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STRENGTHENING OF PESTICIDE DEVELOPMENT CENTRE

DP/IND/89/128

INDIA

Technical report: Findings and recommendations*

Prepared for the Government of India
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of Charles Harmer, consultant on
operational safety with pesticides

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Vienna

* This document has not been edited.

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1. SUMMARY

The report outlines the purpose and content of the first four weeks of a commission originally proposed to cover a two-month period, in support of safety related projects initiated by the Indian Institute of Pesticide Formulation Technology (IPFT). These included the preparation of a comprehensive manual on safety in pesticide formulation, storage and transport and a training workshop for representatives from industry and regulatory authorities, which was designed to present both the Indian and international perspectives on current safety and environmental practices.

As time permitted, advice was provided on specific safety issues identified during an assessment of the pilot plant facilities at the IPFT Research and Development Centre, at Gurgaon and a briefing session was held for two visitors to the Gurgaon Site from the Peoples' Republic of China.

Meetings were held with DR. DEBUA RENPAP-UNDP, to discuss a draft proposal for a workshop to promote safety in chemical production in small and medium scale industries and, through DR. DEBUA'S office, with MR. V. KHOLI, Joint Secretary (Chemicals) at the Ministry of Chemicals and Fertilisers.

The principal contacts while working with IPFT were: DR. KAWAL DHARI, MR. R. P. LUTHRA and MR. S. KUMAR.

2. RECOMMENDATIONS

2.1 That, with UNIDO's agreement, the further work required to complete the Safety Manual be done by the author on a home basis, maintaining a postal contact with IPFT, at Gurgaon, at least as far as the final draft stage, when the need for a further visit can be assessed.

2.2 That the author be responsible for finally editing the Safety Manual.

2.3 That further workshops, organised on the basis of the Ankleshwar Meet be encouraged; using the combined influence of the IPFT and the Pesticides Association

of India (PAI) to achieve common standards of practice within the pesticide formulation and distribution industries in India.

2.4 That, when complete, the Safety Manual be used as a vehicle for this purpose.

2.5 That representations of government and public authorities, including the emergency services, be encouraged to sit alongside the representatives of the industry in promoting improved standards of safety and environmental protection nationally.

3. INTRODUCTION

The Institute of Pesticide Formulation Technology, a Government of India Society was established in May 1991, with the aim of assisting the pesticide industry in the country in all aspects of its development. Facilities at the Institute's Research and Development Centre at Gurgaon, Haryana, about 20 km from New Delhi, include a pilot plant with the capability to develop formulations not yet in common use in India, such as suspension concentrates and dispersible grains as well as the more traditional emulsifiable concentrates and wettable powders.

Safety is a core element of the Institute's programme, which aims to make available to the industry in India the technology to develop inherently safer formulations, together with information on safe operating practices, waste management and environmental controls. To this end, it is also the intention to develop a safety laboratory at the Gurgaon Site. In all of these respects, the advice and assistance obtainable through programmes operated by UNIDO and the UNDP will be vital in order to short-cut the learning process and benefit from experience gained elsewhere.

The Institute works closely with the Pesticides Association of India and the Workshop described in Section 5 of this report was an example of a joint initiative prepared by the IPFT and the PAI. Contributions to this Workshop, together with assistance in the preparation of a comprehensive safety manual for pesticide formulators, represented the greater part of the input of the commission, the Job

Description for which is attached as Annex I. A detailed description of what has been achieved to-date and what still remains to be done, is contained in the paragraphs which follow.

4. PREPARATION OF THE SAFETY MANUAL

4.1 Outline of the Purpose and Content.

The preparation of a Safety Manual, designed to provide practical advice on safety issues concerned with pesticide formulation, storage and transport, is seen as an essential first step toward the rationalisation of safety standards within the industry in India.

Although intended for circulation throughout the industry in the Sub-Continent and, conceivably in other countries in the region, the principal targets will be the medium and smaller companies, whose access to such advice might otherwise be questioned.

