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IDENTIFICATION
ELIMINATION
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PREPAREDNESS
PROTECTION

OCCUPATIONAL SAFETY AND HEALTH ASPECTS OF LEATHER MANUFACTURE

GUIDELINES AND RECOMMENDATIONS FOR MANAGERS AND SUPERVISORS OF TANNERIES AND EFFLUENT TREATMENT PLANTS

J BULJAN
A SAHASRANAMAN
J HANNAK

CHEMICAL SAFETY

MACHINE SAFETY

WORK ENVIRONMENT

PERSONAL PROTECTION

EMERGENCY MANAGEMENT

AUDITING AND MONITORING

SAFETY & HEALTH MANAGEMENT

UNIDO REGIONAL PROGRAMME OFFICE
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

COUNCIL FOR LEATHER EXPORTS

OCCUPATIONAL SAFETY AND HEALTH ASPECTS OF LEATHER MANUFACTURE

Prepared by the Regional Programme Office (RePO-UNIDO)
Regional Programme for Pollution Control in the Tanning Industry
in South East Asia - US/RAS/92/120
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- *Machine drawings from CTC, France*

PUBLISHER'S NOTE

The framework of global trade has undergone many significant changes in the nineties. Emergence of World Trade Organisation in 1995 and Multilateral Environment Agreements following the Earth Summit at Rio de Janero in 1991 are described as watershed in international trade and commerce.

Sustainable development of an industry in any country of the globe is today critically dependent on its ability to coexist with nature in a non-intrusive manner. Succeeding generations deserve to get an earth that is not worse off , if not better off, from the present generation. Environment compatibility of an industry therefore has taken the centre stage.

Equally relevant is the concern shown by the world community towards the work environment in factories. Though laws do exist in all countries of the world for providing safe and healthy work environment, often for want of knowledge or resources, these are not effectively implemented.

Faced with these challenges, the leather industry, like any other, has to find viable responses, at the same time retaining its global competitiveness. Leather industry, as is well known, is truly a global industry.

In this context, the Council for Leather Exports appreciates the efforts taken by the Regional Programme of the United Nations Industrial Development Organization (UNIDO) in helping the tanning industry in South East Asia meet these challenges.

One significant result of the efforts of UNIDO, under its Regional Programme, is this reference manual on occupational safety and health aspects of workers in the tanning industry. Its relevance is all the more greater to countries of South and South East Asia because this contains practical and easily applicable improvements that are specifically applicable to small and medium tanneries of this region. It is a self help manual, readily usable by managers and supervisors of tanneries.

The Council for Leather Exports, Chennai, India, has great pleasure in bringing out this publication for the benefit of the tanning industry in India and South East Asia.

M. Rafeeque Ahmad
Chairman
Council for Leather Exports,
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February 1999.

PREFACE

UNIDO's Regional Programme for Pollution Control in the Tanning Industry in South East Asia has, as one of its major objectives, improvement of occupational safety and health of tannery workers in the region. The strategy for realisation of this objective has been to 'show-how', that is, to demonstrate in selected volunteer tanneries in the participating countries of the region cost effective improvement measures which could serve as guides for other tanneries in these countries. The task of establishing the model OSH sites in volunteer tanneries in the participating countries has been accomplished with the close involvement of UNIDO's sub contractor, CTC, France and its own experts. In order that the improved practices are widely disseminated among the tanners of the region, the need for a reference manual, in easily understandable language, has been keenly felt. The result is this occupational safety and health reference manual which provides simple and effective low-cost recommendations for improving the occupational safety and health standards at work in tanneries and effluent treatment plants.

The recommendations presented in this manual are based on the inputs from tanners, research and development institutions and experts. The basic information was compiled by Mr Vincent Van Den Bossche and Mr Fernand Fioretti, both experts of CTC, France as part of the UNIDO subcontract. In gathering basic information, experts of the Regional Programme for Pollution Control in the Tanning Industry in South East Asia (RePO) played a key role by direct contribution as well as facilitating discussions with tanners, supervisors and representatives of relevant organisations in the region. We thank all individuals, companies and organisations for their contribution to this manual. In particular, we appreciate the participation and commitment of tanners in China, India, Indonesia and Nepal.

The implementation of the recommendations contained in this reference manual will contribute to ensuring improved occupational safety and health standards at work, benefiting everyone engaged in tanneries and effluent treatment plants. This manual is the first of its kind, specifically addressing occupational safety and health needs in the tanning industry. During the preparation of this manual, we took guidance from the ILO action manual "Higher productivity and a better place to work" and have tried to adapt several lessons to the particular case of the tanning industry.

We sincerely believe that the tanners, supervisors and workers will find the information provided useful and implement the recommendations in tanneries and effluent treatment plants. The key areas covered are workplace organisation and layout, safety in use of machines and chemicals, storage and transport of chemicals, safety/health management and providing suggestions for preventive, precautionary and emergency measures.

We are grateful to the following for their substantive contributions: Mr Michel Aloy, Mr Vincent Van den Bossche and Mr Fernand Fioretti, all experts of CTC Lyon, France; Mr Mathew Alexander, Expert, machine safety and maintenance, RePO-UNIDO, Chennai, India; Dr Kalpana Balakrishnan, Sri Ramachandra Medical College & Research Institute, Chennai, India; Dr G Jayaraj, Chief, Medical Centre, Neyveli Lignite Corporation, Neyveli India; Mr Kay Harre, Manager (operations), Shanghai Richina Leather Corporation, Shanghai, China; Mr Niaz Ahmed, Presidency Kid Leather, Kannivakkam, India; Mr Mohamed Ali, H Mohamed Osman & Co, Vaniyambadi, India; Dr S Rajamani and Mr K V Emmanuel, Environmental experts, RePO-UNIDO, Chennai, India; and, Dr. D S Roosevelt of CLRI, Chennai, India.

Furthermore, we appreciate the co-operation received from: Mr Werner Blenk, Country Director, ILO, New Delhi, India; Mr David Gold, Asia Pacific Programme for Occupational Safety and Health, Bangkok, Thailand; Mr S Subash, former Director, Environmental Training Institute, Chennai, India.

Finally, we are deeply indebted to the donors - the Governments of Austria, Denmark, Germany, the Netherlands and Switzerland - for their contribution to the Regional Programme for Pollution Control in the Tanning Industry in South East Asia which indeed has made this publication possible.

We hope that this manual will be one of the useful tools available to the tanners of the South East Asia region and elsewhere for improving the occupational safety and health aspects in tanneries and effluent treatment plants. Suggestions are welcome for improvement of this publication to make it more user friendly.

Our thanks are due to Mr M Rafeeque Ahmed, Chairman, Council for Leather Exports, Chennai, India and Mr P S Kathiresan , its Executive Director, for coming forward to publish this manual.

J Buljan
A Sahasranaman
J Hannak

Chennai, February 1999

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MANAGEMENT OF SAFETY, HEALTH AND WELL BEING

1

INTRODUCTION

Tanning hides and skins of animals into leather has been a widely practised industrial activity in the world. Over the years tanning industry has declined in industrialised countries of the world for a variety of reasons. At the same time, developing countries of the world, particularly of South East Asia, have expanded their tanning industry significantly.

Such expansion has been of recent origin, within the last two decades. The expansion of the industry has resulted in increased pollution caused by the effluent generated. Besides, the chemicals, machinery and equipment and processes used in the tanning industry can pose occupational hazards to workers unless proper preventive and protective measures are adopted.

WHO NEEDS THIS MANUAL

This manual has been primarily prepared for use by tanners and tannery supervisors. It has been designed to provide guidance and ideas on how to improve the occupational safety and health standards at work in the tanneries and effluent treatment plants by presenting the sources of hazards in a tannery and pointing out simple solutions, in a practical and easily understandable manner, for ready implementation on-site. The recommendations compiled in this reference manual are based on actual practices in tanneries around the world, particularly in South East Asia, while also making reference to international and national regulations and standards.

Simple managerial measures to improve OSH standards in a tannery

TO TRAIN WORKERS

- in proper operation of all equipment (machines, drums, devices, utilities);
- in handling chemicals and application of mixtures.

TO DEVELOP AND INTRODUCE

- a system for regular maintenance of equipment and installations;
- a strict system of proper house keeping (cleanliness, well organised stores and work areas,...).

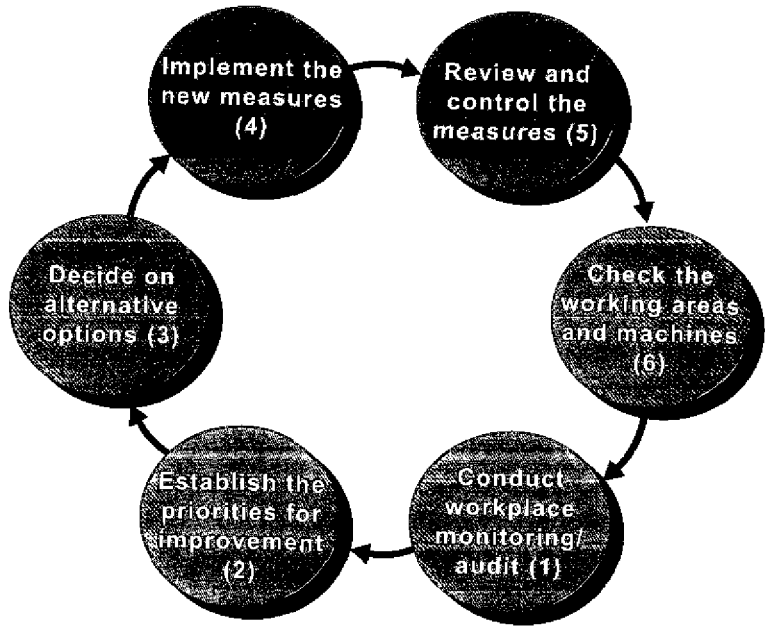
TO CONTROL

- quality of chemicals used in the process;
- quality of raw material processed;
- proper chemical mixture and dosing in different stages of production;
- the procedure of chemical mixtures (e.g. weights of hides/skins and chemicals, volume, temperature and pH of float, running time of the process, rotation time and velocity of drums);
- mechanical operations like fleshing, splitting, trimming, shaving, setting and buffing.

TO PROVIDE

- basic set of equipment for process control (e.g. balances, flow meters for fresh and waste water, thermometers, timers, micrometers, pH meters or paper, and densimeters).

OSH management circle



The recommendations in this manual may be seen as guidelines on how to achieve an acceptable level of occupational safety and health practices at work in the tanning industry. These range from simple good housekeeping measures and operating practices to more complex modifications or structural adjustments.

The manual is also a useful tool for all those who are directly or indirectly concerned with occupational safety and health standards at work such as enforcement agents, planners and consultants.

WHY DO YOU NEED THIS MANUAL

Unsatisfactory occupational safety and health (OSH) standards at work often result in lower productivity of the worker, unacceptable quality of leather and avoidable waste of resources.

Even in traditional tanneries it is possible to significantly improve the OSH standards at little or no cost.

Many solutions are simple and of low cost which can be easily adopted by the industry, *big and small, significantly contributing to* improved productivity, environmental betterment and more conducive work conditions at the same time.

Lack of awareness and know-how has so far prevented tanners, particularly of South East Asia region, from improving the OSH situation in the tanneries.

In improving the OSH situation in a tannery, the first step is to adopt good house keeping measures. This has to be followed by proper *operation procedures. Occupational hazards* in a tannery arise while handling machinery and equipment, storage and application of chemicals and poor work environment (such as slippery floor, leaking pipes, hanging electric wires, etc.).

STRUCTURE OF THE MANUAL

The first part of the manual contains chapters providing useful information to the reader in understanding the core issues of occupational safety and health in the leather manufacturing industry, starting with an overview of health hazards and safety risks usually prevalent in different sections of a tannery. The structure follows the flow of production of leather, comprising raw material handling, beam house, tan yard, wet- and dry-finishing operations.

In addition to these the manual also covers the health hazards and safety risks of utilities such as power generator and effluent treatment facility.

At the end of the chapter, you will find a box indicating *reference sheets* containing a brief analysis of hazards, hazard effects and poor work practices which may contribute to or aggravate the effect of the potential hazard. You can use the points to immediately check the present situation in your tannery.

In chapters 3 - 5 of the manual, you will find practical tips, which will help you to overcome the potential health hazards and safety risks which may be present in your tannery.

These chapters are structured in such a way that these separately deal with different groups of health hazards and safety risks. Accordingly these deal with safety in use of chemicals at work (chapter 3), safety of machines and installations (chapter 4) and work place improvement (chapter 5).

In and at the end of each chapter you will find boxes referring to additional reference information and readily applicable safety checklists.

Chapters 6 - 9 of the manual provide practical guidelines on work place monitoring, dealing with emergencies and selection and use of personal protective equipment in tanneries and effluent treatment plants.

The second part contains practical hints compiled in form of reference sheets. Each reference sheet bears a small flag on top of the page for example "REFERENCE SHEET - 5.2. The first number refers to the corresponding chapter - in this case chapter 5 - while the second number indicates the running number of the reference sheet belonging to this particular chapter allowing easy identification.

