFBRANDGASEN DURCH FLAMMSCHUTZMASSNAHMEN.) [BIB-199309-C2-P-0406]

Due to financial and technological reasons, it is not always possible to use highly temperature resistant materials to reduce the risks that may result from burning plastics. A number of fire-resistant or coated plastics generate even more toxic decomposition and combustion gases than do comparable unprotected plastics. Their increased toxicity seems to be due to a change in burning chemism. In fact, the retarded inflammation of the thus protected plastic materials leads to an increased emission of carbon monoxide, hydrocyanic acid, and specific toxins from the flame retardant. Against the background of safety technology and occupational hygiene, an optimal usage of plastics should be based on constructive and physical measures rather than on the use of chemical flame retardants. In addition, a toxicological classification of plastics in view of the combustion gases generated by them appears to be useful. 4 ref. (Staub-Reinhaltung der Luft, (Jan. 1993), 53, (1), pp. 17-20 [in German]. ISSN 0039-0771)

3251 CALCIUM/ZINC STABILISERS FOR PVC PRESSURE PIPE. [BIB-199309-D2-P-1079]

In western Europe, PVC water pipes are predominantly established using lead salts. Although completely acceptable in terms of performance and water quality, the use of Pb stabilisers may be reviewed on the grounds of reducing exposure to all forms of Pb in the workplace. Calcium and zinc fatty acid salts are regarded as possible alternatives, although there are technical difficulties to be overcome. Ca/Zn systems are less efficient than those based on Pb and can undergo rapid degradation reactions. In addition both Ca and Zn stearate act as lubricants of PVC, and Ca stearate promotes fusion and can increase melt viscosity. Hence careful attention must be paid to lubrication in this application. The success of Ca/Zn stabilisers depends upon the use of synergistic compounds, such as polyols, beta -diketones, hydrotalcites and zeolites, which improved stabiliser efficiency. Literature relevant to the development of Ca/Zn formulations for u-PVC pressure pipe is reviewed. 35 ref. (Thomas, N.L.; Plastics, Rubber and Composites Processing and Applications, (1993), 19, (5), pp. 263-271 [in English]. ISSN 0959-8111)

3252 RAVENSWOOD MAY GET 275 OSHA CITATIONS. [BIB-199201-G4-0003]

Aluminum Corp. could receive as many as 275 citations from the US Occupational Safety and Health Administration as the result of a lengthy inspection of its plant at Ravenswood, West Virginia, USA. The company said many of the pending citations are for infractions that have since been corrected. The citations resulted from a 53 day inspection of the 33 year old plant. (Munford, C.; American Metal Market, (20 Nov. 1991), 99, (224), pp. 2 [in English]. ISSN 0002-9998)

3253 CRESCENT BRASS RECOVERS QUICKLY FROM A FIRE. [BIB-199201-G4-0007]

Crescent Brass suffered a major fire but was able to resume operations within five days as a result of hard work and prior planning. Employees worked long hours to get operations rolling again and a back-up of all PC files, secured in water-proof and fire-proof cabinets, ensured continuous business records. The main advice to foundry operators, however, is to have adequate insurance and ensure that the inventory of white metal plate master patterns is adequately documented. (Smith, V.; Foundry Management and Technology, (Oct. 1991), 119, (10), pp. 27-28 [in English]. ISSN 0360-8999)

3254 EPA EXEMPTS PRECIOUS METAL REFINING FROM BIF RULE. [BIB-199201-G4-0008]

On 16 August 1991, the US EPA issued a technical amendment exempting precious metal refining from new regulations regarding the burning of hazardous waste in boilers and industrial furnaces (BIF). This exemption has been a major goal of the Environmnet and Regulatory Affairs Committee for four years, because a great deal of precious metal refining of materials, such as spent catalyst, would have had to literally shut down under a literal application of the BIF rule. The exemption saves a great deal of disruption to the secondary precious metal markets. The exemption states that burning of hazardous waste for recovery of precious metal is conditionally exempt, the conditions being a one-time notification by refiners of such activity to EPA, sampling to demonstrate that substantial precious metal recovery is actually taking place, and record-keeping. (IPMI News & Review, (Nov.-Dec. 1991), 15, (11), pp. 6 [in English]. ISSN 0730-1901)

3255 ZINC SMELTER FIRE GIVES BULLISH MARKET A WELCOME FOCUS. [BIB-199201-G4-0009]

Germany's Ruhr-Zinc GmbH, a subsidiary of Metallgesellschaft, stopped production at its electrolytic Zn smelter in Datteln following a fire at a nearby oxygen plant. Around 300 t of Zn production was expected to have been lost as a result of the closure. Meanwhile, news of the Datteln smelter stoppage boosted market prices on the LME with SHG three-months metal topping seven-and-one-half month highs of $1210/t at one stage before retracing to the $1194 level. (Metals Price Report: Base Metals Market, (26 Nov. 1991), (135), pp. 1, 3 [in English].)

3256 ACADEMIC QUESTIONS THE SAFETY OF CERTAIN TIN-BASED STABILIZERS FOR PVC. [BIB-199201-P4-0002]

Laboratory experiments show that some organic Sn compounds currently used Gifu Pharmaceutical University, Tokyo, Japan. Altogether, seven different organic Sn compounds, including tributyl tin oxide (TBTO), tributyl tin chloride (TBTC) and dibutyl tin (DBT), caused genetic damage and concomitant enzyme defects when added to cultures of E. coli and salmonella strains. Strong potential exists for transfer of the compounds from polluted environments to human cells via the food chain, Sato believes. He warns of the need for close environmental monitoring of the materials. (Plastics Week, (25 Nov. 1991), pp. 5 [in English]. ISSN 1044-9663)

3257 AUSTRIA TARGETS POLYVINYL CHLORIDE; EC FREE-TRADE ISSUE COULD STOP PROPOSED LAWS. [BIB-199201-P4-0004]

Strict legislation limiting the use of polyvinyl chloride (PVC) is once again being introduced in Austria, but the Austrian PVC industry is fighting back through its new lobby group, Arbeitsgemeinschaft PVC Kunststoffindustrie (API). The new legislation would: reduce vinyl chloride monomer (VCM) levels in PVC applications to 1 ppm, beginning in 1992; ban the use of Ba in any form in PVC compounds, beginning 1 January 1995; ban Cd use in PVC compounds, beginning 1 January 1992; and outlaw disposable products, single-trip packs, and children's toys containing PVC, beginning in 1993. Although still in draft form, the legislation needs only the final signature of Austria's industry minister before it goes before the full parliament. (Plastics & Environment, (13 Dec. 1991), pp. 1, 4 [in English].)

3258 TURNING INFECTIOUS MEDICAL WASTE INTO PLASTIC MARINAS. [BIB-199201-P6-0002]

A Canadian company is commercializing technology for disinfecting combined biomedical waste. The closed loop process uses a combination of high pressure, high temperature, and a special atmosphere to break down and destroy infectious microoganisms. Two end-products result. One is a solid residue that can be mixed with industrial waste to produce an extrudable polyolefin-based composite. The other is a liquid effluent which can be used as a fertilizer. The technology was developed by researchers at the University of Alberta and Alberta's Laboratory of Public Health. Envirotrust Technologies, Toronto, Canada, is commercializing it. The firm is also patenting technology to roll-form polyolefins around a continuous iron rod, meeting the specifications for applications such as timbers in marinas. (Plastics Week, (2 Dec. 1991), pp. 6 [in English]. ISSN 1044-9663)

3259 A LEAD-FREE BAR THAT STILL IS MACHINABLE. [BIB-199201-S4-0001]

Environmental concerns changed the way we look at steel composition. Many of the typical machining additives are potentially hazardous. With an eye to the future, LaSalle Steel Co. had a radical rethink of the end-user's requirements for a fast-machining steel specifically for the mass production of parts. Extensive research and development showed that consistency and reliability, along with low-cost production, are the principal considerations of the end-user. LaSalle's Super 1200 steel bar was produced to optimized chemistry and, by careful selection of the steelmaking route, the company improved the steel's cleanliness and manganese sulfide control. The important feature is that Super 1200 contains no Pb or other potentially hazardous additives. (Keane, D.M.; American Metal Market, (2 Dec. 1991), 99, (230), (Suppl. Cold-Finished Steel), pp. 16A [in English]. ISSN 0002-9998)

3260 CLEAN ANODE PASTE DOSING FROM NORWAY. [BIB-199202-G4-0012]

A cleaner process for the production of anode paste for Al smelting is available from Procon Engineering, Norway. Three innovations lie behind the claims for improved performance: closed and fully dustproof material vessels, precise forced feeding and the loss-of-weight principle. (Process Engineering, (Dec. 1991), 72, (12), pp. 21 [in English]. ISSN 0370-1859)

3261 RAVENSWOOD MULLS OSHA CHARGES. [BIB-199202-G4-0013]

Given until mid-January 1992 to prepare a response to Occupational Safety and Health Administration (OSHA) citations with potential penalties 600 000, Ravenswood Aluminum Corp. said the citations were unwarranted and it plans a thorough review before deciding its next step. Noting the West Virginia, USA, Al company had already been fined $51 000 by OSHA, citations for 231 safety and health violations, added up to the largest ever proposed for any single Al production plant in the US. The citations stemmed from a 53-day inspection of Ravenswood Aluminum's smelting and rolling facilities. (Regan, B.; American Metal Market, (24 Dec. 1991), 99, (246), pp. 2, 16 [in English]. ISSN 0002-9998)

3262 KENNECOTT UTAH HIT FOR WASTE VIOLATIONS. [BIB-199202-G4-0014]

Kennecott Utah Copper Corp. was charged with 217 counts of mismanaging toxic polychlorinated biphenyls (PCBs) and 15 counts for hazardous waste violations, and could face fines of up to $1.4 million. In a complaint issued 20 December 1991 against the company, the US Environmental Protection Agency's Denver, Colorado, regional office said the company improperly handled the toxics at a smelter, refinery, and concentrator located at its Bonneville plant, and at the Bingham Canyon Mine. Based on May 1990 inspections, the charges brought under the Toxic Substances Control Act allege 180 counts of improper use of transformers containing PCBs; 16 counts of improper disposal of PCBs; 20 counts of failure to maintain records of PCB equipment;

and one count of failure to mark an area containing a PCB transformer. (Abrahamson, P.; American Metal Market, (26 Dec. 1991), 99, (247), pp. 2, 12 [in English]. ISSN 0002-9998)

3263 HRT RADIAL-SPIN ELIMINATOR SOLVES PROBLEM AT COPPER SMELTER. [BIB-199202-G4-0015]

The smelter operations group at the Kidd Creek Division of Falconbridge Limited, Timmins, Ontario, Canada, faced a unique and challenging problem in its wet gas cleaning system; how to remove entrained liquid carryover from the scrubber with a non-plugging separator. Watson Process Systems, Markham, Ontario, suppliers specializing in mist/droplet separation equipment, recommended the solution to this problem which was to install an HRT Radial-Spin Eliminator, in the vertical position, between the scrubber and the wet gas booster blower. The HRT spin separator is a versatile, high-efficiency unit that can handle many applications that are not suited to chevron and mesh demisters. The unit was installed in the April 1991 shutdown and has proven to be a success. (Canadian Mining and Metallurgical Bulletin, (Nov.-Dec. 1991), 84, (955), pp. 33 [in English]. ISSN 0317-0926)

3264 FINANCIAL ASSISTANCE AWARD; INTENT TO AWARD A GRANT TO THE WORKPLACE HEALTH FUND. [BIB-199202-G4-0019]

The US Department of Energy (DOE) is making a financial assistance award, based on an unsolicited application to the workplace Health Fund/Collegium Ramazzini, a non-profit professional society, to support "A Proposal to Expand Research Opportunities on Cancer and Ionizing Radiation". The purpose of this proposal relates directly to the mission of the DOE Office of Health because it concerns the potential collection of new data on a large cohort of uranium mines, and thus new data relevant to the health risks of radon exposure. DOE support of this project will provide DOE the opportunity to participate in long-term studies ofthe eastern German and Czech populations. Until recent political changes in eastern Europe, this data was unavailable. (CIS Federal Register Index, (30 Oct. 1991), 56, (210), pp. 55914 [in English]. ISSN 0741-2878)

3265 MOCA STUDY FLAWED. [BIB-199202-P4-0006]

A panel of cancer experts has concluded that scientific evidence does not support a suggestion that 4,4'-methylene bis(2-chloroaniline), also known as MOCA, is a confirmed human carcinogen. The report—commissioned by the US Polyurethane Manufacturers Association—will be presented to the American Conference of Governmental Industrial Hygienists, which is currently considering changing its classification of MOCA to a confirmed human carcinogen from a suspected human carcinogen—a status it has held since 1974. The PMA has been fighting attempted MOCA regulations since the early 1970s and is heading the current battle against the ACGIH. MOCA is the main curing agent of the cast polyurethane industry; strict regulation of the material would be crippling. The curative is currently regulated by the Occupational Safety and Health Administration at a permissible exposure level of 0.02 parts/million with a notation concerning skin contact. (Walters, S.; Urethanes Technology, (Oct.-Nov. 1991), 8, (5), pp. 14 [in English]. ISSN 0265-637X)

3266 NEW METHODS AID TOXICITY ASSESSMENT. [BIB-199202-P4-0007]

The US National Institute of Standards and Technology (NIST) has developed a simplified approach to gauging the toxicity of smoke from burning plastics and other materials. Based on calculations from small-scale lab tests and a reduced number of animal mortality tests, the method predicts the toxic hazard of various materials in post-flashover-stage fires, which account for the majority of fire deaths. It also can be modified for fires in their earlier stages. NIST's methodology does not require extensive animal tests to determine toxicity, but depends primarily on gas analysis and a blend of theory and pragmatism. Basically it involves collecting and analyzing the combustion gases produced by the test material under post-flashover conditions in a test chamber and calculating the toxic potential of the mixture of gases. (Miller, B.; Plastics World, (Jan. 1992), 50, (2), pp. 21 [in English]. ISSN 0032-1273)

3267 STYRENE DECISION CRITICAL, SAYS SIRC CHAIR. [BIB-199202-P4-0011]

Results of ongoing industry research into the various health and environmental issues surrounding the use of styrene monomer could affect far more than just the producers of that raw material, says John Jenks, newly elected chairman of the Washington, DC-based Styrene Information and Research Center (SIRC). Nor, within plastics, will such research only impact producers and processors of such styrene derivatives as ABS, polystyrene, SAN, and styrenated polyesters. Jenks believes that SIRC's research into the carcinogenicity of styrene, undertaken to provide data for EPA, state, and local governments, is absolutely vital to the future of the entire $20 billion US plastics industry. Other industry insiders agree that unnecessary limitations on the use of styrene could set an unwelcome precedent, leading to lengthy regulatory review and possible limitation on the use of other monomeric materials. (Plastics Week, (20 Jan. 1992), pp. 4 [in English]. ISSN 1044-9663)

3268 CAN PU CAUSE CANCER? [BIB-199202-P6-0047]

Breast implants made of silicon rubber coated with polyurethane foam are being investigated by the US Food and Drug Administration and the Department of Health, UK. The FDA has started a review to determine whether to withdraw PU foam-covered breast implants from the US market entirely, while the DoH is waiting for advice from independent experts on cancer risks. Meanwhile US firm Bristol-Myers Squibb, parent company of implant makers Surgitek, has announced the withdrawal of its implants from the market, even those with no PU covering. It is closing the plastic surgery unit of Surgitek, which makes these and other devices for the plastic surgery and urology markets, and selling off the remaining Surgitek operations. (McCann, B.; Urethanes Technology, (Dec. 1991-Jan. 1992), 8, (6), pp. 16 [in English]. ISSN 0265-637X)

3269 ENVIRONMENTAL CHARGES AGAINST DDS. [BIB-199202-S4-0003]

Public Prosecutions in Denmark is considering raising charges against Danish steelmaker Det Danske Stalvalsevaerk for contravening the Danish environmental legislation: unlawfully depositing and storing 21 000 t of earth containing heavy metals, and complicity in the illegal operation of a scrap cleaning plant, run by another company, on the Danish steelworks' premises. Environmental groups are also protesting against legal shipments of particulate matter from Det Danske Stalvalsevaerk to Spain. DDS ships approx 10 000 t of dust, containing heavy metals such as Zn and Pb, collected in bag filters fitted as anti-pollution devices. The environmental group Greenpeace says that the recycling processes used are extremely polluting. (Steel Times, (Dec. 1991), 219, (12), pp. 650 [in English]. ISSN 0039-095X)

3270 NEEDS AND IMPLICATIONS OF EFFLUENT MONITORING. [BIB-199202-S4-0004]

There is increasing pressure, backed by legislation, for more comprehensive information on releases of pollutants, particularly liquids, to be freely available. Consequently there is need to broaden the range and frequency of monitoring activities—which has important implications for steelworks management. (Prater, B.E.; Steel Technology International, (1992), pp. 241-243, 245-246, 248 [in English]. ISSN 0953-2412)

3271 UEC SIGNS TWO CONTRACTS. [BIB-199202-S4-0005]

Altos Hornos de Mexico has hired UEC Environmental Systems, Inc. to conduct a study of environmental contaminants and controls at its integrated steel plant in Monclava, Mexico. Air and water sampling programs are being undertaken and major environmental issues will be assessed during the next year. After this review, alternative pollution control technologies will be considered and the most cost-effective program examined. Also, budgetary estimates will be prepared for the recommended pollution control processes. UEC has also signed an agreement with the East Slovakian Iron and Steel Works (ESI&S). It will provide a proprietary noncapture system to suppress fumes from liquid metal in blast furnace casthouses at ESI&S's steel mill, Kosice, Czechoslovakia. (Iron and Steelmaker, (Jan. 1992), 19, (1), pp. 4 [in English]. ISSN 0097-8388)

3272 POLLUTION CONTROL FOR INDIA. [BIB-199202-S4-0006]

Australian engineers and planners working from Calcutta have prepared environmental management and pollution control plans for four steel plants for the Steel Authority of India. As a result of work over the past two years, integrated environmental monitoring systems are operating or being installed in each plant for stack testing ambient air quality, water discharge quantities, and quality and noise levels. In addition, qualitative monitoring systems in relation to operational

practice have been developed. The project, a joint venture between Kinhill Engineers and BHP Engineering, made detailed assessment of air, water and noise pollution and management of solid waste, the development of an environmental monitoring network, and the formulation of pollution control strategies to bring the steel plants into compliance with Indian and international standards. (Steel Times International, (Nov. 1991), 15, (6), pp. 50 [in English]. ISSN 0143-7798)

3273 THE EPA'S OUNCE OF PREVENTION PLAN DRAWS APPROVAL. [BIB-199204-G4-0022]

The US Environmental Protection Agency's program to encourage companies to prevent pollution at the source rather than treat it later has had some early success. More than 25 metals companies were among the first several hundred companies to commit themselves to voluntary reductions of cyanides, Hg, Pb, and 14 other toxic chemicals on the EPA's high priority list. The 35/50 program is a key part of the agency's pollution prevention strategy. Specifically, the initiative asks industry to voluntarily reduce releases and transfers of 17 toxic chemicals into the land, air, and water by 50% by 1995, with an interim goal of 33% by 1992. (Abrahamson, P.; AMERICAN METAL MARKET, (19 FEB. 1992), 100, (33), (Suppl. Environmental Management), pp. 2A, 11A [in English]. ISSN 0002-9998)

3274 NEW CAN COATING AVOIDS PERILS OF PVC. [BIB-199204-G4-0024]

A new family of can coatings that contain no PVC has been developed by Holden Surface Coatings Ltd., Birmingham, UK. Created in response to a campaign against use of PVC in container coatings in Europe, the new material offers the benefits of high solids content, hence reduced emissions, low odor, high flash point, and an ability to wet contaminated metal surfaces. (Church, F.L.; MODERN METALS, (FEB. 1992), pp. 44CC, 44DD, 44EE, 44FF, 44HH [in English]. ISSN 0026-8127)

3275 CLOSED DEGREASER SLASHES SOLVENT EMISSIONS. [BIB-199204-G4-0025]

Ninety-nine percent reductions in chlorinated solvent emissions are claimed for a vapor degreasing technology developed in Germany by Durr Industries, Inc. Closed equipment replaces conventional open-top degreasers to cut both emissions and consumption. Closed degreasers originated as a response to strict German regulations. The regulation is being phased in, and it is currently at a maximum of 20 mg/m^3 for solvent emissions from degreaser exhaust stacks. Equipment without exhausts cannot have a solvent concentration 1 g/m^3 when the cleaning chamber is opened. (Pennington, J.N.; MODERN METALS, (FEB. 1992), pp. 45-46, 48 [in English]. ISSN 0026-8127)

3276 A NEW APPROACH TO POTLINER DISPOSAL. [BIB-199204-G4-0027]

A recent ruling by the US Environmental Protection Agency has opened the gate for the processing of spent potliner by the Al industry. For well over ten years, Al producers have been struggling with the disposal of this high-volume waste product. In September 1988, because of concerns that the cyanide, fluoride and organics, would leach out into the groundwater, the EPA listed spent potliner as a hazardous waste. On 19 December 1991 the EPA agreed to the conditional delisting of the residue from spent potliners that have been processed using Reynolds' thermal treatment technology. This process involves feeding the spent potliner through big kilns that have been heated at an elevated temperature. Sand and limestone are added to the feed, chemically binding with the fluoride to form calcium fluoride. (Pinkham, M.; AMERICAN METAL MARKET, (19 FEB. 1992), 100, (33), (Suppl. Environmental Management), pp. 6A, 8A [in English]. ISSN 0002-9998)

3277 CAUSTIC ETCH REGENERATION: ITS TIME HAS COME. [BIB-199204-G4-0029]

Caustic etch regeneration (CER), in which caustic anodizing etchant is recycled and the etched Al is retrieved as a by-product, has finally come into fashion. Though CER was first introduced in 1979, it has taken rising environmental and caustic soda costs to make anodizers get serious about it. With CER, aluminum trihydrate sludge—a troublesome and costly waste—can be transformed into an 85% dry cake and sold. Sludge volumes fall so much that environmental compliance is assured. Some CER installations have paid back in less than two years, CER was pioneered by Alcoa, which sold its patent to US Filter Corp. in 1991. The system is now manufactured by Lancy Environmental Systems, Warrendale, Pennsylvania, USA. (MODERN METALS, (FEB. 1992), pp. 52-55 [in English]. ISSN 0026-8127)

3278 EUROPE LOWERS THE HEAT ON BROMINATED FRS. [BIB-199204-P4-0020]

The chances for regulations banning the use of polybrominated diphenyl ether (PBDE) flame retardants by the European Community (EC) in the near future have faded substantially during the past year. What's more, it appears that whatever restrictions eventually are adopted will be limited to the PBDEs—notably the decabromo compound—leaving unscathed other brominated FRs not associated with the dioxin-furan furor. The changing PBDE climate is the result of two crucial meetings of EC officials in fall 1991. National legislation is still possible, however, particularly in Germany and the Netherlands, where the anti-PBDE pressure is highest. (PLASTICS WORLD, (MAR. 1992), 50, (4), pp. 45 [in English]. ISSN 0032-1273)

3279 GENEVA STEEL MEETS TOUGH NEW EMISSION RULES. [BIB-199204-S4-0029]

In late August 1987, when Geneva Steel Co. started up, the last thing on its executives' and backers' minds were environmental issues. While its startup probably ranked as one of the most successful—and profitable—that the American steel industry had seen in years, new and tighter standards were promulgated by the US Environmental Protection Agency just about the time the plant restarted. These regulations are widely referred to as PM 10 because they involve particulates under 10 μm in size. To resolve these environmental issues, Geneva applied some novel approaches to answer what, in addition to its steelmaking modernization, outsiders viewed as the biggest question about its long-term viability. Among the solutions it chose were Ninja bugs, a fierce brand of organism with a taste for ammonia, and a sulfur-treatment system originally developed for the petroleum industry rather than steel industry. (Haflich, F.; AMERICAN METAL MARKET, (19 FEB. 1992), 100, (33), (Suppl. Environmental Management), pp. 4A-5A [in English]. ISSN 0002-9998)

3280 OPTIONS AND OPPORTUNITIES UPDATE ON K061. [BIB-199204-S4-0038]

Even though electric arc furnace (EAF) dust has been listed as a hazardous waste (designated K061 under RCRA, the Resource, Conservation, and Recovery Act) since 1988, many EAF steelmakers are still looking to find the best technology to treat it. A process that draws considerable interest involves vitrifying EAF dust into a marketable ceramic product, without residue or slag developed by Inorganic Recycling Inc. (IRI). (Huskouen, W.D.; THIRTY-THREE (33) METAL PRODUCING, (MAR. 1992), 30, (3), pp. 34, 36 [in English]. ISSN 0149-1210)

3281 TOUGH TIMES SEEN FOR PVC IN EUROPE. [BIB-199205-P4-0021]

Many European countries are joining a growing movement to reduce or ban the use of polyvinyl chloride (PVC) plastics, which are often used in pipe, floor tile, window frames, and other office and home products. More than 60 local governments in Germany have decided to phase out PVC in public construction and government of offices, while Denmark, Sweden, and Switzerland have banned the use of PVC in packaging, while accounts for 10% of PVC production. Consumer groups in the Netherlands, Austria, Luxembourg, and Germany have also supported the packaging ban. (SCRAP PROCESSING AND RECYCLING, (MAR.-APR. 1992), 49, (2), pp. 31 [in English]. ISSN 0036-9527)

3282 SAFEGUARDING HEARING IN THE STEEL INDUSTRY. [BIB-199205-S4-0045]

Exposure to occupationally related noise has been a major topic in occupational health and safety matters for employers and for employees and their representatives over the last two decades. The steel industry has been paying increasing attention to the protection of hearing of its employees: increasingly stringent controls are being implemented by legal requirements specific to individual countries, and employees generally are showing greater interest in the subject. In addition to the in-house problem relating to employees, the industry is, in common with other industries, also subject to concern expressed by those who live outside but who are exposed to works related noise, i.e. neighbourhood

noise. This document does not address that particular aspect, although many of the measures taken to control noise emissions for the purposes of reducing the occupational exposure of employees will of course have a major impact on environmental noise. The document aim to set out sound practical background information and advice on the potential hazards, precautions and standards associated with the subject under review and against the background of works operations. They are primarily intended therefore for use by managers and supervisors in the steel industry who wish to have a greater knowledge of the problem discussed and the precautions which can be taken. They will also be of use to some occupational health and safety professionals. (Catton, J.A.; Publisher: INTERNATIONAL IRON AND STEEL INSTITUTE, Rue Colonel Bourg, 120 B-1140 Brussels, Belgium, (FEB. 1992), Pp 85 [in English].)

3283 EPA CITES WITCO "MYSTERY" MATERIAL IN TOXICS VIOLATION. [BIB-199203-P4-0015]

The US Environmental Protection Agency (EPA) has proposed a $50 439 penalty against Witco Corp. for violations of the Toxic Substances Control Act (TSCA), involving actions at Witco's US Peroxygen Products facility, Richmond, California. The company is a manufacturer of organic peroxides for use as catalysts and initiators in the polymers industry. According to a civil complaint filed by EPA, gloves worn by workers manufacturing a new chemical at the facility were not properly tested for impermeability before the first batch of the substance was produced. The agency's approval of the new chemical's production was contingent upon a number of conditions, including glove testing by the manufacturer. EPA also notes that Witco failed to report required information on another of the substances being made at the same facility. The substance, though unidentified, is one of several hundred chemicals for which production, use, and exposure data must be submitted to US EPA for use in risk assessment under the TSCA regulations. (PLASTICS WEEK, (27 JAN. 1992), pp. 4 [in English]. ISSN 1044-9663)

3284 MODERN STEELMAKING CLEANS UP ITS ACT. [BIB-199203-S4-0009]

Steelmakers in Germany have done more than their fair share of environmental control. They have been forced into conforming with governmental regulations which exceed those of other European countries, and will make Germany a less attractive location for industry. A punitive tax on CO_2 emissions would be grossly unfair to steelmakers, since the use of carbon as a reducing agent is unavoidable. It was calculated that the daily burden of operation costs caused by environmental control in Thyssen's plants is $750 000. (Schulz, E.; STEEL TIMES INTERNATIONAL, (JAN. 1992), 16, (1), pp. 44-46 [in English]. ISSN 0143-7798)

3285 SAFETY DESIGNED INTO STRIP SLITTING LINE. [BIB-199203-S4-0010]

Kitson Steel's incorporation of new safety operation guidelines in its new plant is described. The new guidelines address a number of areas including selecting appropriate safeguards, local guarding of individual parts of a slitting line, safe systems of work for certain jobs, training, and personal safety equipment. The guidelines are aimed at users, manufacturers, and suppliers of slitting line, all of whom can have a positive role in promoting high safety standards. Specific changes include: interlocking safety devices, video cameras, pressure matting, lighting, layout of the plant to ensure a perfect flow line for transport without accidents, and extensive training programs. (SHEET METAL INDUSTRIES, (NOV. 1991), 68, (11), pp. 26, 28 [in English]. ISSN 0037-3435)

3286 GREEN STEEL—PART 2. [BIB-199203-S4-0011]

An account is given of how the raw materials used in steelmaking and actual steelmaking processes may affect the environment and of the steps British Steel has taken and is taking to reduce their impact to a minimum. Special reference is made to the prevention of stockpile dusting and to coke oven controls. Closure of less efficient plants has also had a beneficial effect. (STEEL NEWS (BRITISH STEEL STRIP PRODUCTS WALES), (DEC. 1991), (6), pp. 3 [in English].)

3287 ROURKELA STEEL PLANS INVESTMENT FOR POLLUTION CONTROL. [BIB-199203-S4-0012]

Rourkela Steel Plant (RSP) is embarking on an investment plan of Rs3200M (pounds sterling 70M) involving pollution control measures to build an environment in and around Rourkela comparable to international standards. Implementation of various pollution control measures is in progress under the steel plant's modernisation plans and a Rs1010M (pounds sterling 22M) has been committed in current work. The Rourkela plant was the first public sector steel plant to be set up in the late fifties soon after the country attained independence. Initially, the design of the plant did not provide for pollution control. An environmental engineering department was established in 1987. (STEEL TIMES INTERNATIONAL, (JAN. 1992), 16, (1), pp. 4 [in English]. ISSN 0143-7798)

3288 ENVIRONMENTAL AND HEALTH RISKS DUE TO MINING ACTIVITIES IN DEVELOPING COUNTRIES. (UMWELT- UND GESUNDHEITSRISIKEN VON BERGBAUAKTIVITATEN IN ENTWICKLUNGSLANDERN.) [BIB-199203-S4-0013]

The present paper deals in the first part with the possible technically caused environmental impacts of prospection, exploration, underground and surface mining, and mineral dressing. Politically caused risks for the environment due to mining in developing countries, that are treated in the second part consist in low environmental consciousness, unsuitable mining legislation, conflicts of interests, and insufficient survey of the companies. This is discussed in the scope of insufficient prices for mineral commodities on the world market and possible financial assistance for the developing countries. Finally needs for action of international donor organisations, investors, and government organisations is derived. (Priester, M.; Hentschel, T.; ERZMETALL, (DEC. 1991), 44, (12), pp. 610-618 [in German]. ISSN 0044-2658)

3289 MELT SHOP SAFETY AT DOFASCO. [BIB-199203-S4-0024]

Dofasco has comprehensive safety and occupational hygiene programs that include most safety aspects of scrap preparation and charging, arc furnace melting, hot metal handling and pouring, and accident data analysis. Planned job procedures are deliberate, sequenced methods for doing the job safely. Job-safe practice rules outline safe practices relative to hazards that may be present in the plant area or on a particular job. Job-safe practices are more general and basic than work procedures. On a yearly basis, the work procedures and job-safe practices are reviewed and revised by supervisors with input from employees and the Safety Department. (Engel, E.; Kwartz, J.; IRON AND STEELMAKER, (FEB. 1992), 19, (2), pp. 27-30 [in English]. ISSN 0097-8388)

3290 PROTECTION OF THE GLOBAL ENVIRONMENT. [BIB-199203-S4-0028]

Nisshin Steel's measures to decrease environmental pollution include reduction of carbon dioxide emissions at its plants, care with drainage systems to reduce waste pollution and increased use of recycled products (such as slag from Fe and steelmaking used for road surfacing and cement production). All paper inserts used between stainless steel sheets are recovered and recycled. (NEWS FROM NISSHIN STEEL, (1 DEC. 1991), (58), pp. 1-2 [in English].)

3291 GREENHOUSE GASES FROM ALUMINIUM REDUCTION PLANTS—NOT JUST CO_2. [BIB-199206-G4-0039]

New research results and extensive measurement programmes that have been undertaken at Hydro Aluminium production facilities, confirm that emissions of fluorocarbons from electrolytic reduction pots can be contributory to the global greenhouse effect. (Steinum, T.; ALUNEWS, (MAR. 1992), (1-92), pp. 2 [in English].)

3292 BRASS FOUNDRY LOSES IN STORMWATER SETTLEMENT. [BIB-199206-G9-0198]

The state of Michigan has prosecuted the Mueller Brass Company, Port Huron, in the first settlement arranged under the state's new "Polluters Pay" law. In the settlement, the company agreed to build a $500 000 water treatment plant to clean the rainwater. In addition, the company—which has admitted no wrongdoing—also agreed to buy $800 000 worth of property in marshlands for game and fish management and a $128 000 mobile laboratory as gifts to the Department of Natural Resources. It will also provide $130 000 to the University of Michigan to establish an environmental education program in Port Huron's high schools. But on top of al this, DNR also assessed Mueller a $1 million civil penalty. (CRUCIBLE, (MAR.-APR. 1992), pp. 16 [in English]. ISSN 0011-2199)

3293 PVC AND ENVIRONMENTAL QUESTIONS. [BIB-199206-P4-0026]

The main ecological concerns over PVC have been with the fact that it contains additives, the polymer itself being pathologically inert. At least eight ecobalances carried out over the last 15 years have given a positive picture for plastics. Despite concerns expressed over PVC additives, demand for PVC window frames, cable sheathing and flooring continues to increase. A recent German Health Ministry statement affirms that diethyl hexyl phthalate plasticiser in PVC confers no risk when used in medical equipment. The pathogenesis of the 140 cancer cases world-wide attributed to vinyl chloride monomer confirms that no processors or consumers have been affected. The emissions from properly operated waste incinerators do not contain sufficient amounts of polychlorinated dibenzodioxins and dibenzofurans to have a detectable effect on the population. (Binder, G.; MACPLAS INTERNATIONAL, (FEB. 1992), (3), pp. 38-39 [in English].)