From the outset, it was agreed that the issues addressed in the Manual would be identified under four headings, as follows:

- (i) operational safety
- (ii) occupational safety
- (iii) environmental safety
- (iv) administrative safety

4.1.1 Operational Safety.

Logically, this Section will deal with the design factors necessary for safety during the processing of potentially hazardous materials. Issues include: the choice of site and plant layout, hazard identification, protection of plant against fire and explosion risks, dust and vapour control, and safety in the conduct of maintenance work. Safety during the storage and transport of pesticides is also addressed and planning for the containment of emergencies is considered in some detail.

4.1.2 Occupational Safety.

This section will consider the human safety factors, both in terms of the

protection of workers and the contribution which they can make, as individuals, to their own safety. Safety training, hygiene factors, communication on safety matters and worker response to emergencies, are included under the title of occupational safety.

4.1.3 Environmental Safety.

This is seen as being split between the environment within the workplace and that outside. Whilst the Operational safety section considers those design features necessary to contain harmful substances and prevent their being dispersed in the workplace environment, the means to verify the quality of the workplace environment are outlined under Environmental Safety. Thus, this Section will deal with atmospheric monitoring techniques.

Outside the workplace, the concern is with the means of collecting, treating and disposing of waste, in a manner which will minimise risk to the environment at large.

4.1.4 Administrative Safety.

Divided between legal requirements and managerial responsibility, the Section will support an outline of Indian law, as it relates to the formulation of pesticides, with the concept of establishing safe systems of work and the integration of safety as an essential element of managerial responsibility. The provision of safety data and monitoring safety performance will be covered in this Section, together with the important issue of liaison with external authorities.

4.2 Progress to Date.

Prior to the commencement of the commission, a great deal of information was gathered by senior members of the staff at Gurgaon. The task remaining was to supplement this data, where necessary, and collate the whole into a form suitable for publication.

In the time available, a draft of the section dealing with Operational safety was largely completed. This section will form a major part of the Manual. Work on the remaining sections is at a less advanced stage, though, in all cases, some ground work has been covered.

4.3 Proposals for Completion and Projected Time-Table

At the suggestion of the author it was agreed that one person should be

responsible for editing the Manual, in order that it can be presented in a common style. For purely practical reasons, it was suggested and agreed that this task should fall to the author of this report. Therefore, in the time remaining from the original programme, envisaged to involve two months work, it was proposed that further drafting should be done by the author, at his home station, using the postal service to exchange, correct and agree texts with staff at Gurgaon.

Every effort will be made to complete the first draft by the end of February 1994, leaving time to complete the final details by August 1994. Whilst this may seem a generous timetable, experience with similar projects would suggest that it may be difficult to produce a final text in significantly less time, bearing in mind other demands on the time of those involved and the delays which will inevitably occur as a consequence of the need for postal exchanges.

Some of the initial drafting remains the responsibility of staff at Gurgaon and, in particular, Mr. S. Kumar has agreed to prepare that part of the Administrative Safety Section which will deal with the Indian legal requirements. This can then be amalgamated with the remainder of the same section, to be prepared by the author.

Clearly, however, these proposals are seen as being subject to the agreement of U.N.I.D.O.

5. ANKLESHWAR WORKSHOP

5.1 Purpose.

The Workshop cum. Training Meet was a joint initiative of IPFT and the PAI, organised with the objective of bringing together representatives of the formulating industry and regulatory authorities, to facilitate a dialogue on issues of common interest and concern. A programme for the Workshop is included as Annex II.

5.2 Location and Attendance.

Sponsored by pesticide formulators within the area of Ankleshwar, the Meet attracted an attendance from a wide area, including: Bombay, Hyderabad and New Delhi itself. Annex III gives details of those attending and the companies and

organisations represented.