HOW TO USE THIS MANUAL

If you are just starting with improving the occupational safety and health standards at work in your tannery, start with chapter 2 on health hazards and safety risks. It will give you an idea of what you have to look for when assessing the current situation in your tannery.

Then use the monitoring and auditing checklist in the chapter on work place monitoring (ref. sheet 8.1) and assess the situation on-site in your tannery or any specific section of your tannery.

Once you have identified potential problem areas, refer to the specific chapters of the manual and get an idea of possible solutions.

In case you only want to check on a specific issue e.g. proper storage of chemicals or suitability of a specific personal protective equipment, then go to the respective chapter or subchapter referring to the descriptive information, drawings, guidelines and checklists.

Many guidelines have been prepared in such a way that these can be copied and readily displayed in your tannery. Such sections are specifically highlighted.

Finally, a word of caution!

In view of the great variety of chemicals and different designs of machines used in tanneries the world over as well as the speed of changes and innovations, it is possible that a particular chemical, machine or process may not be covered in this manual.

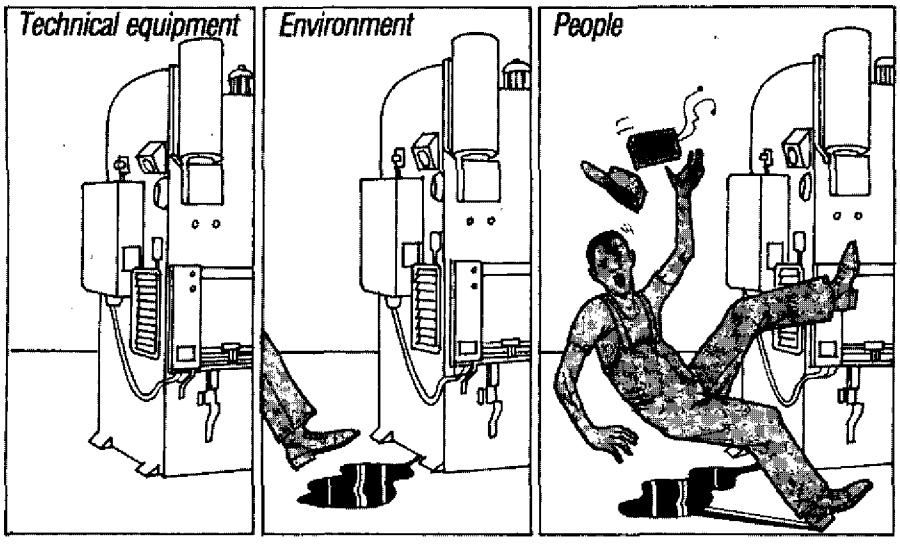
As there is always scope for further improvement, your comments and ideas will be useful to improve the manual.

2

HEALTH HAZARDS AND SAFETY RISKS

There are hazards and risks in all work places. Safety and health are possibly ensured only by knowing these risks and hazards and by properly guarding ourselves until the risks and hazards have been eliminated. Technological progress and change are constantly taking place and while they often bring improvements in both efficiency and safety at work, they also can create new risks and hazards.

THE FOUR MAIN CAUSES



(Source: SIDA)

The main contributing factors to accidents are

MACHINES AND EQUIPMENT: Faulty design and/or poor maintenance can lead to a sequence of events which finally may result in an accident.

CHEMICALS: Chemical substances applied before or during the leather production process can have an impact on safety and health of people exposed to these during the work.

WORKING ENVIRONMENT AND CONDITIONS influence workforce behaviour and practices and thereby indirectly cause accidents or health risks. Such factors include

- disorder at the work place;
- noise;
- temperature and humidity;
- ventilation;
- lighting.

PEOPLE: Managers' and supervisors' performance and behaviour influence those of the workers with regard to following good work practices and being able to respond properly in case of an emergency. Important factors to be taken into account are

- ☐ job experience and training;
- ☐ information and instructions on working practices and hazards involved;
- ☐ supervision by managers and skilled workers.

The easiest way to identifying the prevalent hazards in your tanneries is by looking at each step of the leather production process.

POINTS TO CHECK

- ☐ What machines are in use?
- ☐ Which chemicals are or have been applied?
- ☐ What manual handling processes are involved?
- ☐ What emissions and wastes are likely to be generated during production?
- ☐ What happens with these emissions and wastes?
- ☐ What hazards may result from the machines and chemicals as such and the emissions and wastes?

The reference sheets in the second part of the manual will help you to better understand the potential safety risks, health hazards and their causes as possibly present at the various stages in leather production. It will also facilitate your work when conducting a safety and health audit in your factory.

The structure of the sheets follows a typical tannery process flow, including material handling, beam house, tan yard, wet-finishing and finishing operations as well as various utilities as usually found in tanneries.

Check health hazards and safety risks in

Material storage and handling	ref. sheet 2.1
Beam house	ref. sheet 2.2
Tan yard	ref. sheet 2.3
Wet-finishing	ref. sheet 2.4
Finishing	ref. sheet 2.5
Utilities	ref. sheet 2.6
Effluent treatment plant	ref. sheet 2.7

3

SAFETY IN USE OF CHEMICALS

More than 250 different chemicals are used in the production of leather. Workers in the tannery are exposed to these chemicals in various ways (see box below).

Though each chemical is not necessarily hazardous to human health, one must be aware that the inherent source of the hazard can be either the chemical itself, any emission generated during the use or handling of the chemical (e.g. vapours, fumes, effluent) or the containers used for storage and transport of these chemicals.

Worker's exposure to chemicals. (Photo: CTC)

Inhalation in form of airborne substances (gases, dust, vapours, mist and fumes)

Ingestion (when workers are eating, drinking or smoking in the work area, without washing contaminated hands)

Skin absorption (generally through pores or cuts/wounds of unprotected hands, arms , body)

The impact of such exposure can range from temporary effects such as dizziness, headache, irritation of eyes, skin or lungs, allergic reactions, collapse due to lack of oxygen, poisoning of liver, kidney, nerval system to long term impairments such as ulcer, bronchitis, genetic defects and, in some rare cases, even instantaneous death.

Besides the adverse effects on the human body, chemicals can be the source and the cause of fire, corrosion and damage to structures and electrical installations and may have a harmful effect on the surrounding environment when released in an uncontrolled manner.

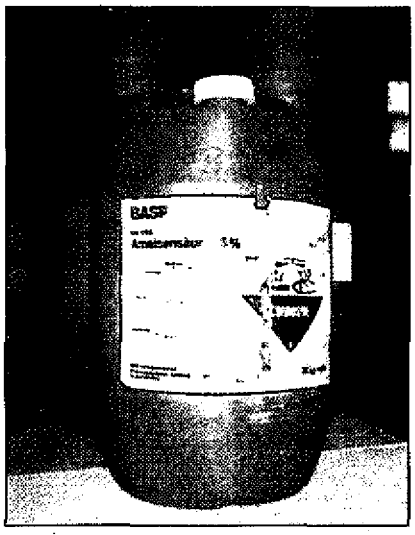
GET SAFETY INFORMATION ON CHEMICALS!

To find out and effectively manage the inherent hazards of chemicals, the first and most important step is collecting information.

Immediate sources of information are labels on chemical containers, chemical danger signs and chemical safety data sheets.

Check reference sheet - 3.2 for the meaning of different chemical danger signs.

Due to lack of space the information on the label on each container is often incomplete. Additional information can be drawn from material safety data sheets which should be



Label chemical containers for easy identification. (Photo: RePO-UNIDO)

Information on chemical container labels

- ☐ Trade name of chemical
- ☐ Identity of chemical
- ☐ Name, address and telephone number of supplier
- ☐ Hazard symbols
- ☐ Nature of the special risks associated with the use of the chemical
- ☐ Safety precautions
- ☐ Identification of the batch
- ☐ Statement that a material safety data sheet giving additional information is available with the tanner
- ☐ Classification assigned under the system established by the competent authority

Source: ILO - Code of Practices

provided by the chemical manufacturer with each hazardous chemical or from the supplier of such chemicals.

The material safety data sheet provides practical information and guidelines to you and your workers on routine handling of the chemical as well as on measures in an emergency.

Information in material safety data sheets

- ☐ Chemical product and company *identification*
- ☐ Information on ingredients/composition of the chemical
- ☐ Possible hazards classification
- ☐ First aid measures
- ☐ Fire fighting measures
- ☐ Measures in case of accidental release (e.g. spillage)
- ☐ *Guidelines on handling and storage*
- ☐ Guidelines on disposal
- ☐ Information on how to control exposure and what personal protective equipment to use

Source: EU Safety Data Sheet (EU Directive 93/112 EEC)

Do not use new chemicals until you have obtained the above information on the chemicals.

Which chemical is he handling? (Photo: RePO-UNIDO)

POINTS TO CHECK

- ☐ Are the material safety data sheets of all hazardous chemicals used in your tannery readily available in one designated place?
- ☐ Does the person in charge of chemicals in the tannery know the basic contents of the material safety data sheets?
- ☐ Do the work floor supervisors and sub-store supervisors know the basic contents of the material safety data sheets pertaining to chemicals used in their respective areas?

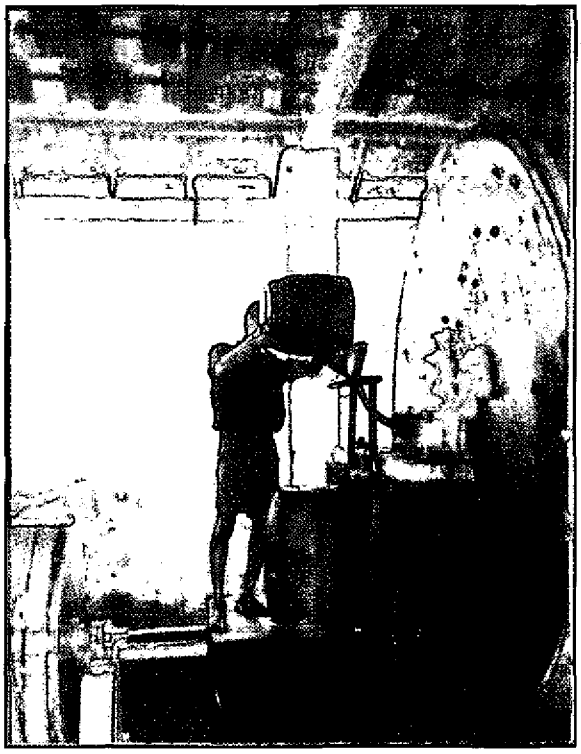
No chemicals should be brought into the tannery, if these are not properly labelled or marked.

To find out whether you are using chemicals which are considered hazardous, check the list of hazardous chemicals in reference sheet - 3.1.

Finally, it is important that all people working with chemicals receive information on the hazards to health and training on how they should protect themselves.

CONTROL CHEMICAL HAZARDS

From the relevant information on the chemical hazards available with you, check where and to what extent workers in the tannery are exposed to these hazardous chemicals.



Worker's are exposure to chemicals due to poor practices and lack of personal protection. (Photo: RePO-UNIDO)

Workers are exposed during

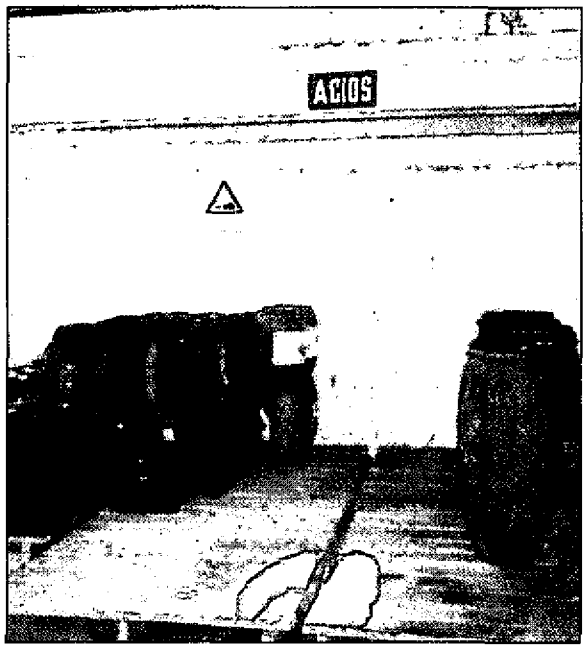
- ⇨ loading/unloading/handling of chemical containers in chemical store;
- ⇨ transfer of chemicals from chemical containers in chemical store;
- ⇨ mixing of chemical recipes in chemical store or work place;
- ⇨ transfer of chemicals from chemical store to work place;
- ⇨ dosing of chemicals in work place;
- ⇨ Loading/unloading of raw material/ pelt/leather into/from pits, paddles, drums;
- ⇨ removal of chemical wastes and effluent from work place;
- ⇨ washing and disposal of chemical containers.

As chemicals emit fumes, mist, vapours or dust during storage and handling, any worker may get exposed to these airborne chemical pollutants in any part of the work place.

Chemicals in liquid and gaseous form do also affect the immediate neighbourhood, when let out into drains or removed from the work place by exhaust blowers and chimneys.