3294 STATE CLOSES POLYMER RESOURCES FACILITY. [BIB-199206-P4-0027]

State officials have temporarily closed a plastics compounding plant in Farmington, Connecticut, USA, after nearby residents complained of noxious fumes. The Connecticut Department of Environmental Protection, through the state attorney general's office, issued an order closing Polymer Resources Ltd.'s Farmington plant in April. Polymer Resources and DEP are conducting tests to see whether plant emissions cause a health hazard for area residents. Company officials said the Farmington plant has had intermittent problems with odors, but does not pose a health hazard. The company has improved its filtration equipment and is spending $100 000 for the environmental tests. (PLASTICS NEWS (DETROIT), (4 MAY 1992), 4, (10), pp. 2 [in English]. ISSN 1042-802X)

3295 MELT SHOP SAFETY AT DOFASCO. [BIB-199206-S4-0051]

The facilities and workforce of Dofasco are briefly described and the program elements of the company's safety and occupational hygiene programs are discussed. The presentation focusses on the steelcasting operations with some reference to other steelmaking operations. The safety aspects of scrap preparation and charging, arc furnace melting, hot metal handling and pouring and accident data analysis are covered. (Engel, E.; Kwartz, J.; ELECTRIC FURNACE CONFERENCE PROCEEDINGS VOL. 49, 12-15 NOV. 1991, Publisher: THE IRON AND STEEL SOCIETY, 410 Commonwealth Dr., Warrendale, Pennsylvania 15086, USA, (1992), pp. 123-126 [in English].)

3296 EASTERN STAINLESS GETS $1.25M POLLUTION BILL. [BIB-199206-S4-0052]

Eastern Stainless Corp., Baltimore, will spend at least $125 million on pollution prevention measures through 1993 under a settlement of a civil action filed against the company by the state of Maryland, USA. Eastern, a division of Cyclops Industries Inc., said in addition it will pay $298 000 to the Maryland Clean Water Fund. The environmental problems involved the regulation of discharges of oil and grease into waterways leading into Chesapeake Bay. (Pollock, B.; AMERICAN METAL MARKET, (10 APR. 1992), 100, (70), pp. 3, 11 [in English]. ISSN 0002-9998)

3297 ENVIRONMENTAL CONCERNS FOR SCRAPYARDS, 1991. [BIB-199206-S4-0053]

A scrapyard project which was initiated to address the problem of oil runoff is described. The objective of the project was to design, construct and operate a system where oil containing scrap could be stored in such a way that the oil would not be released into the environment. A general plan description called for a concrete pad to collect several grades of oily scrap (primarily from machines that use large quantities of cutting oil during machining). Water from the pads would be channeled to a collection point and oil would be prevented from soaking into the ground. Engineering issues addressed which led to the successful completion of the project are described. The project cost $1.5 million and project costs were amortized into material handling costs. (Behr, R.A.; ELECTRIC FURNACE CONFERENCE PROCEEDINGS VOL. 49, 12-15 NOV. 1991, Publisher: THE IRON AND STEEL SOCIETY, 410 Commonwealth Dr., Warrendale, Pennsylvania 15086, USA, (1992), pp. 137-140 [in English].)

3298 ENVIRONMENTAL PROTECTION AND THE HOT DIP GALVANIZING INDUSTRY. [BIB-199206-S4-0057]

On-site application of protective systems during hot dip galvanizing must take place in stages. Steps include surface preparation (avoiding harmful products being released into the environment) and selection of protective materials (taking into account physiological and ecological properties of constituents). For corrosion protection applied in the factory, hot dip galvanizing is very effective and regulations concerning release of contaminated waste are discussed. The use of efficient filters for cleaning air emitted to the atmosphere is described and their value for reducing air emissions is considered. (HOT DIP GALVANIZING, (MAR. 1992), 2, (1), pp. 11-13 [in English].)

3299 ZINC IN THE ENVIRONMENT—PRESENT KNOWLEDGE AND EMERGING ISSUES. [BIB-199207-G4-0044]

Issues relating to the environmental impact of Zn and Zn products are examined and the benefits of Zn are weighed against areas of genuine environmental concern. Zinc's role in human physiology, specific health benefits such as possible delay of macular degeneration and the symptoms of Zn deficiency are described. Toxic effects in humans, excessive exposure and existing regulatory criteria are then discussed. (Cole, J.; INTERNATIONAL ZINC CONFERENCE, 26-28 FEB. 1992, Publisher: AMERICAN ZINC ASSOCIATION, 1112 Sixteenth St., Suite 240, Washington D.C. 20036, USA, (1992), Paper 3, Pp 9 [in English].)

3300 DOW'S VINYL ESTER RESINS REDUCE STYRENE EMISSIONS. [BIB-199207-D4-0005]

Dow Chemical, Midland, Michigan, USA, has introduced two vinyl ester resin systems tailored for different manufacturing processes that address, in different ways, the problems of styrene emission. The first of these is an experimental system, XU 71943, which has been developed for use in prepregging high-performance aligned fibre composites. The novel aspect of this resin is that the vinyl ester is supplied in a methyl ether ketone solution which replaces the conventional styrene in the dual role of solvent and cross-linking agent. The complete elimination of styrene should improve the health and safety status of vinyl ester prepregs. The other Dow product is a general laminating resin, Derakane 441-400, aimed at the traditional chemical plant, marine and construction applications of Derakanes. It was formulated to reduce styrene emissions without sacrificing mechanical, physical or chemical properties. (ADVANCED COMPOSITES BULLETIN, (MAY 1992), pp. 3-4 [in English]. ISSN 0951-953X)

3301 HANDLING ORGANIC COMPOSITES SAFELY. [BIB-199207-D4-0006]

Fabricating organic-matrix composite parts requires special precautions to safeguard workers' health. Direct skin contact with uncured resin systems and inhalation of volatile offgasing products can be harmful. US regulatory agencies are closely monitoring both safe work practices and release of volatiles into the atmosphere. Secondary operations, such as trimming and drilling of cured parts, generate dust from which workers also should be protected. A discussion of safety practices for composite materials handling addresses ventilation systems, gloves for handling of prepregs, precautions after curing, and the importance of training. (Vaccari, J.A.; AMERICAN MACHINIST, (MAY 1992), 136, (5), pp. 59-62 [in English]. ISSN 0002-9858)

3302 EPA DELETES STYRENE FROM CARCINOGENS LIST. [BIB-199207-P4-0033]

In response to a request by SPI's Styrene Information and Research Center (SIRC), the EPA Office of Health and Environment Assessment in the US has removed its classification of styrene as a probable human carcinogen (B2). SIRC wrote to the EPA requesting that styrene's B2 classification in the agency's Health Effects Assessment Summary Tables be removed because the information was being misused by many state regulatory agencies, even though the EPA has reached no formal decision classifying the substance. The misuse of the tables has resulted in stringent air emission regulations or proposals in many states, including Colorado, Idaho, Indiana, Kansas, Massachusetts, Minnesota, and New Jersey, SIRC said. In place of a classification, a notation will refer inquirers to a telephone recording explaining that styrene's classification is under EPA consideration. (PLASTICS ENGINEERING, (MAY 1992), 48, (5), pp. 8 [in English]. ISSN 0091-9578)

3303 CADMIUM GETTING A FAIRER HEARING? [BIB-199207-P4-0036]

EC legislators in Brussels are in the final stages of legislating on the use of Cd pigments in industry. The EC directive has now been published. The bad news, according to reports from the Cadmium Association, is that the Brussels regulators have chosen to ignore the growing weight of evidence that confirms the minimal environmental impact of these additives and their complete safety during both incorporation into polymers and use in products. However, it is noted that the directive does recognise the technical and economic constraints on the use of alternative colourants. The processing temperatures to which colourants, particularly in many engineering thermoplastics, are subjected have limited the introduction of Cd-free colourants. As a result, the directive permits continuing use of Cd pigments in various polymers, and it has delayed implementing the restrictions for many others until December 1995. (PLASTICS AND RUBBER WEEKLY, (23 MAY 1992), (1436), pp. 13 [in English]. ISSN 0032-1168)

3304 MEDICAL IMPLANTS FACE NEW SCRUTINY. [BIB-199207-P6-0126]

Makers of plastic medical implants can expect greater scrutiny of whether their materials migrate through the body, according to an official of Dow Corning Corp., which stopped making breast implants recently. On 17 March, Dow Corning announced it was exiting the market for silicone-gel breast implants, and said it would establish a $10 million fund for ongoing research and to help women in financial need pay to have the implants removed. All medical implants, including those made from polyethylene, Teflon, and other plastic materials, are coming under close scrutiny by the US public, scientists and government regulators. The Food and Drug Administration is reviewing the safety of other implants. Breast implants had not been required to undergo rigorous safety tests because they were on the market before 1976, when the FDA first began reviewing the safety of new medical devices. (Bregar, B.; PLASTICS NEWS (DETROIT), (11 MAY 1992), 4, (11), pp. 1, 5 [in English]. ISSN 1042-802X)

3305 BUSH BACKS MINOR EMISSIONS CHANGE. [BIB-199207-S4-0060]

Despite objections from the US Environmental Protection Agency, President Bush late last week decided to allow industrial facilities to make small emissions changes under the Clean Air Act Amendments of 1990 without public notice or review. Some 34 000 industrial plants, including steel mills, smelters and other metals facilities, will be required to apply for the permits to set and report their air emissions. Instead of a compromise with EPA over a 45-day review and public notice process President Bush allows industry to increase emissions as long as state authorities did not object within seven day of notification. (Abrahamson, P.; AMERICAN METAL MARKET, (19 MAY 1992), 100, (97), pp. 2, 16 [in English]. ISSN 0002-9998)

3306 SIX SIGMA SAFETY EFFORT IN A RESTRUCTURED DECENTRALIZED ALUMINUM COMPANY. [BIB-199208-G4-0047]

The presentation focuses in on those occupational health, safety (and associated product liability issues) facing the small independent in the 1990s. The presentation provides an overview of the most critical issues (both US and international), the reasons for their existence, their legal underpinnings, a proposed strategy to deal with the issues head-on and a review of cost-effective resources. (Laszcz-Davis, C.; 5TH INTERNATIONAL ALUMINUM EXTRUSION TECHNOLOGY SEMINAR, COMMITMENT TO EXCELLENCE. VOL. I, 19-22 MAY 1992, Publisher: THE ALUMINUM ASSOCIATION, ALUMINUM EXTRUDERS COUNCIL, 900 19th St. N.W., Washington, D.C. 20006, USA, (1992), pp. 427-428 [in English].)

3307 DOE RUN CUTS LEAD EMISSIONS. [BIB-199208-G4-0049]

Doe Run Co. reduced emissions of Pb into the air by 20% last year and has begun to replace Pb-contaminated soil in yards of residents who live near its Herculaneum, Missouri, USA, smelter. Those were two of the achievements the Pb producer pointed to in its annual environmental progress report for 1991. The company said average airborne Pb emissions from its operations fell to 0.7 $\mu g/m^3$ of air from between 0.8-0.9 μg in 1990. (AMERICAN METAL MARKET, (16 JUNE 1992), 100, (116), pp. 3 [in English]. ISSN 0002-9998)

3308 BATTLE MOUNTAIN, GALACTIC RESOURCES HIT WITH $180 000 IN FINES. [BIB-199208-G4-0050]

Fines totaling nearly $180 000 were levied against two Colorado, USA, heap leach mines for environmental reasons involving cyanide. In Costilla County, in the southeastern part of the state, Battle Mountain Gold Co. was fined $168 000 for allowing excessive amounts of cyanide concentrations in the tailings ponds at the company's San Luis Mine. In southwestern Colorado, Galactic Resources Ltd.'s Summitville Consolidated Mining Co. was fined $10 600 for two cyanide leaks that occurred last fall. (MINING ENGINEERING (COLORADO), (JUNE 1992), 44, (6), pp. 529 [in English]. ISSN 0026-5187)

3309 OHIO BILL TO HAVE LITTLE EFFECT ON PROCESSORS. [BIB-199208-P4-0038]

The coalition formed to defeat Ohio's chemical right-to-know initiative plans to attack the proposal as having little environmental benefit, possibly at great cost to the plastics industry, including processors. Reportedly, processors whose operations may emit trace amounts of some of the listed chemicals, like vinyl chloride monomer in PVC resin, probably would not be affected. The initiative would require Ohio businesses with ten or more employees to provide warnings on products that contain any of 458 chemicals known to cause cancer, birth defects, or other reproductive disorders. (Loepp, D.; PLASTICS NEWS (DETROIT), (29 JUNE 1992), 4, (18), pp. 3 [in English]. ISSN 1042-802X)

3310 ACGIH REVIEWS STATUS OF TWO CHEMICALS. [BIB-199208-P4-0039]

Epichlorohydrin and vinyl acetate, two chemicals vital to the plastics industry, have recently come under review by the American Conference of Government Industrial Hygienists, Inc. (ACGIH). The ACGIH is an independent organization whose guidelines are considered by many countries, including the US, when establishing regulatory standards. In a decision announced in April, ACGIH's Chemical Substances TLV Committee said it will recommend that a regulation requiring a twenty-fold decrease in worker exposure levels for epichlorohydrin be delayed and that the toxicity classification of vinyl acetate be revised. The recommendations, supported by SPI, must be voted for adoption by the ACGIH membership. (PLASTICS ENGINEERING, (JUNE 1992), 48, (6), pp. 6 [in English]. ISSN 0091-9578)

3311 OCCUPATIONAL EXPOSURE TO METHYLENE CHLORIDE; PROPOSED RULEMAKING (57 FR 24438). [BIB-199208-P4-0040]

This notice schedules informal US public hearings concerning OSHA's (Occupational Safety & Health Administration) proposal (56 FR 57036) to modify the existing provisions for controlling employee exposure to methylene chloride. The Agency requests that interested parties present testimony and evidence regarding the issues raised by the proposed standard and by this hearing notice. In addition, this notice reopens the rulemaking record so OSHA can receive additional comments regarding the proposed rule. The hearings are scheduled for 16 September 1992 in Washington, D.C. and 14 October 1992 in San Francisco, California. (CAPITOL COMPOSITE, (30 JUNE 1992), pp. 1 [in English].)

3312 INCREASINGLY IT'S NOT WHAT YOU SELL, BUT HOW YOU SELL IT. [BIB-199208-P7-0223]

Customer service today is as important as material properties, price and other traditional considerations. One sign of the times: the Plastics Division of Monsanto Co, St. Louis, Missouri, USA, is now assisting medical device manufacturers in the testing of its tradenamed Lustran ABS resins for compliance with the Tripartite Biocompatibility Guidance for Medical Devices. This pact was signed in 1986 by the US Food and Drug Administration and its counterparts in Canada and the UK. It aims to create in these countries a common approach to toxicity testing for materials used in medical devices. The agreement places the burden on device manufacturers to show their goods are safe for use as intended. Although material suppliers are not assigned any specific responsibility under the agreement, Monsanto is forming partnerships with select medical

customers to help with the testing of its engineered thermoplastics. (PLASTICS WEEK, (29 JUNE 1992), pp. 2 [in English]. ISSN 1044-9663)

3313 HOW TO PROTECT WELDERS WORKING IN CLOSE SPACES. [BIB-199209-G4-0051]

Confined space welding requires trained workers wearing respirators and other protective clothing. Dangers come from lack of oxygen and accumulation of flammable, explosive, and toxic gases. Training should cover emergency entry and exit procedures, use of respiratory equipment, first aid and cardiopulmonary resuscitation, lockout procedures to deactivate dangerous equipment, use of safety equipment, rescue drills, fire protection, and communications between people working in the confined space and outside supervisors. (Weymueller, C.R.; WELDING DESIGN AND FABRICATION, (AUG. 1992), 65, (8), pp. 30-32 [in English]. ISSN 0043-2253)

3314 INDUSTRIAL SAFETY IN METAL TRADE. (ARBEITSICHERHEIT IM METALLHANDEL.) [BIB-199209-G4-0053]

An analysis is made of accident rates in the nonferrous metal trade business as compared with the general wholesale trade and warehousing business over the period 1970-1990. The average annual accident rate for the nonferrous metal trade has been greater over this period relative to the other businesses studied. A breakdown of the accidents in metal trade indicates that 82% have occurred in the areas of storage, transshipment and transportation, 13% in the areas of metal treatment, installation and workshops, and 5% in offices and sales activities. These statistics are discussed in regard to cause and cyclicality. Changes in materials handling equipment aimed at reducing accidents are described. Worker safety regulations that will be enforced by the EEC in 1993 are reviewed. (Biermann, J.; Bodmer, R.; METALL, (FEB. 1992), 46, (2), pp. 176-179 [in German]. ISSN 0026-0746)

3315 ENVIRONMENTAL (MAINLY GOOD) NEWS ON COBALT. [BIB-199209-G4-0054]

New legislation and proposals now pending on cobalt are reviewed. In the case of the European Inventory of Existing Substances, Co and CoO, Co_3O_4, and Co_2O_3 remain on the pragmatic list pending submission of data which is being prepared by the Cobalt Development Institute (CDI) together with their ecotoxicity tests. The CDI is also finalizing details for the EEC Material Safety Data Sheets for Co and cobalt oxide. There is good news concerning the Sevesco Directive on the risk of major accidents in industry, as the latest draft eliminates Co and its compounds. The Basle Convention on transporting hazardous waste, proposes that the less harmful wastes would be on a green list, and Co comes into this category if in non-dispersible form. The UK Health and Safety Toxic Review has been completed and a maximum exposure level is proposed for Co. (COBALT NEWS, (APR. 1992), (2), pp. 8 [in English].)

3316 EPA ASKED TO ERASE ZINC FROM ITS LIST OF TOXIC CONSTITUENTS. [BIB-199209-G4-0057]

The Environmental Protection Agency should remove Zn from the list of hazardous constituents recently proposed as part of a new hazardous identification rule, Zn producers and consumers told an EPA hearing. The Zn association, along with Carboline Co., a St. Louis-based manufacturer of Zn-rich paints, and Godfrey Science & Design Inc., Hunting Valley, Pennsylvania, USA, which holds the patent for a new Zn lozenge, told the EPA Zn is conspicuously misplaced on the proposed list. (Gannon, V.; AMERICAN METAL MARKET, (10 JULY 1992), 100, (133), pp. 2, 8 [in English]. ISSN 0002-9998)

3317 THE ENVIRONMENTAL IMPLICATIONS FOR LEAD PRODUCTION AND USES IN THE 1990S. (DER UMWELTSCHUTZ UND SEINE FOLGEN FUR PRODUKTION UND VERBRAUCH VON BLEI IN DEN 1990 JAHREN.) [BIB-199209-G8-1002]

Changes in the world markets for Pb for the period 1970-1990 show significant declines in the areas of sheet, shot, tube, cable, alloys and supplementary applications. These trends have been dictated by OECD strategic documents relating to risk reduction for Pb and EPA regulations. However, the use of Pb in the production of glass, enamels and plastic stablizers during 1970-1990 has increased from 360 000 to 630 000 tons. At the same time, the outlook for Pb usage in batteries is quite positive, especially considering the future potential of electric powered automobiles. Environmentally friendly applications of Pb include radiation shielding. A huge potential future market for Pb sheet in radon shielding of construction foundations is discussed. Increased levels of Pb recycling and new smelting processes all contribute to lowering the level of pollution associated with Pb production. (Cooper, A.; METALL, (FEB. 1992), 46, (2), pp. 163-165 [in German]. ISSN 0026-0746)

3318 COURT REJECTS BROAD OSHA EXPOSURE LIMITS. [BIB-199209-P4-0042]

Plastics industry representatives in the US are claiming victory after a federal appeals court rejected broad government toxic-chemical workplace exposure limits that affected two plastics-related chemicals. The 11th Circuit Court of Appeals, Atlanta, Georgia, USA, on 7 July threw out Occupational Safety and Health Administration limits on ethylene dichloride, styrene and 426 other chemicals, saying that the approach used in setting general limits on those chemicals was irreparably flawed. OSHA claims that determining safe limits on each chemical through separate rulemaking proceedings would take too much time. The air-contamination limits issued in 1989 had lowered the worker exposure limits on ethylene dichloride, a chemical used in making PVC resin, from 50 to 1 ppm/8 h day. The plastics industry generally had followed a 10 ppm recommendation from the American Conference of Governmental Industrial Hygienists. (Gardner, J.; PLASTICS NEWS (DETROIT), (20 JULY 1992), 4, (21), pp. 19 [in English]. ISSN 1042-802X)

3319 OHIO RIGHT-TO-KNOW PROPOSAL UNDER FIRE. [BIB-199209-P4-0046]

A proposed right-to-know law in Ohio, USA, has rallied the plastics industry there to band together in an effort to defeat the plan. More than 100 processors and chemical company representatives calling themselves Ohioans for Responsible Health Information (ORHI) say that federal and state laws already exist for the control of toxic emissions and the Ohio statue would be superfluous. Under the terms of the initiative, which will be on the 3 November 1992 ballot and is said to be favored by 80% of the state's voters, businesses using one or more chemicals the Ohio EPA designates as carcinogens or reproductive toxicants must label the products and mail exposure warnings to the public. Modeled after California's five-year-old Proposition 65, the Ohio law is expected to initially list 500 chemicals requiring a warning. Among the chemicals affecting plastics are vinyl chloride monomer, heavy metals and toluene diisocyanate. (Monks, R.; PLASTICS TECHNOLOGY, (AUG. 1992), 38, (9), pp. 73 [in English]. ISSN 0032-1257)

3320 CFC "DEATH KNELL" SOUNDS. [BIB-199209-P4-0049]

George Mann & Co. Inc. is introducing a process which it claims could eliminate the use of solvents in the application of release agents. The accelerated phase-out of CFCs was approved by the US Senate on 6 February 1992. This decision means the end for the use of Cl-based mould release agents, but will ultimately benefit the polyurethane industry, according to the company, which says that moulders forced to switch to water-based systems will discover a range of positive features, including: health and environmental benefits; elimination of expensive ventilation systems and evaporation problems with solvent system; reduction of paperwork and hazardous waste fees; and in some US stases, reduced taxation. An intangible benefit noted is the improved morale among shopfloor workers following the reduction in use of flammable solvents and hazardous fumes. (URETHANES TECHNOLOGY, (JUNE-JULY 1992), 9, (3), pp. 18 [in English]. ISSN 0265-637X)

3321 HOW TO PREVENT INJURIES FROM REPETITIVE MOTION. [BIB-199209-S4-0069]

Repetitive-motion injuries make up more than one-half of all workplace injuries, according to the US Department of Labor. Welders are especially at risk of developing these injuries when working in awkward positions for long periods of time. Ergonomic design fits the workplace to the worker to reduce muscle strain, fatigue, and injury that result from repetitive movements. (WELDING DESIGN AND FABRICATION, (AUG. 1992), 65, (8), pp. 35-37 [in English]. ISSN 0043-2253)

3322 TOXIC EXPOSURE LIMITS UP IN AIR AFTER RULING. [BIB-199209-S4-0071]

The steel industry gave a collective sigh of relief when a federal appeals court threw out toxic exposure limits for 428 substances, scores of which would have

applied to blast furnaces, basic oxygen furnaces, electric furnaces and steelmaking processes. The court invalidated the air contaminants standard, holding the OSHA failed to prove existing exposure limits presented a serious risk and that the agency did not meet its burden of establishing that the new limits were economically or technologically feasible. The court also ruled that the permissible exposure limit for each of the 428 substances must be supported by substantial evidence. (Gannon, V.; AMERICAN METAL MARKET, (14 JULY 1992), 100, (135), pp. 4 [in English]. ISSN 0002-9998)

3323 POLLUTION THREAT TO US SMELTERS. [BIB-199211-G4-0072]

A study by the Metals and Minerals Research Services consultancy indicates that many base metals producers in the US and Europe would be unable to meet proposed tighter pollution regulations. The US mining and metals industry is under the most pressure because of the large resources available to US environmental groups. In the US, only RTZ Corporation's proposed new Cu smelter at Bingham Canyon mine and Cyprus Minerals new furnace at Miami, Arizona could meet the stringent standards. The American Mining Congress is fighting the legislation. (Gooding, K.; FINANCIAL TIMES, (25 AUG. 1992), pp. 22 [in English].)

3324 COURT VOIDS OSHA REGS FOR CHEMICAL EXPOSURE. [BIB-199211-P4-0068]

More than 400 chemicals, many of which are used by the US plastics industry, are affected by the Eleventh Circuit Court of Appeals' decision to void the occupational exposure standards established by the US Occupational Safety and Health Administration (OSHA). The court determined that OSHA used a flawed approach when it did not document health risks for each of the listed chemicals. OSHA must now evaluate each of the listed chemicals individually and not rely on generic information to determine permissible exposure limits. According to the ruling, each limit must be supported by recorded evidence and accompanied by a sufficient explanation. If OSHA does not appeal the court's decision and the ruling stands, the exposure limits contained in material safety data sheets will be in question. Industry then would be unsure how to maintain the data sheets as required by OSHA. (PLASTICS ENGINEERING, (SEPT. 1992), 48, (9), pp. 6 [in English]. ISSN 0091-9578)

3325 EPA SEES NO PROBLEM WITH CFC SUBSTITUTE. [BIB-199211-P4-0069]

The US EPA says it believes human safety is not jeopardized by exposure to hydrofluorocarbon-134a (HFC-134a, CH_2FCF_3), the CFC substitute that was recently found to induce benign testicular tumors in rats exposed to massive concentrations. Under the 1990 Clean Air Act's safe-alternatives policy, the agency must weigh both the environmental and health effects of compounds that are replacing CFCs. The Clean Air Act requires the regulations prohibiting or controlling the use of various CFC substitutes be finalized by 15 November 1992, but EPA hasn't even proposed them yet. (CHEMICAL AND ENGINEERING NEWS, (28 SEPT. 1992), 70, (39), pp. 35 [in English]. ISSN 0009-2347)

3326 TROUBLE AT T'MILL. [BIB-199211-S4-0081]

Retired steel workers who depend on oxygen bottles to breathe are the worst cases of lung disease Naomi Brent has seen in Sheffield. But they are not alone in blaming breathing problems on their former occupation. For 16 years Brent and her colleagues at the Sheffield Occupational Health Project (SOHP) have been gathering evidence which they believe links the dust and fumes of a steel mill to the destruction of the fine air passages in steel workers' lungs. One study by the SOHP found breathing problems to be six times more common among 500 former steelworkers than in a group of 260 retired men from the white collar Nalgo union. But there has been little other research into incidences of non-fatal disease in the industry. But all that is about to change. In one of the biggest occupational health studies of its kind, British Steel hopes to conclusively determine whether steel workers suffer more cardiovascular problems than they should. The information will be analysed by the Institute of Occupational Medicine, Edinburgh, UK, for incidences of breathing problems ro hardening of the arteries, a cause of heart attacks and strokes. (Baum, R.; ENGINEER, (20-27 AUG. 1992), 275, (7113-7114), pp. 21 [in English]. ISSN 0013-7758)

3327 CLEAN AIR ACT VIOLATORS FINED. [BIB-199211-S4-0090]

USS/Kobe Steel Co., Lorain, Ohio, USA, will pay a $500 000 civil penalty for Clean Air Act violations, according to a proposed consent decree filed recently in a federal court in Ohio by the Environmental Protection Agency and the US Justice Department. In another recent action, the Environmental Protection Agency fined Monessen Inc., a wholly owned subsidiary of Sharon Steel Corp., Farrell, Pennsylvania, $300 000 for violations of benzene emission regulations. Monessen operates a coke byproduct recovery plant in Monessen, Pennsylvania. Also, the EPA entered into a proposed consent decree with Amsted Industries Inc., Chicago, to settle charges that operations at the company's electric-arc furnace and foundry violated the Resource Conservation and Recovery Act. (Gannon, V.; AMERICAN METAL MARKET, (1 OCT. 1992), 100, (191), pp. 12 [in English]. ISSN 0002-9998)

3328 NON-FERROUS METALS: NEW REGULATIONS IN THE UK AND CRITERIA FOR INCREASED RECYCLING. [BIB-199210-G4-0059]

The environmental revolution is now just 20 years old. During this period thinking and action in the UK have undergone their own revolution under the separate pressures of scientific and technological developments, public concerns and political responses. These influences have led to the Environment Protection Act, 1990. The first part of this paper reviews, from an industrial standpoint, the likely impact of this major act. The second part deals with some specific issues for non-ferrous metals, particularly the urgent need to increase recycling and some of the criteria which are judged necessary for this to happen. (Barbour, A.K.; INTERNATIONAL JOURNAL OF MATERIALS AND PRODUCT TECHNOLOGY, (1992), 7, (2), pp. 179-192 [in English]. ISSN 0268-1900)

3329 HEALTH ASPECTS OF NICKEL—IMPACTS ON PRODUCTION AND USE OF NICKEL CONTAINING PRODUCTS. (GESUNDHEITLICHE ASPEKTE BEI NICKEL—AUSWIRKUNGEN AUF DIE ERZEUGUNG UND VERWENDUNG NICKELHALTIGER PRODUKTE.) [BIB-199210-G4-0065]

A review is made of the biological activity of Ni and Ni compounds in relation to potential health hazards in the production and use of Ni and Ni-containing alloys and products. The two main Ni health issues are carcenogenicity and dermatitis. References to these issues date back to 1889. Current hazards classifications in the EEC and Germany for Ni and its oxides, sulfides and other compounds are tabulated. Due to the contact allergy potential posed by Ni, German worker skin exposure standards have been reduced to 0.5 m/cm^2 /wk in December 1991. The cancer risk for workers in Ni mining and in Cu—Ni sulfide matte processing industries has been considered in German air quality standards. (Grimme, D.; Hupfer, P.; METALL, (APR. 1992), 46, (4), pp. 365-369 [in German]. ISSN 0026-0746)

3330 BECU IS SAFE TO MACHINE. [BIB-199210-G4-0068]

Brush Wellman recently funded an investigation to determine exposure levels of airborne beryllium in Be—Cu mold-making operations. Specific operations investigated because of their potential for dust generation were milling, turning, hand grinding, sanding, lapping, and polishing. Except for one air sample at the six sites in the Foley study, all were 33% of recommended maximums. The exception, 96%, was at an operation that did not use any control to reduce or eliminate airborne Be. Of the operations sampled using at least one control measure, the greatest exposure documented was 7% of permissible exposure level. Where multiple controls were used, the greatest exposure level was 6%. (AMERICAN MACHINIST, (SEPT. 1992), 136, (9), pp. 20, 22 [in English]. ISSN 0002-9858)

3331 INHALED FIBERGLASS IS NOT A CAUSE OF LUNG CANCER. [BIB-199210-C4-0002]

Preliminary findings from scientific studies conducted at Research and Consulting Co., Switzerland, indicate that fiberglass does not cause lung cancer. Schuller International, Inc., says it will work actively with the fiberglass industry to seek an immediate reclassification of respirable fiberglass products at International

Agency for Research on Cancer and appropriate US agencies to that of a noncarcinogen. The multimillion dollar industry-funded study, involving 1000 laboratory rats, began in 1989 as part of an overall five-year scientific program to evaluate fiberglass and health. Specially sized rat-respirable fine-diameter fiberglass in formulations representing 90% of the fiberglass wool products manufactured in the US were tested. Exposures ranged 1000 times the typical exposure of occupationally exposed workers for the full two-year lifetime of the animals. (AMERICAN CERAMIC SOCIETY BULLETIN, (SEPT. 1992), 71, (9), pp. 1374 [in English]. ISSN 0002-7812)

3332 EPA WAITS FOR INDUSTRY STUDIES TO DECIDE IF STYRENE MONOMER IS CARCINOGENIC. [BIB-199210-P4-0050]

The ten billion lb US styrene industry is facing a powerful linguistic threat: the word cancer. The US Environmental Protection Agency (EPA) is considering classifying the styrene monomer as a carcinogen, and polystyrene processors are putting together a public information campaign to dispel any fallout. The EPA's Risk Assessment Forum recommended in April, 1991 that styrene (six billion lb are used each year in the manufacture of polystyrene and expanded polystyrene) be classified a Class C carcinogen, indicating the monomer possibly causes cancer. Some in the agency wanted styrene classified in the B category, indicating it probably causes cancer. The recommendation followed intense debate within the agency, reflecting similar divisions in the scientific community. The EPA has not yet issued a final ruling. (PLASTICS & ENVIRONMENT, (4 SEPT. 1992), pp. 1, 4 [in English].)