5.3 Site Visits.

Prior to the commencement of the Workshop proper, visits were arranged to four sites in the area, two of which were operated by United Phosphorus Ltd., while the remaining two were owned by Hoechst and Khantau-Junkers Ltd., respectively. Subsequent to the Workshop, a further site visit was arranged to the premises of Crop Health Ltd., near New Delhi.

Discussions both during and after these visits were full and frank and even those issues which attracted some criticism, that is, from the visiting consultants, were debated without rancour. Indeed, it may fairly be said that such comment was actively sought by those whose sites were visited.

5.4 Meeting With Members of Institute of Chemical Engineers.

Advantage was taken of the occasion to arrange a simultaneous meeting, during one evening, of the Ankleshwar Branch of the Institute of Chemical Engineers. On this occasion, there was no formal presentation of papers but, rather, a wide-ranging discussion of those issues arising from the Workshop itself and the site visits.

5.5 Meeting With Mr. V. Kholi, Joint Secretary.

The Workshop was also the subject of discussion during a meeting with Mr. V. Kholi, Joint Secretary, Chemicals, in the Ministry of Chemicals and Fertilisers.

Arranged by Dr. S. P. DHUA RENPAP-UNDP, following the return to New Delhi from Ankleshwar, the meeting with Mr. Kholi provided further evidence, if indeed evidence was needed, of the need for input in the areas of safety and environmental protection in the formulation industry in India. As before, at Ankleshwar, there were no obstacles to a full and frank discussion with Mr. Kholi and one was left with the clear impression that, within the compass of his authority, he would actively encourage the initiatives of the Institute and the PAI, on these issues.

After a very promising start, the real gain from the Ankleshwar Workshop will only become apparent with time but, in the subjective views of those present, there

was no doubting the usefulness of the discussions generated by the papers presented, or, of the level of interest maintained throughout.

A copy of the author's paper is attached as Annex II but, during the presentation, this paper was used only as a framework around which to give examples, both good and bad, of experience gained elsewhere.

6. OTHER AREAS OF INVOLVEMENT

6.1 Gurgaon Pilot Plant.

Following the terms of the Job Description (Annex I), some discussion took place concerning safety standards in the Gurgaon Pilot Plant. These concerned principally the need to improve dust and vapour control in the plant, as well as the protection of plant with the potential to handle flammable dusts.

With regard to dust and vapour control, the existing system was considered to be poorly designed and, in view of the recent introduction of a number of additional items of pilot scale equipment, wholly inadequate for the future needs of the plant. These shortcomings were by no means unique and similar deficiencies have been observed by the author elsewhere which, taken together, underline the need for guidance in the design of local exhaust ventilation equipment. This subject will be addressed in some detail in the proposed Safety Manual but, in the meantime, specific suggestions were made concerning the installation in the Pilot Plant.

6.2 Visit of Chinese Delegates.

At the request of DR. ДИУА a briefing was arranged for two visitors to the Gurgaon Site from the Peoples' Republic of China: MR. ZHANG QIMING and MR. JIANG BIN.

This essentially informal discussion concentrated on the areas of concern commonly identified in formulation plants throughout the world. Feedback on the level of understanding gained by the visitors was difficult to judge but their eagerness to gain the maximum advantage from the opportunity which the occasion presented was not in doubt.

6.3 Future Workshop.

In response to a request from DR. DHUA comments were offered on a draft document setting out the aims and objectives of a further workshop, to be held during 1994, and aimed at safety in the wider context of the chemical industry in India.

Encouraged by DR. DHUA to be open, honest and frank, it was suggested that the broad brush approach envisaged in the draft, might be of limited benefit.

Although there are clearly matters of common concern across the industry as a whole, it would seem logical to suppose that progress might be achieved more quickly by adopting a sectorial approach, as was the case with the Ankleshwar Meet. In this way, each sector of the industry can focus more precisely on its own needs, thus promoting a more unified response to their resolution.