Chapter 8 provides further information on how to determine the actual exposure to chemicals.

Avoid chemical exposure of workers whether through inhalation, ingestion or skin contact!



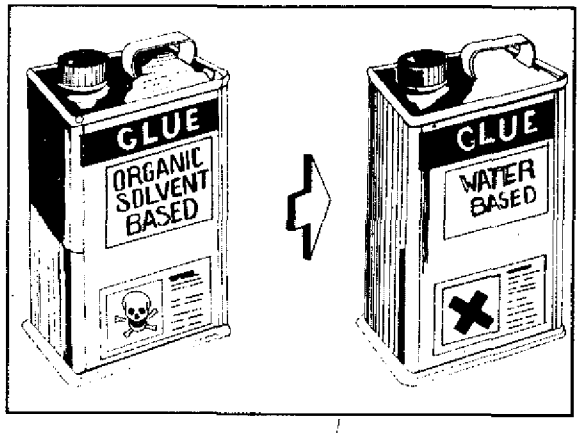
Identify and mark hazardous chemicals. (Photo: RePO-UNIDO)

Worker's skin exposed to chemicals. (Photo: RePO-UNIDO

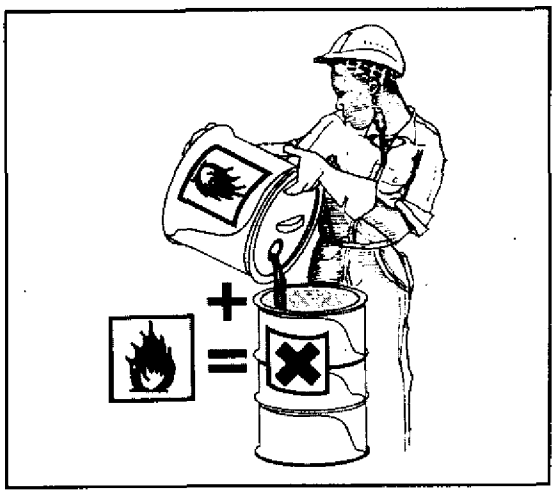
For safe handling of chemicals, it is necessary to take several preventive measures. First, eliminate whenever possible hazardous chemicals from the work place. Secondly, limit the chances of exposure to hazardous chemicals and, thirdly and as a last resort, prevent exposure to hazardous chemicals by use of personal protective equipment.

Eliminate hazardous chemicals and processes

Whenever feasible, fully or partly replace hazardous chemicals with less hazardous ones.



Substitute hazardous chemicals. (Source: ILO)

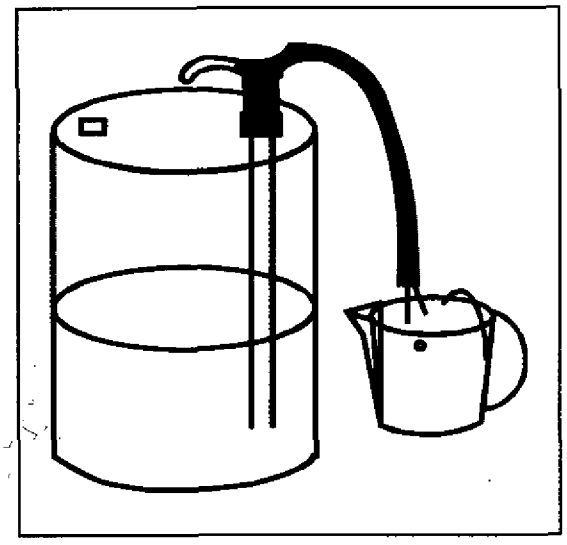


Uncontrolled mixing of chemicals can be dangerous. (Source: ILO)

In some cases, it might be difficult to find replacements. In such cases, it may be useful to look at alternative processes that can be done without using such substances or not emitting same amount of pollutants.

For example:

- ⇨ Use of water based instead of solvent based chemicals
- ⇨ Partial replacement of sodium sulphide with enzymes in liming
- ⇨ Roller coating instead of spraying

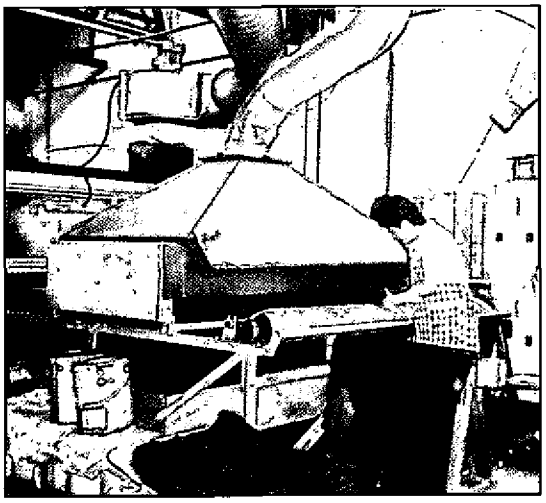


Controlled transfer of liquid chemicals using hand piston pump (Source: CTC)

Contain release of chemicals by use of modified work systems and local exhaust/drains

Simple changes of production process or work systems can reduce the release of chemical fumes, vapours, gases or dust or liquors containing chemicals.

Local exhaust ventilation on machines or in processes can reduce the emission of mist, vapours, gases or dust into the work place. Such extraction systems should be in place on dry shaving, buffing, dedusting and spraying machines.



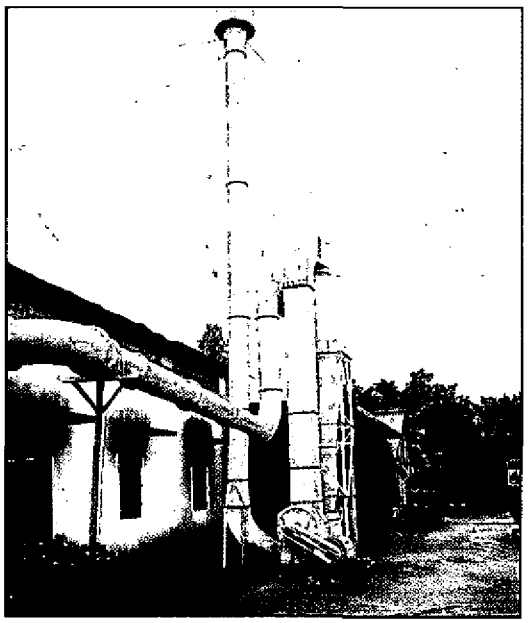
Control vapours at source using an extraction system at the workstation. (Photo: RePO-UNIDO)

Similarly, local drainage systems for paddles and drums prevent chemical containing effluent to spill over work areas in the wet process operations.

- ⇨ Dose and transfer chemicals in fully or partly closed systems
- ⇨ Always put lids and covers on chemical containers
- ⇨ Control discharge of floats from paddles and drums by using hose pipes instead of simply opening the drum doors or paddle faucets.

Ensure that the extraction or drainage system does not simply shift the pollutant from one work place to another in the factory or outside to the neighbourhood.

Local exhaust/extraction systems have to be connected to adequate collection or scrubbing devices, while the drainage system should end at an effluent treatment plant.



Exhausts connected to filter device. (Photo: RePO-UNIDO)

Reduce concentration of airborne pollutants using overall ventilation and natural air flows

In addition to local exhaust/extraction systems, satisfactory overall ventilation and natural air circulation in areas where mist, vapours, gases or dust are likely to be released, will further reduce their concentration in the air. At the same time, such overall ventilation helps to bring down the level of humidity and temperature in the work place.

Before installing overall ventilation and exhaust, be aware about the local air circulation around your tannery to avoid entrance of pollutants through windows or other openings or contamination of other work areas.

Overall exhaust push-type ventilation (fans and vents) should be provided in chemical store and sub-stores and processing areas such as wattle crushing, dry shaving, buffing, dedusting, and spraying. In work areas adjacent to these areas adequate pull ventilation should be available to create a positive pressure which prevents contaminants from entering these areas.

Generally, good housekeeping practices such as regular cleaning of work areas, floors, walls and machines, removal of waste and adherence to safe storage and handling practices reduce the number of potential pollutants in the work place.

Reduce the number of workers in areas with hazardous chemicals

In case these measures do not yield the expected result or are not feasible, your further steps may focus on reducing the exposure of the workers.

Subject to availability of sufficient personnel, assign designated workers only to handle chemicals. At the same time, ensure that the exposure duration of the workers is kept as short as possible.

Limit access to areas with hazardous chemicals. (Photo: RePO-UNIDO)

Besides limiting the overall exposure of your staff, such distribution of work also allows better and specific training of these workers on proper and safe chemical handling practices.

Consider introduction of job rotation, to avoid excessive exposure of the same workers over prolonged duration.

Limit access to areas where hazardous chemicals are likely to be present

Limiting access to areas where chemicals or chemical hazards are present (e.g. chemical stores, effluent treatment plant) is a simple way of limiting exposure. Clear instructions and display of suitable sign boards can help achieve this.

Use personal protective equipment

The protection of workers by providing them with personal protective equipment is an easy and immediate solution, but should be considered as the last resort only.

Keep in mind that the use of personal protective equipment often involves discomfort to the worker, particularly in hot and humid regions.

Whenever it is impossible to prevent personal exposure to chemicals and pollutant at levels at which there is no hazard to health, personal protective equipment must be used.

Personal protective equipment has limitations too. The use of dust masks in buffing areas is ineffective, if there are no local dust extraction systems available on the buffing machines. The high dust concentration in the air clogs the dust masks immediately, rendering these useless.

Check chapter 6 for further guidance on the selection and use of proper personal protective equipment.

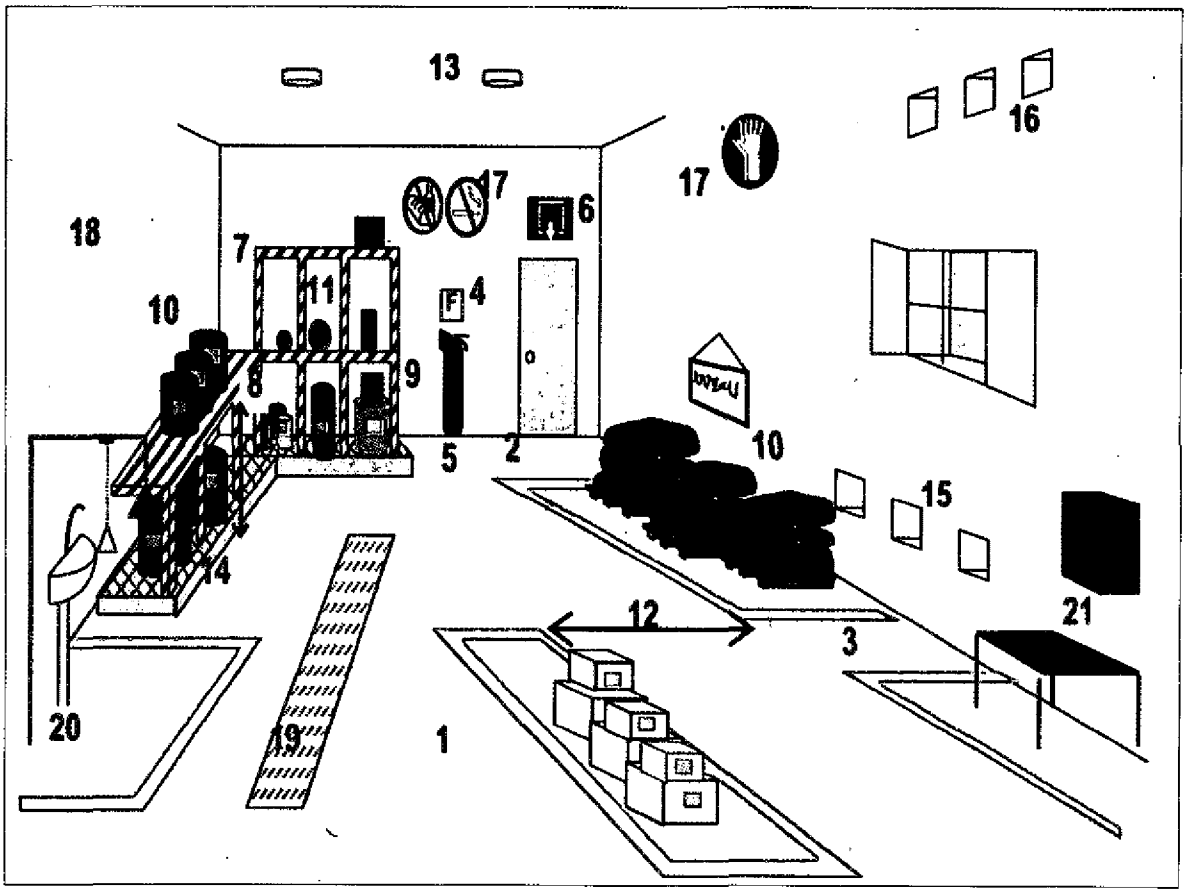
Ensure good personal hygiene of workers

Personal protection also means adherence to basic behavioural practices and principles which must be encouraged by managers and supervisors in tanneries all the time:

- ⇨ Prohibit eating, chewing, drinking and smoking in work areas, particularly where hazardous chemicals are likely to be present.