3333 NEW UK GUIDE TO HEALTH SAFETY AND ENVIRONMENT. [BIB-199210-P4-0054]

Aiming to add credibility to Responsible Care, the UK Chemical Industries Association, CIA; London, has drawn up guidelines for ISO 9001 certification of health, safety, and environmental management systems. The document will also help companies meet the requirements of the British Standards Institute's, BSI; Milton Keynes, new environmental management standard, BS 7750, and the European Commission's Brussels, proposed eco-audit regulation, which will require participating companies to have environmental management systems based on the ISO 9000 quality standard. Six CIA members are conducting pilot management systems for Responsible Care certification, and eight for BS 7750. (Chynoweth, E.; CHEMICAL WEEK, (16 SEPT. 1992), 151, (10), pp. 18 [in English]. ISSN 0009-272X)

3334 OSHA REDUCES CADMIUM EXPOSURE LIMIT. [BIB-199210-P4-0055]

The Occupational Safety and Health Administration has reduced by 95% the workplace exposure limit for Cd, a heavy metal used as a pigment and plastics stabilizer. The new rule allows a permissible exposure limit of five micrograms of Dc/m^2 of air/eight-hour day. It does not make a distinction between exposure to dust or fumes. But two plastics-related processes, pigment manufacturing and plastics stabilizers, will qualify for special rules that will allow employers to reduce Cd to a maximum of 50 mg/m^2 sure limits then must be reached through respiratory protection. Previous limits on Cd exposure were 100 mg/m^2 for Cd dust. Cadmium poses a threat to worker health because it is believed to cause lung cancer and kidney damage. (PLASTICS NEWS (DETROIT), (7 SEPT. 1992), 4, (28), pp. 2 [in English]. ISSN 1042-802X)

3335 JAPAN BANS USE OF COSMETIC SILICONE GEL BREAST IMPLANTS. [BIB-199210-P4-0058]

Following the withdrawal from the US market for silicone gel breast implants by US manufacturer Dow Corning Corp, Japan's Health and Welfare Ministry has banned such implants for cosmetic purposes from the domestic market. Dow Corning was the only exporter of the implants to Japan. The company stopped making and selling the implants in January 1992 after the US Food and Drug Administration placed a moratorium on silicone implant sales because of increasing concern about the product's safety. Since 1979, when the use of silicone breast implants was first approved in Japan, approx 20 000 implant procedures have been carried out. While implants will no longer be generally available to the public, there may be some special cases in which women will be able to receive the implants already in stock. (BIOMEDICAL MATERIALS, (AUG. 1992), pp. 7 [in English]. ISSN 0955-7717)

3336 ILLINOIS REMOVES STYRENE FROM LIST OF TOXICS. [BIB-199210-P4-0061]

The Illinois Pollution Control Board in the US, has removed styrene from a list of 264 toxic air contaminants because a regulatory oversight committee in the Legislature threatened to file objections. Legislators said the pollution control board had not addressed adequately the objections of the Styrene Information and Research Centre, an arm of the Society of the Plastics Industry Inc., Washington. the center said existing scientific evidence does not warrant classifying styrene as a carcinogen. (PLASTICS NEWS (DETROIT), (31 AUG. 1992), 4, (27), pp. 7 [in English]. ISSN 1042-802X)

3337 PS INDUSTRY HAS CUT HAZARDOUS WASTE. [BIB-199210-P4-0062]

Hazardous waste generation from styrene monomer production, PS resin manufacture and PS processing in the US declined from nearly 1.1 million tons in 1984 to 614 223 tons in 1990, according to the study prepared by Franklin Associates Ltd, a Prairie Village, Kansas, environmental consulting firm. that decrease came at the same time as overall generation of hazardous waste in the US decreased from nearly 216.5 million tons to 185.5 million tons. While hazardous waste generation mounted to as high as 1.3 million tons in 1988, the PS industry was responsible for 0.66% of the nations production of hazardous waste in any single year. The study, originally intended to rebut an often-cited 1986 Environmental Protection Agency report that indicated that the PS industry was the fifth-largest generator of hazardous waste in the country, now could help the EPA shape hazardous waste regulations for the polystyrene industry. (Gardner, J.; PLASTICS NEWS (DETROIT), (31 AUG. 1992), 4, (27), pp. 4 [in English]. ISSN 1042-802X)

3338 SAFETY AND HEALTH IN THE WORKPLACE: THEN AND NOW. [BIB-199210-S4-0077]

Concern for workers' safety and health, once nonexistent in the US, hs become a major factor in the way foundries do business. One of the hidden economic benefits of focusing on worker safety and health is a reduction in worker's compensation costs. At Pennsylvania Steel Foundry & Machine Co., Hamburg, Pennsylvania, the company cut their worker's compensation losses from $615 000 in 1990 to $50 000 in 1991 through the implementation of a safety incentive program. The program consisted of financial incentives and some techniques borrowed from Standard Register Co., Dayton, Ohio. (Smith, V.D.; FOUNDRY MANAGEMENT AND TECHNOLOGY, (SEPT. 1992), 120, (9), pp. 162-166 [in English]. ISSN 0360-8999)

3339 TWO PENNSYLVANIA METAL COMPANIES HIT BY EPA ACTION. [BIB-199210-S4-0078]

As part of nationwide efforts to crack down on environmental violations by a variety of industries, the US Environmental Protection Agency filed a lawsuit against Cressona Aluminum Co., that seeks civil penalties and a court order requiring the clean-up of polychlorinated biphenyls (PCBs) at the company's 115 acre Al extrusion facility, which it purchased from Aluminium Co. of America in 1979. Similarly, the agency also filed suit against Bethlehem Steel Corp., for not meeting a deadline to install benzene emissions equipment at coke by-products plants in Bethlehem and Sparrows Point, Maryland, USA. (Scolieri, P.; AMERICAN METAL MARKET, (14 SEPT. 1992), 100, (178), pp. 2, 8 [in English]. ISSN 0002-9998)

3340 ECOBALANCES—FROM THE LIST OF HARMFUL SUBSTANCES, NOW BEING CONSIDERED FOR USE. (OKOBILANZEN—VON DER SCHADSTOFFLISTE ZUR NUTZENBETRACHTUNG.) [BIB-199212-G4-0076]

The current status of Ecobalances in product and process selection and minimizing of harmful substances is discussed. Concepts of environmental relevance, totality balancing or life-cycle-assessment are mentioned. Energy conservation is today a primary step of ecobalancing. Examples are given, i.e. aseptic packaging of fresh food without cooling, energy saving by lighter transport made

of Al cans rather than glass bottles, etc. (Minet, G. W.; ALUMINIUM, (MAY 1992), 68, (5), pp. 364-366 [in German]. ISSN 0002-6689)

3341 A TAX ON PRIMARY LEAD PRODUCTION? [BIB-199212-G4-0077]

Since Pb can be hazardous to human health and the environment, the US Congress and the Environmental Protection Agency (EPA) have been considering several approaches aimed at reducing the amount of Pb in the environment and society's exposure to Pb, in particular, Pb-based paint used in residential housing. (Biviano, M.B.; Owens, J.F.; MINERALS TODAY, (OCT. 1992), pp. 6-10 [in English].)

3342 ZINC AND ENVIRONMENTAL ISSUES. [BIB-199212-G4-0079]

A speech is presented by Mr. George Vary to the Washington chapter of the American Institute of Mining, Metallurgical and Petroleum Engineers on Zn and environmental issues. The speech reviews how amendments were secured to protect Zn, Zn-rich paint and galvanizing from punitive legislation and efforts to keep Zn off a proposed EPA list of hazardous constituents. This short speech gives an excellent overview of Zn legislative issues and the regulatory initiatives affecting this important base metal. (Vary, G.F.; Publisher: AMERICAN ZINC ASSOCIATION, 112 Sixteenth St., N.W., Suite 240 Washington, DC 20036, USA, (14 OCT. 1992), Pp 14 [in English].)

3343 US CADMIUM RULES TAKE EFFECT. [BIB-199212-G4-0080]

Safety rules of the US Labor Department's Occupational Safety and Health Administration, soon to be effective, will limit Cd dust or fume levels to an average of 5 μg of Cd/m^3 of air over an 8 h period, as compared with present levels of 200 and 100 ug, respectively. Zn/Cd refining, Ni/Cd battery manufacturing, and four other designated industries will be allowed to reduce the exposure levels in workplaces to 50 and 15 μg. The 5 μg level is said to be the most restrictive worldwide. (METAL BULLETIN, (3 SEPT. 1992), (7711), pp. 11 [in English]. ISSN 0026-0533)

3344 MANAGEMENT OF EC REGULATIONS IS SET DOWN. [BIB-199212-P4-0072]

Regulations to implement the EC Framework directive on the introduction of measures to improve the health and safety of workers were laid before the British Parliament recently. The Management of Health and Safety at Work Regulations 1992, previously in draft form, will come into force on 1 January 1993. The new regulations are the first in a series to implement six EC directives. The aim is to set out broad general duties which apply to almost all work activities to improve health and safety management. They make more explicit what is required of employers under the Health and Safety at Work Act. (PLASTICS AND RUBBER WEEKLY, (10 OCT. 1992), (1456), pp. 7 [in English]. ISSN 0032-1168)

3345 CADMIUM RULING IRKS PIGMENT MAKERS. [BIB-199212-P4-0074]

Angered by what it sees as the US Occupational Safety and Health Administration's disregard for chemical differences between Cd-based pigments and other Cd compounds, the Dry Color Manufacturers' Association, Alexandria, Virginia, has filed an appeal of OSHA's recent 95% reduction in the allowable workplace exposure to the heavy metal. DCMA asked the US Court of Appeals for the Fourth Circuit in Richmond, Virginia, to review OSHA's ruling, passed on 31 August and published in the Federal Register on 14 September. OSHA issued long-awaited workplace standards for Cd, which is used in pigments and vinyl heat stabilizers. Under the new standards, permissible exposure levels during an 8 h day have been lowered from the former 200 $\mu g/m^3$ of air for Cd dust and 100 $\mu g/m^3$ for Cd fumes to 5 $\mu g/m^3$ for either. (Monks, R.; PLASTICS TECHNOLOGY, (NOV. 1992), 38, (12), pp. 78 [in English]. ISSN 0032-1257)

3346 GREEN PRESSURES FORCE PVC TO TAKE LCA LEAD IN EUROPE. [BIB-199212-P4-0075]

Because it contains 50% Cl—number one on Greenpeace's chemicals hit list—and because of an alleged link between the polymer and dioxin formation during manufacture and incineration, and its use in food packaging, developing a methodology for life cycle analysis (LCA) of PVC has become a major focus for work in Europe. European PVC producers—including European Vinyls Corp. (EVC) Brussels; Solvay, Brussels; Elf Atochem, Paris; and Norsk Hydro, Oslo—have all carried out LCAs on PVC. Norsk Hydro has taken lead by publishing PVC and the Environment, a 220 page book that includes a full LCA of PVC. The book is designed to be easily understandable for nonscientists, while still containing a substantial amount of detailed research. (Chynoweth, E.; Roberts, M.; CHEMICAL WEEK, (18 NOV. 1992), 151, (20), pp. 41-42 [in English]. ISSN 0009-272X)

3347 VOTERS REJECT ENVIRONMENTAL INITIATIVES. [BIB-199212-P4-0077]

Voters in two US states on Election Day rejected ballot initiatives that plastics industry groups opposed, but Americans elected a president who says he wants strong recycling laws. Voters in Ohio overwhelmingly rejected a toxic-chemical labeling law that would have required plastics processors and other users of 458 chemicals known to cause cancer or birth defects to label their products and notify residents near their plants about the chemicals. The Society of the Plastics Industry Inc., Washington, joined a coalition of business and community organizations that waged a $2.7 million campaign to frame the Ohio vote as a choice between jobs and the environment. In Massachusetts, voters rejected a measure to require recycling, reuse, source reduction or recyled content in packaging. That measure also was the subject of a $5 million multi-industry opposition campaign that was joined by SPI's environmental arm, the American Plastics Council. (Gardner, J.; PLASTICS NEWS (DETROIT), (9 NOV. 1992), 4, (37), pp. 1, 22 [in English]. ISSN 1042-802X)

3348 EPA RELEASES FIRST MAJOR AIR TOXIC RULES UNDER CLEAN AIR ACT. [BIB-199212-P4-0078]

The US Environmental Protection Agency (EPA) is taking aim at the synthetic organic chemical manufacturing industry, which supplies plastics with basic petrochemicals and many monomers. The agency released the first proposed air toxic rules under the 1990 Clean Air Act Amendments, expected to reduce emissions from the chemical industry by approx 80% or 522 500 tons/year. The reductions will cost industry $182 million/year to implement, added on to an initial $347 million capital outlay. If passed along to customers, this would mean close to a 3% price hike. Of the 189 air toxics listed in the 1990 amendments, 149 are covered in the new proposed regulations. They are being emitted by approx 370 chemical manufacturing plants nationwide, although most are in highly populated areas of Texas, New Jersey, and Louisiana. (PLAST. ENVIRON., (13 NOV. 1992), pp. 5 [in English].)

3349 US HITS CF&I FOR ROEBLING CLEANUP. [BIB-199212-S4-0096]

The US Environmental Protection Agency and Department of Justice have asked a bankruptcy court to approve a $27 million settlement with CF&I Steel Corp. and its subsidiaries for cleanup costs associated with the Roebling Steel Superfund Site in Roebling, New Jersey. Total cleanup costs are expected to reach $100 million. The 250 acre site is contaminated with polychlorinated biphenyls, baghouse dust, chemical piles, lead-contaminated soil and slag piles. Under the terms of the proposed settlement, EPA would receive $27 098 870 in CF&I stock to reimburse the agency for a $4 million emergency waste removal action completed in 1988 and to pay for future cleanup activities. (Gannon, V.; AMERICAN METAL MARKET, (16 OCT. 1992), 100, (202), pp. 1 [in English]. ISSN 0002-9998)

3350 THE SAFETY EXPLOSION. [BIB-199212-S4-0099]

Much new legislation has been introduced in the field of Health & Safety in recent years and more is to follow. The author believes that the majority of steel stockholders do not comply with their legal obligations. This article is intended to help clarify what is required of employers and to provide some pointers for self-help in returning to the straight and narrow. (Collier, J.; STEEL TIMES, (OCT. 1992), 220, (10), pp. 481, 484 [in English]. ISSN 0039-095X)

3351 SILENT RUNNING. [BIB-199212-S4-0100]

Noise at work regulations may appear complicated and time-consuming to many employers weighed down with an ever-increasing mass of health and safety legislation. This article unravels the mystery of noise in the workplace, highlighting areas of possible improvement and warning of pitfalls. (Sugden, M.; STEEL TIMES, (OCT. 1992), 220, (10), pp. 482, 484 [in English]. ISSN 0039-095X)

3352 NO EVIDENCE FOUND TO LINK ALZHEIMER'S TO ALUMINUM. [BIB-199301-G4-0002]

In an effort to determine if there is any connection between Al and Alzheimer's disease, the Al industry and The Aluminum Association have sponsored medical research for 10 years. The association also has reviewed the world's literature on health effects of Al and its compounds. To date, scientists conclude there is no evidence that exposure to Al or Al products causes Alzheimer's disease. That conclusion is supported by a myraid of studies, including work funded by the National Institute of Health. The US Food and Drug Administration (FDA), the Alzheimer's Association and the US Environmental Protection Agency have issued statements recognizing the lack of evidence supporting the theory that exposure to Al or Al products causes Alzheimer's disease, or providing grounds to influence the use of products containing Al. (DIE CASTING ENGINEER, (NOV.-DEC. 1992), 36, (6), pp. 60 [in English]. ISSN 0012-253X)

3353 MERCURY GETS HARSH SPOTLIGHT. [BIB-199301-G4-0004]

State and local governments, concerned about the potential health hazards related to Hg, appear to be favoring steps that either discourage the use of products containing the metal or limit its chances of entering into the environment. South Florida, USA, community decided to eliminate Hg battery waste—frequently found in the form of discarded button-size batteries—by encouraging use of batteries made from less-toxic material. Earlier, New Jersey enacted a sweeping environmental law that effectively phases out the sale of Hg-containing batteries. Under the legislation, the Hg content in household batteries must be reduced to one part per million by weight by 1995. (Goodwin, M.E.; AMERICAN METAL MARKET, (20 NOV. 1992), 100, (226), pp. 9 [in English]. ISSN 0002-9998)

3354 ENVIRONMENTAL ISSUES HAVE CHANGED THE FACE OF ADDITIVES BUSINESS. [BIB-199301-P4-0001]

Environmental issues have changed the face of the plastics business in the past five years or so. It's not just markets for virgin resins that are being influenced; recycling, degradability and product safety issues have shaken up the plastics additives business in the US, too. Some idea of the changes being wrought can be seen in a 2000 page study on plastics additives just released by the Mount Olive, New Jersey, office of Phillip Townsend Associates. The study reports that though plastics recycling has been one of the hottest topics in the industry in the US, lack of end-use markets for products and weak virgin resin prices have both coincided to hinder this business. Other hot issues include biodegradability, Cd and Pb stabilizers, health hazards from pyrolysis of flame retardants, and preservatives, especially as used in PVC. (PLASTICS WEEK, (7 DEC. 1992), pp. 4 [in English]. ISSN 1044-9663)

3355 PMN REQUIRED FOR SOME FILLERS. [BIB-199301-P4-0006]

The Toxic Substances Control Act (TSCA) requires manufacturers and importers to file a Premanufacturing Notice (PMN) with the US EPA before producing or importing a substance which is not on the TSCA inventory. It is illegal to use a chemical substance that is known to have been manufactured in violation of the PMN provisions of TSCA. The industry has generally believed that treated fillers have been exempt from the PMN requirements. Recent industry meetings with EPA, however, now make it clear that this exemption applies only if: the treatment does not react with the filler, whether or not the treatment reacts with the resin matrix; the treated filler is merely a mixture of filler and treatment; or the treatment does not react with the filler, but the treated filler does not subsequently react with the resin matrix. (Schweitzer, J.; CI ON COMPOSITES, (OCT.-NOV. 1992), pp. 4-5 [in English].)

3356 SAFEGUARDING AMERICA'S STEELWORKERS. [BIB-199301-S4-0010]

While recent safety numbers strongly suggest that conditions are already improving at a rapid pace, safety managers expect even more impressive results in the future as new, safer technologies and a better understanding of workplace behavior play a key role in many companies' plans. There are several reasons that safety has become such an important issue to steel company executives; injuries, particularly serious ones, can temporarily slow down or shut down a plant's operations; the financial aspects of workmen's compensation claims can be staggering; and valuable and knowledgeable employees can be lost through accidents. (Ambrosia, J.; IRON AGE, (NOV.-DEC. 1992), 8, (11), pp. 16-20 [in English]. ISSN 0897-4365)

3357 STYRENE LEVEL CHALLENGED. [BIB-199302-P4-0011]

The permissible exposure limits set by the US Occupational Safety and Health Administration (OSHA) in 1989 for styrene at 50 parts/million (ppm) (averaged over the 8 h day) have been thrown out by a Federal Court in the US (previous limits were 100 ppm). According of the Composites Institute of the US Society of the Plastics Industry (SPI), New York, OSHA is likely to appeal on this ruling and in the meantime the 50 ppm rule will continue to apply. If OSHA wins its case the implication will be that from December 1993, composite moulders will not be able to use respirators to achieve the working limits. The exception to this rule will be constructors of large boats. A new rule proposed recently by OSHA for styrene in the maritime, agricultural and construction industries has an added restriction as it identifies styrene as a possible carcinogen. The SPI is prepared to testify before OSHA to remove this classification which is contrary to the evidence amassed by the industry body in recent years. (ADVANCED COMPOSITES BULLETIN, (DEC. 1992), pp. 7 [in English]. ISSN 0951-953X)

3358 MDA LEVEL SET AT TEN PARTS PER BILLION. [BIB-199302-P4-0012]

The US Occupational Safety and Health Administration has established a permissible average exposure limit (PEL) for 4,4-methylene dianiline (MDA), widely used as a curing agent for thermosetting epoxy resins. The PEL sets a limit of an average of ten MDA parts/billion (ppb) of air for an eight hour working day. Short term exposure limits of 100 ppb for periods of up to 15 min are permissible if the average exposure over the working day 5 ppb. The new regulations mean that if airborne exposure is 5 ppb without skin contact, then companies need not introduce expensive employee training or hygiene facilities, or provide medical surveillance. Prior to the new ruling, which has in general been well received by the industry groups involved, no guidelines for exposure were set in the US despite the findings of laboratory test on rats which raised the possibility that MDA is a carcinogen. (ADVANCED COMPOSITES BULLETIN, (DEC. 1992), pp. 7 [in English]. ISSN 0951-953X)

3359 STATE AGENCY INDICATES IT LIKES CALIFORNIA STEEL EFFORT. [BIB-199302-S4-0016]

California Steel Industries signed a voluntary agreement with the California Environmental Protection Agency (Cal/EPA) to investigate suspected pollution caused by the former Kaiser Steel plant, Fontana, Califronia, USA. California Steel bought a portion of the Kaiser plant in 1984 and the company said it voluntarily assumed responsibility for investigating suspected areas of contamination and organizing a cleanup plan for the site. (Viani, L.; AMERICAN METAL MARKET, (29 DEC. 1992), 100, (250), pp. 4 [in English]. ISSN 0002-9998)

3360 OCCUPATIONAL EXPOSURES TO CADMIUM. [BIB-199303-G4-0019]

Effective 14 December 1992, facilities which have employees exposed to Cd and Cd compounds must comply with several requirements of the new Cd standard, from the Occupational Safety and Health Administration (OSHA). Employees exposed to Cd face a significant risk to their health from lung cancer and serious kidney damage at the current permissible exposure limits. The new 8 h time-weighted permissible exposure level (PEL) for employees exposed to Cd in their work place has been lowered to 5 mg/m^3 air. (Harder, U.M.; FINISHERS' MANAGEMENT, (JAN. 1993), 38, (1), pp. 18-20 [in English]. ISSN 0015-2358)

3361 RECLAIMING FUEL OILS FROM WASTE PLASTICS. [BIB-199303-P1-0052]

The world's first technology for reclaiming fuel oil from chloride-based plastics has been developed by researchers at the Environmental Engineering Laboratory of Toshiba Corp, Tokyo, Japan. Because chlorides release poisonous hydrogen chloride gas (HCl) during conventional heat decomposition, fuel oil reclamation has been prevented until now. However, the new technology can be applied to the thermoplastics that decompose when exposed to heat. This category includes polyvinyl chloride (PVC), acrylonitrile-styrene copolymer, acrylonitrile-butadiene-styrene (ABS) copolymer, polyethylene and polypropylene. By adding a high-density alkaline solution to the reaction chamber during the heating proc-

ess, the HCl can be transformed into a harmless salt. The fuel oil can thus be reclaimed without generating the gas. An added benefit is that the alkaline solution decomposes some plastic additives that resist heat decomposition, increasing the retrieval rate for the oil from 50%-90%. (NEW MATERIALS/JAPAN, (FEB. 1993), pp. 16 [in English]. ISSN 0265-3443)

3362 NON-RUBBER TPES COULD GAIN EDGE. [BIB-199303-P7-0104]

Concern about AIDS may have an indirect effect on demand for thermoplastic elastomers from Advanced Elastomer Systems, according to the material supplier based in St. Louis, Missouri, USA. AIDS has promoted the use of products such as latex gloves and condoms. There has been a growing number of complaints about allergic reactions to natural rubber latex, which in turn has led to scrutiny from the Food and Drug Administration. Advanced Elastomer anticipates that FDA soon will require special labels on certain classes of medical devices containing latex, leading some medical companies to look for alternative materials, such as TPEs. Advanced Elastomer recently introduced a softer, medical-grade TPE, Santoprene rubber grade 281-45. (PLASTICS NEWS (DETROIT), (15 FEB. 1993), 4, (50), pp. 12 [in English]. ISSN 1042-802X)

3363 LEAD-FREE BRASS ALLOYS FIGHT TOXICITY. [BIB-199304-G5-0028]

AT&T recently was granted a US patent for a family of Pb-free brass alloys that offer promise in eliminating potential drinking water problems caused by Pb leaching from brass plumbing fixtures. The new alloys were developed by scientists at Bell Laboratories' Metallurgy and Ceramics Research Department. This technological advance has significant environmental implications because Pb is known to seriously affect the central nervous system in humans. In the new alloys bismuth is the substitute for Pb. Small amounts of other elements also are present in predetermined amounts. It is claimed that the new alloys, whose detailed chemical analysis remains undisclosed, are readily manufactured and may be considered viable, economical substitutes for leaded brass. (Foundry Management and Technology, (Feb. 1993), 121, (2), pp. 8 [in English]. ISSN 0360-8999)

3364 BILL WOULD BOOST OSHA, LIMIT PVC PRECURSOR. [BIB-199304-P4-0019]

A bill designed to strengthen the US Occupational Safety and Health Administration includes air-contamination exposure limits on a PVC precursor that a federal court rejected last year. The Comprehensive Occupational Safety and Health Reform Act, which was to be introduced on 9 March by Rep. William Ford, D-Michigan, also would require processors to establish health and safety programs. It would make management responsible for violations that cause death or serious injury—which could subject plant managers to criminal penalties. Ford, Chairman of the House Education and Labor Committee, sponsored similar OSHA reform legislation in the last session of Congress, but the bill fizzled from lack of widespread support. The latest bill adds a section that revives 1989 OSHA permissable air-exposure regulations on 400 chemicals, including the PVC precursor ethylene dichloride. (Gardner, J.; Plastics News (Detroit), (15 Mar. 1993), 5, (3), pp. 4 [in English]. ISSN 1042-802X)

3365 GREENPEACE BRINGS ANTI-PVC CAMPAIGN TO NORTH AMERICA. [BIB-199304-P7-0113]

A campaign seeking to phase out chlorinated chemicals in general, and polyvinyl chloride specifically, is underway in North America by Greenpeace, the international environmental organization. Greenpeace seeks to build public support for a report issued last year by the International Joint Commission, a US—Canadian venture that monitors the quality of water in the Great Lakes. The report recommended development of a timetable to end the use of chlorine and chlorine-containing industrial feedstocks. Greenpeace, with US offices in Washington, D.C., convened a meeting to discuss the report last December in Monroe, Michigan. Some 300 activists and researchers attended. (Leaversuch, R.D.; Modern Plastics, (Mar. 1993), 70, (30), pp. 43-44 [in English]. ISSN 0026-8275)

3366 TESTS SHOW STAINLESS OFFERS BETTER CLEANABILITY. [BIB-199304-S6-0041]

Stainless steel has characteristics that make it an important material for manufacturing domestic sinks and similar commercial and institutional equipment required to meet exacting hygiene standards. Recent research has shown bacteria residue on stainless steel is approx 100 times less than on other materials. New research work has shown that addition of a wiping action to the washing treatment enchances still further the bacterial cleanability of stainless steel. (Holah, J.T.; Nickel, (Mar. 1993), 8, (3), pp. 2 [in English].)

3367 REFRACTORY CERAMIC FIBERS COALITION AND EPA ANNOUNCE COOPERATIVE PROGRAM FOR MONITORING WORKPLACE EXPOSURE TO RCFS. [BIB-199306-C4-0002]

The Refractory Ceramic Fibers Coalition (RCFC), based in Washington, DC, and the US Environmental Protection Agency (EPA) have signed a consent agreement establishing a cooperative program for monitoring workplace exposure to refractory ceramic fibers (RCFs). The agreement calls for a five-year monitoring program to: estimate average workplace airborne fiber concentration levels; study trends in the levels of workplace airborne fiber concentrations over time; and study differences in workplace concentrations among employees performing different jobs and tasks involving RCFs. RCFC's member companies account for approx 90% of the RCFs manufactured in the US and, with coordination from the RCFC, will jointly complete the studies called for under the Consent Agreement. (Publisher: REFRACTORY CERAMIC FIBER COALITION, 1133 Connecticut Ave., NW, Suite 1200, Washington, DC 20036, USA, (4 MAY 1993), Pp 4 [in English].)

3368 JITTERY PROCESSORS IN EUROPE CONFRONT STYRENE CARCINOGENICITY SCARE. [BIB-199306-P4-0026]

Concerned about possible controversy over the dangers of styrene monomer being revived at an upcoming meeting of cancer specialists in Helsinki, Europe's trade association for plastics manufacturers, APME, is launching a preemptive strike, carrying the message that there is no proof of the potential carcinogenicity of styrene. West European PS producers have developed a data bank that will be used in establishing policies, statements, and position papers for such uses as pro-active representation to government authorities, and correcting inaccurate media coverage. Styrene has been the subject of numerous studies around the world that have attempted to establish whether or not it is carcinogenic. Neither in Europe, nor in the US, is styrene categorized as a carcinogen. However, the International Agency for Research on Cancer labels it as a possible carcinogen, a classification the APME's newly formed styrene steering committee is campaigning to have changed. (Plastics Week, (3 May 1993), pp. 3 [in English]. ISSN 1044-9663)

3369 CONCERNS BROADEN OVER CHLORINE AND CHLORINATED HYDROCARBONS. [BIB-199306-P4-0028]

Public concern is growing that chlorinated organics are causing cancer in adults and adverse health and reproductive effects in the offspring of both humans and wildlife. It has already brought regulations and the banning of selected products as well as calls from several groups for an eventual phaseout of at least some sectors of the chlorine industry. In Germany and Austria, a number of towns and cities have decided not to use PVC materials for new public buildings. Four of the nine regional capitals in Austria—Vienna, Linz, Salzburg, and Innsbruck—have PVC-free construction policies for public buildings, and two Austrian states have followed suit. More than 100 German communities will no longer use PVC in their new public buildings. A discussion reports on the arguments against the continued use and production of PVC and other chlorinated compounds. (Hileman, B.; Chemical and Engineering News, (19 Apr. 1993), 71, (16), pp. 11-20 [in English]. ISSN 0009-2347)

3370 GARY WORKS CLEANUP ESTIMATED NEAR $300M. [BIB-199306-S4-0050]

US Steel Group disclosed in a 10K filing that it could budget as much as $300M over the next ten years to clean up the Gary Industrial Works. But the proposal has raised a lot of questions from state and federal environmental authorities who are concerned about the flexibility of the plan and whether their agencies have the statutory authority to execute it. The USX Corp. division wants to spend a fixed amount per year, between $20-30M, on environmental enhancements at its largest steel mill. The proposal would enable USS to better plan its environmental program over a decade and help it remain competitive in the national and international markets. (Beirne, M.; American Metal Market, (20 Apr. 1993), 101, (75), pp. 4 [in English]. ISSN 0002-9998)

3371 NEW SENSITIVE ASSAY FOR CADMIUM IN BIOLOGICAL SAMPLES. [BIB-199307-G3-0126]

A method is described for accurately and precisely determining cadmium concentrations in blood, urine, or other biological samples that is accurate to 0.02 μg/l. The method uses commercial chemicals and should be useful should OSHA implement lower permissible exposure limits for Cd concentrations in the workplace. Care must be taken during the procedure to avoid contamination because of the extreme sensitivity of the method. (Haeharyya, M.H.; Peterson, D.P.; Sacco-Gibson, N.; SEVENTH INTERNATION CADMIUM CONFERENCE, 6-8 APRIL 1992, Publisher: CADMIUM ASSOCIATION, 42 Weymouth Street, London W1N 3LQ, UK, (1992), pp. 113-114 [in English].)

3372 STRICT LEAD STANDARD IN WORKS. [BIB-199307-G4-0048]

The US Occupational Safety and Health Administration introduced an interim lead-exposure standard for construction workers that is in line with standards for general industry and is working on a new, stricter Pb-exposure standard that will have across-the-board applications. That would mean a reduction from the current universal standard of 50 $\mu g/m^3$ of air to approx 10-15 $\mu g/m^3$. (O'Sullivan, O.; American Metal Market, (14 May 1993), 101, (93), pp. 5 [in English]. ISSN 0002-9998)

3373 NICKEL LEGISLATION IMPACTS ON PM INDUSTRY. [BIB-199307-G4-0049]

The major concern for the PM industry has arisen from the inclusion of elemental Ni powder among the dangerous substances. Recently, the situation in the European Community (EC) has been gaining a particularly high profile. Although some of the relevant legislation has been around for a fair time, it has only been since the Single European Market became operative at the beginning of 1993 that the PM industry in the member states and its material suppliers have had to regard it as legally binding. This has had a powerful effect in concentrating the mind on these issues. Among the health hazards, considered by these various classifications, are potential carcinogenic effects. Nickel metal (and many Ni compounds) in inhalable form feature among the categories of carcinogens at some level in all the major classification systems. (Metal Powder Report, (May 1993), 48, (5), pp. 21-25 [in English]. ISSN 0026-0657)

3374 ENVIRONMENT AND CADMIUM. [BIB-199307-G4-0051]

The chief environmental concern of cadmium is its potential to cause kidney and lung cancer, especially in those working in Cd-using industries. Soil and food pathways are also major concerns, and content in vegetables is related to the amount in the soil, soil pH and presence of other metals such as lead and calcium. Cadmium absorption in humans is influenced by diet and other physiological and pathological conditions such as iron deficiency and pregnancy. Extensive data on Cd in foods is presented. (Goyer, R.A.; SEVENTH INTERNATION CADMIUM CONFERENCE, 6-8 APRIL 1992, Publisher: CADMIUM ASSOCIATION, 42 Weymouth Street, London W1N 3LQ, UK, (1992), pp. 13-15 [in English].)

3375 CADMIUM IN SOILS: BIOAVAILABILITY AND POSSIBLE WAYS TO MANAGE IT. [BIB-199307-G4-0054]

Consideration of the factors which control chemical uptake of plants from the soil are discussed in light of determining the most effective methods to minimize uptale of known harmful elements such as cadmium. The factors considered include pH, iron and manganese contents, and effects of other trace elements. Results indicate that limiting to increase pH and adding Fe and Mn compounds to soil can be effective in reducing Cd uptake. The chemical form of the Cd also has an effect, with nitrates being most easily absorbed and phosphates less so. Higher soil temperatures were also found to increase Cd uptake. (Juste, C.; SEVENTH INTERNATIONAL CADMIUM CONFERNECE, 6-8 APRIL 1992, Publisher: CADMIUM ASSOCIATION, 42 Weymouth Street, LondonW1N 3LQ, UK, (1992), pp. 69-71 [in English].)

3376 CADMIUM IN THE ENVIRONMENT: LEVELS, TRENDS, AND CRITICAL PATHWAYS. [BIB-199307-G4-0056]

The favorable trends of environmental cadmium levels in Western Europe are described using mainly Belgium data. The effect of decreasing environmental levels on the Cd content of food, the main pathway for Cd transfer to humans, is demonstrated and a risk assessment using the most recent data is discussed. Industry's strategy to continue these favorable trends is described. The strategy includes further emission control, contamination prevention from recycling (e.g. batteries), and risk assessment and management at historically contaminated sites. (Assche, F.; Ciarletta, P.; SEVENTH INTERNATIONAL CADMIUM CONFERENCE, 6-8 APRIL 1992, Publisher: CADMIUM ASSOCIATION, 42 Weymouth Street, London W1N 3LQ, UK, (1992), pp. 51-56 [in English].)

3377 OCCUPATIONAL HEALTH STANDARDS FOR CADMIUM. [BIB-199307-G4-0057]

Worldwide occupational health standards for cadmium are in a state of flux because of the wide differences of opinion and laws range from an essential ban in Sweden to a 200 μg/m3 limit in the US. A summary of current standards is presented along with the argument for a conservative review of standards as new data becomes available. The contradictory nature of much of the data indicates that caution and flexibility should be exercised in any development of regulations. (Robbins, D.A.; SEVENTH INTERNATIONAL CADMIUM CONFERENCE, 6-8 APRIL 1992, Publisher: CADMIUM ASSOCIATION, 42 Weymouth Street, London W1N 3LQ, UK, (1992), pp. 110-112 [in English].)

3378 INTERNATIONAL PROGRAM ON CHEMICAL SAFETY (UNEP/ILO/WHO) ENVIRONMENTAL HEALTH CRITERIA ON CADMIUM. [BIB-199307-G4-0060]

The World Health Organization's work on development of Environmental Health Criteria (EHC) as part of the International Programme on Chemical Safety is described, with the results from a task group on cadmium used as an example. Results covered three exposures, smoking, food and general environment and occupational sources. Future research needs were identified, and although there are still debates as to the effects of Cd on health, the study does provide some data to justify certain national and international activities to decrease the present level of exposure and lower risk. (Becking, G.C.; SEVENTH INTERNATIONAL CADMIUM CONFERENCE, 6-8 APRIL 1992, Publisher: CADMIUM ASSOCIATION, 42 Weymouth Street, London W1N 3LQ, UK, (1992), pp. 99-102 [in English].)

3379 REGULATORY STATUS OF CADMIUM IN JAPAN. [BIB-199307-G4-0061]

Much of the legislation on cadmium in Japan resulted from the belief that Cd was a prime cause of Itai-itai disease. Recent surveys of health and Cd content in blood and urine have thrown this theory into doubt and no higher incidence of Itai-itai disease was found in Cd polluted areas as compared to unpolluted areas. Much work was also done on levels of Cd in rice, water, and air over a wide geographic area. The need for care in establishment of regulations is highlighted. (Shigematsu, I.; Yamamto, A.; Sato, T.; SEVENTH INTERNATIONAL CADMIUM CONFERENCE, 6-8 APRIL 1992, Publisher: CADMIUM ASSOCIATION, 42 Weymouth Street, London W1N 3LQ, UK, (1992), pp. 115-117 [in English].)

3380 THE REGULATORY STATUS OF CADMIUM IN AUSTRALIA. [BIB-199307-G4-0062]

A survey of existing regulations for cadmium control in various Australian states is given for four areas: occupational, environmental, community, and others. These regulations are in a state of flux as new information is developed. Increasing cooperation among states may eventually lead to the formation of a National Environmental Protection Authority which will have authority over a number of areas including air, waste, noise and recycling. Industry will have to do its part by following defined programs to reduce exposure to Cd. (Clark, N.; SEVENTH INTERNATIONAL CADMIUM CONFERENCE, 6-8 APRIL 1992, Publisher: CADMIUM ASSOCIATION, 42 Weymouth Street, London W1N 3LQ, UK, (1992), pp. 118-121 [in English].)