Taken as a whole, the industry is infinitely complex and an expert in one field may not be so regarded in another, for example, pesticides and petrochemicals. By adopting a broad brush approach, it seems likely that any debate will address only the generalities, rather than specifics, and progress will be limited in consequence. Put another way, when an employer or manager asks the question 'What does it mean to me?', he will expect a qualified answer. He will want to know why he should be concerned, what problems may arise should he fail to respond, how he must respond, and, not least, what will it cost? The answers to these questions will not be found in the broad view but only by making an in-depth assessment, essentially on a narrow front, when expert opinion and experience within a particular sector of the industry, can be used most profitably.

7. CONCLUSIONS

7.1 The priorities of the commission were not precisely as outlined in the Job Description, where the reference to the Safety Manual appeared almost as a secondary demand on the consultant's time.

In the event, the compilation of this Manual will be a major task, as well as a cornerstone to progress. It is, indeed, a first pre-requisite from which other developments will follow and its significance will be reflected in the time necessary for its satisfactory completion.

7.2 Similarly, the Job Description did not specify a contribution on the scale of the Ankleshwar Workshop but merely suggested a few lectures to selected groups.

As events proved, the concept of the Workshop was of great significance and fully justified the time spent on the preparation and presentations which it involved. One might go so far as to suggest that the event provided a perfect forum within which to have meaningful discussions about issues of real concern to the industry, with the people most able to influence their direction.

7.3 In an international context, the issues identified during the commission bore an obvious similarity to those found elsewhere and the difficulty will not be in finding solutions but, rather, in applying those solutions on an industry wide basis.

7.4 In support of change is an existing framework of legislation, regulatory bodies, professional institutes and trade associations which parallels that found elsewhere, including the United Kingdom, and the initiatives discussed in this report may be seen as the essential building blocks upon which progress will be established.

8. ACKNOWLEDGEMENT

The author of this report freely acknowledges the help so willingly provided throughout the commission by members of IPFT, RENPAP-UNDP and the many people whose acquaintance was made during the course of the Ankleshwar Workshop. Their assistance was not only invaluable to progress but provided the author with the greatest possible level of job satisfaction.

CMH.

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

JOB DESCRIPTION

DP/IND/89/128/11-65

Post title: Consultant on Operational Safety with Pesticides

Duration: 1 m/m

Date required: November 1993

Duty station: New Delhi with daily travel to project site at Gurgaon, Haryana (around 20 km away from Delhi) and also possible travel within India.

Purpose of the project An Institution building project, to assist the pesticide industry in India by developing and promoting safer, new generation pesticide formulations and utilizing indigenously developed technology for the production of formulation and improving the formulation capabilities of the country.

Duties: The consultant is required to advise the technical staff of Institute of Pesticide Formulation Technology (IPFT), formerly known as Pesticide Development Centre (PDC) on drafting, laying down and audit of safety policies and the preparation of safety standards for use in pesticide formulation industry. He is desired to assist the project in the areas of formulation safety and safety in storage and transportation of pesticides and to advise the project how to provide safety, health and environmental services.

During his assignment, consultant is expected to deliver few lectures in the above mentioned areas to project personnel and selected group of pesticides industry. Expert opinion and advice will also be sought during his visit on the SAFETY MANUAL being drafted by the project.

At the end of his assignment the consultant will submit a report.

THE INTERNATIONAL SAFETY STANDARD IN PESTICIDE INDUSTRY - ITS IMPLEMENTATION AND MONITORING

Charles M. Hammer - UNIDO Expert

1. Introduction :

This paper has been written on the basis that between what we choose to call the developed and developing countries, there is not two scenarios but only one, which has the same aims and objectives. Moreover, where differences exist, they reflect only the extent of the progress made towards a common end.