Reduce worker's exposure. (Photo: RePO-UNIDO)

- ⇨ Make sure that workers clean and wash exposed parts of body after handling chemicals or processes involving chemicals.
- ⇨ Provide facilities for washing, changing and storage of clothes.
- ⇨ Encourage personal hygiene of workers. Make sure that they always wash hands before eating or smoking.
- ⇨ Inform and train workers on safe work practices in handling chemicals (see sections on storage and handling of chemicals).



Model layout of chemical store. Cross-check numbers for specific recommendations listed in the text below. (Source: CTC)

STORE CHEMICALS SAFELY

The following rules should be followed to ensure safety in the storage of chemicals in tanneries. (Cross-check the numbers with the corresponding section in the drawing above!)

Ensure proper structure and layout of chemical store

Adequate storage facilities are a prerequisite for safe storage. Generally, the chemical store should always be physically separated from production areas, occupied buildings, other storage areas (e.g: raw material, semi-finished and finished leather), workshops or areas with potential sources of ignition such as generators, electrical control panel or transformers. (18)

- ☐ The floor of the chemical store should be flat (to allow easy handling of chemical containers) and non-permeable to prevent contamination of soil and ground-water from chemical spills. (1)
- ☐ Emergency drains should be available and connected to the effluent treatment plant. (19)
- ☐ The chemical store should have at least two clearly marked emergency exits (e.g. doors, windows). Access to these exits has to be kept free at all times to allow easy escape of personnel trapped inside the store in an emergency. (2, 6)

Storage discipline? (Photo: RePO-UNIDO)

At all times, unauthorised personnel must be prevented from entering the chemical store. The main doors should be locked. In addition, a sign board prohibiting unauthorised entry should be displayed at the entrance to the chemical store.

Fire fighting equipment e.g. ABC type fire extinguisher should be kept ready at easily accessible locations. These locations should be clearly marked. (4, 5)

Ideally, one fire extinguisher should be placed outside the chemical store.

- Electrical installations in the store such as switches, switch boards, light fittings, cables have to be insulated and "explosion proof". Ideally, switches should be placed outside the chemical store.

- To keep humidity, temperature or any vapour/fume concentration low, natural and artificial ventilation have to be provided. It is important that exhausts at floor level for removal of heavy vapours and exhausts/vents at a higher wall level for removal of light vapours are provided. (13, 14, 16)

No smoking and use of open fire in chemical stores!

A washbasin, eye/face rinsing station or safety shower should be available in or near the chemical store for personal hygiene and emergencies (see also chapter 7 - dealing with emergencies). (20)

The storage area should have a ramp outside to facilitate access and use of trolleys for transfer and movement of chemical containers.

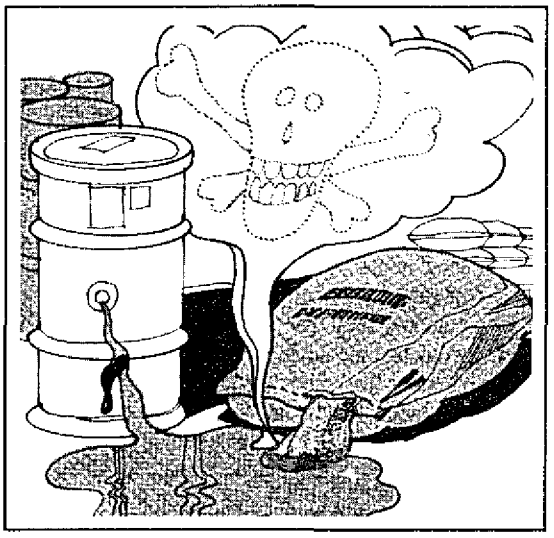
Proper storage lay-out and structure to use efficiently available space. (Photo: RePO-UNIDO)

Find the right storage space for chemicals

Before actually storing the chemicals in the chemical store, prepare an inventory of all chemicals to be kept in the store.

⇨ Identify the hazardous chemicals (with the help of the material safety data sheets - MSDS).

The MSDSs contain specific guidelines for storage (e.g. temperature, humidity) as well as information on compatibility with other chemicals.



Keep incompatible chemicals separately! (Source: SIDA)

Chemicals (or their vapour/gas) can react together and form hazardous mixtures, which may possibly generate poisonous gas or heat. The latter can result in ignition of fire or explosion.

Keep acids away from sodium sulphide and ammonia sulphate as any accidental mixture of these results in generation of hydrogen sulphide gas.

Once the minimum, average and maximum storage quantities have been noted down, the available storage space can be properly laid out.

Basic rules and principles

⇨ Group and store different chemicals according to their type and compatibility. For easier stock keeping, provide boards indicating name, maximum, minimum and current stock for each group. (10)

⇨ For maintaining better storage discipline, allot the specific storage areas for each group and mark the designated areas with yellow floor markings.

⇨ While doing so, sufficient width for movement of persons and material should be ensured (about 0.8 meters for persons, more than 1 meter for handling of chemicals, more than 2 meters for movement of pallet or fork lift trucks). The passageways should be marked on the floor. (12)

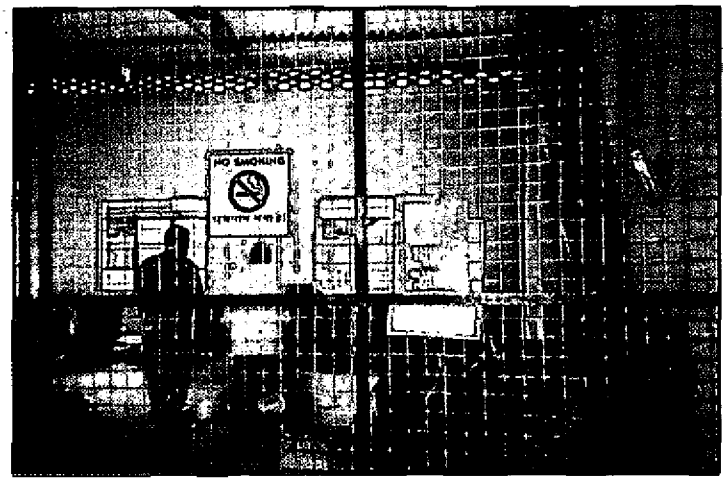
Avoid storage of chemicals directly on the floor!

The humidity from the ground can quickly spoil the quality of powdered chemicals.

⇨ Racks and shelves increase the available storage space. Smaller chemical containers (e.g. samples of dyes, fatliquours) can be stored on these. (7, 11)

⇨ Heavier chemical containers - particularly those containing liquid chemicals (e.g. acids) - should be stored on wooden or plastic pallets at the floor level. Lighter chemical containers and powdered chemicals can be stored on upper shelves. (10, 14)

⇨ Barrels containing liquid hazardous chemicals have to be stored on catchpits. (9)



Keep hazardous chemicals under lock. (RePO-UNIDO)

HANDLE CHEMICALS SAFELY

As a general principle the quantity of chemicals in or at the work place should be reduced to that required for daily or batch use. The remainder should be kept in the safe chemical store.

Pay special attention to safe handling practices during:

- ☐ Transfer of chemicals from large containers to smaller ones;
- ☐ Preparation of chemical recipes, including dilution of acids;
- ☐ Transfer of chemicals from the chemical store to the production area;
- ☐ Dosing of chemicals.

If available space in the tannery permits, finishing chemicals, particularly dyes, fatliquours and solvents could be stored in a separate chemical store.

Information on hazardous chemicals (e.g. *one copy of each material safety data sheet*) and chemical inventory list should be kept ready on record either in the chemical store itself or in the tannery's administrative office. In case of an emergency, such information provides valuable and often life-saving clues on rescuing of personnel and emergency measures.

Affix cautionary and warning signs in the chemical store, prescribing certain precautionary and preventive measures. (17)

Transfer of chemicals from chemical containers

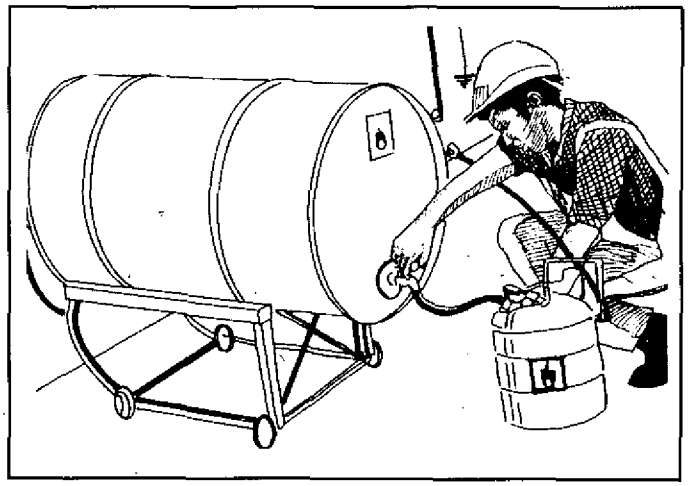
Careful handling practices will reduce not only safety risks and health hazards but also waste of chemicals and contamination of work place.

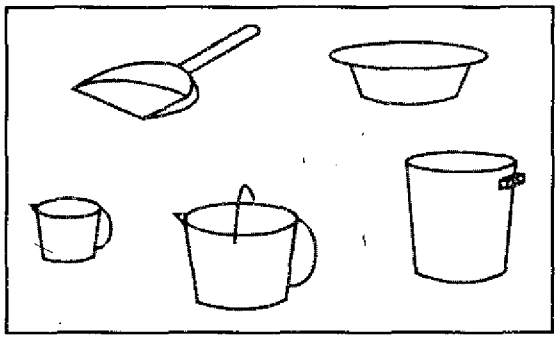
⇨ Make sure that the smaller containers used for transfer of chemicals from the chemical store/sub-store to the work place are clearly labelled and marked (e.g. colour coding, signs, labels).

Proper labelling of main chemical containers prevents mistakes by workers. Colour and shape of chemical containers are no distinctive indicators. Clear instructions and training of workers engaged in handling of chemicals are important.

⇨ After transferring the chemical, make sure that lids and taps are tightly closed.

Positioning of barrels for easier transfer of liquids. (Source: ILO)





Tools for transferring and measuring chemicals. (Source: CTC)

When transferring chemicals, take advantage of simple tools and arrangements such as hand piston pumps (e.g. for transfer of acids) or positioning of barrels on horizontal racks (e.g. for fatliquours).

Do not use the same spatula, measuring cups for taking different chemicals to avoid contamination of chemicals!

Preparation of chemical recipes

⇨ Avoid mixing and preparation of chemical recipes in the work area. Ideally, designate a separate area in your tannery.

This will eliminate distraction and allow better control over proper mixing and preparation.

Basic rules and principles in handling of chemicals!

⇨ Never mix chemicals randomly or indiscriminately!

⇨ Handle chemicals carefully when pouring or measuring to prevent spillage and waste!

⇨ Use tools such as scoops, spatulas and measuring cups!

⇨ Avoid breathing chemical fume, dust or vapours! Use appropriate respirators and masks when using chemicals which emit gas, dust or vapours! (Check the material safety data sheet!)

⇨ Avoid skin contact with chemicals! Use safety goggles and other personal protective equipment as required by the applicable material safety data sheet!

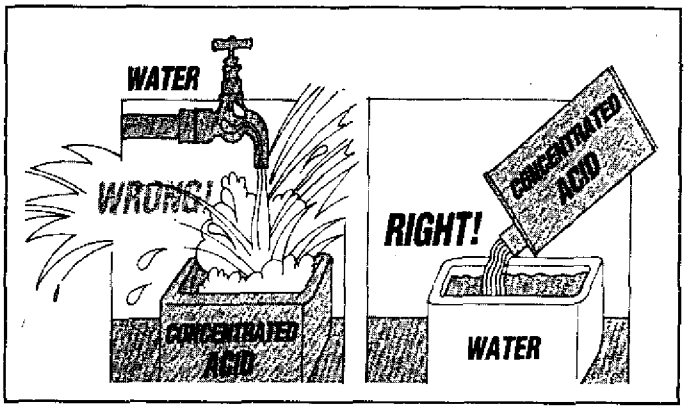
⇨ Do not place fingers into mouth, nose, ears and eyes while handling chemicals!

⇨ Remove chemical spills on skins and eyes immediately!

⇨ Wash hands with disinfectant soap after handling of chemicals!

⇨ Any chemical spillage should be cleaned up and reported to the supervisor.

Always add acid to water, not water to acid!