3381 ENVIRONMENTAL HEALTH IMPACT OF CADMIUM—CONCLUSIONS OF THE CADMIBEL STUDY. [BIB-199307-G4-0063]

Because three early studies of cadmium exposure vs. mortality were inconclusive, an extensive cross-sectional morbidity study was conducted in Belgium called the Cadmibel study. Results show the Cd burden of the body increases with age and is greater for smokers. Highest urinary Cd was found where soil was contaminated with Cd. Exposure to Cd may induce renal tubular dysfunction. Indications were also found that high Cd could influence calcium homoe-

ostasis and bone metabolism. Additional indicated studies are underway. (Lauwerys, R.; Buchet, J.P.; Bernard, A.; Roels, H.; Staessen, J.; Rondia, D.; Claeys, F.; Sarton, F.; SEVENTH INTERNATIONAL CADMIUM CONFERENCE, 6-8 APRIL 1992, Publisher: CADMIUM ASSOCIATION, 42 Weymouth Street, London W1N 3LQ, UK, (1992), pp. 165-168 [in English].)

3382 BIOLOGICAL MONITORING OF CADMIUM-EXPOSED WORKERS. [BIB-199307-G4-0064]

In order to provide data to establish reference values for occupational and environmental exposures, a nine year study of cadmium exposed workers (office workers and students) was conducted. Reference values for environmental exposure are: for Cd in blood, 0.3 μg/dl; for Cd in urine, 3 μg/g of creatinine; for beta2-microglobuline concentration in urine, 500 μg/g of creatinine (1000 for older populations). The occupational levels developed do not appear to be effective to protect workers against minor biochemical changes. (Sakurai, H.; SEVENTH INTERNATIONAL CADMIUM CONFERENCE, 6-8 APRIL 1992, Publisher: CADMIUM ASSOCIATION, 42 Weymouth Street, London W1N 3LQ, UK, (1992), pp. 175-179 [in English].)

3383 HEALTH EFFECTS OF CADMIUM ON WORKERS IN CHINA. [BIB-199307-G4-0065]

A survey of 296 workers, 234 active and 64 retired, was taken in a zinc factory known to have high concentrations of cadmium. Workers were grouped by area of the plant and were surveyed by both questionaire and medical examination of blood and urine. Workers whose blood and urine Cd were 8.5 μg/l and 8.2 μg/gCr showed no renal tubular dysfunction. Hypophosphatema and hypercalcemia were noted to be associated with higher levels. Results on retired workers indicate that renal dysfunction may be reversible after cessation of exposure. (Nomiyama, K.; Nomiyama, H.; Liv, S.J.; SEVENTH INTERNATIONAL CADMIUM CONFERENCE, 6-8 APRIL 1992, Publisher: CADMIUM ASSOCIATION, 42 Weymouth Street, London W1N 3LQ, UK, (1992), pp. 169-174 [in English].)

3384 AEROSPACE APPLICATIONS OF NICKEL—CADMIUM BATTERIES. [BIB-199307-G6-0132]

NASA has had excellent performance from its various Ni—Cd batteries in missions as diverse as Megellan and the Topex/Poseidon spacecraft along with other tracking and data relay satellites. An ongoing battery development program is being carried out to evaluate space power systems and provide fundamental data and training in battery technology. Pending OSHA rulings reducing the level of cadmium in industrial environments could impact the successful manufacture and use of the proven Ni—Cd battery system. (Habib, S.; SEVENTH INTERNATIONAL CADMIUM CONFERENCE, 6-8 APRIL 1992, Publisher: CADMIUM ASSOCIATION, 42 Weymouth Street, London W1N 3LQ, UK, (1992), pp. 30-33 [in English].)

3385 SPI FIGHTS TO KEEP "POSSIBLE CARCINOGEN" LABEL OFF ETHYLENE AND PROPYLENE. [BIB-199307-P4-0034]

US plastics makers and chemical manufacturers are gearing up for a battle with the International Agency for Research on Cancer (IARC), which is considering reclassifying the two olefins as Group 2B (possible) carcinogens. The Society of the Plastics Industry (SPI), fears the reclassification could taint the image of PE and PP, and make life difficult for olefin makers using the feedstocks. IARC will evaluate the two monomers next February. Following a late-May emergency summit to discuss the issue, SPI will jointly present challenges to reclassification with the Chemical Manufacturers Association (CMA), while CMA's Olefins Group will offer toxicological studies. SPI will also be devoting most of its efforts to showing how little risk is involved in the use of these monomers in end products, and how a 2B classification will confuse the public and give rise to wasteful regulatory shifts at US agencies. (Plastics Week, (14 June 1993), pp. 6 [in English]. ISSN 1044-9663)

3386 JAPANESE RESEARCHERS SAY PLASTICS INCINERATION IS SAFE. [BIB-199307-P4-0035]

Since 1988, Japan's Plastic Waste Management Institute (PWMI), Tokyo, and some of the country's leading incinerator makers have been conducting extensive research into incineration of plastics. The latest results have been released. With a combustion temperature of 1000 °C and a large excess of oxygen, incineration of nylon 6 produces only trace amounts of ammonia and HCN, with acrylonitrile undetectable; similar results were obtained when incinerating polyacrylonitrile. Carbon monoxide levels for the two resins were 27 ppm and 23 ppm, respectively, with fly ash measured at 0.03 g/m^3 and 0.041 g/m^3. No ammonia was detectable on incineration of polyurethane, with HCN only present in trace amounts. Combustion tests with a polyethylene/10% PVC mixture in which hydrated lime was fed to the combustion chamber resulted to HCl concentrations of 16.6 ppm. PWMI also obtained favorable results for ABS, and PS and PE in earlier tests. (Plastics Week, (14 June 1993), pp. 5 [in English]. ISSN 1044-9663)

3387 THE INTERGOVERNMENTAL APPROACH TO ENVIRONMENTAL ISSUES. [BIB-199308-G4-0067]

An overview covers the worldwide work on environmental issues relating to the regulations affecting production and use of Pb and zinc. The various projects include controls on the use of Pb in gasoline, regulation is on recycling Pb from scrap Pb-acid batteries, based convention on the control of transboundary movement of hazardous wastes and their disposal, and OECD's initiative to develop measures to reduce health risk against heavy metals, such as mercury, lead and cadmium. The toxicological profiles for Zn and Pb are currently being examined. (Weghofer, E.; RECYCLING LEAD AND ZINC: THE CHALLENGE OF THE 1990S, 11-13 JUNE 1991, Publisher: INTERNATIONAL LEAD AND ZINC STUDY GROUP, 58 St. James Street, London SW1A 1LD, UK, (1991), pp. 189-191 [in English].)

3388 OPERATIONS ENGINEERING AND MANAGEMENT: CRADLE TO GRAVE. [BIB-199308-G4-0070]

A review is presented of a growing number of imperatives, some self imposed, some imposed by society, which the mining and metals industry faces in carrying out its business. These imperatives bear on all activities from the exploration phase, through engineering, design, plant construction and operation, to decommissioning. Graphs, Maps. (Curlook, W.; COPPER 91 (COBRE 91), 18-21 AUG. 1991, Publisher: PERGAMON PRESS INC., Maxwell House, Fairview Park, Elmsford, New York 10523, USA, (1992), pp. (Vol. I), 15-25 [in English].)

3389 THE ENVIRONMENTALIST ASSAULT ON LEAD AND GOVERNMENT/INDUSTRY RESPONSES. [BIB-199308-G4-0073]

The argument against the use of lead being continued in the industrial society is that it is consumed in large quantities and is toxic and ubiquitous. Analysis of results on leaching of Pb indicates the metal to be stable in a landfill environment. Both the recent and pending legislative and regulatory initiatives on the hazard of Pb are highlighted including Reid-Lieberman bill and a draft of OECD document. Current developments in the US recycling policy are reviewed which mainly considers imposing taxes on any Pb-bearing articles. Taxation of primary and imported Pb (and batteries) is a recurring theme in the US. Evidence suggests a declining level of Pb in blood in the US and in Europe. Attacks on the usage of Pb may pose a major threat not just to its production, but to a larger sector of the non-ferrous mining industry. (Muth, R.J.; RECYCLING LEAD AND ZINC: THE CHALLENGE OF THE 1990S, 11-13 JUNE 1991, Publisher: INTERNATIONAL LEAD AND ZINC STUDY GROUP, 58 St. James Street, London SW1A 1LD, UK, (1991), pp. 107-176 [in English].)

3390 QUEMETCO IN TIJUANA SMELTER CLEANUP FOR $2.3 MILLION PLUS FINE. [BIB-199308-G4-0074]

Quemetco Inc., RSR Corp.'s West Coast subsidiary, has agreed to pay $2.3M to help clean up the abandoned Alco Pacific lead smelter near Tijuana, Mexico. The company also will pay a $200 000 fine in conjunction with a no-contest plea to charges of illegally transporting hazardous waste from its Los Angeles smelter to Mexico. Dallas-based RSR announced the settlement yesterday with federal authorities and the Los Angeles County District Attorney's Office, which had filed the charges against the company three weeks ago in California courts. (Marley, M.; American Metal Market, (16 June 1993), 101, (115), pp. 1 [in English]. ISSN 0002-9998)

3391 THE NEW OSHA STANDARD: A SUMMARY OF ITS REQUIREMENTS. [BIB-199308-G4-0075]

OSHA released its interim final standard on lead exposure in construction, 29 CFR 1926.62, on 29 April 1993. This new standard is meant to protect 900 000

construction workers against the hazards of Pb, and promises to have a significant impact on the painting industry. The effective date for the standard is 3 June 1993. All requirements of the interim final rule, except for engineering controls, must be complied with no later than 60 days after the effective date (2 August 1993). Feasible engineering controls are to be implemented no later than 120 days after the effective date (1 October 1993). (Lead Paint Bulletin, (June 1993), pp. 1, 4-6 [in English].)

3392 A REVIEW OF THE NEW OSHA LEAD IN CONSTRUCTION STANDARD. [BIB-199308-G4-0076]

OSHA Regulation 29 CFR 1926.62 affects all workers exposed to lead dust in excess of 30 $\mu g/m^3$, even if only for one day/year. The important criteria for OSHA is not the concentration of Pb on a painted substrate, but the exposure resulting from disturbed Pb particles. Contractors working on HUD projects must meet both the HUD guidelines and the new standard. (Cignatta, J.V.; Duffy, T.; Lead Paint Bulletin, (June 1993), pp. 2-3, 6 [in English].)

3393 REFRACTORY CERAMIC FIBER COALITION'S PRODUCT STEWARDSHIP PROGRAM. [BIB-199308-D4-0010]

Recognizing the need for a comprehensive plan to ensure worker safety, the Refractory Ceramic Fibers Coalition (RCFC) member companies in the US developed a uniform program. Although each producer uses a somewhat different internal structure for administering its product stewardship program (PSP), all of the producers actively involve senior management in the process. Additionally, some RCF producers employ an advisory board of outside experts in various technical and policy-related fields. These advisory boards provide important input to the design and function of product stewardship, help establish priorities on PSP activities, and make recommendations on many key issues and decisions. Active involvement by top management and the use of outside experts have been essential to the success of PSP. The RCFC has identified seven key areas as necessary to its PSP. These areas include: health effects research, workplace monitoring, exposure assessments, study of workplace controls, product research, special studies, and communications. (Barrows, G.L.; Chen, S.H.; Shemanski, L.; American Ceramic Society Bulletin, (July 1993), 72, (7), pp. 28-34 [in English]. ISSN 0002-7812)

3394 REFRACTORY COALITION AND EPA FORM CO-OP PROGRAM. [BIB-199308-D4-0011]

The Refractory Ceramic Fibers Coalition (RCFC) and the US Environmental Protection Agency have agreed to establish a cooperative program for monitoring workplace exposure to refractory ceramic fibers. The program calls for a five-year monitoring program to estimate average workplace airborne fiber concentration levels; study trends in the levels of workplace airborne fiber concentrations overtime, and study differences in workplace concentrations among employees performing different jobs and tasks involving RCFs. The Product Stewardship Program includes seven elements: health effects research, workplace monitoring, study or workplace controls, exposure assessments, product research, special studies and communications. The RCF Coalition is an association of the leading US manufacturers of refractory ceramic fibers—The Carborundum Company, Premier Refractories and Chemicals, Inc., and Thermal Ceramics, Inc. (American Glass Review, (June 1993), 113, (12), pp. 5 [in English].)

3395 THE TREATMENT OF EAF-DUST IN EUROPE. [BIB-199308-S4-0063]

The melting of iron scrap in an electric arc furnace (EAF) produces 10-15 kg of dust/tonne of steel with a total of approx 480 000 tonnes/year in Western Europe. The EAF dust contains up to 0.07% Cd, 8% Pb, 25% FeO and 35% Zn and is classified as hazardous waste unsuitable for landfilling in the US. The primary treatment of the dust is by Waelz process of thermal treatment in a rotary kiln where coke is used both as fuel and reducing agent. Metal vapours from the charge are oxidized in the surplus air of the kiln producing mixed oxide of zinc and lead which is separated from the flue gas via cooling tower and electrostatic precipitator. The Waelz oxide is treated together with other secondary materials in a hot briquetting plant. The economics of the Waelz process is outlined which has apparently no environmental problem. The treatment of stainless steel dusts by Tetronic system using plasma furnace is highlighted. (Kola, R.; RECYCLING LEAD AND ZINC: THE CHALLENGE OF THE 1990'S, 11-13 JUNE 1991, Publisher: INTERNATIONAL LEAD AND ZINC STUDY GROUP, 58 St. James Street, London SW1A 1LD, UK, (1991), pp. 279-295 [in English].)

3396 NEW YORK LOOKS INTO ROTH STEEL FLUFF ALLEGATIONS. [BIB-199308-S4-0066]

New York's Bureau of Environmental Conservation investigations unit is looking at allegations that approx 5000 tons of shredder fluff was illegally buried at Roth Steel Corp., Syracuse, near the shores of Onondaga Lake. A state environmental spokesman said the charges came to light when a local newspaper was tipped off by a former employee, who now buys junked cars for his car crushing operation and is a competitor to Roth Steel. Workers trucked the nonmetallic shredder residue approx 100 yards to a swampy area approx 12 ft deep and covered it with gravel. The motive was to save approx $500 000 in haulage and tipping fees at a landfill. (Worden, E.; American Metal Market, (25 June 1993), 101, (122), pp. 9 [in English]. ISSN 0002-9998)

3397 OUTDATED EASTERN EUROPEAN EQUIPMENT THE PRIMARY OFFENDER. [BIB-199308-S4-0067]

Poland, the Czech and Slovak republics, and eastern Germany are the most heavily polluted areas in Europe, and the International Labor Office (ILO) has laid the blame on outmoded industrial enterprises in Eastern Europe's iron and steel sectors, and a proliferation of coal-fired power stations. As capacities are cut in the east, the are will benefit from an improved environment as has Western Europe, which has closed outmoded facilities in favor of more environmentally friendly, efficient ones, but the close proximity of industry to densely-populated areas poses an ongoing problem. (Iron and Steelmaker, (July 1993), 20, (7), pp. 10, 12 [in English]. ISSN 0097-8388)

3398 WATERJET SLICES LEAD, HAZARDS. [BIB-199309-G4-0085]

Vulcan Lead Products Co., Milwaukee, Wisconsin, USA, manufacturer that fabricates lead components for such applications as X-ray shielding, helps ensure worker safety with ongoing safety training programs, monthly blood tests, and regular analysis of shopfloor air samples. New equipment also contributes to reducing lead exposure. An example of the latter approach is the Paser abrasive waterjet cutting system that Vulcan purchased last year from Flow International Corp., Kent, Washington. Replacing sawing, the system minimizes airborne dust and particles and streamlines production by eliminating up to three processing steps. The Paser also minimizes environmental compliance problems by using Flow's closed-loop water recirculation system to eliminate water discharge and reduce water consumption. (Tooling and Production, (Aug. 1993), 59, (5), pp. 32, 35-36 [in English]. ISSN 0040-9243)

3399 REGULATIONS CONTROLLING THE USE OF NICKEL ARTICLES WHICH CONTACT THE SKIN. [BIB-199309-G4-0086]

Today most cases of nickel contact dermatitis occur domestically, arising from contact of the skin with Ni electroplate or Ni alloy use in the production of jewellery, metal articles for clothing, and spectacle frames. The incidence of Ni contact dermatitis is increasing and dermatologists, particularly in Scandinavia, have established a good case for regulating articles containing Ni which contact the skin. (Flint, G.; Metal Casting and Surface Finishing, (May-June 1993), 39, (5-6), pp. 44 [in English]. ISSN 0008-7521)

3400 COSHH STILL NOT FULLY ACCEPTED. [BIB-199309-P4-0045]

An evaluation survey of the Control of Substances Hazardous to Health (Coshh) regulations in the UK has found that 22% of employers sampled needed to make more effort to comply with Coshh, and that 6% had made little or no attempt to comply with Coshh. The major five year study from the Health and Safety Executive (HSE) also shows that 12% of employers had carried out no assessments at all. The good news was that 74% of employers had done all, or almost all of their Coshh assessments, and that 71% of those surveyed had implemented Coshh. The Coshh regulations came into force on 1 October 1989, and they form one of the most significant pieces of health and safety legislation since the Health and Safety at Work Act of 1974. The survey work in 1991-1992 involved visits to 536 establishments to find out how effectively employers were implementing Coshh, how much it was costing them, and what problems and benefits they

were finding. (Plastics and Rubber Weekly, (24 July 1993), (1495), pp. 2 [in English]. ISSN 0032-1168)

3401 SPI FIGHTS CANCER LABEL ON ETHYLENE AND PROPYLENE. [BIB-199309-P4-0046]

US resin producers and chemical manufacturers are gearing up for a battle with the International Agency for Research on Cancer (IARC), based in Geneva, Switzerland, which is considering reclassifying ethylene and propylene as Group 2B (possible) carcinogens. The Society of the Plastics Industry fears the reclassification could taint the image of PE and PP, and make life difficult for olefin makers handling the raw materials. IARC will evaluate the monomers next February. SPI and the Chemical Manufacturers Association (CMA) are challenging the proposed reclassification. CMA's Olefins Group will offer toxicological studies, SPI also wants to illustrate how a 2B classification will confuse the public and give rise to wasteful regulatory shifts at US agencies. According to SPI's general counsel, the US Occupational Safety and Health Administration would reclassify the monomers as carcinogenic hazards, thereby putting in place work rules and requiring materials safety data sheets indicating carcinogenic status; EPA would create extensive regulations for waste disposal and air and water pollution prevention; and California would list both substances as carcinogens under its Proposition 65 labelling laws. (Rogers, J.K.; Modern Plastics, (July 1993), 70, (7), pp. 11 [in English]. ISSN 0026-8275)

3402 CHROME FREE—HASSLE FREE. [BIB-199310-G4-0089]

Wells Aluminum, Monett, Missouri, USA, is a closely-held custom aluminum extruder/fabricator with seven plants in the Midwest and Southeast. About 300 men and women work at its Monett/Cassville, Missouri, plant, where they extrude and finish storm door and window shapes primarily. The paint line was installed in 1978. For the first ten years, chrome phosphate was used to clean, etch, and pretreat the extrusions. Starting in 1987, EPA regulations made treatment and disposal of chrome-containing effluents very expensive and cumbersome. Wells looked at several different products, they found the Chrome Free pretreatment system from Bulk Chemicals, Mohrsville, Pennsylvania. Chrome Free gives freedom from all those regulatory hassles and from future liability. (Cassidy, V.M.; Modern Metals, (Sept. 1993), 49, (8), pp. 48-51 [in English]. ISSN 0026-8127)

3403 CLEVELAND USA LEAD REFINER SHUT. [BIB-199310-G4-0091]

The Ohio Environmental Protection Agency shut down secondary lead refiner Master Metals Inc., citing continued violations of national ambient air and state stack emission standards, and a lack of a sound emission control plan. Ambient air levels around the plant were measured at 12.84 $\mu g/m^3$ during the second quarter of 1993, which were lower than the 37.4 $\mu g/m^3$ of air measured during the first quarter of 1992 but above the national standard of 1.5 $\mu g/m^3$ of air. (American Metal Market, (30 Aug. 1993), 101, (167), pp. 2 [in English]. ISSN 0002-9998)

3404 NEW CONTROLS ON CADMIUM COME INTO EFFECT IN EUROPE. [BIB-199310-G4-0092]

New legislation restricting the marketing and use of cadmium, a toxic metal, came into force on 31 July 1993. The Environmental Protection (Controls on Injurious Substances) (No. 2) Regulations 1993 implement a European Community Directive agreed in 1991. The Directive bans three uses of Cd and its compounds. First, it may not be used to colour finished products made from a specified list of plastics; such coloured products or components with a Cd content 100 ppm may not be marketed. Second, it may not be used to stabilise specified finished PVC products; such stabilised products and components with a cadmium content 100 ppm may not be marketed. Nor may it be used to plate metallic products or components used in specified sectors or applications; these plated products and components may not be marketed. (Publisher: DEPARTMENT OF ENVIRONMENT (UK), 2 Marsham St., London, SW1P3EB, UK, New Controls on Cadmium Come Into Effect in Europe, (2 AUG. 1993), Pp 8 [in English].)

3405 GUIDE FOR PACKAGING SIC WHISKERS AND FIBRES. [BIB-199310-D4-0012]

A guide for the packaging of silicon carbide whiskers and fibres has been produced by the American Society for Testing and Materials' (ASTM) E34.70 Subcommittee on single crystal ceramics whiskers, part of Committee E34 on Occupational Health and Safety. The standard covers the packaging of unbound silicon carbide fibres and whiskers and materials containing respirable amounts of these. It addresses issues such as material characteristics to be considered in packaging design, recommendations to limit personnel exposure, packaging and product quality concerns, labelling, recommended container characteristics and the disposal of containers. This is the fourth standard produced by this group, all aimed at ensuring these potentially hazardous materials are safely used by the composites community. (Advanced Composites Bulletin, (Sept. 1993), pp. 8 [in English]. ISSN 0951-953X)

3406 PRETREAT ENDS CHROME PROBLEMS AT ALCAN ILLINOISE, USA. [BIB-199310-S2-0262]

By converting to chrome-free, dried-in-place pretreatment, Alcan Building Products, Illinois, USA, has eliminated chrome at its Franklin Park plant. The process cut wastes by 7500 lb and cut water usage by 8.5+ million gal/year in 1992. The new process also helped to significantly cut operating costs in 1992 and solve safety problems associated with hazardous waste. Alcan is the largest US manufacturer of galvanized steel residential siding, with 80% of the market and the Franklin Park plant is well-positioned to help the company maintain its dominance. (Modern Metals, (Aug. 1993), 49, (7), pp. 72, 74 [in English]. ISSN 0026-8127)

3407 PROCESS SAFETY MANAGEMENT: DOES IT APPLY TO YOUR IRON AND STEEL FACILITY? [BIB-199310-S4-0074]

OSHA believes that the process safety management standard will have a positive effect on the safety of all employees in the workplace, as well as other potential benefits to employers, such as increased productivity. Smaller businesses with limited resources should consider alternative avenues of decreasing the risk associated with HHCs (highly hazardous chemicals). For example, a business could reduce its inventory of HHCs. Inventory reduction will cut the risk and potential for a catastrophic incident. Employers also could reduce on-site quantities of HHCs to below the established threshold quantities. (Roughton, J.; Iron and Steelmaker, (Sept. 1993), 20, (9), pp. 52-54 [in English]. ISSN 0097-8388)

3408 AN INTERNATIONAL APPROACH TO BIOTECHNOLOGY SAFETY [BIB-IDA015489]

Biotechnology industrial safety - covers (1) project background; risk identification and assessment methodology (2) regulations of genetic engineering in laboratories; research and development (3) risks and regulations of large-scale operations: relevant legislation on workers industrial safety in USA, EEC, UK and Japan (4) pollution control; environmental applications, relevant international cooperation. Recommendations. Appends glossary, Department of Health Guidelines for research on recombinant DNA molecules. Additional references: ICGEB, UNIDO, WHO, UNEP. Table, diagrams. (Karny, Geoffrey M.; UNIDO; Publisher: UNIDO, Vienna, UNIDO-ID/358, UN-E.89.III.E.6, UNIDO-UNIDO/IS.627, 145 pages [in English].)

3409 CLEAN TECHNOLOGY DIGEST. (A PROPOSAL) [BIB-IDA017889]

Expert report outlining and discussing contents of a proposed "Digest" of industrial pollutants, sources and agents, and of "clean" technology, as an essential part of beneficial technology transfer - covers (1) industrial processes and emissions for various manufactures (2) chemicals and risks (3) environmental engineering and clean technologies; pollution control. Statistics, flow charts, bibliography. Additional references: textiles, leather, pulp and paper industry, cement. Tables, diagrams. (Winter, Ernst Florian; UNIDO; Publisher: UNIDO, Vienna, UNIDO-IPCT.123, 73 pages [in English].)

3410 THE INTENTIONAL INTRODUCTION OF ORGANISMS TO THE ENVIRONMENT [BIB-IDA018003]

Introduction of non-indigenous organisms to the environment (reference: microorganisms) - covers (1) existing regulations in developed countries governing laboratory based research involving genetic manipulations; problem of harmonizing regulations and guidelines (2) legal aspects of the release and use of genetically engineered organisms (3) proposed international and regional cooperation for assessment and monitoring. Bibliography. Additional references: genetic engineering, biotechnology, UNEP, UNDP, FAO, UNIDO, WHO. (Beringer, John; UNIDO; Publisher: UNIDO, Vienna, 6 pages [in English].)

3411 REGULATIONS ON AIR POLLUTION AND WASTE INCINERATION IN EUROPE: SELECTED COUNTRIES [BIB-IDA018059]

Regulations on air pollution and waste incineration in selected European countries - covers (1) competences for legislation and administration (2) physical planning and zoning (3) standardization of pollution (4) environmental impact assessment and licensing (5) appealing procedures (6) sanctions and penalties (7) indemnification (8) economic aspects (9) main countries under consideration: Austria, Belgium, Denmark, France, Germany FR, Italy, Luxembourg, Netherlands, Switzerland, UK. Additional references: pollutants, health, environment, sulphur, advanced technology, agriculture, forestry, waste utilization, EEC. (Perez, Christa; UNIDO; Publisher: UNIDO, Vienna, UNIDO-IPCT.122, 56 pages [in English].)

3412 HYDROGEN PEROXIDE PRODUCTION. THE INFORMATION PACKAGE [BIB-IDA018062]

Expert report on the possible use of hydrogen peroxide in the chemical industry (reference: pollution control) - contains an information package on demand, production methods and possible applications of hydrogen peroxide as a substitute for more dangerous chemicals such as chlorine, for bleaching in the pulp and paper industry and textile industry, and as an oxidizing agent, i.a. for waste water treatment. Bibliography, statistics, diagrams. Tables, graphs, diagrams. (Ruiz-Cortes, Christina; UNIDO; Publisher: UNIDO, Vienna, 59 pages [in English].)

3413 ECONOMIC INCENTIVES AND DISINCENTIVES FOR THE INTRODUCTION AND APPLICATION OF CLEAN TECHNOLOGIES IN DEVELOPING COUNTRIES [BIB-IDA018075]

Expert report on the influence of economic incentives on choice of technology and pollution control in developing countries - covers (1) economic and environmental problems in developing countries to be considered in relation with technology transfer, foreign direct investment policies, with reference to the foreign investment of the USA (2) economic disincentives, such as pollution charges and taxes based on the "Polluter-Pays-Principle"; direct controls of potential pollutants (3) types of subsidies and their suitability as positive fiscal incentives. Statistics, diagrams, bibliography. Additional references: tax incentives, tax exemption. Tables, graphs, diagram. (Cacnis, Demetrios G.; UNIDO; Publisher: UNIDO, Vienna, UNIDO-IPCT.118, 65 pages [in English].)

3414 CONTROL OF INDUSTRIAL POLLUTION AND THE FINAL DISPOSAL OF HAZARDOUS WASTES [BIB-IDA018091]

Expert report on pollution control with special reference to waste disposal for hazardous wastes - covers (1) parameters for measuring the extent of pollution; effluent treatment and water management (2) the treatment of hazardous wastes prior to deposition, and their disposal, regarding i.a. site selection, evaluation, site assessment, problems arising during transport, types and possibilities of incineration, the filtering of, and approach to dangerous chemicals and biological pollutants and contaminants, such as dioxines (3) economic aspects and costs of different disposal options. Statistics, diagrams, illustrations, bibliography. Additional references: soil, marine pollution, choice of technology, treatment technology. Tables, graphs, diagrams, illus. (Meyer, John H.; UNIDO; Publisher: UNIDO, Vienna, UNIDO-IPCT.120, 74 pages [in English].)

3415 EIA (ENVIRONMENTAL IMPACT ASSESSMENT) MODELS FOR UNIDPLAN [BIB-IDA018093]

Expert report concerning the introduction of models designed at facilitating environmental impact assessment (EIA) - covers (1) the structure of such models surveying (a) the transport, distribution, transformation, etc. of chemicals and pollutants and (b) their effect problems (2) priority industries in the UNIDO environmental programme, such as metalworking industry, pulp and paper industry, cement industry, textile industry and low-grade coal power plants, and the recipients of such industrial effluents (3) a characterization of special models requirements for different purposes. Recommendations, tables. Additional reference: pollution control. Tables. (Jerneloev, Arne; Wahlgren, Ulf; UNIDO; Publisher: UNIDO, Vienna, 10 pages [in English].)

3416 SELECTED DATA ON POLLUTION EMISSIONS, ABATEMENT COSTS AND ABATEMENT TECHNOLOGIES IN U.S. INDUSTRY. CONTRIBUTION TO SECTOR REPORT FOR UNIDO GLOBAL REPORT [BIB-IDA018094]

Expert report giving data on industrial pollution and pollution control in the USA, with special reference to abatement costs and choice of technology - covers (1) value data for each 3-digit ISIC industry, including manufacturers value added, gross production value, pollution abatement equipment operating and capital costs (2) quantity data on pollutants emitted by the same group of industries (3) a list of relevant case studies, giving also physical properties of, and minimum standards for pollutants, methods of waste disposal and industrial effluent treatment, and alternative new low-waste technologies. Statistics, diagrams, bibliography. Tables, graphs. (Labys, Walter C.; UNIDO; Publisher: UNIDO, Vienna, 44 pages [in English].)

3417 POLLUTION PREVENTION AND INTEGRATED ENVIRONMENTAL MANAGEMENT: GUIDELINES FOR LEGISLATION [BIB-IDA018138]

Expert report supplying guidelines for legislation regarding pollution control and integrated environmental management - covers (1) possibilities of pollution prevention in factories, transport, agriculture and in products; energy saving (2) goals and techniques of integrated management of human impact on the environment (3) legislative approaches in Germany FR, in the USA, etc. (4) a draft pollution prevention and integrated environmental management act. Bibliography. (Irwin, Will A.; UNIDO; Publisher: UNIDO, Vienna, UNIDO-IPCT.119, 57 pages [in English].)

3418 REGULATIONS AND SAFETY ASPECTS OF ENGINEERED PLANTS AND MICROBIAL SPECIES. FINAL REPORT OF THE UNIDO/MBI WORKSHOP [BIB-IDA018148]

Regulations and industrial safety of engineered plants and microbial species (reference: genetic engineering) - covers (1) the biotechnology industry; risk assessment; data collecting (2) case studies (3) regulations at the global level and in Latin America (4) government policies; international organizations. Recommendations. List of participants. (Levin, Morris A.; Zilinskas, Raymond

A.; UNIDO; MARYLAND BIOTECHNOLOGY INSTITUTE, UNIVERSITY OF MARYLAND, USA; Publisher: UNIDO, Vienna, 17 pages [in English].)

3419 REVIEW AND ASSESSMENT: TECHNOLOGIES FOR RESIDUES UTILIZATION IN DEVELOPING COUNTRIES [BIB-IDA018150]

The use of wood residues in developing countries (reference: wood wastes) - covers (1) logging and milling residues; residue reduction (2) economic aspects (3) potential products from residues: energy; activated carbon; chemical extractives and by-products; bark extractives; naval stores (4) animal feed (5) fibreboard; particle board; solid wood residue (6) appropriate technologies; wood processing. Bibliography. Statistics. Additional references: plywood, kiln, drying, adhesives, capital investment, laboratory, equipment, energy, cement, gypsum, forest product processing. Table. (UNIDO; FOREST PRODUCTS LABORATORY, USA; Publisher: UNIDO, Vienna, 33 pages [in English].)

3420 PROTECTION DE L'ENVIRONNEMENT ET CONTROLE DE LA POLLUTION: UNE ANALYSE DE 60 PROJETS DE COOPERATION TECHNIQUE MIS EN OEUVRE PAR L'ONUDI DANS CE DOMAINE [BIB-IDA018226]

Expert report analyzing 60 projects for technical cooperation for environment protection and pollution control - covers (1) the role of UNIDO and her adopted policies (2) a survey of the projects, listed according to their respective industrial sectors, i.e. agro-industry, chemical industry, capital goods and metalworking industry, etc.; geographic distribution. Statistics. Additional reference: environmental engineering. Tables. (Motte, Francois; UNIDO; Publisher: UNIDO, Vienna, 52 pages [in French].)

3421 REPORT. (MEETING ON BIOTECHNOLOGY SAFETY) [BIB-IDA018237]

Report of a meeting on UNIDO, WHO and UNEP working group on biotechnology industrial safety - covers (1) reports on implementation of previous recommendations (2) concept papers on risk assessment and risk management; EEC-regulations of modern biotechnology; biosafety regulations in developing countries. Recommendations. List of participants. Additional references: trade, agriculture, financing, environment, laboratory, government contribution. (UNIDO; Publisher: UNIDO, Vienna, UNIDO-IPCT.113, 18 pages [in English].)

3422 TECHNOLOGY TRENDS IN CFC AND HALONS REPLACEMENT. TECHNOLOGY TRENDS SERIES: NO.11 [BIB-IDA018307]

UNIDO pub discussing trends in technological change concerning the replacement of chlorofluorocarbons (CFC) and halons (references: chemicals, air pollution) - covers (1) properties and uses of CFCs and halons, i.e. for refrigeration, plastic foam blowing, sterilization, as solvents and as aerosol propellants (2) approaches to CFC replacement, ongoing research and development and substitution possibilities for different industries (3) special considerations for developing countries, regarding barriers to technology transfer, financial aspects and constraints, etc. Diagrams, bibliography. Additional references: pollution control, chemical industry, ozone. Tables, graphs, diagram. (Ferguson, Sheila A.; Muir, Warren R.; Young, John S.; UNIDO; Publisher: UNIDO, Vienna, UNIDO-IPCT.114, 46 pages [in English].)