Our laws are not so different. Parallel laws exist here in India, which mirror much of the legislation existing in other countries in Western Europe and elsewhere. At any one time, the extent to which these standards have been developed may vary but differences are inevitable between countries and even between states which exist within a common community. It is a moving scenario, understandable and even acceptable, provided always that progress is maintained in a forward direction.

It is surely the joint responsibility of governments, institutes, industry and industry associations, to ensure that such forward progress is maintained.

2. Current Trends in Legislation :

First, it is important to remember how much of our legislation, or rather the pressure to develop that legislation, has arisen.

It came from Flixborough (U.K), Seveso (Italy) and Bhopal.

It came from the realization that in years past and perhaps still today, workers have suffered from undue and unnecessary exposure to harmful substances.

It came from our waking up to the fact that our environment has suffered and cannot be allowed to continue to suffer in the same way indefinitely.

Hence, we have our many acts and regulations, which are aimed at preventing major incidents and the protection of people and the environment.

Let us consider only a few of these major statutes, taken from the U.K. scene but which have parallels elsewhere.

2.1 Health and Safety at Work Act

An all embracing statute under which subsidiary legislation is enacted. The Act places wide responsibilities on employers and, significantly, it recognises the fact that the employer must think for himself in order to provide safe systems of work in all aspects of his operations, including those which are not covered by specific legislation.

Also, and perhaps uniquely, the Act places a responsibility on individual employees, to contribute toward their own safety and the safety of others who may be working in the same area, or on the same operation.

2.2 Control of Industrial Major Accident Hazards Regulations

These regulations are designed to control risks on plants handling significant quantities of hazardous substances.

The Regulations demand that plants holding inventories of hazardous substances above specified levels be notified to the Regulatory Authority. There are two levels of notification, according to the quantities of materials involved, and the most stringent demands are placed on the top-tier, that is, the larger sites.

Information concerning the site is passed also to other authorities such as the fire authority for the area, and all parties have an opportunity to contribute to the preparation of emergency plans.

Information must also be given to those members of the general public, who could be affected by an incident on the site and who must be aware of what they should do in such circumstances.

A great deal of work is involved but the pay back is not just greater safety but the knowledge that industry can be seen to be acting in a responsible manner toward the community.

2.3 Control of Substances Hazardous to Health Regulations

Aimed at the protection of workers within the plant from the harmful effects of hazardous substances, these Regulations require employers to examine their processes and assess the effectiveness of their containment systems.

Weaknesses in the ability of the plant to contain hazardous substances must be corrected, routine monitoring must be instituted to ensure that such containment is ongoing and workers must receive routine health checks.

Records of assessments, monitoring and health checks must be maintained, in some cases for as long as thirty years.

2.4 Control of Pollution Act

Directed at the protection of the environment, this Act places restrictions on emissions to air and water and controls the disposal of waste, including hazardous or special wastes.

2.5 Food and Environment Protection Act

This Act provides, for the first time in the U.K., a comprehensive framework of control over many aspects of pesticide safety and efficacy, including: importation, advertisement, sale, supply, storage and use.

In addition, there are numerous other relevant pieces of legislation relating to pesticide production, transport and waste disposal, though it should be appreciated that the majority of legislation embraces other industries also. Broadly speaking, the legislation relating to pesticides covers health and safety at work, pollution prevention, public health, protection of domestic animals and wildlife, and requirements which apply to the use of pesticides.

3. The Response of the Pesticide Industry

It would be fair to say that responsible companies worldwide, have not waited for the pressures of legislation before meeting their responsibilities, both to their employees and to the public at large. There are examples of initiatives that have been taken within the pesticides industry, to elevate its standards, by voluntary commitment, and to illustrate this point, two such examples may be briefly described as follows.

3.1 Responsible care

In common with other branches of the chemical industry, the pesticide companies in North America adopted the principle of Responsible care. This, in essence, is a good neighbour policy, by which the industry has sought to establish a more understanding relationship within the communities in which it operates.