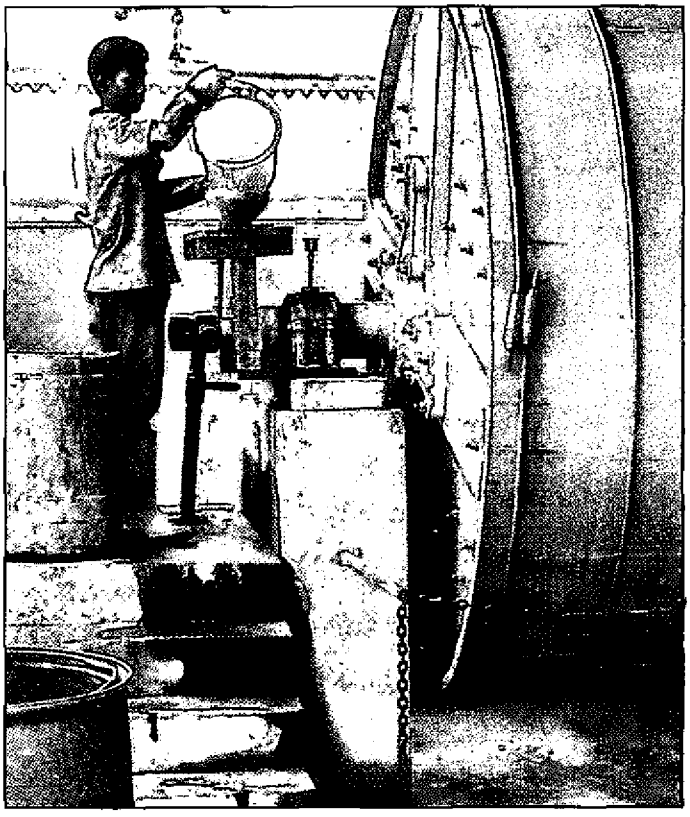


Always add acid to water, not water to acid! (Source: ILO)

Transfer of chemicals in the tannery

Carrying of chemicals manually and in open containers should be avoided to prevent spillage, distribution of vapours and chemical accidents.

Instead, transport chemicals in closed containers, using trolleys and pallet trucks. The installation of ramps and levelling of floors will facilitate the use of such trolleys and pallet trucks.



Proper arrangement for dosing of chemicals in small-scale tanneries. (Photo: RePO-UNIDO)

Dosing of chemicals

Usually, the worker empties the chemical container (bucket, barrel, bag) directly into the pit, paddle or drum.

While doing so, chemicals in form of dust, vapours or mist are released, affecting the worker and the work area. Poor arrangement of dosing chemicals through vent holes or doors on drums result in waste of chemicals due to spillage which also renders the drum area contaminated.

Particularly, while lifting the chemical container or carrying it up to the funnel or vent hole, chemicals are spilled as the worker struggles for balance.

To contain such effects, consider dosing the chemicals in a closed system. Besides saving your worker from risks and hazards, such measures result in a significant saving of chemicals.

In a small tannery the installation of an automated dosing system may not be feasible; however, use of low-cost appliances or redesign of existing gadgets can help as well.

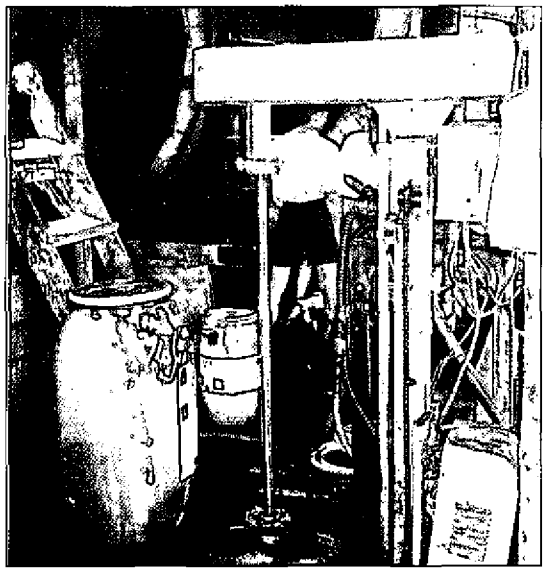
Install a fixed funnel (with connection to the drum axle)

Install steps to the funnel, which are not higher than 20 cm each.

The upper edge of the funnel should not be higher than the hip of the worker when standing on the platform.

To completely avoid the carrying of the chemical containers, use a hand piston pump (see transfer of chemicals) to dose liquid chemicals.

Make sure that the worker uses the personal protective equipment as required for dealing with the type of chemical(s).



Mixing of chemicals using mechanical mixer. (Photo: RePO-UNIDO)

DISPOSE CHEMICAL WASTE

Empty chemical containers can pose a safety risk and health hazard, when not disposed of properly.

Basic rules and principles

⇨ *Remove empty chemical containers* from the store and work areas as you will need the space.

By rinsing the container before disposing, you may gain more chemicals out of the same container.

Do not let the waste containers be used for storage of drinking water or food grains!

Possibility of chemical residue in disposed containers being absorbed by drinking water or food grain and thus finding their way into the human body cannot be ruled out.

Remove empty containers from chemical store and workplace and keep ready for proper disposal! (Photo: RePO-UNIDO)

⇨ Safely store the containers in a separate area of your tannery.

⇨ Do not pour or mix different waste chemicals in the same waste container or barrel.

⇨ Make sure that the rinsing water, if not used in the tannery, is discharged to the effluent treatment plant.

⇨ Return of the empty chemical containers back to the supplier for refill and reuse is a possible option.

Check reference sheet - 3.3 for DO's and DON'ts in laboratories of tanneries and effluent treatment plants and reference sheet - 3.4 for DO's and DON'Ts in general handling of chemicals.

4

SAFETY OF MACHINES AND INSTALLATIONS

Machines and mechanical equipment play an important role in modern tanneries. Though these result in increased productivity, their use has also introduced new hazards into the tanneries.

Machines designed with proper safety provisions are generally costly. Even though many machines are supplied with certain safety devices to control hazards, workers often remove these for their own convenience or forget to reinstall these after completion of repair and maintenance work.

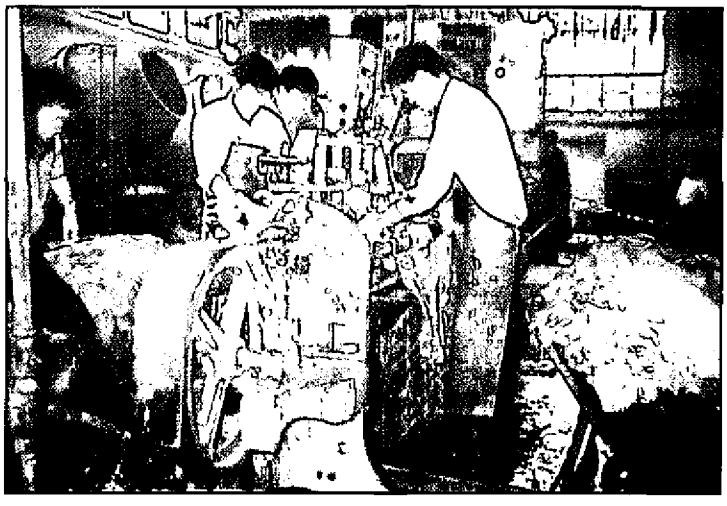
IDENTIFY POTENTIAL MACHINE HAZARDS

Dangers from machines exist in several specific locations such as at the point of operation, where the power is transmitted to machines and around any moving parts of the machine.

Operation of machines causes emissions (e.g. noise, dust, heat, vapours) and/or slippery floor conditions around the machine, which pose serious hazards, if not contained at their source with appropriate engineering devices or proper maintenance.

This chapter will provide guidance on how to ensure safe conditions of various machines used in tanneries, proper maintenance practices and safe work practices in use and operation of these machines.

The reference sheets to this chapter contain specific guidelines for typical tannery machines widely used. Though there may be differences in features of the same machine according to make and country of origin, the basic inner design and operations remain more or less similar.



Identify potential machine hazards! (Photo: RePO-UNIDO)

The next time you order a new machine for your tannery, cross check with the respective checklist and specify a machine which is safe by construction, with dangerous machine parts well guarded and protected.

SUCH ACCIDENTS DO HAPPEN IN TANNERIES!

- Trapping of fingers/forearms between rollers and bladed cylinders of shaving, fleshing and setting machines.
- Trapping of finger/forearms between belts and pulleys of drive of drums, padddles and other machines.
- Trapping of fingers between glass roll and bed of glazing machine.
- Hit by moving protruding parts of machines such as drum door handle, moving link/glazing arm of glazing jack, entanglement between roller and blades of Slocomb staking machine.
- Trapping of fingers/arms between plates of a hydraulic press.
- Contact with the grinding wheel of a shaving machine.
- Contact with knife band of splitting machine.
- Contact with rotating fleshing cylinder.
- Contact with live parts of electrical installations on the machine.
- Contact with hot plates of plating machine, vacuum dryer and boiler system.
- Hit by parts of disintegrating grinding stones.

Adherence to good safety and maintenance practices in the use of machines and mechanical equipment in tanneries and effluent treatment plants

✓ reduces the number and severity of accidents;

✓ reduces machine down-time;

✓ reduces energy consumption;

✓ improves workflow due to higher rate of machine production.

CHECK SAFE INSTALLATION OF MACHINES AND ELECTRICALS

In general, regardless of the specific machine, check the following on the machines in your tannery and effluent treatment plant:

☐ Availability of passive safety devices (e.g. guards, fences) on prime movers, belts, open gears and transmission parts and other moving parts of machine;

☐ Availability and functioning of active safety devices (e.g. dynamic guards operated on pneumatic, ultrasonic, optical or electrical basis) on cylinder and multi-roller machines, splitting machines, presses;

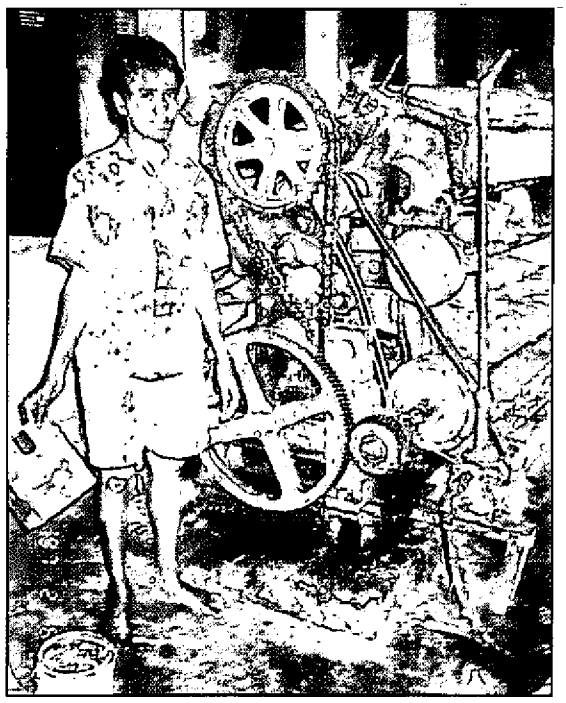
☐ Siting of machines in terms of adequacy of machine foundation, space around machines, availability of space for proper work flow in front of machine for safe and convenient handling of material in process, availability of space for maintenance work and easy removal of waste and effluent;

☐ Standards of electrical installations with regard to electrical cabling, adequacy of electrical protection, control panel location (consistent with safety regulations), suitability of motors and switch gears for area of use (e.g. IP 55 degree protected devices);

☐ Operation controls (e.g. controls labelled in local language, emergency OFF button within easy reach of operators, work position of operator and helpers on the machine);

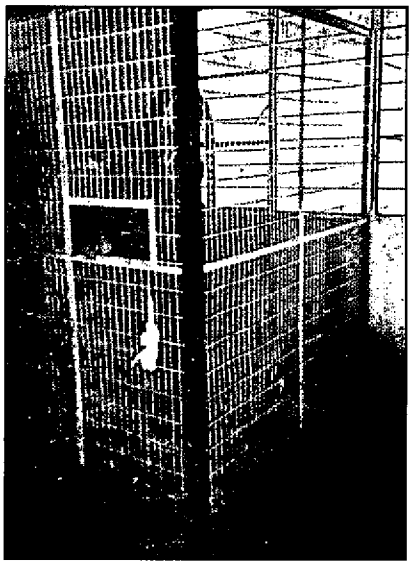
To check the machines in your tannery , use the following checklists. You can find these in the second part of the manual!

Drum	ref. sheet 4.1
Fleshing machine	ref. sheet 4.2
Splitting machine	ref. sheet 4.3
Sammying machine	ref. sheet 4.4
Cylinder shaving machine	ref. sheet 4.5
Cylinder setting out machine	ref. sheet 4.6
Slocomb staking machine	ref. sheet 4.7
Vibration staking machine	ref. sheet 4.8
Buffing machine	ref. sheet 4.9
Manual spraying	ref. sheet 4.10
Automatic spraying machine	ref. sheet 4.11
Vacuum dryer	ref. sheet 4.12
Plating/embossing machine	ref. sheet 4.13
Glazing machine	ref. sheet 4.14
Electrical supply utilities	ref. sheet 4.15
Power generating facilities	ref. sheet 4.16



Be aware of hazards from contact with unguarded gear mechanisms! (Photo: RePO-UNIDO)

- ☐ Maintenance in terms of availability of operating manuals, recording of maintenance details, replacement schedule, daily pre- and post-operation checks and maintenance work;
- ☐ Emission levels of noise, vibration, radiant heat, dust, gas / vapours / mist;
- ☐ Availability, adequacy and functioning of (dust/vapour) extraction facilities or control facilities (e.g. vibration/noise control devices, local extraction and exhaust equipment).