3423 THAILAND. MODERN PHARMACEUTICAL FORMULATIONS BASED ON THE TRADITIONAL THAI PHARMACOPOEIA. FINDINGS AND RECOMMENDATIONS. TECHNICAL REPORT [BIB-IDA018350]

Expert report on the use of traditional pharmacopoeia for modern pharmaceuticals in Thailand (reference: toxicity) - covers (1) laboratory and other facilities at a research centre, regarding i.a. equipment and information services (2) organizational aspects and specific needs, such as further training for the staff. Recommendations, diagrams. Diagrams. (Dayan, Anthony D.; UNIDO; Publisher: UNIDO, Vienna, UNIDO-DP/ID/SER.A/1347, 20 pages [in English].)

3424 CULTURAL ATTITUDES AND RISK MANAGEMENT IN INDUSTRIAL SETTINGS [BIB-IDA018460]

Cultural attitudes and risk management in industrial settings (reference: industrial safety) - covers (1) the influence on industrial facilities on the physical and cultural environments (2) types of risks: risks to personnel (health risks); risks to equipment; risks to surrounding community; causes of risks; ignorance; negligence; physical and mental fatigue; alcohol and drug use; dissatisfaction with working conditions (3) cultural attitudes: towards self, other persons, their property (4) risk reduction. Bibliography. Statistics. (Key, Carl Alan; UNIDO; Publisher: UNIDO, Vienna, UNIDO-IO.60, UNIDO-IO.60/Corr.1, 21 pages [in English].)

3425 TECHNICAL REPORT ON A SURVEY OF INDUSTRY ON THE PRESENT SITUATION REGARDING THE PHASEOUT OF OZONE DEPLETING SUBSTANCES AND ON THE ADHOC UNIDO INDUSTRY MEETING ON PHASING OUT OZONE DEPLETING SUBSTANCES HELD IN VIENNA ON 31 MAY 1990 [BIB-IDA018504]

Expert report on an industry survey and a meeting regarding the phaseout of ozone depleting chemicals (references: air pollution, environmental protection) - covers (1) problems and suggestions concerning substitution, concepts of waste disposal, recycling, etc. of air pollutants, refrigeration liquids, plastic foams, solvents, and halons in developed countries and developing countries; and the possible role of UNIDO (2) a summary of the presentations to the meeting and information obtained through interviews and from documents received from industry. Recommendations, statistics, agenda, list of participants. Additional references: financial aspects, chemistry, chlorine, polyvinyl chloride. (Moll, Klaus; UNIDO; Publisher: UNIDO, Vienna, 45 pages [in English].)

3426 PROVISIONAL LIST OF PARTICIPANTS [BIB-IDA018573]

List of participants for a meeting on industrial wastes, water management and effluent treatment, with special reference to countries in Africa. - (UNIDO; Publisher: UNIDO, Vienna, UNIDO-ID/WG.507/7/Rev.2, 2 pages [in English].)

3427 REPORT ON THE WORKSHOP ON INDUSTRIAL HYGIENE AND OCCUPATIONAL HEALTH SAFETY AND THEIR ENVIRONMENTAL CONCERNS, MANILA, 1991 [BIB-IDA019051]

Expert report on industrial hygiene and industrial safety including their environmental concern - covers (1) country papers from Afghanistan, Bangladesh, China, India, Indonesia, Korea R, Malaysia, Myanmar, Pakistan, Philippines, Sri Lanka and Thailand (2) FAO's report on distribution and use of pesticides (3) seminars. Recommendations. Appends list of participants. Additional references: health, laboratory. (Maramba, Nelia C.; UNIDO; Publisher: UNIDO, Vienna, UNIDO-DP/ID/SER.A/1485, 29 pages [in English].)

3428 FINAL REPORT. (UNIDO COUNTRY DIRECTORS ENVIRONMENT WORKSHOP: INTRODUCTION TO THE GUIDELINES ON ENVIRONMENTAL APPRAISAL) [BIB-IDA019086]

UNIDO pub presenting guidelines on environmental appraisal - covers (1) background; specific aims, output; definitions; procedures (2) the UN system; Specialized Agencies (3) project types, environmental assessment aims and mechanisms. Statistics, diagrams. Additional references: iron and steel industry, UNIDO, UNEP, ILO, FAO, WHO, OECD, industrial safety, health, pollution control, educational aspects, training. Tables, diagrams. (UNIDO; ENVIRONMENTAL RESOURCES LIMITED, LONDON; Publisher: UNIDO, Vienna, 56 pages [in English].)

3429 FINAL REPORT. (IN-DEPTH TRAINING COURSE ON CLEANER PRODUCTION TECHNOLOGY: SURFACE FINISHING) [BIB-IDA019129]

Training programmes on clean production technology with special reference to surface finishing and pollution control - covers (1) chemical and physical processes to change the surface and increase corrosion resistance; chemical coatings (2) potential environmental effects of surface treatment (3) replacements of hazardous chemicals by less toxic substances (4) waste water treatment; effluent treatment; control of air pollution. Additional references: environmental engineering, management technique, advanced technology. (Butlin, John; UNIDO; JOHN A. BUTLIN LIMITED, UK; Publisher: UNIDO, Vienna, 34 pages [in English].)

3430 ISSUES IN SUPPORT OF ECOLOGICALLY SUSTAINABLE INDUSTRIAL DEVELOPMENT [BIB-IDA019223]

Report of a meeting on ecologically sustainable industrial development (reference: pollution control) - covers (1) the concept (2) barriers to ecologically sustainable industrial development (3) relevant industry initiatives: pollution control and prevention, integration of environmental responsibility in decision making at management levels, research and development, relevant technology transfer (4) government contribution; international cooperation (5) future role of UNIDO. (UNIDO; Publisher: UNIDO, Vienna, UNIDO-ID/WG.516/2, 12 pages [in English].)

3431 STRIVING FOR ECOLOGICALLY SUSTAINABLE INDUSTRIAL DEVELOPMENT [BIB-IDA019225]

Ecologically sustainable industrial development (reference: pollution control) - covers (1) the UNIDO environment programme consulting; investment promotion (2) the project cycle, project identification, project formulation (design): project implementation, project evaluation (3) environmental guidance for projects (4) training of staff; seminars (5) environmental components of information systems (6) coordination with other organizations of the UN system; financing. Bibliography. Diagrams. Diagram. (UNIDO; Publisher: UNIDO, Vienna, 32 pages [in English].)

3432 INDUSTRY AND ENVIRONMENT. A GUIDE TO SOURCES OF INFORMATION [BIB-IDA019252]

Handbook on sources of information on industry and environment in various languages (reference: industrial information) - (1) discusses methods of finding information, including the analysis of the problem to be solved and the procedure (2) covers suppliers of information, institutions, information centres, data bases, bibliographic material (3) contains a subject index and an index of on-line vendors. Diagrams. Publisher: Verlag Dr. Grueb Nachf., Bollschweil, Germany)., graphs, diagrams. (UNIDO; Publisher: UNIDO, Vienna, 284 pages [in English].)

3433 SECTORAL PROGRAMME OF POLLUTION CONTROL IN THE TANNING INDUSTRY IN THE SOUTH-EAST ASIA REGION. EXECUTIVE SUMMARY ON THE STATUS OF THE PREPARATORY ACTIVITIES UNDER THE PROJECT US/RAS/89/246 [BIB-IDA019270]

Pollution control in the tanning industry in South East Asia - covers (1) introduction of low-waste advanced technology, economic aspects, legislation, technology transfer and human resources development, constraints (2) sectoral programme development (3) country projects (4) costs. (UNIDO; Publisher: UNIDO, Vienna, UNIDO-ID/WG.520/1, 10 pages [in English].)

3434 TYPICAL TANNERY EFFLUENT AND RESIDUAL SLUDGE TREATMENT [BIB-IDA019275]

Tanning sludge and effluent treatment - covers (1) basic principles, disregarding factory size (2) preventive measures inside the factory, reduction of water consumption, better utilization of chemicals, internal recycling, in-plant control appropriate technologies (3) pollution control (4) effluent treatment for small scale industries and medium scale industries (5) sludge treatment and disposal. Statistics, diagrams. Bibliography. Additional references: water treatment, water pollution, waste disposal. Tables, graphs, diagrams. (Clonfero, Giuseppe; UNIDO; Publisher: UNIDO, Vienna, UNIDO-ID/WG.520/6, 39 pages [in English].)

3435 DRAFT REPORT ON THE ENVIRONMENTAL PROBLEMS IN THE LEATHER INDUSTRY [BIB-IDA019309]

Expert report on the economic implications of environmental protection in the tanning industry - covers (1) official limits on tannery discharges (2) strategies for pollution control (3) problems with specific pollutants, i.e., salt, pesticides, sulphides, chromium, solvents emissions, water and solid wastes. Statistics, diagrams. Additional references: waste disposal. Tables, diagram. (Reaks, Guy; UNIDO; Publisher: UNIDO, Vienna, 24 pages [in English].)

3436 A SUMMARY OF THE DOCUMENTARY FILM, "A COMMON SENSE [BIB-IDA019495]

Documentary picture on sustainable economic development (reference: environment) - presents several distinct stories about successful moves for sustainable business practices in the areas of chemical industry (Du Pont Corporation, USA), asbestos industry (dismantling of industrial complex in Switzerland), automobile industry (recycling of extracted materials at Volkswagen, Germany FR), transport (environmental engineering of Asea Brown Boveri), electronic power generation (energy economics project of Pacific Gas and Electric and Southern California Edison). Additional references: industrial development, pollution control, research and development, energy saving, industrial policy, pilot project, role of UNIDO. (UNIDO; THE TELEVISION TRUST FOR THE ENVIRONMENT (TVE), UK; Publisher: UNIDO, Vienna, 9 pages [in English].)

3437 CONSULTANCY ASSISTANCE PROMOTION OF UNIDO KNOWLEDGE-BASED EXPERIENCE IN THE ACQUISITION OF ANTI SO_2/NO_x POLLUTION TECHNOLOGIES FOR STEEL AND POWER INDUSTRIES IN HUNGARY, CZECHOSLOVAKIA AND POLAND [BIB-IDA019496]

The acquisition of pollution control advanced technologies for iron and steel industries in Hungary, Czechoslovakia and Poland - covers (1) industrial administration and environmental regional government policy in Hungary: regulations, energy economics; strategies to cope with sulphur dioxide and various noxious nitrogen oxides (NO_x); pollutants; air pollution (2) the situation in Czechoslovak Poldi steel factory and power plant (3) electric power stations in Poland; the Katowice steel works (4) available appropriate technologies. Additional references: raw material, limestone, energy, solvent, humidity, heating, testing, knowhow, quality control. (Ito, Tadaharu; UNIDO; Publisher: UNIDO, Vienna, 42 pages [in English].)

3438 DEVELOPMENT AND USE OF MICROBES TO DEGRADE HAZARDOUS WASTE [BIB-IDA019551]

The use of microorganisms to degrade industrial wastes - covers (1) the effects of air pollution and water pollution on the environment; current methods of waste disposal (2) biodegradation as the process of mineralization of organic material by microbes (3) procedures involved in on site biodegradation; site examination (4) costs (5) health and environmental hazards (6) generic problems associated with using microbes to degrade wastes. Bibliography. Statistics, diagrams. Additional references: microbiology, biochemistry, biotechnology, chemical analysis, pollution control, advanced technology. Tables, diagrams. (Levin, Morris A.; UNIDO; Publisher: UNIDO, Vienna, 49 pages [in English].)

3439 ORNAMENTAL PLANTS AND NON-METALLIC SORBENTS FOR ENVIRONMENTAL PROTECTION [BIB-IDA019582]

Ornamental plants and nonmetallic sorbents for environmental protection - covers (1) environmental engineering (2) functions of greenery: 'production' of oxygen, hygiene, water and soil protection; sanitation. Appends catalogue of cultivars. Additional reference: pollution control. Illus. (UNIDO; UNIDO-CZECHOSLOVAKIA JOINT PROGRAMME, PILSEN; Publisher: UNIDO, Vienna, 56 pages [in English].)

3440 AUDIT AND REDUCTION MANUAL FOR INDUSTRIAL EMISSIONS AND WASTES [BIB-IDA019593]

Handbook for audit and reductions of air pollution and industrial wastes - covers (1) introduction to auditing of wastes, procedure (2) process inputs and outputs, recording of water utilization, measuring of levels of waste utilization and recycling, accounting for waste water, gaseous emissions and off-site wastes, determining and evaluation of waste reduction measures, developing of long-term options, segregation (4) case studies. Statistics, diagrams. Additional references: training, advanced technology, environment. Tables, diagrams, illus. (UNIDO; UNEP, PARIS; Publisher: UNIDO, Vienna, UN-91.III.D6, 127 pages [in English]. 92-807-1303-5)

3441 CHEMICAL POLLUTION FROM INDUSTRY-SOURCES, EMISSIONS AND EFFECTS. PAPER I [BIB-IDA019596]

Pollution control with special reference to water pollution and air pollution by chemicals - covers (1) background (2) pollution from (a) hides and skins industry, tanning, leather goods (b) pulp and paper industry (c) petrochemical industry and plastics industry (d) fertilizer industry and pesticides (e) metalworking industry (f) electronics industry (3) the relevant environments, processing methods, emissions and effects. Statistics, diagrams. Additional references: raw material, solvent, oxygen, sulphate, sulphuric acid, caustic soda, ammonia,

ammonium nitrate, ethylene, methanol, vinyl chloride, toxicity, waste disposal, water treatment, effluent treatment, Bangladesh, China, India, Indonesia, Korea R, Sri Lanka, Thailand, Malaysia, Philippines, Pakistan, Vietnam. Tables, graphs, diagrams. (UNIDO; ENVIRONMENTAL RESOURCES LIMITED (ERL), LONDON; Publisher: UNIDO, Vienna, 95 pages [in English].)

3442 CHEMICAL POLLUTION FROM INDUSTRY-MANAGEMENT AND CONTROL. PAPER II [BIB-IDA019597]

Industrial pollution control with special reference to source management of waste streams - covers (1) basic procedures for cost-effective pollution control, environmental awareness (2) evaluation, implementation, training, monitoring, review audit. Statistics, diagrams. Additional references: waste disposal, water treatment, solvent, gas, effluent treatment, advanced technology, recycling, water management. Tables, diagrams. (UNIDO; ENVIRONMENTAL RESOURCES LIMITED (ERL), LONDON; Publisher: UNIDO, Vienna, 64 pages [in English].)

3443 SELECTING THE MOST APPROPRIATE DATABASES TO ANSWER SPECIFIC QUESTIONS REGARDING THE ENVIRONMENTAL IMPACT OF INDUSTRY [BIB-IDA019598]

Selecting appropriate data bases for answering questions on environmental impact of industry - covers (1) data bases for consideration on the basis of specific requirements (2) hosts proposed for consideration (3) details on data bases relevant in the field of environmental impact of industry, databases produced by UN and specialized agencies, regional UN agencies, national centres with regional vocations, data bases produced by commercially oriented national organizations (4) detailed on selected hosts. Appends questionnaire. Bibliography. Additional references: electronic data processing. (Vasarhelyi, Pal; UNIDO; INTERNATIONAL FEDERATION FOR INFORMATION AND DOCUMENTATION (FID), THE HAGUE; Publisher: UNIDO, Vienna, 54 pages [in English].)

3444 ENVIRONMENTAL MANAGEMENT IN FISHERY-BASED INDUSTRIES. WORKING PAPERS IN INDUSTRIAL PLANNING NO.5 [BIB-IDA019678]

Environmental management in fishery product processing - covers (1) waste utilization of the fish processing industry (2) environmental aspects of waste and waste water from fish processing industries (3) waste water characteristics in such industries (4) sources of solid wastes (5) solid waste reduction, by-products and recycling (6) waste water treatment and by-products, economic aspects (7) health and industrial safety, maintenance and repair. Recommendations. Bibliography. Statistics, diagrams. Additional references: fish meal, fish protein concentrate, fishery. Tables, diagrams. (UNIDO; Publisher: UNIDO, Vienna, UNIDO-IO.53, 88 pages [in English].)

3445 TECHNOLOGY TRANSFER FOR SUSTAINABLE DEVELOPMENT. TRANSFER OF ENVIRONMENTAL TECHNOLOGIES: WHAT DOES IT MEAN [BIB-IDA019720]

Technology transfer for sustainable development (reference: pollution control - covers (1) technology transfer and sustainable development, history and present meaning (2) technology needed to solve environmental problems (3) relevant problems in developing countries: deforestation, desertification, urbanization, quality and supply of fresh water, sea and coast, biotechnology, industrial wastes (4) types of industry: agriculture, transport, sewage treatment, energy, food industry, tanning, cement industry, mining, iron and steel industry, coke, petrochemical industry, chemical industry (5) case study. Statistics. Table. (UNIDO; WAITRO ENVIRONMENTAL TECHNOLOGY GROUP, STOCKHOLM; Publisher: UNIDO, Vienna, 21 pages [in English].)

3446 VOLUNTARY CODE OF CONDUCT FOR THE RELEASE OF ORGANISMS INTO THE ENVIRONMENT [BIB-IDA019721]

Code of conduct for the release of organisms into the environment (reference: biotechnology) - covers (1) purpose and objectives (2) general principles (3) required government contributions (4) responsibilities of research and development. Extensive bibliography. Additional references: pollution control, micro-organisms, genetic engineering. (UNIDO; Publisher: UNIDO, Vienna, 29 pages [in English].)

3447 BLUEPRINT FOR CLEAN INDUSTRY. CONCLUSIONS AND RECOMMENDATIONS OF THE ESID CONFERENCE [BIB-IDA019751]

Ecologically sustainable industrial development (reference: pollution control) - presents conclusions and recommendations of the Conference on ecologically sustainable industrial development (ESID). (UNIDO; Publisher: UNIDO, Vienna, UNIDO-PI/111, 20 pages [in English].)

3448 PROCEEDINGS OF THE CONFERENCE ON ECOLOGICALLY SUSTAINABLE INDUSTRIAL DEVELOPMENT [BIB-IDA019752]

Ecologically sustainable industrial development (reference: pollution control) - (1) presents (a) report of the conference on ecologically sustainable industrial development (ESID) (b) paper on special issues (c) working papers (d) reports of technical symposiums (e) executive summaries of case studies (2) covers (a) the concept of ESID, definitions, barriers, initiatives of the industrial sector and government contribution, international cooperation (b) the role of transnational corporations and nongovernmental organizations (c) problem areas: attitudinal barriers, patents, labour, lack of training and quality control, financial crises (d) the role of financial institutions (e) the role of chambers of commerce and of trade unions (f) research and development, training (g) technology transfer. Recommendations. Bibliography. Tables, graphs, diagram. (UNIDO; Publisher: UNIDO, Vienna, UNIDO-PI/112, 276 pages [in English].)

3449 SERVING DEVELOPMENT BY SAVING THE ENVIRONMENT (PROMOUVOIR LE DEVELOPPEMENT EN SAUVEGARDANT L'ENVIRONNEMENT) [BIB-IDA019753]

Sustainable industrial development and safeguarding the environment - covers (1) manufacturing, economic development and the environment, linkages (2) ecologically sustainable industrial development (3) possible government contributions, the role of the industrial sector (4) community participation, international cooperation, nongovernmental organizations. (UNIDO; Publisher: UNIDO, Vienna, UNIDO-PI/113, 24 pages [in English, French].)

3450 FINAL REPORT. (COURSE ON ENVIRONMENTAL BIOTECHNOLOGY) [BIB-IDA019762]

Final report on a seminar on environmental biotechnology - covers (1) financial aspects: financial support for students (2) course programme (3) course evaluation. Statistics. Tables. (UNIDO; INSTITUTO DE BIOTECNOLOGIA, UNAM, MEXICO; Publisher: UNIDO, Vienna, 36 pages [in English].)

3451 GUIDELINES FOR RISK ASSESSMENT AND MANAGEMENT IN PETROCHEMICAL PLANTS [BIB-IDA019769]

Risk assessment and management in petrochemical industry (reference: industrial safety) - covers (1) petrochemical industrial enterprises and hazardous chemicals (2) risk assessment: discharges of industrial wastes, accidental massive release, fire and explosion, health effects etc. (3) risk management inside and outside of factory, site assessment, industrial safety measures, safety standards, development of skills, emergency response plan of action, physical planning, administrative aspects. Bibliography. (Dave, J.; UNIDO; Publisher: UNIDO, Vienna, 26 pages [in English].)

3452 THE IMPACT OF ENVIRONMENTAL ISSUES IN THE CAPITAL GOODS INDUSTRY IN LATIN AMERICA (LOS EFECTOS DE LAS CUESTIONES AMBIENTALES EN LA INDUSTRIA DE BIENES DE CAPITAL DE AMERICA LATINA) [BIB-IDA019773]

Environmental issues in the capital goods industry in Latin America - covers (1) the industrial sector in Latin America and the Caribbean 1980-90 (2) environmental issues: a case study approach (a) pulp and paper industry (b) hydroelectric power generation (c) chemical industry and iron and steel industry (d) mining (3) pollution control, interaction of pollutants with the environment, strategies, measures (4) environmental management and the capital goods industry (5) interrelationship between environmental awareness, economic development and the capital goods industry. Bibliography. Statistics. Tables. (Marcovitch, Jacques; UNIDO; Publisher: UNIDO, Vienna, UNIDO-ID/WG.526/4, 41 pages [in English, Spanish].)

3453 LINEAS DE TRABAJO PARA ENFRENTAR EL PROBLEMA DE LA CONTAMINACION INDUSTRIAL [BIB-IDA019825]

Industrial pollution and pollution control in Chile - covers (1) background and objectives (2) the industrial situation, impact on the environment by various industrial sectors (3) the role of industrial growth, increase in productivity with obsolescent infrastructure (4) air pollution, water pollution, contamination by solid industrial wastes (5) relevant projects in development (6) the impact of industrial production on the quality of life, the lack of relevant government policies, options to reduce emissions in the fields of raw materials processing and industrial production, possible regulations (7) role of UNIDO. Statistics. Table, graphs. (Katz B., Ricardo; UNIDO; Publisher: UNIDO, Vienna, 26 pages [in Spanish].)

3454 ENVIRONMENTAL GUIDELINES FOR THE FERTILIZER INDUSTRY. A DRAFT FOR THE PROJECT "UNIDO/WORLD BANK INDUSTRIAL POLLUTION GUIDELINES [BIB-IDA019881]

Draft environmental guidelines for the fertilizer industry - covers (1) sulphuric acid production (2) phosphoric acid production (3) ammonia production (4) nitric acid production (5) fertilizer production and use. Statistics, diagrams. Additional references: pollution control, pollutants, industrial safety, health, effluent treatment, waste utilization, appropriate technology, capital, costs. Tables, diagrams. (UNIDO; NORSK HYDRO AB, NORWAY; Publisher: UNIDO, Vienna, 54 pages [in English].)

3455 WORLD BANK POLLUTION CONTROL GUIDELINES FOR THE COPPER AND NICKEL INDUSTRIES [BIB-IDA019908]

UNIDO pub containing IBRD pollution control guidelines for the copper and nickel industries - covers (1) mining and processing of mineral resources (2) the copper and nickel manufacturing processes (3) economic and environmental factors (4) primary raw materials (5) consumption data (6) industrial wastes, waste utilization (7) waste minimization, recycling (8) major contaminants: arsenic, lead, mercury, nickel, silica, sulphur (9) hazardous material handling, effluent treatment (10) health, industrial safety (11) advanced technologies (12) capital costs. Bibliography. Statistics, diagrams. Tables, diagrams. (UNIDO; Publisher: UNIDO, Vienna, 32 pages [in English].)

3456 UNIDO PROGRAMME OF COOPERATION WITH DEVELOPING COUNTRIES TO ASSIST THEM MEET THEIR OBLIGATIONS UNDER THE MONTREAL PROTOCOL: AN OUTLINE OF THE WORK PROGRAMME FOR 1993 [BIB-IDA019916]

UNIDO programme of cooperation with developing countries with regard to their obligations under the Montreal Protocol (reference: pollution control) - covers (1) environmental aspects of electronics industry, the phasing out of ozone-depleting substances (ODS) (training and management programmes, investment, technology transfer, industrial information, appropriate institutional framework) (2) UNIDO's sector-based experience: refrigeration (Vietnam), plastics, plastic foam, solvents, recycling, information exchange (3) criteria for selection of countries (4) budget. (Haenninen, Pekka; UNIDO; Publisher: UNIDO, Vienna, 11 pages [in English].)

3457 TECHNICAL PAPER ON ENVIRONMENT PROTECTION IN ENGINEERING IN GENERAL AND IN THE ELECTRICAL AND ELECTRONICS INDUSTRY IN PARTICULAR [BIB-IDA019934]

Environmental protection in engineering and in the electrical industry and the electronics industry - covers (1) background and objectives (2) methods of pollution control applied in engineering industries, main pollutants, waste source reduction and waste minimization (3) process, equipment and material substitution (4) environmental protection in the electrical and electronics industries, processes (5) identification of pollutants (6) energy saving in electrical and electronics industry (7) follow-up actions. Bibliography. Statistics, diagrams. Additional references: chemicals, air pollution, solvent, semiconductor. Tables, diagrams. (Blagojevic, Gruja; UNIDO; Publisher: UNIDO, Vienna, 75 pages [in English].)

3458 PULP AND PAPER. CASE STUDY NO. 1 [BIB-IDA019940]

The environmental impact of pulp and paper production - covers (1) the impact of fibrous raw materials extraction from natural resources, chemical pulping (sulphite and alkaline pulping), bleaching of chemical pulps, waste paper processing, environmental impact of papermaking (2) energy conservation and paper manufacture (3) energy trends in technology development (4) environmental requirements for achieving ecologically sound industrial developments, water pollution limits, efforts to reduce such pollution, measures to reduce air pollution (5) government contribution (6) international cooperation. Bibliography. Statistics, diagrams. Tables, diagrams. (Fellegi, Jan; Judt, Manfred; UNIDO; Publisher: UNIDO, Vienna, UNIDO-ID/WG.516/4, 43 pages [in English].)

3459 INTERNATIONAL SAFETY GUIDELINES FOR PESTICIDE FORMULATION IN DEVELOPING COUNTRIES. A DRAFT REPORT [BIB-IDA019977]

Draft expert report on industrial safety for pesticides formulation in developing countries - covers (1) site assessment, factory building design, factory layout (2) maintenance and repair, preventive maintenance (3) establishment of analytical laboratory, contamination in working sites, safety equipment, safety regulations (4) packaging. (Sales, R.; UNIDO; Publisher: UNIDO, Vienna, 10 pages [in English].)

3460 EMERGENCY SAFETY PROCEDURES FOR PESTICIDE FORMULATION UNITS [BIB-IDA019978]

Emergency industrial safety procedures for pesticides formulation units - covers (1) disasters in chemical industry factories, release of gases etc. of higher toxicity (2) causes and effects: equipment failure, power system failure, human failure, natural calamities (3) prevention of emergency, pre-emergency procedures, communication procedure, emergency action drills. Appends chemical data form. Diagram. Additional references: maintenance and repair, transport, regulations, chemicals. Diagrams. (Srivastava, M.G.; UNIDO; Publisher: UNIDO, Vienna, 28 pages [in English].)

3461 INTEGRATION OF SAFETY WITH LOCAL ADMINISTRATION [BIB-IDA019979]

Integration of industrial safety with local level administration (reference: pesticides) - covers (1) legal aspects (2) types of integration (routine measures and emergency measures) (3) administrative aspects of integration of safety measures, management of integration (4) industrial safety in pesticides formulation factory. Additional references: insecticides, toxicity, environment, hygiene, health. 16 P. (Srivastava, M.G.; UNIDO; Publisher: UNIDO, Vienna, [in English].)

3462 PRODUCTION OF PETROCHEMICALS USING CLEAN TECHNOLOGIES [BIB-IDA020048]

Handbook on the production of petrochemicals with special attention to pollution control (reference: choice of technology) - covers (1) definition of low pollution technologies in such industry (2) main technologies considered for use in petroleum refining and various processing (3) environmental aspects in hazardous waste disposal, waste utilization, recycling (4) prospects for cleaner technologies, economic aspects (5) industrial pollution control in developing countries. Bibliography, diagrams, list of documents, manufacturers and research centres. Additional references: fermentation, sewage treatment, fuel gas. Diagrams. (UNIDO; Publisher: UNIDO, Vienna, 236 pages [in English].)

3463 SAFETY IN THE CONTAINED USE AND RELEASE OF TRANSGENIC ANIMALS AND RECOMBINANT PROTEINS [BIB-IDA020057]

Industrial safety in the contained use and release of transgenic animals and recombinant proteins (reference: genetic engineering) - covers (1) applications of recombinant genomes (2) production of such genomes (3) existing regulations (4) safety in the production of GMOs (5) contained use and release (6) environmental aspects (7) legal aspects. Glossary, Bibliography. Additional references: biotechnology, laboratory, ecology. (Powell, Don; UNIDO; Publisher: UNIDO, Vienna, 33 pages [in English].)

3464 SITE SELECTION/LOCATION [BIB-TINJ00001]

JUSTIFICATION

Factors involving availability of energy, raw material, proximity to dwellings, watercourses, markets are all critical for site location. The geographical environment of the plant and external developments may change with time and present safety, health and environment problems for future operation.

GUIDELINE

Site location for pesticide formulation plant should be carefully selected so as to minimize any present and future potential risk to human health and safety, and impact on the environment. Provision should be made for possible future extension.

KEY ELEMENTS

1. No proximity to residences/hospitals/schools, rivers or watercourses.
2. Area not prone to natural kalamities.
3. Ground structure—Good loadbearing and permiability aspects.
4. Good access road/rail facilities.
5. Adequate energy—Power resources.
6. Prevailing wind direction.

3465 PLANT DESIGN [BIB-TINJ00002]

JUSTIFICATION

The formulation of pesticide products is complex, involving multiple operations and activities in the use of, and exposure to potentially hazardous materials with associated risks arising from contamination, fire and other emergency situations.

GUIDELINE

A pesticide formulation plant design should comply with relevant local regulations and incorporate containment and preventive measures to ensure safe, hygienic and environmentally sound operation.

KEY ELEMENTS

1. Separated operating areas
2. Segregation—Dividing walls—Fire/contamination prevention.
3. Isolated solvent storage
4. Bunded areas—Leakage containment.
5. Good internal road network—Transport and emergencies.
6. Site security—Unauthorized access.
7. Ventilation.

3466 SITE LAYOUT [BIB-TINJ00003]

JUSTIFICATION

Formulation plant site layout reflects the sequence of process activities ranging through receipt of raw materials, formulation and finished product, storage or dispatch, and segregation to avoid cross-contamination of products. The strategic integration of site services, emergency facilities into the layout, communication between units and road access are vital to both routine operations and emergency situations.

GUIDELINE

Site layout should reflect the sequence of site activities with provision for unhindered routine and emergency passage between each unit or zone.

KEY ELEMENTS

1. Functional separation of areas in a logical sequence of plant equipment according to activities.
2. Separation of incoming raw materials from outgoing finished products.
3. Segregation of herbicides/rodenticides from other types of pesticides.

3467 ACCESS TO SITE AND BUILDINGS [BIB-TINJ00004]

JUSTIFICATION

The operation of a formulation plant may present considerable traffic and security problems during normal business and more so during emergencies.

GUIDELINE

A pesticide formulation site should have unobstructed, well lit and well maintained access and approach roads for safeguarding the workers, the general public and the surroundings, as well as for facilitating emergency actions. Similarly within the site there should be unhindered and well sign-posted access to site buildings.

KEY ELEMENTS

1. Permanent road structure, good load-bearing and maintenance.
2. Clear access to and around buildings.
3. Identification of alternative emergency approach routes.
4. Detailed emergency plans, including evacuation in cases of fire.
5. Separate entries for personnel and goods.

3468 MATERIALS OF CONSTRUCTION [BIB-TINJ00005]

JUSTIFICATION

Overall safety of a formulation plant may be improved by a careful selection of materials of construction to protect against fire, corrosion, flood and other risks.

GUIDELINE

Formulation and storage buildings should be constructed using strong fire-resistant material in preference to unprotected steelwork. Roof cladding should be light weight and capable of ventilating fume and smoke in the event of fire. Floors should be impervious, easy to clean and have a non-slip surface.

KEY ELEMENTS

Consideration of materials of construction:

- safety,
- functional considerations,
- compliance with laws and regulations,
- local availability.

3469 CLEAN TECHNOLOGY [BIB-TINJ00006]

JUSTIFICATION

A new or existing formulation plant could be improved by the selection of appropriate clean technology that brings about increased productivity, better utilization of materials and energy, produces less wastes and emissions.

GUIDELINE

All processes should be regularly monitored and improved for more efficient use of materials, resources and energy, and reduction of emissions.

KEY ELEMENTS

Process technology review—Consideration of:

- safety,
- raw materials,
- energy efficiency,
- nominal wastes and emissions.

3470 START-UP PROCEDURES [BIB-TINJ00007]

JUSTIFICATION

The start-up of a new plant or modified process always involves an element of safety risk requiring careful preparation and evaluation before handover for routine operation.

GUIDELINE

All relevant personnel should be trained in the plant process with special reference to safe operation before start-up.

KEY ELEMENTS

1. Establishment of start-up teams and definition of responsibilities.
2. Process routes and equipment operation and handling of chemicals.
3. Full identification and marking of equipment and piping before use.
4. Equipment and piping tests with or without water.
5. Final complete process check prior to actual production start-up.
6. Involve all relevant personnel in the plant commissioning stages to familiarize with use and minimize safety risks.
7. Operating procedures of equipment and piping.
8. Agreement and record of hand-over.

3471 SAFE PLANT OPERATION [BIB-TINJ00008]

JUSTIFICATION

The formulation of pesticides involves the use of hazardous materials and the exposure and/or contamination leading to potential safety risks during plant operation.

GUIDELINE

All safety procedures should be included in the operation manual and adhered to strictly by management and workers. The manual should be reviewed periodically and updated.

KEY ELEMENTS

1. Authority approval for plant design and operation.
2. Training in process and handling dangerous materials.
3. Updated safety instructions.

* Contained in: *International Integrated Safety Guidelines for Pesticide Formulation in Developing Countries*, UNIDO (1992)

4. Updated production procedures.
5. Formal safety assessment of plant operation.

3472 EQUIPMENT MAINTENANCE [BIB-TINJ00009]

JUSTIFICATION

Pesticides are usually formulated in multi-purpose plants producing a wide range of products from the same basic equipment. Lack of proper maintenance may lead to accidents and product contamination.

GUIDELINE

The safe and continuous operation of all formulation units should be ensured through a regular planned equipment maintenance programme. A stock of key spare parts should be held.

KEY ELEMENTS

1. Regular and preventive equipment maintenance.
2. Planned and scheduled maintenance—No temporary solutions.
3. Recorded actions.
4. Permit to work procedures.
5. Post maintenance inspections.
6. Correct spare parts and materials in use.
7. Workers observations and report of abnormalities.