Whilst seeking to maintain high standards of safety within their operations, companies committed to responsible care have shared this confidence with representatives of local communities and community authorities. This does not prevent accidents occurring, and it would take a fool rather than a brave man to pretend that accidents will never happen, even in well organised and disciplined establishments, but it does help the public to understand better what is being done in the interests of safety and to put a perspective on those risks that cannot be set aside. Thus, should an accident occur, people living in the community will have a better idea of what it may mean to them and how they should react.

Since its beginnings of North America, the principle of responsible care has spread to Europe and elsewhere and, in the U.K. for example, it is firmly supported by the membership of the Chemical Industries Association.

3.2 Safe Storage of Pesticides

This example is taken from the U.K., where the two trade associations concerned with the preparation and distribution of pesticides, the British Agro chemicals Association and the U.K. Agrochemical Supply and Trading Association, respectively, have sought and succeeded in establishing their own standard for the safe storage of pesticides, which is monitored by an independent inspecting authority.

Whilst it would be true to say that this scheme had its origins in the aftermath of a number of fires in pesticide stores, it would also be fair to point out that the industry did not wait for government legislation, before setting and seeking its own standards for safer storage.

This initiative was developed even further with the establishment of a standing committee, representative not only of the pesticide production and distribution industries but also those public authorities which would inevitably become involved, in the event that an emergency in a store should occur. These include: fire authorities, water authorities, the Regulatory Authority, police, etc.

The committee is very much a working body and examples of the initiatives it has taken include, the drafting of guidelines for fire authorities on how to combat fires involving pesticides, and a publication which deals with the inspection of pesticide stores, and which was agreed jointly by the industry's stores inspection body, the fire officers association and the association of water authorities.

Both of these examples share a common aim, namely, the desire for partnership and the realization that, given the will, more can be achieved by working together than by trying to progress alone.

4. Some Issues of Particular Concern to the Pesticide Industry

Many of the accidents which occur in the pesticide industry are common across industry as a whole but these are not the concern of this presentation, the purpose of which is to identify, instead, those issues which, through experience, have developed a special interest. They include, as examples, storage and transport, environmental protection and stewardship in the use of pesticides.

4.1 Storage and Transport

It is both appropriate and convenient to consider these two subjects together, for they share in common the fact that, to a large extent, they take place outside the direct control of the pesticide industry proper and, yet, their safe conduct is vital both to the business and reputation of the industry.

Consider for a moment the fact that pesticides in transit must run the gauntlet of heavy traffic, often on poor roads and in severe weather, ultimately to be deposited in stores controlled by persons whose skills lie in distribution, rather than pesticide technology.

Together, these facts underline the vulnerability of pesticides in transit and in store, and the vulnerability of the industry itself to criticism, should a serious accident occur in these circumstances.

To counter these risks in the U.K., for example, pesticide stores must be registered and, as has already been mentioned, be routinely inspected. Account is taken of the location of the building in relation to other property and water courses, its construction, fire resistance and provisions for fire fighting, the facilities for the containment of effluent in the event of a fire and other factors. Pesticide store operators must be able to satisfy certain requirements concerning their knowledge of the products and the hazards involved. Pre-planning in order to deal with an emergency must have been given consideration.

None of these factors guarantee immunity from accidents but they go a long way towards minimising the risk and providing a more effective control of those incidents that may, from time to time, occur.

Similarly, safety in the transport of pesticides is supported by legislation and an increasingly effective liaison between the industry and the emergency services, concerning the action to be taken following an accident.

In addition to any hazard markings required on the vehicle itself, the driver carries a transport information card which describes, for the benefit of the emergency services, the nature of the products and the action to be taken following, for example, a spillage or leak. Significantly, this card also displays a telephone number for use should further advice or assistance be needed.

Again, these precautions do not provide immunity from accidents but are aimed at providing a better level of control, should an accident occur.