Passive safety guards. (Photo: RePO-UNIDO)

Availability of passive safety devices

Passive safety devices are guards, fences or covers which serve as a barrier to prevent contact of workers with moving machine parts such as prime movers, belts, open gears, transmission parts and other moving parts of machine (e.g. rotating drum or paddle).

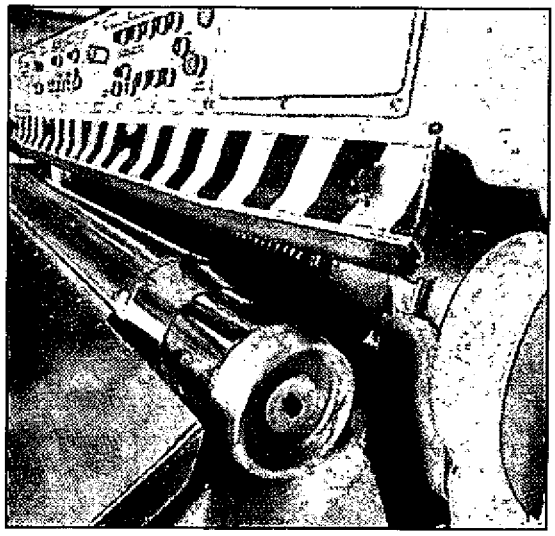
- ⇨ Ensure that these are properly fixed on the floor or on the machine itself.
- ⇨ Increase the effectiveness of the passive safety guard by painting it in a signalling colour (e.g. yellow).
- ⇨ Make sure that passive guards are put back in place after removal for maintenance and cleaning work.

Availability of active guards

Machines such as cylinder, multi-roller, splitting machines and presses should be provided with active safety devices (e.g. dynamic guards operated by pneumatic, ultrasonic, optical or electrical basis).

Active guards are designed and installed in such a way that these immediately stop or reverse the process when actuated. These prevent workers hands/fingers and other body parts from getting drawn into and caught in the machine.

Fully mechanical machines of older designs usually do not have active guards. It is possible to upgrade the design of these models to basic mechanic-electrical types.

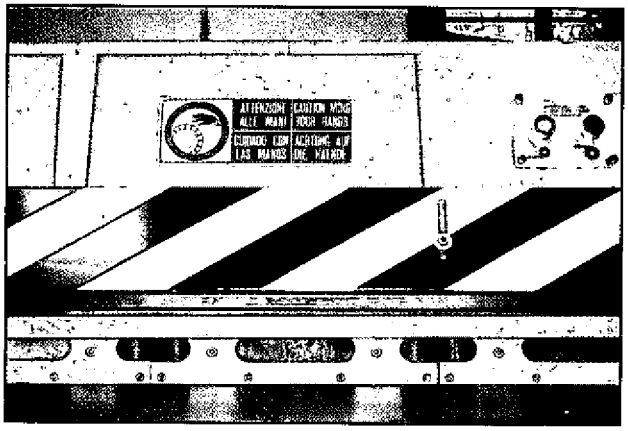


Active safety device on multi-roller machine. (Photo: RePO-UNIDO)

⇨ Consider phasing out these machines as these not only pose safety risks to the workers but in many cases also limit quality of production.

⇨ Check the functioning of the active safety device on a daily basis before starting operation.

⇨ Clearly mark the active safety device by painting it in a signalling colour (e.g. yellow).



Create awareness by using cautionary signs. (Photo: RePO-UNIDO)

Proper siting of machine

A good machine foundation contributes to longer life of the machine. Particular care about the levelling needs to be taken when installing multi-roller machines. This avoids fast wear of cylinders and bearings as well as keeps maintenance cost low. It ensures good product quality (e.g. no chatter marks on shaved leather).

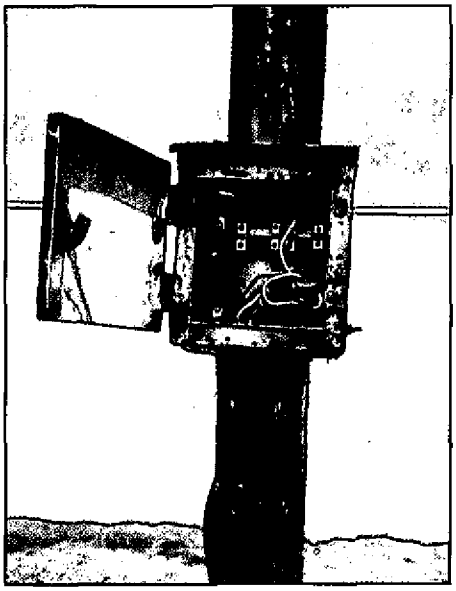
When installing the machine, take care that at least one meter (three feet) distance is avilable around the machine. This allows space for maintenance, easy handling of material in process and daily cleaning and removal of waste.

Standards of electrical installations

Tanneries and effluent treatment plants have highly corrosive conditions (e.g. high levels of humidity, presence of corrosive chemicals in liquid and gaseous form). These affect the electrical installations all over the tannery but particularly on and around machines.

Earthing wires corrode quickly and snap. Water from paddles, drums, fleshing and sammying machines splash on switch boxes, starters and can cause short-circuits. Inadequate electrical cabling and wiring can result in wastage of electricity and damage to machines, besides posing high safety risks to workers (e.g. electrical shocks, burns, injuries from a fall triggered by a minor electrical shock) and causing fire.

⇨ Insulate, enclose and protect all live parts (exposed/unconnected wires, open fittings) using barriers or installation out of reach (e.g. overhead transmission line).



Check condition of electrical installations. (Photo: RePO-UNIDO)

⇨ Effectively actuate protective devices such as fuse and circuit breakers by sustained overloads or short circuits and immediate disconnection of electrical supply.

⇨ Use earth leakage protective switches as another protection which disconnect electrical supply before a lethal current can be drawn from the main lines (e.g. in case a person gets a shock from his earthing a live wire);

⇨ Make sure that cables and equipment are effectively disconnected and locked-out when carrying out maintenance or repair work (e.g. remove fuses in the supply line).

⇨ Make sure that metal casings of electrical equipment (motor, starter boxes) are earthed. The earthing cables have to be connected to an earthing conductor placed in an earthing pit.

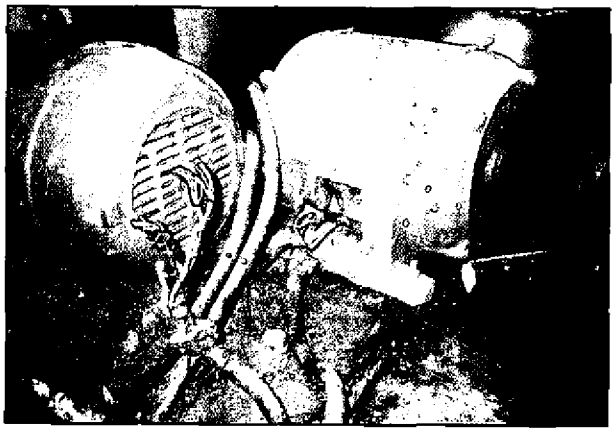
⇨ Use standard colour coding for clear identification of type of wire and connection.

Check with reference sheet - 4.17 for standard colour coding of cables/wires.

For machines located in wet-processing and dusty areas (dry shaving, buffing), check the electrical motors for the following:

☐ Check the index of protection (IP) of the motors used (usually mentioned on a small label) and verify its adequacy for the location (Electric motors in wet-processing areas must have IP 55 index of protection).

☐ Ensure that the terminal boxes of the motors are covered.

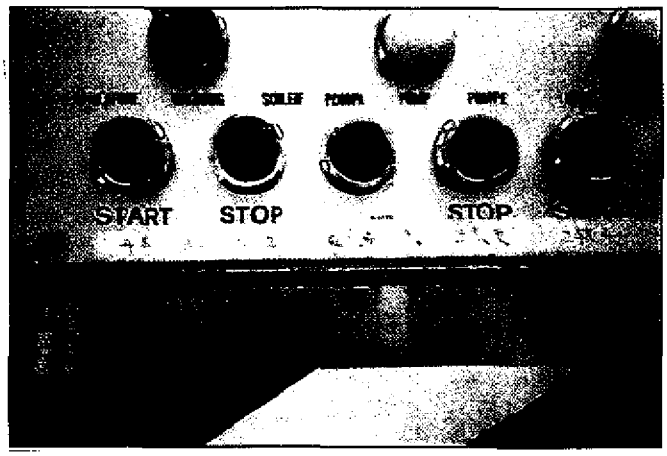


Do not allow open terminal boxes and missing cable glands. (Photo: RePO-UNIDO)

- ☐ Insulate all wires (no bare conductors or blank wires) and, preferably, place in cable ducts.

- ☐ Check that the earthing wires are in place (e.g. on motor, metal starter boxes and transformers) and not corroded.

When carrying out electric maintenance work, rely on skilled and trained personnel or contractors only.



Label control buttons in local language. (Photo: RePO-UNIDO)

Check with reference sheet - 4.18 for further information on index of protection.

Operation controls

All switches and buttons on the machine should be clearly marked with colours and labels in the local language. Imported machines do often have labels in the language of country of origin.

The operator may know the meaning of each button due to long work experience on a particular machine. However, in an emergency, other workers may not be able to take adequate action. Therefore:

- ⇨ Label all control buttons and switches on the machine in the local language.

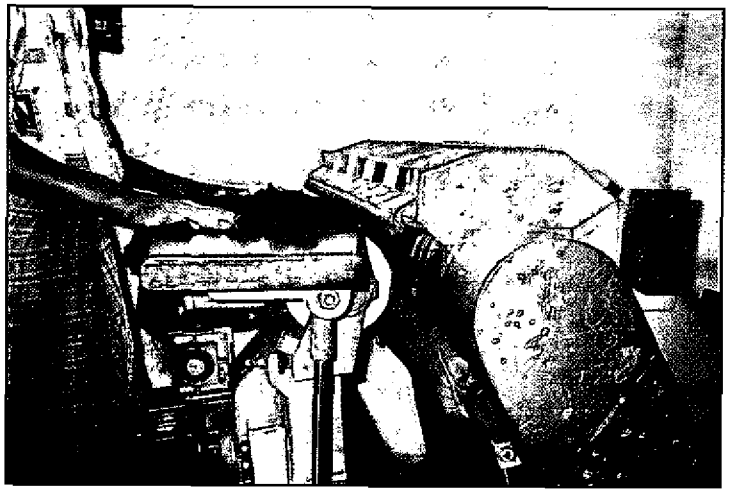
- ⇨ Make sure that an emergency OFF button is within the reach of the operator(s).

Ensure that operators and helpers have a correct work position on the machine (e.g. provide platform of adequate height and proper material).

Control emissions

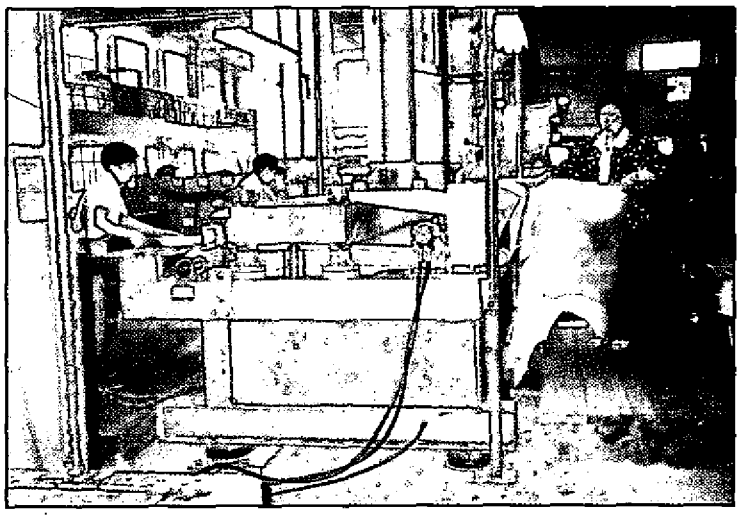
During many stages in the leather production, processing of material in or on the machine, sometimes in combination with addition of chemicals, may result in emissions affecting the operator and other workers in the work place. Such emissions include noise, vibration, heat and various airborne contaminants such as dust, gas, vapours and mist.

Excessive noise emitted by a machine may indicate a waste of energy as noise is energy in a different form.



Ensure proper working position of workers. (Photo: RePO-UNIDO)

Vibration and noise absorbing mounts. (Photo: RePO-UNIDO)



Excessive vibrations can affect machine and worker. A simple solution is to place the machine on vibration absorbing mounts or feet.

Machines which are known to emit airborne contaminants (e.g. dry shaving, buffing, dedusting, spraying machines) have to be equipped with local extraction and exhaust facilities.

Their adequacy and proper functioning can be verified during work place auditing and monitoring as described in chapter 8.

Effective noise control should start at the source itself. First, try to identify the source and cause of the noise.