3473 "PERMIT TO WORK" [BIB-TINJ00010]

JUSTIFICATION

Formulation plants require shutdown for maintenance and/or repair on a planned or unplanned basis. This involves maintenance staff who are not always fully aware of hazards and safety risks.

GUIDELINE

All potential risks to maintenance and/or repair personnel should be identified, and the necessary preventive measures stipulated in a formal authorized "permit to work", prior to the commencement of the work.

KEY ELEMENTS

1. Permit to work formal document contains:
- name of issuing authority,
- period of validity,
- identification of area and type of work.
2. Provision of appropriate Personal Protective Equipment(PPE).
3. Setting up of warning signs and notification.
4. Prior inspection of the work area is mandatory before issue of permit.
5. Full inspection of work area or equipment on completion of work.

3474 ON-LINE MONITORING EQUIPMENT [BIB-TINJ00011]

JUSTIFICATION

The regular and reliable monitoring at all stages of formulation ensures safe and efficient production.

GUIDELINE

Careful selection of monitoring equipment for safe, efficient and quality production should be ensured.

KEY ELEMENTS

1. Location of equipment.
2. Specific duty required.
3. Information required (temperature, pressure, flows, etc...).
4. Separate and integrated systems.
5. Regular inspection, maintenance and calibration of monitoring equipment.
6. Availability of spare parts.

3475 SAFETY CONTROL INSTRUMENTATION [BIB-TINJ00012]

JUSTIFICATION

Operational process stages in pesticide formulation may present potential hazards and safety risks which may be minimized and/or controlled by built-in safety devices and instrumentation in the event of process failure or malfunction.

GUIDELINE

Process plant and equipment should be fitted with fail-safe devices and instrumentation. Regular inspections and tests should be conducted so that hazardous situations do not develop.

KEY ELEMENTS

1. Provision of overflow tanks or cut-off sensors to prevent overfill.
2. Activated fail-safe devices to prevent unscheduled breakdowns.
3. Purge equipment with inert gas to remove inflammable solvents if necessary.
4. Adequate ventilation.
5. Gas, vapour and dust monitoring equipment.

3476 FIRE SAFETY [BIB-TINJ00013]

JUSTIFICATION

A fire in a pesticide plant or warehouse presents enormous hazards to persons within and outside the site with a serious immediate and future threat to the environment.

GUIDELINE

Emergency plans, fire fighting equipment and environmental protection measures should be considered for each specific location.

KEY ELEMENTS

1. Emergency/contingency plans including a layout map of fire fighting systems.
2. Training, regular fire drills and evacuation procedures.
3. Fire extinguishers—Portable and mobile.
4. Hydrants, hoselines, sprinkler systems.
5. Spent water containment.
6. Post-fire clean-up procedures.

3477 MATERIALS HANDLING [BIB-TINJ00014]

JUSTIFICATION

The hazardous nature of active ingredients and the other raw materials used in pesticide formulation requires that all responsible personnel are fully aware and informed of their safe handling.

GUIDELINE

Safety instructions should be given to all personnel involved in the materials handling of pesticide formulations.

KEY ELEMENTS

1. Materials Safety Data Sheets.
2. Operational safety information.
3. Training.
4. Safety equipment and maintenance.
5. Workers participation.

3478 CLOSED OPERATING SYSTEMS [BIB-TINJ00015]

JUSTIFICATION

Closed operating systems lead, in principle, to complete containment to avoid contamination at the working site and the environment.

GUIDELINE

All potentially hazardous emissions from processes and other activities should be removed at source, contained and, where possible, recycled or re-used.

KEY ELEMENTS

1. Dust extractions and product recovery using cyclone, bag filters, etc...
2. Vapour absorption/adsorption.
3. Membrane technology, effluent reduction, re-use, etc...
4. Loading and unloading closed systems.
5. Effluent treatment, re-use.
6. Waste incineration, heat recovery.
7. Selected re-use of some containers.

3479 PACKAGING AND LABELLING [BIB-TINJ00016]

JUSTIFICATION

Basic requirements in pesticide packaging are product containment, no leakage or permeation. It gives good physical protection during transport and storage and prevents decomposition. Labelling conveys product information and precautionary measures for distributors and users.

GUIDELINE

Containers, outer packages and labels should conform to national and/or international safety standards relating to hazardous substances.

KEY ELEMENTS

1. Storage tests on product stability and package suitability.
2. Use of the World Health Organization (WHO), "Classification of Pesticides Based on Hazards", and the Food and Agricultural Organization (FAO), "Code of Conduct on Distribution and Use of Pesticides".
3. Ease of handling, stacking and use (pouring).

4. Labelling—choice of direct print versus adhesive labels.
5. Label facing and durability.
6. Information—instruction—language.

3480 QUALITY CONTROL [BIB-TINJ00017]

JUSTIFICATION

Quality of raw materials influences the quality and safety of the finished products. Well equipped laboratory and qualified staff working to well-defined specifications are an essential requirement.

GUIDELINE

A formulation plant should have a quality control programme designed to ensure product quality in compliance with national/international specifications. The system should cater for the quality of both incoming and outcoming materials including packaging.

KEY ELEMENTS

1. Well equipped laboratory and qualified staff.
2. Well defined sampling procedures, analytical methods and procedures (WHO and FAO specifications and Collaborative International Pesticide Analytical Council (CIPAC) methods).
3. Training facilities.
4. Data recording and security.
5. Compliance with national and international specifications.
6. Auditing performance by independent authority.
7. Samples retention.
8. Traceability of raw materials.

3481 "NEAR MISSES" [BIB-TINJ00018]

JUSTIFICATION

"Near misses" such as unexpected escape of material or release of energy occurring wholly on-site are readily contained with minimal potential for off-site effects. Such near misses are important lessons for unsatisfactory equipment or procedures.

GUIDELINE

All abnormal occurrences , however minor, should be investigated, causes identified and remedial actions implemented.

KEY ELEMENTS

1. Incident investigation and remedial action.
2. Inclusion of lessons in training programme.
3. Product spillage.
4. Localized fire outbreak.
5. Monitoring equipment failure.

3482 MATERIALS FOR EQUIPMENT CONSTRUCTION [BIB-TINJ00019]

JUSTIFICATION

Chemical and atmospheric corrosion, galvanic couple effect, and wear and tear of materials of construction, may lead to leakage and/or breakdown of the equipment resulting in hazardous situations. Steel, stainless steel, anti-abrasion alloys, plastics and elastomers, are commonly used in formulation plants. Use of low quality of materials construction reduces safety and capability of the formulation plant.

GUIDELINE

Materials for construction of equipment and related parts should be selected to resist the chemical attack by liquids and the abrasive action of solids involved in the formulation process. The atmospheric corrosion should also be taken into account.

KEY ELEMENTS

1. Testing materials of construction, specially plastics and elastomers.
2. The presence of heavy metals may produce degradation of some pesticides.
3. Plate of characteristics attached to each equipment.
4. Grounding/earthing and anti-static electricity devices for discharging static electricity.
5. Explosion proof electric motors and wiring in classified areas.
6. Spark-free fork lifts.

3483 SIGNS [BIB-TINJ00020]

JUSTIFICATION

Display, at appropriate places, of signs and symbols giving warnings, information and instructions ensure safety and security in the formulation plant. Internationally accepted signs and symbols are available.

GUIDELINE

Label or sign stewardship should be established to manage the overall quality, suitability and acceptability of labels, signs and pictograms, in accordance with national/international standards.

KEY ELEMENTS

1. Use of standard sign.
2. Easily visible location.
3. Employee-friendly—Description in local language—Pictograms.
4. Durable, chemical resistant and weatherproof.
5. Regularly inspected.
6. Transport vehicles—Contact information in case of emergency.

3484 MATERIAL SAFETY DATA SHEET (MSDS) [BIB-TINJ00021]

JUSITIFICATION

The Material Safety Data Sheet (MSDS) for each chemical used in the plant provides essential safety information such as product properties and the associated handling safety, environmental and emergency advice. The MSDS is provided from the supplier and may be abstracted from other publications. The use of MSDS by management may prevent the occurrence of potential hazards.

GUIDELINE

A Material Safety Data Sheet (MSDS) should be held for each chemical being handled, including active ingredients, formulation ingredients and the formulated products.

KEY ELEMENTS

1. Internationally accepted format (European Commission, International Labour Organization, ILO). See records coded: BIBL-TINJ00045 & BIBL-TINJ00046.
2. Access to MSDS on formal request—Competent authorities—Management and workers representative.
3. Sources of information for MSDS:
- Supplier,
- International Programme on Chemical Safety (World Health Organization, WHO),
- International Register of Potentially Toxic Chemicals (United Nations Environment Programme, UNEP),
- Occupational Safety and Health Administration (OSHA USA).

3485 EMERGENCY SAFETY PROCEDURES [BIB-TINJ00022]

JUSTIFICATION

Emergency situations arise due to failure of plant equipment, human failure or natural calamities. These may involve fire explosion, injury, environmental hazard, loss of containment.

GUIDELINE

Emergency safety procedures should be carefully prepared and contained in a contingency plan covering:

- pre-emergency measures to identify and control hazards, and trained personnel in the coping procedures,
- actions to contain and minimize hazards during emergency. Management should coordinate with local authorities and provide trained personnel to cope with emergency.

KEY ELEMENTS

1. Internal and third party assessment of hazard.
2. Alertness level zoning of high risk areas of the plant.
3. Documentation of emergency procedures.
4. Regular practice of emergency procedures.
5. Coordination of safety actions during emergency.
6. Warning systems and communication with neighbouring community.
7. Post emergency reporting, salvage, loss assessment (and claim), repair and recommissioning of plant.
8. Modification and improvement of procedures.

3486 OCCUPATIONAL HEALTH MONITORING [BIB-TINJ00023]

JUSTIFICATION

Health assessment of workers handling pesticides along with biological monitoring and medical examination is essential for the safety of workers and may

identify early stage of health deviations.
GUIDELINE
An occupational health monitoring programme appropriate for the products and processes should be provided for the workers by the management. Medical records should be maintained.
KEY ELEMENTS
1. Pre-employment and periodical examinations.
2. Assessment of pesticide exposure.
3. Personal and static hygiene monitors.
4. Inhalation exposure assessment.
5. Dermal exposure assessment.
6. Threshold Limit Values (TLV).
7. Maintenance of individual health records.

3487 PERSONAL PROTECTIVE EQUIPMENT (PPE) [BIB-TINJ00024]

JUSTIFICATION
The use of appropriate Personal Protective Equipment (PPE) is a safeguard to any person and cannot be substituted by effective engineering controls, need for sound working conditions/practices and personal hygiene.
GUIDELINE
Workers in pesticide formulation plants should use appropriate Personal Potective Equipment (PPE) which should be provided by management.
KEY ELEMENTS
1. PPE programme and enforcement (responsibilities defined).
2. PPE appropriate to process and hazards category.
3. Comfort in use of PPE.
4. Decontamination, cleaning, maintenance, and storage.
5. Training in proper use.
6. PPE for emergency situations.

3488 VENTILATION [BIB-TINJ00025]

JUSTIFICATION
Properly designed ventilation is essential in all pesticide plants, laboratories and warehouses to minimize the effects of dangerous fumes, vapours and odours. This problem is aggraved by hot climates.
GUIDELINE
All plants, laboratories and warehouses should be properly designed or modified to ensure regular air changes and where necessary provided with assisted air movement using fans or extractors.
KEYELEMENTS
1. Correct location of wall and roof vents.
2. Fan assisted air flow.
3. Controlled storage of materials for good air circulation.
4. Spot ventilation, if needed.
5. Monitoring of air quality in buildings.

3489 MEDICAL FACILITIES [BIB-TINJ00026]

JUSTIFICATION
The provision of adequate medical facilities in pesticide formulation plants is normally a legal requirement stipulating minimum acceptable standards to ensure health and safety of the workers.
GUIDELINE
The pesticide formulation plant should provide well equipped medical facilities and qualified personnel to handle all medical requirements relevant to the type of product formulated and size of the plant.
KEY ELEMENTS
1. Number of workers on-site.
2. Professional services of occupational health professionals.
3. Contract with emergency hospital and ambulance service.
4. Adequate medical emergency equipment.
5. Supplies of medicines, drugs and antidotes.
6. First aid training.
7. Periodical medical checks and individual health records.

3490 ACCIDENT REPORTING [BIB-TINJ00027]

GUIDELINE
The establishment and maintenance of systematic accident reporting in accordance with national or international standards should be the commitment and responsibility of management.
JUSTIFICATION
Accident reporting and investigation of causes are vital in order to prevent further accidents.
KEY ELEMENTS
1. Reporting system. See records coded: BIBL-TINJ00047, BIBL-TINJ00048, BIBL-TINJ00049, BIBL-TINJ00050 and BIBL-TINJ00051.
2. Process for follow-up and action taken.
3. Maintain accurate records.
4. Sharing accident experiences.
5. Reporting to external statutory authorities.
6. Analysis, evaluation of accident reports for corrective measures.

3491 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) [BIB-TINJ00028]

JUSTIFICATION
An Environmental Impact Assessment (EIA) identifies the potential impact of a new or modified plant and how this may be eliminated or minimized at the design stage. It is particulary important to carry out an EIA in situations where local legislation and planning controls are inadequate or non-existent.
GUIDELINE
A formal environmental impact assessment (EIA) should be conducted and documented for new plants at an early stage and also for major changes in existing plants.
KEY ELEMENTS
1. Site location.
2. Disposal of solid wastes, liquid effluents and gaseous emissions.
3. Containment of spillages, leakages and wastes.
4. Compliance with local legislation/standards.
5. Destruction of used containers.
6. Flora and fauna protection.
7. Soil and groundwater contamination.

3492 PROXIMITY OF DWELLINGS [BIB-TINJ00029]

JUSTIFICATION
Houses, hospitals and schools sited in close proximity to a pesticide formulation plant can lead to extremely sensitive situations. Complaints relating to nuisance-noise, odours and road traffic can be expected. The event of a fire or other serious emergency situation could result in the severe restriction of future activity or even site closure.
GUIDELINE
A formulation plant should prepare and implement an emergency plan which considers the proximity of dwellings. Site operations should undergo a safety and environmental external impact study.
KEY ELEMENTS
1. Community relations initiatives—Site representative—Information on safety systems installed.
2. Investigate and respond to all complaints.
3. Open-house policy—Discuss operations and concerns with local residents.
4. Carry out external environmental/safety impact study.
5. Prepare action plans for implementation in event of an emergency.

3493 WASTE RECYCLING/DISPOSAL [BIB-TINJ00030]

JUSTIFICATION
Waste materials arising from pesticide formulation are potentially toxic, polluting and costly for disposal. Recycling of all wastes, where possible at source, is essential to minimize quantities of disposal. Non-recoverable wastes, unless properly managed during disposal may present toxic exposure and contamination risk to both man and the environment.
GUIDELINE
Waste minimization and recycling should be regarded as an integral part of the formulation process. Non-recoverable wastes should be safely disposed in a legal and responsible manner.
KEY ELEMENTS
1. Waste minimization studies.
2. Process selection and modification.
3. Quantification of recovered materials/benefits.

4. Safe disposal of non-recoverable wastes using Best Available Technology (BAT).
5. Records—compliance with disposal regulations.
6. Off-site disposal through certified contractor using BAT.
7. Community's right to know.

3494 DECOMMISSIONING OF PESTICIDE FORMULATION PLANT [BIB-TINJ00031]

JUSTIFICATION

Pesticide formulation plants may be closed or moved to another site due to economic, health or environmental considerations. This may involve disposal of unused or unwanted raw materials and products which may create safety hazards.

GUIDELINE

Decommissioning of pesticide formulation plants should be carefully planned and carried out by trained personnel with the knowledge of the appropriate authorities and the surrounding community.

KEY ELEMENTS

1. Community's right to know.
2. Classification of chemicals and wastes.
3. Re-use and/or disposal of products and equipment.
4. Site decontamination.
5. Final clearance by appropriate local authorities.

3495 DISPOSAL OF UNWANTED PESTICIDE STOCK [BIB-TINJ00032]

JUSTIFICATION

Stock of unwanted pesticides for various reasons may accumulate into large quantities for storage. These present special problems for disposal particulary in developing countries where suitable disposal technologies may not exist.

GUIDELINE

Unwanted pesticide stocks should be classified, SAFELY over-packed, labelled, recorded and SECURELY stored to await re-use or disposal option.

KEY ELEMENTS

1. Good stock forecasting and turnaround.
2. Reformulation for use if suitable.
3. Sell or give to approved users.
4. Identification over packing and recording.
5. Safe and secure storage.
6. Disposal initiatives—Incineration—Government—multinational. Shared central resources.
7. International Group of National Associations of Manufacturers of Agrochemical Products (GIFAP) Guidance Booklet, "Disposal of Unwanted Pesticide Stocks", 1991.

3496 PRODUCT SELECTION [BIB-TINJ00033]

GUIDELINE

Products should be selected on the basis of a full appraisal of the hazards associated with the raw materials and the type of formulation.

JUSTIFICATION

Pesticide active ingredients and adjuvants including filters, solvents, surfactants, may present hazards of toxicity, flammability and explosion.

KEY ELEMENTS

1. Material Safety Data Sheets (MSDS).
2. Proven technologies.
3. In-house process data.
4. Quality control capability.
5. Formulation recipe sheet.
6. Raw materials specification.
7. Suitability of packaging materials.
8. Documents on banned or restricted pesticides.
9. World Health Organization WHO classification of pesticides based on hazards.

3497 SAFETY AUDIT [BIB-TINJ00034]

JUSTIFICATION

Periodic internal and external safety reviews or audits, assist in the early identification of hazards and their control. Involvement of management and workers will create awareness and responsibility in the safe operation of a pesticide formulation plant.

GUIDELINE

An internal periodic staff audit should be undertaken by a team comprising members from within and outside the company, including management and workers representation, with at least one member knowledgeable in safety, health and environmental compliance as required by local law.

KEY ELEMENTS

1. Checklist for audit.
2. Regular audits—All staff levels involved.
3. Hazard controls, accident reports, biological and environmental monitoring.
4. Equipment maintenance, training schemes.
5. Safety interviews—Discussions with staff.
6. Recommendations, follow-up actions.
7. Publicize actions—Results of actions taken.

3498 RISK ASSESSMENT AND MANAGEMENT [BIB-TINJ00035]

JUSTIFICATION

Assessment and management of risks in a formulation plant are essential elements of a progressive overall site safety strategy to evaluate potential risk areas and implement corrective actions to prevent occurrences.

GUIDELINE

Risk assessment and management should form a part of the overall site safety and environmental strategy and be aligned specifically to the products and operations.

KEY ELEMENTS

1. Design, planning and modification.
2. Safety inspections and audits.
3. Elimination/reduction of risk.
4. Standards operation procedures.
5. Contigency planning including mutual aid arrangements with neighbouring plants.

3499 TRAINING [BIB-TINJ00036]

JUSTIFICATION

Ongoing and regular training of all staff is essential to promote awareness of safety needs and also to provide necessary knowledge and skills to prevent and minimize hazards.

GUIDELINE

Regular training and refresher programmes for all staff at all levels in the areas of safety, health and environmental control measures should be implemented.

KEY ELEMENTS

1. Identification of training needs.
2. Development of training plan.
3. Implementation.
4. Evaluation and recording.
5. Improvement of training programmes and refresher courses.
6. Training of the trainers.

3500 SECURITY OF PLANTS [BIB-TINJ00037]

JUSTIFICATION

Security risks arise from unauthorized entry or activity in plant premises, infrastructure, systems and facilities.

GUIDELINE

The formulation plant should be secured against unauthorized entry and security arrangements should be periodically reviewed and updated.

KEY ELEMENTS

1. Security of total premises (boundary wall/fence, gates, lighting).
2. Security guards (own employed/hired).
3. Security of individual activity unit (plant, warehouse, etc...).
4. Workers identity.
5. Entry pass system for visitors.
6. Security of records.
7. Liaise with police.

3501 USER AND ENVIRONMENT FRIENDLY FORMULATIONS [BIB-TINJ00038]

JUSTIFICATION

The improvement of overall safety for both the manufacturer and user is dependent upon the continuous risk assessment and modification of product formulations from more hazardous to more user-and environment-friendly materials.

GUIDELINE

Management should adopt strategies to substitute hazardous formulations with safe and more user-and environment-friendly types.

KEY ELEMENTS

1. Reduction of inflammable solvents and propellants.
2. More water-based products.
3. Dust-free granules.
4. Liquid seed dressings.
5. Application—Reduced—Dosage rates.
6. Use of ozon-friendly propellants.
7. Slow release formulations.
8. Bio-pesticides.

3502 INTEGRATION OF SAFETY WITH LOCAL ADMINISTRATION [BIB-TINJ00039]

JUSTIFICATION

The in-house safety procedures and equipment of the formulation plant can be linked with existing procedural requirements and facilities of the state/local administration and services. This optimizes the safety of the plant.

GUIDELINE

Integration of safety with local administration and services should cover the statutory requirements of routine nature as well as the measures to be taken during emergency.

KEY ELEMENTS

1. Routine inspections—actions.
2. Environment protection system—effluent treatment, air, water monotoring and use of approved landfill sites.
3. Procedures and resources to be utilized during fire.
4. Safety measures in the case of an accident, injury poisoning or natural calamity.
5. Information and reporting to the local authorities.

3503 MAINTENANCE OF SAFETY DATABANK [BIB-TINJ00040]

JUSTIFICATION

The efficient input, retrieval and protection of records are essential to ensure a quantitative and qualitative future base for monitoring and improving Safety, Health and Environment (SHE) aspects of operational activities.

GUIDELINE

The development and maintenance of an efficient safety data bank should form an integral requirement of pesticide formulation activity.

KEY ELEMENTS

1. Collection, processing and maintenance of safety data.
2. Data classification and protection.
3. Confidential and open-access.
4. Storage time limit of records.

3504 WORKER/MANAGEMENT RESPONSIBILITY [BIB-TINJ00041]

JUSTIFICATION

Both management and the workforce have a shared responsibility and commitment to ensure safe working conditions and practices within the workplace.

GUIDELINE

A committee of workers and management should be formed to meet regularly to discuss and agree on site safety policies and implementation.

KEY ELEMENTS

1. Management/workers group meetings.
2. Worker observations and feedback.
3. Resources and manpower commitment.
4. Training and communication.
5. Performance—joint reviews and actions.
6. Periodic and emergency meetings.

3505 INSURANCE COVER [BIB-TINJ00042]

JUSTIFICATION

Insurance is necessary to cover damages to plant personnel, neighbouring community and environment. Insurance is not a substitute for safety measures but guarantees the economic plant viability in the event of an accident.

GUIDELINE

Management should take insurance cover against damages incurred in any accident in addition to normal leagal requirements.

KEY ELEMENTS

1. Scope of cover—see records coded: BIBL-TINJ00052, BIBL-TINJ00053 and BIBL-TINJ00054.
- Personnel injuries/present and long term medical viability.
- Neighbouring community and property.
- Environment damages.
2. Third party risks against transport and transit accidents.
3. Periodic appraisal of insurance coverage.

3506 ROLE OF THE GOVERNMENTS [BIB-TINJ00043]

It is recommended that Governments should:

1. Ratify the Integrated International Safety Guidelines for Pesticide Formulation and take necessary measures to assist pesticide formulation industries to adopt the guidelines.
2. Consult international organizations and make necessary requests for advisory services to improve Safety, Health and Environment (SHE) aspects related to pesticide formulation in their countries.
3. Provide co-ordination between industries and relevant ministries to facilitate the implementation of the safety guidelines.
4. Provide necessary incentives for improving SHE aspects related to pesticide formulation and encourage introduction of cleaner technology, safer and environment friendly products.
5. Keep the community informed about local pesticide formulation plants, their safety records, the waste generated and disposed of every year and steps taken to minimize waste.
6. Take necessary steps to join the UNIDO-Global Network on Safety (GLONESA) in pesticide formulation and seek on a cost sharing basis, and through Technical Cooperation among Developing Countries (TCDC), assistance from international organizations in order to improve the overall safety in pesticide formulation for the benefit of workers, users, the community and the environment.
7. Encourage uniform accident reporting for the pesticide formulation industry and share the information with the Member Countries of GLONESA so that they could benefit by preventing similar types of accidents.
8. Promote through regional and sub-regional networking an efficient and economical way of dissemination of information through a centralized data bank.

3507 ROLE OF INDUSTRIES [BIB-TINJ00044]

It is recommended that industries should:

1. Take necessary steps to adopt measures to improve safety, health and environment (SHE) aspects related to existing pesticide formulation plants or installation of new plants.
2. Maintain close contact with the local community and the authorities to make their plant operations transparent with respect to SHE aspects.
3. Seek assistance from international organizations directly or through their governments to provide information on international specifications or standards whenever needed and in getting advisory services to improve safety measures.
4. Co-operate with local authorities and other chemical industries to solve waste disposal problems.
5. Maintain a data bank regarding their waste generated, recycled/re-used and disposed of and aim at minimization of waste.
6. Endeavour to introduce cleaner technologies and consult their governments regarding suitable assistance for adoption of new technology.
7. Establish product stewardship so that their products are monitored with regard to their safety and acceptability by the users.

8. Follow strictly "good manufacturing practice" and "responsible care" in their formulation activities.

3508 CRITERIA FOR MATERIAL SAFETY DATA SHEETS [BIB-TINJ00045]

Criteria for the preparation of pesticide-related Material Safety Data Sheets for hazardous chemicals should ensure that they include essential information including, as applicable:
1. chemical product and company identification (including trade or common name of the chemical and details of the supplier or manufacturer);
2. composition/information on ingredients (in a way that clearly identifies them for the purpose of conducting a hazard evaluation);
3. hazards identification;
4. first-aid measures;
5. fire-fighting measures;
6. accidental release measures;
7. handling and storage;
8. exposure controls/personal protection (including possible methods of monitoring workplace exposure);
9. physical and chemical properties;
10. stability and reactivity;
11. toxicological information (including the potential routes of entry into the body and the possibility of synergism with other chemicals or hazards encountered at work);
12. ecological information;
13. disposal considerations;
14. transport information;
15. regulatory information;
16. other information (including the date of preparation of the Material Safety Data Sheet).

3509 FORM FOR MATERIAL SAFETY DATA SHEETS [BIB-TINJ00046]

An example of a pesticide-related Materials Safety Data Sheet requests information for each product on: in relation to fire and explosion as well as to exposure (i.e. inhalation, skin, eyes and ingestion) details on acute hazards and symptoms, prevention, first aid and fire fighting; spillage disposal; storage; packaging and labelling; physical properties; environmental data. Space for other relevant information is provided.

3510 FORM FOR ACCIDENT REPORT [BIB-TINJ00047]

An example of an Accident Report requests the following type of information:
- company/plant;
- time and place of accident;
- authorities informed;
- injuries to persons;
- material damaged by explosion or fire;
- quantity and type of release (i.e.spillage and airborne);
- stage of process handling or type of equipment involved;
- materials/chemicals involved;
- operation (see records coded: BIBL-TINJ00048, BIBL-TINJ00049, BIBL-TINJ00050);
- value of lost property or other losses (including persons and turnover);
- environment damage;
- short description of incident with causes and consequences;
- action and recommendations to prevent recurrence;
- applicability of occurrence in similar locations.

3511 ACCIDENT REPORT, CODING LIST—OPERATION DURING WHICH THE INCIDENT STARTED [BIB-TINJ00048]

Operation during which the incident started:
1. Normal procedure/work;
2. Start-up of process/equipment etc ...,test run;
3. Shutdown of process/stopping of machinery, etc;
4. Failure in process/corrective action;
5. Repairs/maintenance/installation/modification;
6. Transport;
8. Weekend/night or other time outside working hours;
9. Other operation/not known/of no importance.

3512 ACCIDENT REPORT, CODING LIST—TRIGGER EVENTS—CAUSES OF ESCALATION [BIB-TINJ00049]

Trigger events—Causes of escalation:
1. Absence of inadequacy of safety device;
2. Safety device not functioning;
3. Other construction defects, failures;
4. Wrong or faulty construction material;
5. Shortcomings in the process or in its control system;
6. Poor condition due to insufficient maintenance;
7. Incorrect use of equipment or material;
8. Insufficient instructions/training/supervision;
9. Lack of experience in duty/temporary manpower;
10. Human error/illness/carelessness;
11. Other triggering events. Which?;
12. Cause not known;
13. Incorrect plant location or lay-out;
14. Inadequate structural fire or explosion protection;
15. Lack of space/crammed space;
16. Insufficient fire fighting or rescue material;
17. Insufficient instructions or training for emergency;
18. Disregard of earlier damages and hazardous incidents;
19. Other causes increasing the damages. Which?

3513 ACCIDENT REPORT, CODING LIST—CAUSES OF PRODUCT LIABILITY INCIDENTS [BIB-TINJ00050]

Causes of product liability incidents:
1. Product quality does not correspond to the specifications;
2. Products packing inadequate;
3. Product damaged during transport (e.g. residues of other products in the tank);
4. Packing damaged during transport;
5. Product or packing damaged in intermediate storage;
6. Insufficient operational instructions;
7. User error;
8. Other causes related to product liability;
9. Soil contamination or water contamination.

3514 CODES FOR FORMULATION TYPES [BIB-TINJ00051]

AB grain bait
AE aerosol
AS aqueous solution
BB block bait
BR briquettes
CA coating agent
CB bait concentrate
CG encapsulated granules
CM cream
CR crystals
CS capsule suspension
DP dustable powder
DS dry seed treatment
EC emulsifiable concentrate
EM emulsion
EO water-in-oil emulsion
EW oil-in-water emulsion
FC liquid cream
FD smoke tin
FG fine granules
FP smoke cartridge
FS flowable concentrate for seed treatment
FT smoke tablet
FU fulmigant
FW smoke pellets
GA gas
GB granular bait
GE gas-generating product
GF smoke granules
GG macrogranules
GL gel
GP flow-dust

GR granules
GS grease
HN hot fogging concentrate
IC impregnated collar
IM impregnated material
IS impregnated strip
IW impregnated wiping cloth
KN cold fogging concentrate
LA lacquer
LF liquid fumigant
LI liquid
LP liquid paste
LS liquid seed treatment
MC microcapsule suspension
MG microgranules
MS mist spray
NB fogging concentrate
OF oil-miscible flowable concentrate
OI oil
OL oil-miscible liquid
PA paste
PB plate bait
PD poison drink
PO pour-on
PR plant rodlet
PS seed coated with pesticide
PT pellets
PW powder
PY pump spray
RB bait (ready for use)
RS ready-to-use suspension
SB scrap bait
SC suspension concentrate
SG water-soluble granules
SL soluble concentrate
SM solid material
SN solution
SP water-soluble powder for seed treatment
ST seed treatment
SU Ultra Low Volume suspension
TB tablet
TC technical material
TP tracking powder
TW twin pack
UL Ultra Low Volume liquid
VP vapour-releasing product
WG water-dispersible granules
WP wetable powder
WS slurry for seed treatment
WT water-soluble tablet

3515 GUIDELINES ON PROJECT RISK INSURANCE [BIB-TINJ00052]

Risk	Classes of Insurance	Purchaser
Procurement and shipment of goods, materials, supplies and equipment to site	Transportation insurance	The buyer or the seller depending upon the terms of shipment
Goods, materials, supplies, equipment in work in progress on site. Testing risks.	Insurance of the works	The buyer or seller
Contractor's plant and equipment	Insurance of contractors equipment	Contractors
Project delays following loss or damage in transit or on site	Business interruption insurance	The buyer or the seller
Incidents causing injuries to third parties and/or damage to third party property	Liability insurance; general liability insurance	The buyer or seller
Faulty design, engineering and project management	Professional indemnity insurance	Professional architects, engineers, project managers
Injuries, illness caused to employees	Employers liability insurance	All employers on site, unless their employees not permitted to sue

3516 GUIDELINES ON PERFORMANCE RISK INSURANCE [BIB-TINJ00053]

Risk	Classes of Insurance	Purchaser
Financial guarantees, surety bonds	Tender and performance bonds on guarantees	Tenderers, seller contractors, sub-contractors on behalf of their clients
Product guarantees and/or warranties	Product guarantees	Provided by seller and/or suppliers

3517 GUIDELINES ON OPERATIONAL RISK INSURANCE [BIB-TINJ00054]

Risk	Classes of Insurance	Purchaser
Loss of or damage to the plant; breakdown of machinery, explosion of pressure vessels; business interruptions; injuries to third parties and damage to third party property; automobiles; injuries to employees, illness of employees; fraudulent acts of employees; financial default of customers	On-going insurances	The owner of the plant

3518 KILN DRYING OF CCA-TREATED WOOD - SOME SAFETY AND ENVIRONMENTAL CONSIDERATIONS (EFTERTORKNING AV IMPREGNERAT VIRKE - INLEDANDE STUDIER ROERANDE LAEMPLIGA HANTERINGSRUTINER) [BIB-SE8820323]
(Bystedt, T.; Edlund, M.L.; (1988), p. 111-135 [in Swedish]. Torkning av impregnerat trae. Arbeten och aktiviteter initierade av Svenska traeskyddsinstitutet 1977-1987)

3519 DUST EXPLOSION PROTECTION IN GRINDING PLANTS OF AGRICULTURAL AND FOODSTUFF INDUSTRY (STAUBEXPLOSIONSSCHUTZ AN MAHLANLAGEN DER LAND- UND NAHRUNGSGUETERWIRTSCHAFT) [BIB-DD8800830]
(Sauermann, W.; Beck, G.; Kunath, J.; ((1988)), v. 38(6) p. 277-278 [in German]. ISSN 0323-3308)

3520 COMPUTER ANALYSIS OF EVAPORATOR'S SAFETY PERFORMANCE IN SUGAR FACTORY [BIB-TT8800548]
Computer-aided operability studies are performed with cause equations as the input and operability studies tables, fault trees and fault symptom matrices as output. The method of analysis can be applied to any industry (Farabi, H.; Mellowes, W.A.; Sugar Association of the Caribbean (Barbados); (1985), v. 1 p. 238-250 [in English].)

3521 THE REGULATION OF HERB PRODUCTS FOR MEDICINAL PURPOSES [BIB-US8837056]
(Peck, G.E.; ((1987)), (no. 530) p. 35-39 [in English].)