4.2 Environmental Protection

Much has already been said by other speakers about the protection of the external environment, waste treatment and waste disposal, which need not be repeated here, but let us consider for a moment the need to preserve a healthy environment for workers within pesticide plants.

It is not enough to rely solely on the use of personal protective equipment; the problem of dust and vapours emitted within the plant must be tackled at source, with the use of efficient local air extraction systems. Yet, seemingly, there often appears to be a limited understanding of the laws of air movement, which results in the less than efficient operation of many such systems.

The weakness can often be seen to lie in the design of the dust or vapour control hood, which is used to embrace the source of contamination. Yet, given the basic design, it is as easy to fabricate a hood that will work efficiently, as one which will not.

Of course, there is more to the design of an efficient system than the design of the hood alone, but the parameters for establishing good air flow conditions are well known and it is surprising, therefore, to see the same mistakes occurring in the design of extract systems, again and again.

Together with regular plant cleaning, preferably using industrial vacuum cleaners, control of contaminants at source is the most effective means of maintaining a good working environment which, in turn, will go a long way toward countering concerns over the well being of pesticide workers.

4.3 Stewardship in the Use of Pesticides

Stewardship is a term used to embrace the complete span of a supplier's responsibility for his products. Notwithstanding the care and attention given to ensuring that pesticide containers carry adequate instructions on the label for the safe use of the

products, it is recognised that peasant farmers, in particular often need a broader base of understanding, if accidents in use are to be avoided. To this end, many suppliers of pesticides now operate stewardship programmes which provide training for farmers, in conjunction with local organisations and authorities. Such schemes make an especially worthwhile contribution to safety in areas where literacy levels may be low and, as well as helping to avoid accidents, this has a pay off for the farmer in helping to ensure that products are used correctly, in the correct strengths, thus providing better standards of crop protection and better crops.

Stewardship helps to bridge the gap between the supplier and user and is yet another example of the application of responsible care.

5. Progress through Partnership-Conclusions

Whilst no right minded persons would pretend that we live in a perfect world, progress through partnership is a principle that can apply within and between countries, both developed and developing.

More can be achieved by partnership than by unilateral effort. Whilst we all try, understandably to serve our own particular interests, the ultimate objective must be a common one. Governments must legislate on the basis of sound advice, institutions can develop new technology, or evaluate the work of others in order to provide advice to those who need it, trade associations can represent their member companies and provide a liaison with other groups and industry itself must develop its business on a sound basis. Each in its turn has a common objective: to make progress without incurring unacceptable risk.

This paper contains only a few examples of what has been achieved elsewhere in what we sometimes choose to call the developed world, but let us not forget that already here in India structures exist around which to build toward the same end. There is a similar framework of legislation, the same institutes, professional bodies and trade associations. Surely then, through these means it must be possible to achieve similar ends.

Of course, it will take time, as it has done elsewhere. Some of the examples of achievements quoted above, were gained only over periods of years but, as was said at the outset of this presentation, the aims and objectives must be the same here as elsewhere the only difference at this point in time is the extent to which we have progressed toward those targets, learning from and, where possible, improving on the experience of others.

UNIDO Comments

The report comes out at the appropriate time when the Indian chemical industry is opening up for foreign investment and greater share of export market. In all this integrated industrial safety is of vital importance not only to safeguard the property damage, human loss, environment from deterioration, workers/public right to know but also the reputation of the industry. The report clearly reflects UNIDO's long term persuasion to increase safety standards, corporate responsibility and finally to reach ecologically sustainable industrial development. UNIDO strongly supports the safety manual based on UNIDO's Global approach reflecting the country level implementation. Such a manual should be user/reader friendly, informative and success criteria built-in. We also agree that such an approach should be carried out at industry subsectoral level in order to have a greater success for implementation eventhough many issues would be common for various chemical industries.

In this connection the manual should take into account the National Pollutant Release and Transfer Register (NRRTR) now taken up under chapter 19 and 20 of Agenda 21.