In many cases, better lubrication of the noisy machine parts may solve the problem. Alternatively, consider replacement of the noisy part with a less noisy one.

Example - drums:

- Machine-cut gears of drums emit less noise and vibration than rough-cast ones.
- Teflon/plastic pinions are considerably less noisy than iron-cast pinions.

Noise emission on some machines such as older models of through feed staking machines or reverse setting machines cannot be controlled this way. In such cases, encasing of the machine (e.g. installation of noise baffle, construction of noise absorbing walls around the machine) or relocation of the noisy machine to a separate location may be more viable options.

In latter cases, you have to make sure that operators and workers are provided with hearing protection.

For further information on control of airborne contaminants, please also refer to chapter 3.

Low noise Nylon pinion on drum drive. (Photo: RePO-UNIDO)

CARRY OUT PREVENTIVE MAINTENANCE

Regular and systematic maintenance of machinery and installations is a prerequisite for cost-effective and safe production in your tannery.

Prepare and keep a maintenance schedule.

Maintenance is more than simple breakdown repair. The emphasis should be on preventive maintenance to avoid breakdown and stoppage of machines.

On a daily basis, the operator should carry out pre- and post-operation maintenance work. This includes amongst others:

- ☐ Check proper functioning of machine before start of operation.
- ☐ Test functioning of active safety devices before start of operation.
- ☐ Check proper placing of passive safety devices.
- ☐ Clean machine after completion of work.
- ☐ Lubricate moving machine parts.

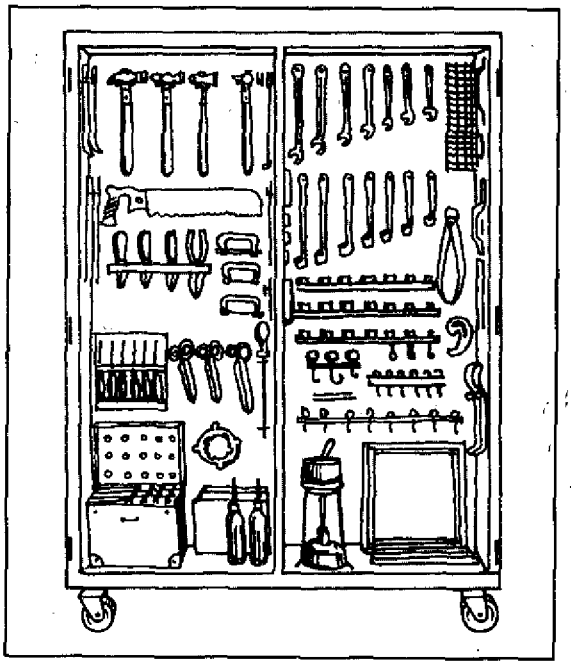
Machine manuals and other technical information to be used for repair or ordering spares etc. must be catalogued. The latter is also important to work out a specific maintenance schedule.

- ⇨ Retrieve the information from the operating manuals of your machines.
- ⇨ If not available, get the manual from your machine supplier!
- ⇨ Keep separate maintenance records for each machine in your tannery.
- ⇨ Based on this information organise an annual plan of the maintenance activities.
- ⇨ List the maintenance and spare parts required for all machines in your tannery.

This will help you to exploit cost saving potential such as by reducing the variety of lubricant and hydraulic oil, reducing unnecessary stocks of easily available spare parts, avoiding machine down time due to non-availability of spare parts, or rescheduling major maintenance work to lean periods.

Make sure that your tannery has personnel with the requisite knowledge and experience in maintaining the plant machinery and equipment. They should know about:

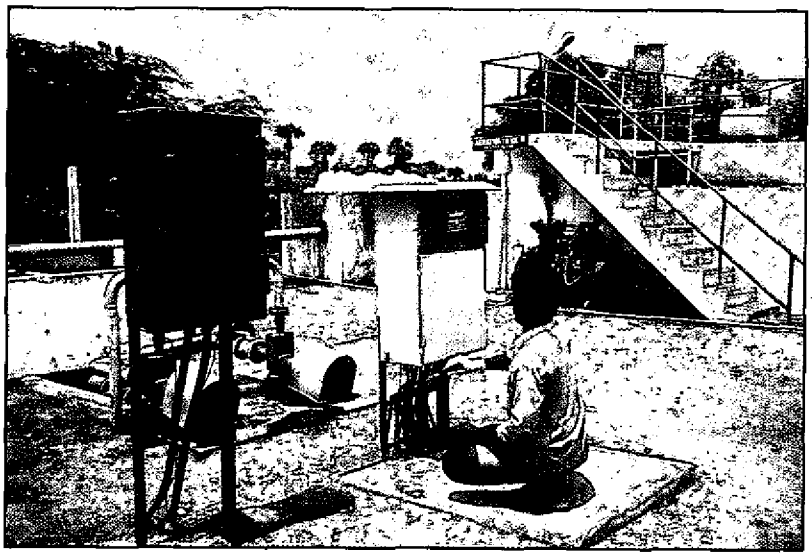
- Rationalisation as well as correct application of lubricants and hydraulic oil;
- Material and tolerances to be typically used for bush bearings;
- Correct application of electrical motors and switch gears in each area of the tannery and effluent treatment plant.



Keep tools ready and mobile. (Source: ILO)

Allocate space and provide tools for maintenance

One separate area in the tannery premises should be allocated for maintenance work by tannery's own or outside personnel as well as storage of tools and spare parts.



Take care of corrosion protection in tanneries and effluent treatment plants. (Photo: RePO-UNIDO)

- ☐ Stock and properly store general mechanical and electrical engineering hand tools and service equipment.
- ☐ Stock critical spares, particularly, those that cannot easily be procured at short notice.
- ☐ Stock lubricants and other consumable maintenance material in sufficient number and quantity.

Apart from general engineering tools, tanneries should have following special equipment and instruments:

- ☑ Tong tester electrical, digital, autoranging, digital 0-1000V, 0-600 A, with ohm meter
- ☑ Multi-meter autoranging, digital 0 - 1000 VAC, 0-300 Vdc, 0 -10 A
- ☑ Vernier calliper 300 mm X 0.02 mm
- ☑ Precision spirit level 200 mm length, sensitivity 0.05 mm/m

For maintenance of shaving cylinders, your tanneries should also have access to a dynamic balancing facility (recommended specification for balancing machine: 300 kg hard bearing, 1,500 mm diameter x 3,000 mm long, max. rotor size, variable rpm 20 - 2000 and 5 micron accuracy).

POINTS TO CHECK

AVAILABILITY OF SAFETY DEVICES

- ☐ Is the machine provided with passive safety device (e.g. guard, cover, fence) preventing contact with prime mover, belts, open gears and transmission parts?
- ☐ Is the machine (e.g. cylinder and splitting machines, presses) provided with active safety devices (e.g. dynamic guards operated on pneumatic, ultrasonic, optical or electrical basis) immediately stopping or reversing the process when actuated?
- ☐ Do these active safety devices function properly?

SITING OF THE MACHINE

- ☐ Is the machine properly sited in relation to adequacy of machine foundation?
- ☐ Is there at least one meter (i.e. three feet) free space provided around the machine?
- ☐ Does the available space around the machine facilitate maintenance and removal of waste?
- ☐ Is the space in front of the machine sufficient to ensure proper work flow? (Do workers collide with each other when loading and unloading material?)

ELECTRICAL INSTALLATIONS

- ☐ Are the electrical installations (e.g. motor, switch gears, terminal boxes, electrical connector and starter) on the machine of adequate degree of protection (e.g. IP 55 for machine in wet and corrosive conditions)?
- ☐ Is the location of the control panel consistent with the safety regulations?

OPERATING CONTROLS

- ☐ Are the control switches label and operating instructions in local language?
- ☐ Is the emergency off button in reach of the operator?

MAINTENANCE PROVISIONS

- ☐ Do you have the operating manual of the machine?
- ☐ Are the maintenance details recorded?
- ☐ Are daily pre- and post-operation check carried out on the machine?

EMISSION CONTROL

- ☐ Does the machine generate excessive noise (above 85dbA), vibration, dust, gas and / or mist?
- ☐ Is there an extraction or control facility available on the machine?
- ☐ Is the extraction or control facility adequate and functioning well?

5

WORKPLACE ENVIRONMENT AND CONDITIONS

Workplace environment and conditions influence workers' performance in your tannery.

Temperature, humidity, noise and quality of light are some key conditions. These can have an effect on safety and health of workers and can be improved by you by simple means.

Similarly, changes of work organisations and work place layout can have an impact on the productivity of the tannery while improving safety and health standards at work.

Accordingly, some aspects which you can check are:

- ☐ Adequacy of layout and spacing between production facilities and walk ways (availability of space);
- ☐ Storage and handling practices (size and layout of storage areas, use of trolleys for transfer of material);
- ☐ Adequacy of ventilation to control temperature and humidity in the work areas (use of natural and artificial ventilation, insulation);
- ☐ Adequacy of lighting in the work areas (adequate light intensity, proper use of natural and artificial illumination arrangements, avoidance of glare).

ORGANISE AND IMPROVE THE WORKFLOW

Major modifications of the existing workflow are often not easily possible. Over the time, your tannery may have expanded by adding on to the existing production facilities paying little heed to productivity or workflow. Maybe, the production facilities are based on the methods and technologies of the time. Over the time, the available floor space got distributed among various competing demands, all not necessarily conducive to efficient production.

Space for work and movement of material in a large-scale tannery. (Photo: RePO-UNIDO)

Increase available work space

Over a period, you may notice spare parts and materials being placed in the work area for lack of other storage space, incomplete repair of floors and haphazard storage of material leading to a shortage of available pathways and work areas. Such conditions may result in injuries from fall due to uneven or slippery floor conditions or by falling over items kept on the walkways.

To increase productivity and facilitate use of time and labour saving methods, consider the following:

⇨ Remove all materials from the work area not immediately needed for the production.

⇨ Provide and clearly indicate separate space for storage of material in process, certain processes (e.g. sorting, loading, unloading), storage of chemicals and other inputs needed in the immediate production process.

Allot space for work and movement in a work area. (Photo: RePO-UNIDO)

⇨ Provide and clearly indicate passageways for walking and movement of material. Use floor markings such as coloured, preferably yellow, lines to mark passageways and dashed lines for specific work or storage areas.

⇨ Remove and collect waste (fleshing, trimmings, shaving) as often as possible from the work area and temporarily store the same at a specially assigned place until final removal or disposal.

Indicative space (in meter) required for passage/aisles:

- 1 m free space around machines
- 0.8 m for one person walking
- 1 m for one person carrying material
- 1.5m for movement of a manual pallet truck or trolley
- 2 m for movement of a self-driving pallet truck

Improve flooring

Uneven and at some places broken floor and uncovered drainage prevent the movement of trolleys and require the material and other inputs (e.g. chemicals) to be carried manually from the stores to the work area or from one production stage to the next. You lose valuable time as the workers can only carry a limited number of skins/hides or materials at a time.

At the same time, solid waste collects in the open and uncovered drains, resulting in clogging of the same and slippery floor conditions, particularly in and around the wet-processing areas.

Simple action of improving the floor will allow easy and fast transfer of materials and chemicals in your tannery.

Cover floor openings and drains. (Photo: RePO-UNIDO)

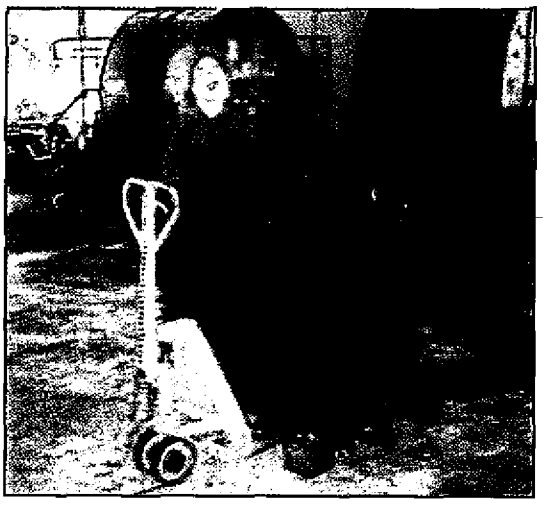
- ⇨ Cover all drains in the work area with grates, with small holes to prevent solid waste from falling into the drains (The grates should be made of concrete, wood or other corrosion proof material and should be at the same level as the floor).
- ⇨ Cover all other floor openings (e.g. wells, pits at floor level) to prevent falls and accidents.
- ⇨ Ensure that floors have a slip-proof surface. A gently sloping floor will help to drain effluent and water.

Manual handling and carrying during the production should be reduced to the minimum extent possible. Keep in mind that there are specific limits for maximum weight workers should lift or handle during a workday (Usually specified in the labour legislation of your country!).

There are more efficient ways of moving materials in your tannery.