3522 PESTICIDES AND GROUNDWATER - SITUATION AND NEED FOR ACTION (PFLANZENSCHUTZMITTEL UND GRUNDWASSER - SITUATION UND HANDLUNGSBEDARF) [BIB-DE88U0567]
It is shown that the present emotional public debate of the ultra trace limit value of 0.1 microgramm/liter prevents all involved parties from making decisions deliberately. It is necessary to inform the public completely about the situation and the prevention character of the limit value and to accept the naturally given coexistence of agriculture and water supplying and the mutual right of existence. The solution of regional problems is only possible by developing common concepts among all involved parties. A rediscussion of the EC limit value seems to be necessary because all involved parties had problems with keeping this limit value which could hardly be coped with (Saele, M.; ((1988)), (no.245) p. 103-117 [in German]. ISSN 0067-5849)

3523 [MOBIL OIL SYMPOSIUM FOR THE PARTICLEBOARD INDUSTRY (2). THE PARTICLEBOARD INDUSTRY MET THE REQUIREMENTS OF ENVIRONMENTAL PROTECTION] (MOBIL OIL SYMPOSIUM FUER DIE SPANPLATTENINDUSTRIE (2). DIE SPANPLATTENINDUSTRIE HAT DIE FORDERUNGEN DES UMWELTSCHUTZES ERFUELLT) [BIB-DE88T1754]
(Anon.; ((1988)), v. 114(94) p. 1344-1345 [in German]. ISSN 0018-3752)

3524 TESTS ON FIRES IN PULP AND PAPER STORES SHOW: WATER SPRINKLERS EXTINGUISH BEST [BIB-SE8820372]
(Sehlberg, L.; ((1988)), (no. 1) p. 48-50 [in English]. ISSN 0284-6454)

3525 IDENTIFYING, CLASSIFYING AND DESCRIBING HAZARDOUS WASTES [BIB-FR8900818]
(Yakowitz, H.; ((Jan-Mar 1988)), v. 11(1) p. 3-10 [in English]. ISSN 0378-9993)

3526 [13TH MOBIL-OIL SYMPOSIUM FOR THE PARTICLEBOARD INDUSTRY] (13. MOBIL-OIL-SYMPOSIUM FUER DIE SPANPLATTENINDUSTRIE) [BIB-DE88T2164]
(Anon.; ((1988)), v. 46(9) p. 354-356 [in German]. ISSN 0018-3768)

3527 RECOGNISING AND PREVENTING THE RISK OF DUST EXPLOSION IN THE GRAIN PROCESSING INDUSTRY (STAUBEXPLOSIONSGEFAHR IN DER GETREIDEVERARBEITUNGSINDUSTRIE ERKENNEN UND VERHINDERN) [BIB-DD8801280]
(Semjonow, L.; Karberg, U.; ((1988)), v. 22(10) p. 230-232 [in German]. ISSN 0300-2705)

3528 WASHED COTTON: WASHING TECHNIQUES, PROCESSING CHARACTERISTICS, AND HEALTH EFFECTS [BIB-US8823525]
(Wakelyn, P.J.; Jacobs, R.R.; Kirk, I.W.; United States. Agricultural Research Service. Southern Regional Research Center; Cotton Incorporated (USA); National Institute for Occupational Safety and Health (USA); Publisher: U.S. Dept. of Agriculture, Agriculture, Agricultural Research Service, Southern Regional Research Center, (1986), 118 p. [in English].)

3529 EVALUATION ON STATUS OF AGRICULTURAL ENVIRONMENT QUALITY AROUND A ZINC SMELTER [BIB-CN8802318]
(Zhou Gendi; ((Oct 1988)), v. 7(5) p. 43-44, 30 [in unknown language]. ISSN 1000-0267)

3530 REGARDING THE INFLUENCE OF WASTES FROM TOWNSHIP ENTERPRISES ON THE AGRICULTURAL ENVIRONMENT AND ITS CONTROL IN XIANNING AREA [BIB-CN8802328]
(Xianning Prefectural Station of Agricultural Environment Protection, Hubei (China); ((Aug 1988)), v. 7(4) p. 43-44 [in unknown language]. ISSN 1000-0267)

3531 ENGINEERING FOR FOOD SAFETY AND SANITATION: A GUIDE TO THE SANITARY DESIGN OF FOOD PLANTS AND FOOD PLANT EQUIPMENT [BIB-US8830243]
A factual, practical reference book for food plant design engineers and food plant sanitation managers provides a well-illustrated (270 figures), descriptive text covering standard procedures and recent developments for designing food plants for optimum food safety and sanitation control. The text is organized into 12 sections: the importance of sanitation programs to the food processing industry; organizing the food plant layout; design considerations in component and support facilities of the food plant building; design considerations in processing and other equipment; electrial design requirements; physical plant construction; plant maintenance facilities and protocols; facility cleaning systems; solid waste and pest control systems; and control of foreign matter. A special section on pertinent food laws and regulations is included (Imholte, Thomas J.; Publisher: Technical Institute of Food Safety, (1984), 283 p. [in English].)

3532 [CONSEQUENCES OF OCCUPATIONAL IMPACT OF NOISE] (FOLGEN BERUFSBEDINGTER LAERMBELASTUNG) [BIB-DE89T0877]
(Bloch, G.W.; Bundesforschungsanstalt fuer Forst- und Holzwirtschaft, Hamburg (Germany, F.R.); Publisher: Wiedebusch, (Dec 1988), p. 424-425 [in German]. Forschung fuer die Forst- und Holzwirtschaft. Folgen von Waldschaeden. Zukunft der Holzproduktion. Neue Technologien)

3533 [INDUSTRIAL ACCIDENTS OCCURRING DURING CARPENTRY WORK] (ARBEITSUNFAELLE IM ZIMMERERHANDWERK) [BIB-DE89T0658]
(Hoffmann, B.; Noetel, K.-H.; ((1989)), v. 91(2) p. 102-104 [in German].)

3534 [TECHNICAL AND HUMAN ASPECTS OF REDUCING RISKS OF DUST EXPLOSIONS IN THE FOOD AND AGRICULTURAL SECTOR] (ASPECTS TECHNIQUES ET HUMAINS DE LA PREVENTION DES RISQUES D'EXPLOSIONS DE POUSSIERES DANS LES IAA) [BIB-FR8901854]
(Pilorget, G.; ((Oct 1988)), v. 105(10) p. 987-990 [in French]. ISSN 0019-9311)

3535 RECOGNISING AND PREVENTING THE RISK OF DUST EXPLOSION IN THE GRAIN PROCESSING INDUSTRY (STAUBEXPLOSIONSGEFAHR IN DER GETREIDEVERARBEITUNGSINDUSTRIE ERKENNEN UND VERHINDERN) [BIB-DD8900134]
(Karberg, U.; Semjonow, L.; ((1988)), v. 22(11) p. 257-259 [in German]. ISSN 0300-2705)

3536 RECOGNISING AND PREVENTING THE RISK OF DUST EXPLOSION IN THE GRAIN PROCESSING INDUSTRY (STAUBEXPLOSIONSGEFAHR IN DER GETREIDEVERARBEITUNGSINDUSTRIE ERKENNEN UND VERHINDERN) [BIB-DD8900142]
(Semjonow, L.; Karberg, U.; ((1988)), v. 22(12) p. 285-288 [in German]. ISSN 0300-2705)

3537 [OPPORTUNITIES FOR THE REDUCTION OF THE EFFECTS OF DANGEROUS SUBSTANCES DURING POWER SAW APPLICATION] (MOEGLICHKEITEN ZUR VERRINGERUNG DER GEFAHRSTOFFBELASTUNG BEIM MOTORSAEGENEINSATZ) [BIB-DE89T1090]
(Panther, R.H.; ((1989)), v. 115(62-63) p. 1000 [in German]. ISSN 0018-3752)

3538 INDUSTRIAL REFRIGERATION DESIGN SAFETY [BIB-US8923190]
(Bonar, H.B. II; ((1988)), v. 34 p. 1-12 [in English]. ISSN 0412-6300)

3539 CHEMICAL AND CHEMICAL SAFETY MANUAL: TECHNICAL DATA FOR PESTICIDES OF THE STRUCTURAL PEST CONTROL INDUSTRY [BIB-US8921942]
(Anon.; National Pest Control Association (USA); Publisher: National Pest Control Association, (1986), vp. [in English].)

3540 CURRENT STATUS OF JOJOBA OIL UTILIZATION IN COSMETICS IN JAPAN [BIB-US9006143]
(Katoh, M.; Taguchi, M.; Kunimoto, T.; Publisher: American Oil Chemists' Society, (1988), p. 318-342 [in English].)

3541 TOXICOLOGY AND SAFE HANDLING OF PESTICIDES [BIB-PH8811626]
(Bureau of Plant Industry, Malate, Metro Manila (Philippines). Philippine-German Crop Protection Programme; (1987), 56 p. [in English].)

3542 SAFE HANDLING OF HYDROGEN PEROXIDE BEGINS WITH PROPER SYSTEMS DESIGN. HYDROGEN PEROXIDE OFFERS MANY ADVANTAGES IN TODAY'S BLEACH PLANTS, BUT IT MUST BE STORED AND HANDLED PROPERLY TO AVOID ACCIDENTS [BIB-US9008950]
(Hall, S.S.; ((Jun 1989)), v. 63(6) p. 110-111 [in English]. ISSN 0033-4081)

3543 COOPERATIVE INDUSTRY EFFORTS WITH DEVELOPING COUNTRIES TO IMPROVE AGROCHEMICAL REGISTRATION, LABELING AND EDUCATION AND TRAINING [BIB-FR9000604]
(Hollis, W.L.; ((Jul-Sep 1987)), v. 10(3) p. 34-37 [in English]. ISSN 0378-9993)

3544 ENZYMES IN FOOD INDUSTRY IN FINLAND (ELINTARVIKETEOLLISUUDESSA KAEYTETTAEVAET ENTSYYMIVALMISTEET) [BIB-FI8900354]
(Kaerenlampi, S.; Publisher: National Board of Trade and Consumer Affairs, (1989), 65 p. [in unknown language]. Elintarviketeollisuudessa kaeytettaevaet entsyymivalmisteet)

3545 BEHIND THE POISON CLOUD: UNION CARBIDE'S BHOPAL MASSACRE [BIB-US9001604]
(Everest, Larry; Publisher: Banner Press, ([1986]), 192 p. [in English].)

3546 DISCOLORATION OF WOOD TREATED WITH FLAME RETARDANT [BIB-JP9002892]
(Kai, Y.; Nakanishi, M.; Yoshida, H.; ((Mar 1988)), (no.12) p. 45-48 [in unknown language]. ISSN 0389-9489)

3547 INCOMBUSTIBILITY OF FIRE PROTECTION WOOD TREATED WITH THREE COMMERCIAL FIRE RETARDANT CHEMICALS [BIB-JP9002893]
(Yoshida, H.; Taki, K.; ((Mar 1988)), (no.12) p. 49-58 [in unknown language]. ISSN 0389-9489)

3548 FLAME-RETARDANT TREATMENT OF WOOD WITH A DIISOCYANATE AND AN OLIGOMER PHOSPHONATE [BIB-US9026425]
(Ellis, W.D.; Rowell, R.M.; ((Oct 1989)), v. 21(4) p. 367-375 [in English]. ISSN 0735-6161)

3549 ADEQUACY OF OSHA PROTECTIONS FOR CHEMICAL WORKERS: HEARING BEFORE THE EMPLOYMENT AND HOUSING SUBCOMMITTEE OF THE COMMITTEE ON GOVERNMENT OPERATIONS, HOUSE OF REPRESENTATIVES, ONE HUNDRED FIRST CONGRESS, FIRST SESSION, NOVEMBER 6, 1989 [BIB-US9031332]
(Anon.; United States. Congress. House. Committee on Government Operations. Employment and Housing Subcommittee; Publisher: U.S. G.P.O., (1990), 182 p. [in English].)

3550 TOXICITY OF PESTICIDES [BIB-US9033681]
(Criswell, J.T.; (Apr 1989), 6 p. [in English]. ISSN 0473-6885)

3551 SAFE PRACTICES IN THE USE AND HANDLING OF FUMITOXIN [BIB-US9037868]
This ready reference manual produced by PESTCON SYSTEMS INC. compiles FUMITOXIN fumigant labels and its Material Safety Data Sheet in individual clear plastic covers. It emphasizes safe handling and application practices in the use of this restricted pesticide for stored, processed, manufactured product pest control (Anon.; Pestcon Systems, Inc (USA); Publisher: Pestcon Systems, Inc., ([1988]), vp. [in English].)

3552 ARE OSHA HEALTH INSPECTIONS EFFECTIVE?: A LONGITUDINAL STUDY IN THE MANUFACTURING SECTOR [BIB-US9041013]
(Gray, Wayne B.; Jones, Carol Adaire; National Bureau of Economic Research (USA); Publisher: National Bureau of Economic Research, ([1990]), 31 p. [in English].)

3553 WATER QUALITY CRITERIA FOR RECYCLING IN POULTRY PROCESSING PLANTS [BIB-US9037599]
(Rose, M.J.; United States Department of Agriculture and The Ohio State University; Publisher: Department of Poultry Science, The Ohio State University, (1988), p. 145-151 [in English].)

3554 PRODUCER'S LIABILITY - WHAT LIES AHEAD OF US? (PRODUZENTENHAFTUNG - WAS KOMMT AUF UNS ZU?) [BIB-DE89H0630]
(Hahn, P.; ((1989)), v. 56(10) p. 622-626, 616-618 [in unknown language]. ISSN 0015-4539)

3555 DANGEROUS SUBSTANCES. THE NEW LAW [BIB-GB8907288]
(Stranks, J.; ((1989)), v. 91(7) p. 36-37, 39 [in English].)

3556 [THE NEW ORDER FOR PRESSURE VESSEL AND CONSEQUENCES FOR THE BREWING INDUSTRY] (DIE "NEUE" DRUCKBEHAELTERVERORDNUNG UND IHRE AUSWIRKUNG AUF DIE BRAUEREIEN) [BIB-DE90J0156]
(Fischer, K.-H.; ((1990)), v. 130(19) p. 729-735 [in German]. ISSN 0724-696X)

3557 [THE HUMAN WORLD OF WORK: PILOTE-PROJECT OF THE WOODWORKING PROFESSIONAL ASSOCIATION FOR SMALL ENTERPRISES] (HUMANE ARBEITSWELT: PILOT-PROJEKT DER HOLZ-BERUFSGENOSSENSCHAFT FUER KLEINBETRIEBE) [BIB-DE90T0480]
(Ruske, W.; ((1990)), v. 116(78) p. 1259 [in German]. ISSN 0018-3792)

3558 [EXPOSURE [OF EMPLOYEES] OF TIMBER INDUSTRY AND TRADE TO DUST] (STAUBEXPOSITION IN DER HOLZINDUSTRIE UND IM HANDWERK) [BIB-DE90T0256]
(Priessnitz, H.; ((1990)), v. 116(29) p. 410-411 [in German]. ISSN 0018-3792)

3559 AN ENCLOSED SYSTEM FOR PESTICIDE MIXING AND LOADING [BIB-US9048688]
(Wesley, R.A.; Smith, L.A.; Williford, J.R.; (1988), 12 p. [in English].)

3560 [REGULATIONS CONCERNING FIRE PROTECTION IN WOODWORKING PLANTS] (BRANDSCHUTZANFORDERUNGEN AN HOLZVERARBEITENDE BETRIEBE) [BIB-DE90T2622]
(Fach, B.; ((1990)), v. 25(6) p. 706-708 [in German]. ISSN 0721-2585)

3561 [ARE JOINERS AND CABINET-MAKERS ENDANGERED? THE SUSPICION ON CANCEROGENIC EFFECTS OF WOOD DUST] (SIND SCHREINER UND TISCHLER GEFAEHRDET? HOLZSTAUB UND DER VERDACHT AUF KREBSERZEUGUNG?) [BIB-DE90T0578]
(Buslei, W.; ((1989)), v. 70(11) p. 54-56 [in German]. ISSN 0341-8839)

3562 [THE PROBLEMS OF WOOD DUST HAZARDS NOT ONLY FRUSTRATE MEDIUM-SIZED ENTERPRISES] (HOLZSTAUBPROBLEMATIK FRUSTIERT NICHT NUR MITTELSTAENDISCHE BETRIEBE) [BIB-DE90T2203]
(Kuffner, H.P.; ((1990)), v. 116(120) p. 1819 [in German]. ISSN 0018-3792)

3563 POTENTIAL ROLE OF CANCEROGENIC CHEMICALS IN THE DEVELOPMENT OF NASAL CANCER AMONG FURNITURE WORKERS. CHEMICAL STAINS (MOEGLICHE BETEILIGUNG VON KREBSERZEUGENDEN ARBEITSSTOFFEN AN DER ENTSTEHUNG VON NASENKREBS BEI BESCHAEFTIGTEN IM HOLZVERARBEITENDEN GEWERBE. CHEMISCHE BEIZEN) [BIB-DE90T1802]
(Ruetze, M.; Noack, D.; Schumacher, C.; ((1990)), v. 48(6) p. 229-235 [in German]. ISSN 0018-3768)

3564 [FIRE PROTECTION IN A PARTICLEBOARD PLANT. EXPERIENCES WITH SPARK-QUENCHING INSTALLATIONS] (BRANDSCHUTZ IN EINEM SPANPLATTENWERK. ERFAHRUNGEN MIT FUNKENLOESCHANLAGEN) [BIB-DE90T2621]
(Rehr-Zimmermann, S.; ((1990)), v. 25(6) p. 704-705 [in German]. ISSN 0721-2585)

3565 [FORMALDEHYDE-EMISSION FROM MATERIALS, FURNITURE, BUILDING ELEMENTS FOR INTERIOR USE] (FORMALDEHYD-EMISSIONEN AUS MATERIALIEN, MOEBELN, INNENAUSBAUTEILEN) [BIB-DE90T1332]
(Barghoorn, A.W.; Wilhelm-Klauditz-Institut, Braunschweig (Germany, F.R.). Frauenhofer-Arbeitsgruppe fuer Holzforschung; (1990), p. 45-54 [in German]. Moebel und Formaldehyd - Rechtliche Situation, Pruefmethoden, Herstelltechniken und Betriebskontrollen)

3566 [THE TESTING OF LARGE FURNITURE IN BIG TESTING CHAMBERS] (DIE GANZTEILPRUEFUNG VON MOEBELN IN GROSSEN PRUEFRAEUMEN) [BIB-DE90T1334]
(Meyer, B.; Wilhelm-Klauditz-Institut, Braunschweig (Germany, F.R.). Frauenhofer-Arbeitsgruppe fuer Holzforschung; (1990), p. 83-98 [in German]. Moebel und Formaldehyd - Rechtliche Situation, Pruefmethoden, Herstelltechniken und Betriebskontrollen)

3567 [4TH GRECON SYMPOSIUM ON FIRE PROTECTION (2). PREVENTIVE ACTIONS FOR SAFETY ARE CHEAPER THAN FINANCIAL COMPENSATION] (4. GRECON-BRANDSCHUTZ-SYMPOSIUM (2). VORBEUGENDE SICHERHEITSMASSNAHMEN SIND BILLIGER ALS SCHADENSREGULIERUNGEN) [BIB-DE90T0199]
(Anon.; ((1990)), v. 116(3) p. 16 [in German]. ISSN 0018-3792)

3568 [PROBLEMS OF TECHNICAL SAFETY IN THE BREWERY] (FRAGEN DER TECHNISCHEN SICHERHEIT IN BRAUEREIEN) [BIB-DE90J0245]
(Linke, W.; ((1990)), v. 108(10) p. 340-341 [in German]. ISSN 0172-0589)

3569 FR FINISH OF CHARCOAL-CONTAINING COTTON FLANNEL: APPLICATION OF CALIBAN F/R P44 AND ITS MODIFICATION [BIB-US9050823]
(Xu, M.; Wang, J.; Gao, F.; ((Jul 1990)), v. 23 p. 43-47 [in English]. ISSN 0093-4658)

3570 [NOTES TO APPROVAL OF EQUIPMENT OF THE GRAIN PROCESSING INDUSTRY IN CONNECTION WITH ENVIRONMENT PROTECTION] (HINWEISE ZUR IMMISSIONSSCHUTZRECHTLICHEN GENEHMIGUNGSVERFAHREN FUER ANLAGEN DER GETREIDEVERARBEITUNG) [BIB-DE90S0000]
(Moormann, F.J.; ((1989)), v. 43(3) p. 78-82 [in German]. ISSN 0367-4177)

3571 GENETIC ENGINEERING: A PERSPECTIVE ON CURRENT ISSUES [BIB-NZ9000305]
This overview of the new biological technologies seeks to examine public concerns about genetic engineering. The first part outlines the industrial and agricultural applications of genetically-modified organisms. This is followed by a discussion on ethical concerns and safety. Finally animal rights are covered (Macer, D.; Publisher: DSIR Crop Research, (Jul 1990), 93 p. [in English]. ISSN 1170-3407)

3572 RECYCLING AND DISPOSING OF WOOD ASH [BIB-US9104060]
(Campbell, A.G.; ((Sep 1990)), v. 73(9) p. 141-146 [in English]. ISSN 0734-1415)

3573 PROGRESS IN FOOD PRESERVATION PROCESSES [BIB-NL9101422]
(Folstar, P.; Publisher: Pudoc, (1989), p. 83-94 [in English].)

3574 WOOD INDUSTRY FIRE RESEARCH PROGRAM [BIB-US9119316]
(Glowinski, R.W.; LeVan, S.L.; ((1988)), [92] p. 57-59 [in English].)

3575 SAFETY MANAGEMENT IN FOOD SERVICE [BIB-US9118040]
Historically, employees were viewed as a disposable commodity in the workplace. However, state and federal legislation placing full responsibility for employee safety on the employer has caused employers to view safety management from a different perspective. Loss control takes a more humanistic approach when the employer attempts to solve safety problems by examining and modifying human factors. Unsafe acts of persons and unsafe conditions in the workplace lead to accidents and injuries, most of which can be prevented. Equipment guards, safety meetings and posters, and first aid training—all traditional methods of safety management—were found to be insufficient in accident reduction. Employers found improved safety, as noted by fewer accidents and injuries, when individualized training for specific jobs was implemented In studying workplace accidents and injuries, human error usually surfaces as the culprit, stemming from employee stress and a lack of safety awareness. Management now seeks to reduce human error by providing stress management classes for employees and utilizing more physical abilities testing to assure that workers are capable of carrying out assigned jobs. Accident prevention also incorporates a managerial commitment to correcting safety hazards, establishing safety standards, maintaining a continuous training pro-

gram including technicians on safety committees, and offering incentives for reducing accidents (Mann, N.L.; ((Aut 1989)), v. 13(2) p. 157-160 [in English]. ISSN 0149-6808)

3576 A SOLUTION TO THE MAJOR WEED PROBLEMS IN WET-SOWN RICE: EXPERIENCES WITH PRETILACHLOR/FENCLORIM IN SOUTH-EAST ASIA [BIB-US9126626]
(Allard, J.L.; Zoschke, A.; Publisher: New York Published for the Society of Chemical Industry by Elsevier Applied Science, (1990), p. 378-388 [in English].)

3577 CINMETHYLIN: A NEW HERBICIDE DEVELOPED FOR USE IN RICE [BIB-US9126623]
(Jones, R.G.; Publisher: New York Published for the Society of Chemical Industry by Elsevier Applied Science, (1990), p. 349-357 [in English].)

3578 [SAFETY AT STORAGE AND DOSAGE OF CLEANING AND DISINFECTING CONCENTRATES [BREWING INDUSTRY]] (SICHERHEIT BEI DER LAGERUNG UND DOSIERUNG VON REINIGUNGS-UND DESINFEKTIONSKONZENTRATEN [BRAUINDUSTRIE]) [BIB-DE91J0064]
(Hantmann, B.; ((1990)), v. 130(46) p. 2169-2170, 2172-2174 [in German]. ISSN 0724-696X)

3579 [ORGANISATION OF FACTORY INSPECTORATE IN PLANTS OF THE BEVERAGE INDUSTRY] (DIE ORGANISATION DES ARBEITSSCHUTZES IN DEN BETRIEBEN DER GETRAENKEINDUSTRIE) [BIB-DE91J0121]
(Hensele, W.; ((1991)), v. 131(6) p. 190-192 [in German]. ISSN 0724-696X)

3580 NOISE POLLUTION AND CONSERVATION IN THE PALM OIL INDUSTRIES [BIB-MY9105208]
(Ahmad Shahrom bin Mohd Yunus; ((Jul-Sep 1990)), (no. 19) p. 11-17 [in English].)

3581 MOTIVATION, TRAINING AND SAFETY. SAWMILL PRODUCTIVITY IMPROVEMENT [BIB-XF9103431]
(FAO, Kuala Lumpur (Malaysia). Asia Pacific Forest Industries Development Group; (Sep 1990), 28 p. [in English].)

3582 [ORGANISATION OF FACTORY INSPECTORATE IN PLANTS OF THE BEVERAGE INDUSTRY] (DIE ORGANISATION DES ARBEITSSCHUTZES IN DEN BETRIEBEN DER GETRAENKEINDUSTRIE) [BIB-DE91J0144]
(Hensele, W.; ((1991)), v. 131(10) p. 343-344 [in German]. ISSN 0724-696X)

3583 CHALLENGES: THE INDUSTRIAL VIEWPOINT [BIB-US9129692]
(Engel, J.F.; Harnish, W.N.; Staetz, C.A.; Publisher: M. Dekker, (1990), p. 551-573 [in English].)

3584 PREVENTION OF EXPLOSION AND SAFETY AT WORK WHEN METHANOL IS USED IN THE ASAM PROCESS (EXPLOSIONS- UND ARBEITSSCHUTZ BEIM EINSATZ VON METHANOL FUER DAS ASAM-VERFAHREN) [BIB-DE91T1759]
(Kaufmann, K.; ((1991)), v. 45(7) p. 396-402 [in German]. ISSN 0031-1340)

3585 [SAFETY AS GUARANT OF QUALITY [CLEANING PRODUCTS STORAGE AND USE IN THE BREWING INDUSTRY]] [BIB-BE9100715]
(Milius, J.A.J.; ((1991)), v. 16(1) p. 52-54 [in unknown language]. ISSN 0770-1713)

3586 [HANDLING OF DANGEROUS MATERIALS IN BREWERIES AND BEVERAGE PLANTS] (UMGANG MIT GEFAHRSTOFFEN IN BRAUEREIEN UND GETRAENKEBETRIEBEN) [BIB-DE91J0254]
(Roedel, H.; ((1991)), v. 31(1) p. 26-27 [in German]. ISSN 0344-6816)

3587 LIQUIDATION OF THE SUGAR DUST IN THE SUGAR FACTORY (LIKVIDACE CUKERNEHO PRACHU V CUKROVARU) [BIB-CS9100778]
Sugar dust from sugar factory devices can be removed by means of cyclones or foam separators. Insufficiencies of these characteristic methods - low efficiency in cyclones and limited feasibility in foam separators - made the application of cloth filters necessary. A new type of reverse jet filter is described, which is secured against sugar dust explosion. (Lipavsky, B.; ((Jan 1991)), v. 107(1) p. 15-18 [in Czech]. ISSN 0024-4449)

3588 [DANGEROUS MATERIALS] (GEFAHRSTOFFE. 1. TEIL: ALLGEMEINES) [BIB-DE91J0243]
(Anon.; ((1991)), v. 131(18) p. 739-740 [in German]. ISSN 0724-696X)

3589 [EXPERIENCES AND REQUIREMENTS CONCERNING PROTECTION CLOTHING FROM THE VIEW OF INDUSTRIAL MEDICINE] (ARBEITSMEDIZINISCHE ERFAHRUNGEN UND ANFORDERUNGEN AN SCHUTZKLEIDUNG) [BIB-DE91T0422]
(Voigt, B.; Kuratorium fuer Waldarbeit und Forsttechnik e.V. (KWF), Gross-Umstadt (Germany); Publisher: KWF, (1990), p. 52-64 [in German]. Waldarbeiterschutzkleidung. Wie lassen sich Schutzwirkung, Trageeigenschaften und Gebrachswert verbessern?)

3590 [PREVENTION OF OPERATIONAL DISEASES BY MEANS OF INDUSTRIAL MEDICINE] (ARBEITSMEDIZINISCHE BETREUUNG) [BIB-DE91T0442]
(Vollmer, M.; ((1991)), v. 46(9) p. 462-465 [in German]. ISSN 0002-5860)

3591 [THE FIRE PREVENTION IN THE DAIRY INDUSTRY] (LA PREVENZIONE DEGLI INCENDI NELL'INDUSTRIA LATTIERO-CASEARIA) [BIB-IT9160989]
(Balocco, L.; ((Jul 1990)), v. 15(7) p. 606-612 [in Italian]. ISSN 0392-6060)

3592 PRE-FIRE PLAN FOR HANDLING AGRICULTURAL CHEMICAL FIRES [BIB-US9137495]
Designed to aid the agri-chemical dealer in developing a pre-fire plan for handling agricultural chemical fires, this step-by-step guide includes fire fighting and post-fire clean-up instructions, first aid information, pages for drawing maps of the facility and immediate surroundings and site drainage, and pages for recording emergency and agency notification telephone numbers, location of emergency equipment and supplies and water supplies. Includes completed example forms (Anon.; Chevron Chemical Company (USA); Publisher: Chevron Chemical Company, ([1985]), 20 p. [in English].)

3593 ERGONOMICS PROGRAM MANAGEMENT GUIDELINES FOR MEATPACKING PLANTS [BIB-US9137938]
(Anon.; United States. Occupational Safety and Health Administration; Publisher: U.S. Dept. of Labor, Occupational Safety and Health Administraion, (1990), 31 p. [in English].)

3594 [WOOD DUST MONITORING RELATED TO FORESTRY, TIMBER INDUSTRIES AND TRADE] (PERSONENBEZOGENE HOLZSTAUBMESSUNGEN IN DER FORST- UND HOLZWIRTSCHAFT) [BIB-DE91T0628]
(Hammer, T.; Fachhochschule Luebeck (Germany). Fachbereich Angewandte Naturwissenschaften; (1990), 148 p. [in German]. Personenbezogene Holzstaubmessungen in der Forst- und Holzwirtschaft)

3595 PROTECTION OF HEALTH, LABOR AND FIRE IN THE DAIRY INDUSTRY OF KARL-MARX-STADT DISTRICT (ZUR DURCHSETZUNG DES GESUNDHEITS-, ARBEITS- UND BRANDSCHUTZES IN DEN BETRIEBEN DES BEZIRKES KARL-MARX-STADT) [BIB-DE91C0344]
(Toepper, M.; ((1988)), (no.4) p. 96-97 [in German].)

3596 PESTICIDE APPLICATION AND SAFETY TRAINING STUDY GUIDE: GENERAL [BIB-US9146640]
This general Colorado study guide/manual for commercial pesticide applicators covers the pesticide planning and safety principles, pesticide toxicity and poisoning, storing, mixing and handling, pesticide classification, formulation and labels, pesticide application techniques and equipment are described. Insects, vertebrate pests and plant diseases are discussed. Safety, first aid treatments and environmental concerns are addressed. Calibration tables, area formulas and application rates and equivalent tables are given. A glossary is included. Colorado State Extension Service Offices' addresses and telephone numbers and the Rocky Mountain Poison Control Center toll free telephone number is listed (Anon.; Colorado (USA). Division of Plant Industry; Publisher: Colorado Dept. of Agriculture, Division of Plant Industry, ([1990]), 81 p. [in English].)

3597 [CONSTRUCTION OF EQUIPMENT FOR WOOD PROCESSING MACHINES. MANUAL FOR INDUSTRY AND HANDICRAFT] (VORRICHTUNGSBAU IN DER HOLZVERARBEITUNG. HANDBUCH FUER INDUSTRIE UND HANDWERK) [BIB-DE91T0924]
(Dittrich, H.; Wehmeyer, H.; Publisher: DRW-Verlag, (1991), 164 p. [in German]. Vorrichtungsbau in der Holzverarbeitung. Handbuch fuer Industrie und Handwerk)

3598 [REQUIREMENTS ON FIRE PROTECTION IN WOOD-PROCESSING ENTERPRISES] (BRANDSCHUTZANFORDERUNGEN AN HOLZVERARBEITENDE BETRIEBE) [BIB-DE91T2479]
(Fach, B.; ((1991)), v. 117(128) p. 2033, 2035-2036 [in German]. ISSN 0018-3792)

3599 [AGRO-INDUSTRY AND SANITARY QUALITY OF THE FOODS OF ANIMAL ORIGIN] (AGROINDUSTRIA E QUALITA SANITARIA DEGLI ALIMENTI DI ORIGINE ANIMALE) [BIB-IT9162190]
(Ballarini, G.; ((Jul-Aug 1990)), v. 11(7-8) p. 23-31 [in Italian]. ISSN 0392-1913)

3600 TEXAS COTTON GINNERS' SAFETY PLAN [BIB-US9151014]
(Link, J.; ((1991)), v. 1 p. 500-501 [in English].)

3601 OSHA REGULATIONS [BIB-US9156115]
(Dykes, J.D.; ((1991)), (no. 67th) p. 114-120 [in English]. ISSN 0066-0582)

3602 PREPARATION OF FLAME RESISTANT RUBBERISED COIR [BIB-LK9100093]
(Coomarasamy, A.; ((1987)), v. 67 p. 33-40 [in English].)

3603 [INNOVATION. MADE IN AUSTRIA. [HEATING TECHNOLOGY]] (INNOVATION, MADE IN AUSTRIA [HEIZUNG]) [BIB-DE92T1027]
(Anon.; ((1991)), v. 72(6) p. 101-105 [in German]. ISSN 0341-8839)

3604 ELECTROFILTERS IN THE PARTICLEBOARD INDUSTRY (2) (ERFAHRUNGEN MIT EINEM ELEKTROFILTER IN DER SPANPLATTENINDUSTRIE (2)) [BIB-DE92T0114]
(Heer, H.; ((1991)), v. 26(12) p. 1570-1573 [in German]. ISSN 0721-2585)

3605 EXPERIENCE WITH AN ELECTRIC FILTER IN THE CHIPBOARD INDUSTRY (1) (ERFAHRUNGEN MIT EINEM ELEKTROFILTER IN DER SPANPLATTENINDUSTRIE (1)) [BIB-DE92T0052]
(Heer, H.; ((1991)), v. 26(11) p. 1452-1453 [in German]. ISSN 0721-2585)

3606 [ENGINE PROTECTION. PART 2] (MASCHINENSCHUTZ. FOLGE 2) [BIB-DE92J0040]
(Schmidt; ((1991)), v. 131(49) p. 2369-2370 [in German]. ISSN 0724-696X)

3607 TEXTILE AND APPAREL INDUSTRY SUPPORT FOR THE CRAFTED WITH PRIDE CAMPAIGN: A SYSTEMS PERSPECTIVE [BIB-US9173813]
The U.S. textile and apparel industries have until quite recently displayed a limited capacity to change in spite of continued challenges presented by foreign competition and other environmental factors. The apparent improvement in industry economic indicators since 1986 suggests that these industries may be demonstrating a new and positive adaptability. To some extent this turnaround coincides with the creation and execution of the Crafted With Pride (CWP) campaign. A national survey of presidents in both industries shows that support of CWP is correlated with innovative business practices. These results are logical from a systems perspective which suggests that structure and management of a system are given energy by inputs from the external environment; inputs are then converted by the system into outputs. In this project, CWP is viewed as a component in the external marketing environment of the textile and apparel industries (Doulgas, S.U.; Morganosky, M.A.; ((Aut 1990)), v. 9(1) p. 37-44 [in English]. ISSN 0887-302X)

3608 NOISE AT WORK [BIB-GB9107213]
(Stranks, J.; ((1990)), v. 92(9) p. 16-17 [in English].)

3609 COSHH IN PRACTICE [CONTROL OF SUBSTANCES HAZARDOUS TO HEALTH] [BIB-GB9107214]
(Stranks, J.; ((1990)), v. 92(10) p. 12-13 [in English].)

3610 HOW THE GINNING INDUSTRY IS DEALING WITH NEW REGULATIONS [BIB-US9179201]
(Wakelyn, P.J.; Johnson, F.; ((1990)), p. 525-527 [in English].)

3611 [THE OCCURRENCE OF ACCIDENTS IN THE TIMBER INDUSTRY OF SAXONY AT THE TURN OF THE CENTURY] (ZUM UNFALLGESCHEHEN IN DER SAECHSISCHEN HOLZINDUSTRIE UM DIE JAHRHUNDERTWENDE) [BIB-DE92T1318]
(Kutzsche, K.; ((1992)), v. 47(8) p. 217-218 [in German]. ISSN 0932-9315)

3612 [SECURITY MANAGEMENT OF ENVIRONMENTAL PROTECTION [BREWING INDUSTRY]] (SICHERHEITS- UND UMWELTSCHUTZMANAGEMENT) [BIB-DE92J0192]
(Adams, H.-W.; ((1992)), v. 40(1) p. 5-6 [in German].)

3613 [ENGINE PROTECTION. PART 4] (MASCHINENSCHUTZ (FOLGE 4)) [BIB-DE92J0146]
(Schmidt, H.-J.; ((1992)), v. 132(10-11) p. 429-430 [in German]. ISSN 0724-696X)

3614 USDA TO REVISE DIRECTIVE ON POULTRY PLANT SAFETY [BIB-US9187710]
The Department of Agriculture said this week that procedures to protect federal inspectors in food processing plants would be revised following the fire last week that killed 25 workers in a North Carolina poultry plant. The directive prepared by USDA's Food Safety Inspection Service (FSIS) includes instructions to guide federal meat and poultry inspectors in steps to take to protect themselves from hazardous conditions (Anon.; ((13 Sep 1991)), v. 21(36) p. 6 [in English]. ISSN 0736-0096)

3615 PESTICIDE APPLICATION AND SAFETY TRAINING STUDY GUIDE: STORED COMMODITIES TREATMENT [BIB-US9186825]
This Colorado study guide/manual contains the educational information needed by the commercial pesticide applicator to pass the written state licensing examination in the treatment of stored grain and other stored commodities. Grain storage principles and problems are discussed and illustrated. Chemical treatments including fumigation techniques are highlighted. Other application methods and equipment that are described and illustrated include sprayers, aerial equipment, pumps and fans. Safety strategies, first aid treatments and environmental concerns are addressed. Calibration tables and formulas are given. Colorado State Extension Service Offices' addresses and telephone numbers are listed. The Rocky Mountain Poison Control Center toll free telephone number is included (Anon.; Colorado (USA). Division of Plant Industry; Colorado State Univ. (USA). Cooperative Extension Service; Publisher: Colorado Dept. of Agriculture, Division of Plant Industry, (1990), 52 p. [in English].)

3616 HAIR, SERUM, AND URINE, CHROMIUM CONCENTRATIONS IN FORMER EMPLOYEES OF THE LEATHER TANNING INDUSTRY [BIB-US9191585]
(Simpson, J.R.; Gibson, R.S.; ((Jan-Mar 1992)), v. 32 p. 155-159 [in English]. ISSN 0163-4984)

3617 THE RUBBER INDUSTRY AND SAFETY PRECAUTIONS [BIB-LK9200152]
(Karunaratne, S.W.; ((1986)), v. 22 p. 9-10 [in English].)

3618 [ELECTRICAL ENGINEERING [BREWERY]] (ELEKTROTECHNIK) [BIB-DE92J0475]
(Merdian, J.; ((1992)), v. 132(36) p. 1666-1668 [in German]. ISSN 0724-696X)

3619 [LEGAL REGULATION FOR NOISE ABATEMENT [BREWING INDUSTRY]] (RECHTLICHE BESTIMMUNGEN ZUR LAERMMINDERUNG) [BIB-DE92J0604]
(Rothe, R.; ((1992)), v. 132(45) p. 2270 [in German]. ISSN 0724-696X)

3620 ADVANCES IN INDUSTRIAL ERGONOMICS AND SAFETY II. PROCEEDINGS OF THE ANNUAL INTERNATIONAL INDUSTRIAL ERGONOMICS AND SAFETY CONFERENCE, MONTREAL, QUEBEC, CANADA, 10-13 JUNE, 1990 [BIB-GB9115729]
(Das, B.; Publisher: Taylor and Francis, (1990), 1039 p. [in English].)

3621 [WOOD WORKING INDUSTRIES AND ENVIRONMENTAL PROTECTION] (HOLZINDUSTRIE UND UMWELTSCHUTZ) [BIB-DE92T1963]
(Anon.; ((1986)), v. 21(6) p. 14-17, 21 [in German]. ISSN 0721-2585)

3622 CHEMICAL-ANALYTICAL CONTROL OF THE PRODUCTION PROCESSES IN THE PAPER AND BOARD INDUSTRY, WITH CONSIDERATION OF THE REGULATIONS WITHIN THE COMMON MARKET (CHEMISCH-ANALYTISCHE UEBERWACHUNG DER PRODUKTIONSPROZESSE IN DER PAPIER-, KARTON- UND PAPPENINDUSTRIE IM HINBLICK AUF DIE VORSCHRIFTEN INNERHALB DES GEMEINSAMEN MARKTES) [BIB-DE92T0979]
(Derra, R.; ((1992)), v. 46(10) p. 597-601 [in German]. ISSN 0031-1340)

3623 PROCESS SAFETY MANAGEMENT IN THE PULP AND PAPER INDUSTRY [BIB-US9315538]
(Brown, C.A.; Buettner, C.A.; ((Aug 1992)), v. 75(8) p. 59-63 [in English]. ISSN 0734-1415)

3624 HEALTH, SAFETY, AND ENVIRONMENTAL ASPECTS OF FLUID FERTILIZERS [BIB-US9311317]
(Wells, R.G.; Johnson, K.T.; ((1992)), v. 7 p. 563-598 [in English]. ISSN 0071-4623)

3625 SECTION 10. RELIABILITY AND SAFETY OF COLD STORES, QUALITY CONTROL AND MAINTENANCE. INDUSTRIAL AMMONIA REFRIGERATION, SAFETY IMPROVEMENTS DURING THE LAST 10 YEARS, NEW LEGISLATION AND EXCHANGE OF EXPERIENCE [BIB-FR9302413]
(Lindborg, A.; Institut International du Froid, Paris (France); Publisher: IIF, (1990), p. 771-778 [in English]. ISSN 0151-1637)

3626 MACHINERY SAFETY [BIB-GB9118835]
(Stranks, J.; ((1991)), v. 93(6) p. 12-13 [in English].)

3627 [ARCHITECTURAL AND CONSTRUCTIONAL ARRANGEMENTS. PT. 1 [BREWERIES]] (PLANUNG, ERSTELLUNG UND ERHALTUNG VON "BAULICHEN EINRICHTUNGEN". TEIL 1) [BIB-DE93J0033]
(Reichelt, J.; ((1992)), v. 132(49) p. 2533-2534 [in German]. ISSN 0724-696X)

3628 [CONSTRUCTIONAL ARRANGEMENTS. PT. 2 [BREWERIES]] (BAULICHE EINRICHTUNGEN. TEIL 2) [BIB-DE93J0061]
(Reichelt, J.; ((1993)), v. 133(1-2) p. 35-36 [in German]. ISSN 0724-696X)

3629 ANALYSIS OF LOST TIME ACCIDENTS - 1990. (ACCIDENT REPORTING SCHEME STATISTICS) [BIB-NZ9122425]
(Wallace, K.; (1991), 4 p. [in English].)

3630 [ELECTRICAL ENGINEERING [BREWERY]] (ELEKTROTECHNIK) [BIB-DE92J0495]
(Merdian; ((1992)), v. 132(40) p. 1893-1894 [in German]. ISSN 0724-696X)

3631 SAFE USE OF PESTICIDES AND DISINFECTANTS IN THE POULTRY INDUSTRY [BIB-US9332219]
(Ernst, R.A.; ((1990)), (no. 39th) p. 115-116 [in English]. ISSN 0094-8780)

3632 [CONSTRUCTIONAL ARRANGEMENTS [BREWERIES]. CONTINUATION] (BAULICHE EINRICHTUNGEN. FORTSETZUNG) [BIB-DE93J0095]
(Reichelt, J.; ((1993)), v. 133(5) p. 209-210 [in German]. ISSN 0724-696X)

3633 LIMITED-USE CHEMICAL PROTECTIVE CLOTHING FOR EPA SUPERFUND ACTIVITIES [BIB-US9197517]
(Sawicki, J.C.; Risk Reduction Engineering Laboratory (USA); Arthur D. Little, Inc (USA); Publisher: Risk Reduction Engineering Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, ([1992]), 41 p. [in English].)

3634 HISTORY OF FLOUR MILLS CONSTRUCTION, PT.100: FIRES AND DUST EXPLOSIONS (STORIA DELLE COSTRUZIONI DEI MOLINI, PT.100: INCENDI ED ESPLOSIONI DI POLVERI) [BIB-IT9361545]
(Madureri, E.; ((Dec 1992)), v. 43(12) p. 1095-1105 [in Italian]. ISSN 0040-1862)

3635 THE FIRE HAZARD IN WOODWORKING AND WOOD PROCESSING FACTORIES (BRANDGEFAHREN IN HOLZBE- UND HOLZVERARBEITENDEN BETRIEBEN) [BIB-DE93T2101]
(Borghaus, G.; ((1992)), v. 27(7-8) p. 820-821 [in German]. ISSN 0721-2585)

3636 FIRE PROTECTION IN WOODWORKING ENTERPRISES (BRANDSCHUTZ IN HOLZVERARBEITENDEN BETRIEBEN) [BIB-DE93T2102]
(Mayr, J.; ((1992)), v. 27(7-8) p. 822-825 [in German]. ISSN 0721-2585)

3637 PREVENTING FIRES IN PELLETING SYSTEMS [IN FEED INDUSTRY] (PREVENZIONE DEGLI INCENDI NEGLI IMPIANTI DI CUBETTATURA [NEI MANGIMIFICI]) [BIB-IT9361542]
(Wetzel, W.; ((Nov 1992)), v. 43(11) p. 1022-1026 [in Italian]. ISSN 0040-1862)

3638 OCCUPATIONAL SAFETY AND HEALTH: OSHA ACTION NEEDED TO IMPROVE COMPLIANCE WITH HAZARD COMMUNICATION STANDARD : REPORT TO CONGRESSIONAL REQUESTERS [BIB-US9314089]
(Anon.; United States. General Accounting Office; Publisher: The Office, (1991), 112 p. [in English].)

3639 SECURITY IN CIVIL WORKS FOR FOOD FACTORIES. PT.1 (LA SICUREZZA DEI FABBRICATI PER LE INDUSTRIE ALIMENTARI. PT.1) [BIB-IT9361589]
(Rizzo, R.; ((Jan 1993)), v. 32(311) p. 25-33 [in Italian]. ISSN 0019-901X)

3640 SECURITY IN CIVIL WORKS FOR FOOD FACTORIES. PT.2 (LA SICUREZZA DEI FABBRICATI PER LE INDUSTRIE ALIMENTARI. PT.2) [BIB-IT9361629]
(Rizzo, R.; ((Feb 1993)), v. 32(312) p. 134-146, 150 [in Italian]. ISSN 0019-901X)

3641 HACCP: PRINCIPLES AND APPLICATIONS [BIB-US9314341]
This reference work provides readers with a systematic blueprint for applying Hazard Analysis and Critical Control Points (HACCP) to control biological, chemical and physical hazards in foods. Geared toward quality control/quality assurance specialists, technical managers, educators and other professionals who are involved in food safety management (Pierson, M.D.; Corlett, D.A.; Institute of Food Technologists (USA). Continuing Education Committee; Publisher: Van Nostrand Reinhold, (1992), 212 p. [in English].)

3642 THE UK REGULATORY APPROACH TO THE RELEASE INTO THE ENVIRONMENT OF GENETICALLY MODIFIED ORGANISMS [BIB-GB9102771]
(McGowan, C.M.; ((1989)), v. 27(2) p. 217-219 [in English].)

3643 [SEED PROCESSING INDUSTRY: A HANDBOOK] [BIB-QT9300286]
(Aguirre, R.; Peske, S.T.; Centro Internacional de Agricultura Tropical, Cali (Colombia); Publisher: CIAT, (1992), 247 p. [in Spanish].)

3644 STRATEGIES FOR ASSESSING THE SAFETY OF FOODS PRODUCED BY BIOTECHNOLOGY: REPORT OF A JOINT FAO/WHO CONSULTATION [BIB-US9320967]
Presents the conclusions of an international group of experts convened by FAO and WHO to consider strategies and procedures for assessing the safety of food produced by biotechnology. The Consultation reviewed the current and potential applications of biotechnology to food production and formulated a number of recommendations; for example, it considered that, from the point of view of safety, there was no fundamental difference between traditional products and contemporary ones obtained by means of biotechnology, and that any safety assessment should be based on the molecular, biological, and chemical characteristics of the material to be assessed (Anon.; WHO (Switzerland); Publisher: WHO, (1991), 59 p. [in English].)

3645 PATTERNS IN TASK DEMANDS AND IN OCCUPATIONAL ACCIDENTS: A RELATIONSHIP INVESTIGATED IN THE SWEDISH SAWMILL INDUSTRY. METHODOLOGICAL REPORT ON THE ANALYSIS OF ACCIDENT FREQUENCY, SEVERITY, AND CHARACTERISTICS AND OF TASK DEMAND AND MENTAL LOAD IN TRIMMING HOUSES [BIB-SE9311692]
(Laflamme, L.; Friedrich, P.; Publisher: Arbetsmiljoeinstitutet, (1993), 70 p. [in English]. ISSN 0346-7821)

3646 [WORK AND HEALTH IN THE AGRICULTURAL SECTOR: INDUSTRIAL HEALTH CARE AS A MEANS TO REDUCE RISKS TO HEALTH] (ARBEID EN GEZONDHEID IN DE AGRARISCHE SEKTOR. BEDRIJFSGEZONDHEIDSZORG ALS MIDDEL TER BEHEERSING VAN GEZONDHEIDSRISICO'S) [BIB-NL9305653]
(Boleij, J.S.M.; Publisher: Pudoc, (1992), p. 9-15 [in Dutch]. Arbeidsomstandigheden in de agrarische sector. Onderzoek naar fysieke belasting als gezondheidsrisico)

3647 [CONSTRUCTIONAL ARRANGEMENTS [BREWERIES]] (BAULICHE EINRICHTUNGEN.) [BIB-DE93J0338]
(Reichelt, J.; ((1993)), v. 133(9) p. 381-382 [in German]. ISSN 0724-696X)

3648 BIOTECHNOLOGIES FOR THE FOOD SECTOR (LE BIOTECNOLOGIE PER IL SETTORE ALIMENTARE) [BIB-IT9362483]
A possible future scenary of biotechnologies for the food sector, based on an examination of research activities in this area, is presented. The role played by the innovations from biotechnology is becoming important as a result of the demand for simplicity of use, safety of use and nutritional validity in products and for the expansion of food typologies. The increase in the number of the new food ingredients, derived from new forms of transformation of agricultural products, is the most significant fact to appear over the past few years Viene presentato uno scenario delle possibilita' di sviluppo di biotecnologie di prima generazione e di ingegneria genetica che interessano il settore alimentare, per processi innovativi di utilizzazione delle risorse agricole, per la produzione di ingredienti ed additivi, per i controlli di qualita' e il trattamento dei reflui. L'importanza dei ritrovati, in termini di semplicita' d'impiego, sicurezza d'uso e miglioramenti della qualita' nutrizionale, che appare sempre piu' rilevante, viene valutata in termini di rilevazioni sulle ricerche in corso (Cantarelli, C.; ((Jan 1992)), v. 31(300) p. 1-10 [in Italian]. ISSN 0019-901X)

3649 [NOISE ABSORPTION PLUS HYGIENE IN THE BREWING INDUSTRY] (SCHALLABSORPTION PLUS HYGIENE IN DER BRAUINDUSTRIE) [BIB-DE93J0359]
(Anon.; ((1993)), v. 78(4) p. 291-292 [in German]. ISSN 0341-7115)

3650 OPERATOR EXPOSURE TO AGROCHEMICAL SPRAYS [BIB-GB9123249]
(Stevenson, D.; Publisher: Royal Society of Chemistry (RSC), (1991), p. 459-465 [in English].)

3651 SAFE HANDLING OF SOLVENTS IN RELATION TO CLASSIFICATION AND LABELLING [BIB-SE9311768]
(Haugaard, J.; (Apr 1990), p. 91-96 [in English].)

3652 BIOLOGICAL CONTROL: AN INDUSTRIAL PERSPECTIVE [BIB-US9334294]
(Ferguson, J.S.; ((Dec 1992)), v. 75(4) p. 421-429 [in English]. ISSN 0015-4040)

3653 HAZARD ANALYSIS AND CRITICAL CONTROL POINT APPLICATIONS TO THE SEAFOOD INDUSTRY [BIB-US9335783]
(Lee, J.S.; Hilderbrand, K.S.; Publisher: Sea Grant Communications, Oregon State University, ([1992]), 25 p. [in English].)

3654 NEW INCIDENCE REGULATION AND ITS IMPLICATIONS FOR THE FURNITURE INDUSTRY (NEUE STOERFALL-VERORDNUNG UND IHRE BEDEUTUNG FUER DIE MOEBELINDUSTRIE) [BIB-DE93T3128]
(Borghaus, G.; Schroeer, W.; ((1993)), v. 28(5) p. 542-547 [in German]. ISSN 0721-2585)

3655 TRANSPORT AND THE ENVIRONMENT [BIB-TINE000737]

Passenger and freight traffic trends in OECD countries from 1970 to 1987 are shown. Urban passenger transport in some countries is detailed by mode and the wide variation in vehicle fleets in various parts of the world is shown. The increase in world oil consumption since 1950 and the relative energy intensity of different vehicles are illustrated. The recent reduction in leaded petrol consumption is the United States of America and the excessive levels in certain areas in the Europe region are shown. The environmental effects of principal transport modes and legal exhaust limits for automobiles in selected countries are listed. Alternative fuels are compared. (UNEP—Industry and Environment Programme Activity Centre; Publisher: UNEP—IE/PAC, Paris, Industry and Environment, (Jan-June 1993), 1-2, 16, pp. 4-6 [in English]. 0378-993)

3656 MOBILITY IN THE GREENHOUSE [BIB-TINE000738]

To reduce global warming to a tolerable extent, greenhouse gas emissions should be cut by 60% within 50 years. To this end, the growth in the numbers of automobiles must be restricted. Non-polluting transportation systems that provide a high level of amenities and are low in energy utilization are needed in both developed and developing countries. The huge difference in harmful emissions between railway and road transport for passengers and freight traffic is illustrated. A striking negative correlation between fuel prices and energy consumption in OECD countries is shown. Honest pricing of different means of transport and the introduction of more efficient and rational vehicles are among the most important steps that need to be taken. (Petersen, Rudolf; Weizsäcker, Ernst von; Publisher: UNEP—IE/PAC, Paris, Industry and Environment, (Jan-June 1993), 1-2, 16, pp. 7-10 [in English]. 0378-9993)

3657 TRANSPORT PLANNING AND POLICY: THE DANISH EXPERIENCE [BIB-TINE000739]

A recent study of the Danish transportation system examined various strategies for reducing air pollution and achieving energy savings. The year 2010 was chosen as a likely date for implementation of proposed actions. The environmental impacts of each of 13 action measures were analysed. Target variables (energy consumption, air pollution) can be reduced by combining six complementary actions, namely energy economy, U.S. norms for emissions, speed limits, load factor improvements for trucks, walking and cycling and electric vehicles. The best ways to implement these measures were not examined. (Jorgensen, Claus Hvashoj; Krawak, Susanne; Sorensen, Michael Munk; Therkelsen, Henning; Publisher: UNEP—IE/PAC, Paris, Industry and Environment, (Jan-June 1993), 1-2, 16, pp. 11-14 [in English]. 0378-9993)

3658 ECOLOGICALLY SUSTAINABLE DEVELOPMENT AND THE TRANSPORT SECTOR [BIB-TINE000740]

The Brundtland Report (1987) challenged the world to find ways to achieve ecologically sustainable economic development. In response, the Australian Government set up nine industry-based working groups, the task of the one relating to transport being to apply the notion of ecologically sustainable development (ESD) to transport and to derive policy recommendations. More energy efficiency vehicles, alternative fuel sources and improved transport services can be considered to achieve ESD in transport, while policy measures that might be adopted include a C tax on energy sources and regulations for vehicle emissions. The first stage of the Australian ESD process was completed in 1991 and consideration is currently being given to implementation of its recommendations. (Throsby, David; Publisher: UNEP—IE/PAC, Paris, Industry and Environment, (Jan-June 1993), 1-2, 16, pp. 15-17 [in English]. 0378-9993)

3659 URBAN PUBLIC TRANSPORT MANAGEMENT IN CURITIBA, BRAZIL [BIB-TINE000741]

Using the example of Curitiba (a Brazilian city with a population of 1.6 million) it is shown that the development of an integrated transport system plays a fundamental role in urban physical management and allows a given community to develop further environmental initiatives. The reasons for the success of the system are Curitiba's land use policies, based on type and density of use, and the designation of a hierarchy of roads including express busways and circular inter-district bus routes. There is full integration between express buses, inter-district buses and conventional (feeder) buses. (Rabinovitch, Jonas; Publisher: UNEP—IE/PAC, Paris, Industry and Environment, (Jan-June 1993), 1-2, 16, pp. 18-20 [in English]. 0378-9993)

3660 TRANSPORT IN DELHI: ENERGY AND ENVIRONMENTAL CONSEQUENCES [BIB-TINE000742]

A simple model of passenger transport in Delhi is developed using the computer-based software, Long Range Energy Alternative Planning (LEAP). Traffic patterns are represented in terms of passenger travel demand, mode (rail/road), types of vehicles and persons per vehicle. Transport demand and energy consumption calculations are based on a transport database in the city, together with fuel consumption values for the vehicle types. Emission factors corresponding to actual vehicles and driving conditions are linked to fuel consumption values to estimate total emissions of CO, NO_x, SO_2, hydrocarbons and Pb. Total energy demand and vehicle emissions are estimated for the period 1990 to 2010. Five scenarios examine the effect of alternative policy initiatives on transport energy and emissions as an aid to limiting future fuel consumption increases and air pollution. (Bose, Ranjan Kumar; Mackenzie, Gordon A.; Publisher: UNEP—IE/PAC, Paris, Industry and Environment, (Jan-June 1993), 1-2, 16, pp. 21-25 [in English]. 0378-9993)

3661 SINGAPORE'S LAND TRANSPORT POLICY AND THE ENVIRONMENT [BIB-TINE000743]

The basic objective of Singapore's land transport policy is to keep road traffic free-flowing with consequent economic and environmental benefits. Limited space has already led to roads occupying 10% of the country's land: Transport policy is based on further sustained road building, integrated land use planning, promotion of public transport and management of vehicle ownership and use. Vehicles in Singapore are subject to strict exhaust and noise emission standards before registration and in use. The Government encourages replacing old vehicles by new less polluting and more road-worthy ones. (Shen, Tong Ming; Publisher: UNEP—IE/PAC, Paris, Industry and Environment, (Jan-June 1993), 1-2, 16, pp. 26-27 [in English]. 0378-9993)

3662 MANAGING THE TRANSITION TO A LOW-EMISSION FUTURE IN DEVELOPING COUNTRIES [BIB-TINE000745]

Air quality problems associated with transport are especially grave in most major cities in the Asia/Pacific region. The threat air pollution poses to human health in many urban areas is compounded by the climate and lifestyles of the warmer countries. Work to reduce vehicle emissions, and so improve air quality and to contain future vehicle growth rates, needs to focus on each of six vehicle types (conventional cars, diesel cars, buses, mini-buses, trucks and motorcycles). Noise pollution caused by traffic can also be severe. The percentage of each type of motor vehicle exceeding 100 dB at a distance of 0.5m on heavily travelled roads in Bangkok are summarized. (Walsh, Michael P.; Publisher: UNEP—IE/PAC, Paris, Industry and Environment, (Jan-June 1993), 1-2, 16, pp. 28-31 [in English]. 0378-9993)

3663 AUTOMOTIVE OPTIONS AND AIR QUALITY MANAGEMENT IN DEVELOPING COUNTRIES [BIB-TINE000746]

Transport is a significant contributor to the acute air quality problems being faced in rapidly growing cities in many developing countries. Maximum benefit at minimum cost could be achieved by giving priority to vehicle inspection and maintenance and repair strategies, transportation planning and traffic management programmes, improved vehicle technology and fuel selection (unleaded petroleum). Alternative fuels do not generally offer quick low-cost solutions to emission problems, so "clean vehicle" programmes in the developed world should be evaluated carefully before such fuels are considered as options in less-developed economies. (Saville, S.B.; Publisher: UNEP—IE/PAC, Paris, Industry and Environment, (Jan-June 1993), 16, pp. 32-36 [in English]. 0378-9993)

3664 THE ELECTRIC CAR (L'AUTOMOBILE ELECTRIQUE) [BIB-TINE000747]

Despite the recently revived interest in the electric car to reduce air pollution, commercialization has so far been restricted to small electric utility vehicles. However, larger vehicles are now begining to be designed specifically for electric propulsion and much research is underway to develop new electric batteries (e.g. Cd-S) to overcome the size and weight problems of conventional

designs. It is unlikely that electric cars will be suitable for use outside cities or develop more than a modest performance. Financial incentives could offset the cost of such vehicles that have added advantages of creating a quieter environment in urban areas. (Lamure, Claude; Publisher: UNEP—IE/PAC, Paris, Industry and Environment, (Jan-June 1993), 16, pp. 37-41 [in French]. 0378-9993)

3665 ANALYSING THE LIFE CYCLE IMPACT OF CARS: THE CASE OF CO_2 [BIB-TINE000748]

The Japanese automobile sector is reviewed, with special reference being made to environment problems, the recent rapid development of electric vehicles and a new concept vehicle with an Al body. Cars have various environmental impacts, their life cycle, including raw material production, assembly, use and maintenance and final disposal. The construction and maintenance of roads are other factors that need consideration. As an example of the quantitative analysis of life cycle environmental impacts, CO_2 emissions from the production and use of cars have been estimated using the "summing-up" approach and the input-output analysis approach. (Moriguchi, Yuichi; Kondo, Yoshonori; Shimizu, Hiroshi; Publisher: UNEP—IE/PAC, Paris, Industry and Environment, (Jan-June 1993), 16, pp. 42-45 [in English]. 0378-9993)

3666 ENVIRONMENTAL IMPACT OF DESIGN AND MATERIALS SELECTION IN CARS [BIB-TINE000749]

The energy used for the annual production of 50 million cars worldwide and the operation of about 700 million motor vehicles is equivalent to more than 6 billion tonnes of crude oil. Over the lifetime of a car, more than 90% of its energy and other resource requirements are used in its operation. Reduced resource demand per car is currently achieved mainly through weight reduction (using lightweight materials, especially polymers), through improvements in aerodynamic performance and through extending the lifetime of individual parts. Every effort should be made to achieve "total resource management" which considers materials and energy (including resource recovery at the time of the vehicle disposal) and hence environmental pollution management, as a whole. (Krummenacher, Bruno; Publisher: UNEP—IE/PAC, Paris, Industry and Environment, (Jan-June 1993), 1-2, 16, pp. 46-50 [in English]. 0378-9993)

3667 CIVIL AVIATION AND THE ENVIRONMENT [BIB-TINE000750]

In the future, the aviation industry will need to pay increasing attention to environmental problems. New factors to be considered include further growth in air transport demand and changing public attitudes towards the environment. In addition to problems that have been addressed for many years, such as aircraft noise and emissions, there are growing concerns about the greenhouse effect and the depletion of the ozone layer. The work of the International Civil Aviation Organization (ICAO), the UN agency responsible for civil aviation, in response to these problems is described. (Crayston, John; Publisher: UNEP—IE/PAC, Paris, Industry and Environment, (Jan-June 1993), 16, pp. 51-53 [in English]. 0378-9993)

3668 AIRLINES, AVIATION AND THE ENVIRONMENT- THE BRITISH AIRWAYS PROGRAMME [BIB-TINE000751]

In 1990 almost 9000 subsonic jet aircraft flew more than 1.7×10^{12} passenger km (excluding those from the former USSR). British Airways'(BA) fleet of 230 aircraft carried more than 25 million passengers in 1991. The environmental impact of such activity is being increasingly focused on at BA. The environmental issues identified by the airline are noise, emissions and energy efficiency, waste (energy, materials and water) and tourism. Programmes have been developed to address these issues and to review environmental performance. Measures beneficial for the environment can be equally good for the aviation industry. (Somerville, Hugh; Publisher: UNEP—IE/PAC, Paris, Industry and Environment, (Jan-June 1993), 16, pp. 54-59 [in English]. 0378-9993)

3669 THE INTERNATIONAL AIR TRANSPORT ASSOCIATION AND THE ENVIRONMENT [BIB-TINE000752]

The International Air Transport Association (IATA) is the airline industry's worldwide trade association. In 1990, IATA established an Environmental Task Force (ETAF) to develop policies and strategies to improve the environment. ETAF works with manufacturers, airports, environmental groups, etc. It also coordinates with IATA's Aircraft Noise and Emissions Task Force (ANETAF). Noise is the dominant environmental issue, even though noise levels are down 75% since the first jets. Aviation is responsible for 3% of fossil fuel derived CO_2 emissions. N oxides (NO_x) are the largest aviation emission pollutant by weight and may add to the greenhouse effect. (Michal, Emmanuel; Publisher: UNEP—IE/PAC, Paris, Industry and Environment, (Jan-June 1993), 16, pp. 59 [in English]. 0378-9993)

3670 RAIL TRANSPORT AND THE ENVIRONMENT (TRANSPORT FERROVIAIRE ET ENVIRONNEMENT) [BIB-TINE000753]

The ecological effects of rail transport (energy consumption, emission of harmful substances, safety, noise and land usage) are considered and the external costs of passenger and goods traffic pollution of the atmosphere, earth and water, noise, accidents, etc.) are estimated for different modes of transport. On any of these criteria, choosing rail means more protection for nature. Developing rail infrastructure, by constructing a trans-European network of high-speed railways and by promoting combined transport systems, will allow railways to offer products that are competitive and also of ecological benefit. (Ellwanger, Gunther; Publisher: UNEP—IE/PAC, Paris, Industry and Environment, (Jan-June 1993), 16, pp. 60-64 [in French]. 0378-9993)

3671 OPINION (POINT OF VIEW - QUESTIONS AND ANSWERS) (POINT DE VUE) [BIB-TINE000754]

An outline is given of the important role played by the French Minister of the Environment regarding the infrastructure of different means of transport and their impact on the environment. The Minister participates in current projects and long-term programmes. Special studies are made of the impact on the environment of specific large-scale projects such as the TGV (trains a grande vitesse or high-speed trains) during their construction and in operation. (Lafont, Jean; Publisher: UNEP—IE/PAC, Paris, Industry and Environment, (Jan-June 1993), 16, pp. 65-66 [in French]. 0378-9993)

3672 SUSTAINABLE URBAN DEVELOPMENT: INDUSTRIAL SITING IN LAE, PAPUA NEW GUINEA [BIB-TINE000755]

Environmental sustainability is increasingly becoming a major concern of many governments in developed and developing countries. Environmental problems arising from industrial location in Lae City, Papua New Guinea, are examined. The importance of the siting of a clinker grinding and cement packaging factory is described. Environmental impact assessment (EIA) is considered to be the basis of sustainable development planning. Methods of avoiding environmental disasters (increasing public awareness and participation, tougher legislation measures for environmental planning and monitoring) are also identified. (Kaitilla, S.; Publisher: UNEP—IE/PAC, Paris, Industry and Environment, (Jan-June 1993), 16, pp. 67-70 [in English]. 0378-9993)

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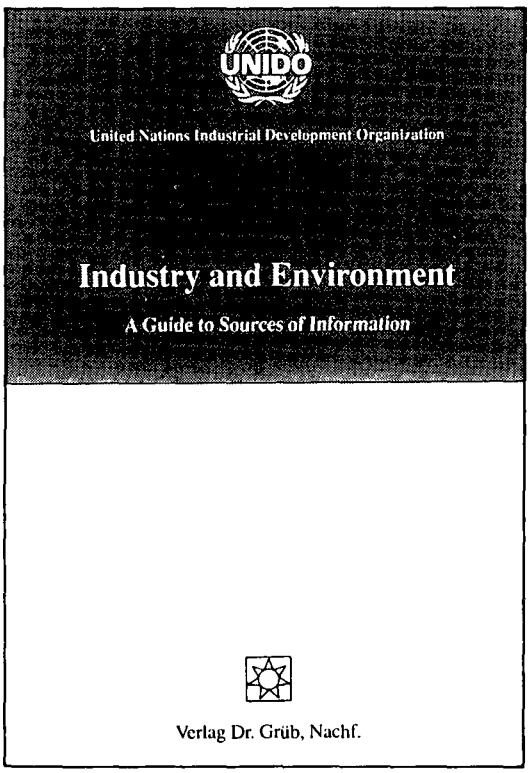

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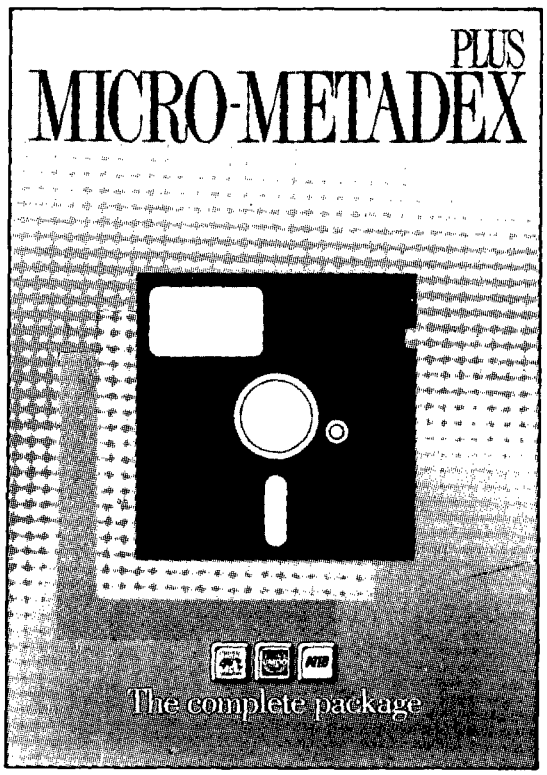

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