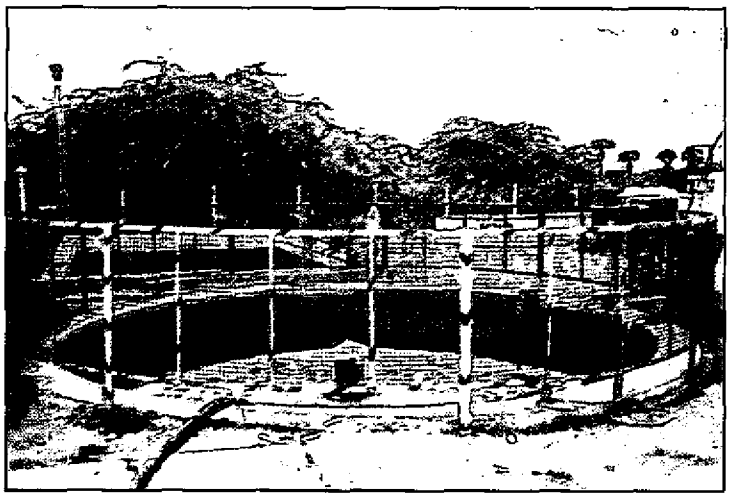
IMPROVE WORK ENVIRONMENT

During the production of leather, the processes on machines and the chemical reactions involve emission of heat, dust, gases, vapours, noise, vibration to which your workers and you are exposed on a daily basis.



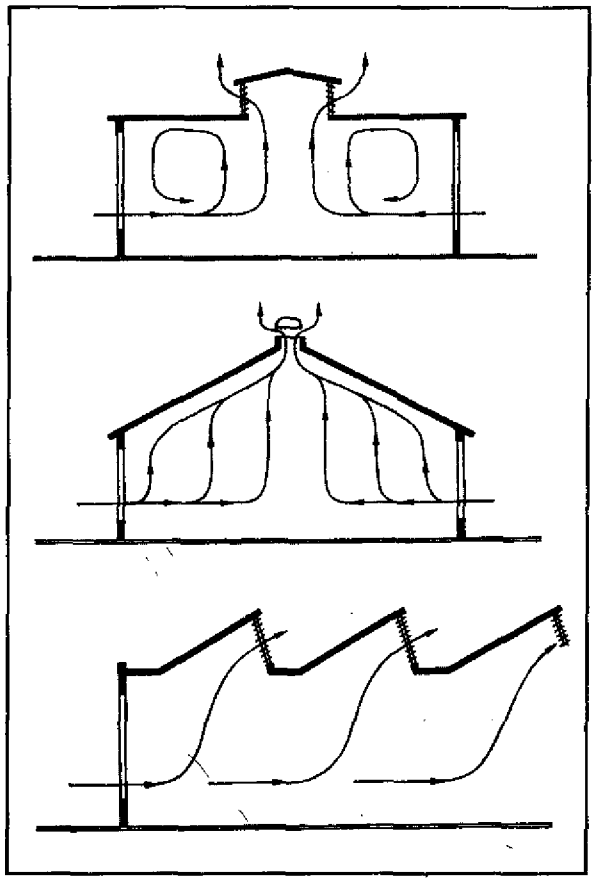
Use hand pallet truck for easier movement and handling of material. (Photo: RePO-UNIDO)

For information on control of chemical emissions (e.g. gas, vapour, dust) see chapter 3. For information on control of noise, refer to chapter 4.



Guard pits and other openings. (Photo: RePO-UNIDO)

Open workspace for good ventilation.
(Photo: RePO-UNIDO)



Ventilation for different building designs.
(Source: ILO)

Control temperature and humidity through natural and artificial ventilation

Good ventilation and air circulation in the work area and insulation of buildings against outside heat and cold will contribute to a pleasant temperature and reduction of humidity. At the same time, overall ventilation also reduces the concentration of airborne contaminants.

Ideally factors such as direction of wind and facing northern direction for sun shine should be always considered when planning the construction of a tannery.

- ⇨ Use natural ventilation and air circulation to achieve low cost overall ventilation first, taking advantage of horizontal air movement around and through buildings or the tendency of hot air to rise. Simple modifications such as removal of separating walls or increase of wall openings will improve the natural air flow.
- ⇨ Install fans, where natural air ventilation and circulation are not sufficient.

Insulate against heat and cold

Before resorting to expensive equipment to control temperature, be aware that heat and cold are also caused by outside climatic conditions. Heat and cold may get inside the tannery directly through openings such as windows, doors, gaps, skylights or indirectly through conduction through walls and roofs. While ventilation is one way to remove heat from the work place, also consider to

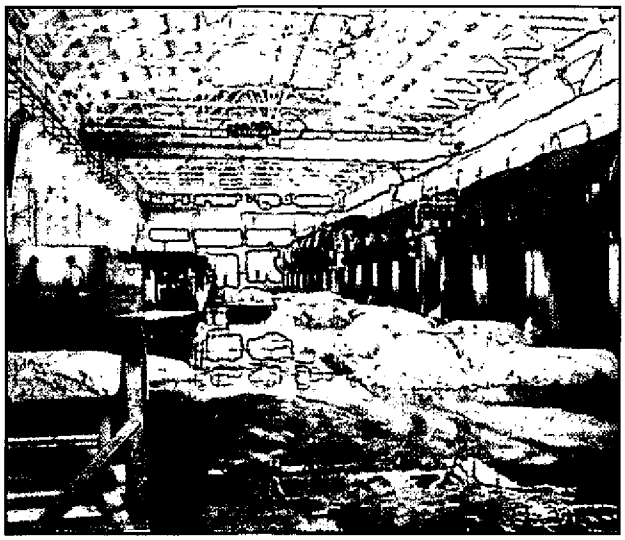
- ⇨ improving the heat reflection of walls and roofs by plastering or whitewashing;

- ⇨ improving the insulation of the roof by using insulating material or double layer roof;
- ⇨ using radiant heat from machines and process to warm the work place in cold climate;
- ⇨ using shades for the wall openings to deflect heat from direct sun shine;
- ⇨ planting trees and shrubs around the premises which not only provide shade but also become a natural filter for outside dust, besides giving your tannery a pleasant appearance.

Ensure quality of light

Poor lighting leads to low productivity and poor quality, particularly in finishing operations, as workers will start suffering from eye strain, fatigue and headache. Better lighting does not mean that more light bulbs have to be fixed. In many cases, rearrangement of existing lighting and proper maintenance and cleanliness of reflectors/ fittings will result in improvements.

- ⇨ Make full use of natural daylight by installing skylights or modifying size and location of windows. Keep windows clean all the time. You save the electricity cost of artificial lighting.



Use natural light for good light quality in the work area. (Photo: RePO-UNIDO)

- ⇨ Paint ceilings and inner walls in lighter colours. This provides better reflection and distribution of existing light sources besides resulting in better visual conditions and a pleasant work environment.

Install local lighting for better quality and safety. (Photo: RePO-UNIDO)

- ⇨ Avoid direct and indirect glare, particularly in areas involving multi-roller machines and finishing machines directly operated by the workers (e.g. staking machine, glazing jack). Glare can distract the workers' concentration, possibly resulting in poorer quality or even accidents.
- ⇨ Find the right place for light sources (e.g. Do not place a light source above a ceiling fan, which results in a stroboscope effect!) and maintain/ clean the same to ensure high light efficiency.

To verify whether the level of lighting is adequate, you can check with the help of a light (lux) meter

For further information on the lighting requirements, check with reference sheet - 5.1!

Reduce the overall noise level at the work place

Exposure to excessive noise at the work place affects the workers' ability to concentrate, causes mental stress and results in irreversible partial or complete hearing impairment or loss. Noise at the work place can mask what we want to hear. This can cause accidents, because the worker will not be able to hear warning shouts or signals.

Not every type of noise will affect the human being. The effect depends on the volume (loudness) measured in decibel (dB) and the pitches (high and low frequency) measured in Hertz (Hz). High pitches irritate more than low ones.

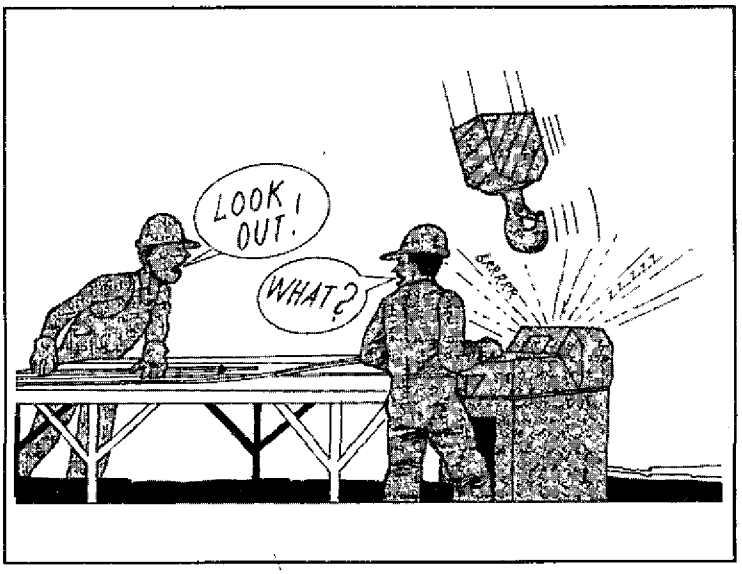
Noise which is continuous at levels of 85 -90 dB(A) - sound measured in dB(A) corresponds closely to the effects on the ear - or more is injurious to hearing.

You risk damage to your hearing, if you spend more than five hours a day at these levels. Hearing can also be damaged by sudden loud noise such as from an explosion.

If you are unable to have a conversation in a normal tone of voice at an arm's length from your partner, the noise level is too high. Normal conversation takes place at around 60 dB(A).

Try to contain noise levels in your tannery such that these do not exceed 60 - 70 dB(A). To reduce the noise levels in your tannery, consider

- ⇨ checking the noise level of each machine and, if possible, reduce noise level by repair or maintenance work (e.g. better lubrication);



Noise may mask what you want to hear! (Source: SIDA)

- ⇨ replacing noisy machine parts (e.g. metal, iron) with ones made of low-noise emitting material (e.g. Teflon/ plastic pinions on drums);

Reduce noise pollution by enclosing noisy machines or machine parts e.g. vibration staking machine. (Photo: RePO-UNIDO)

- ⇨ enclosing the entire machine or noisy parts of it with mufflers or cases with foam plastic lining;
- ⇨ shifting noisy machines to an isolated location or build a wall covered with sound absorbing material around it.

If the noise level cannot be reduced below 85 dB(A) by these methods, the operators have to be provided with hearing protectors (e.g. ear plugs, ear muffs).

For further information on hearing protection, check with chapter 6 on personal protective equipment.

Use hearing protection, if you cannot contain noise otherwise! (Photo: RePO-UNIDO)

6

PERSONAL PROTECTIVE EQUIPMENT

The use of personal protective equipment and clothing is an immediate but only short-term solution for dealing with health hazards and safety risks at the work place.

The use of personal protective equipment should be only considered as the last and supplementary solution, where it is not possible to completely eliminate or prevent exposure to hazards.

(Photo: RePO-UNIDO)

The most commonly needed personal protective equipment in tanneries and effluent treatment plants are

- protective clothing (gloves, safety shoes/boots, aprons);
- hearing protection;
- protective goggles and shields; and
- respirators.

It is the management's responsibility to provide the appropriate personal protection equipment, to keep the same in good and clean condition and to replace when necessary.

It is the worker's duty to use the personal protective equipment provided by the management.

Provision of personal protective equipment to workers alone is not enough. Workers need to be trained on the proper use and maintenance of personal protective equipment.

SELECT THE CORRECT PERSONAL PROTECTIVE EQUIPMENT

While numerous types of personal protective equipment are available in the market, selecting the most appropriate and cost-effective one is not an easy task.

Respirators

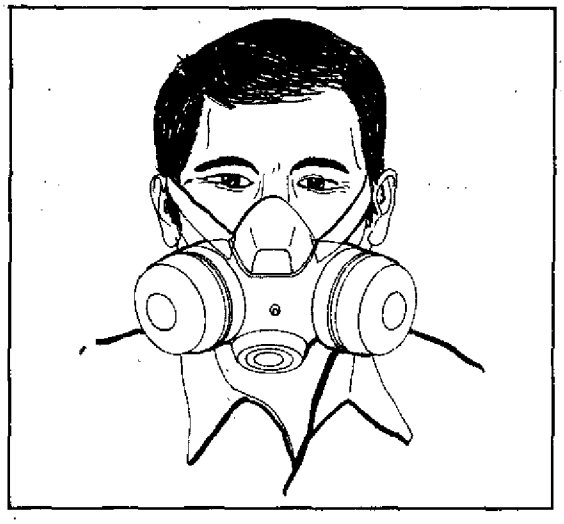
Respirators, covering mouth and nose, prevent the entry of chemicals into the body through inhalation.

They need to be worn whenever the concentration of airborne pollutants (dust, vapours, gases) can not be reduced to acceptable levels by other means.

Important factors to be considered for the correct selection of appropriate respirators are:

- ☐ type of contaminant or contaminants;
- ☐ expected and permissible concentration in the workplace (the latter also called threshold limit value);
- ☐ type of activity of worker: The respirator must be compatible with hard hats, goggles, other personal protective equipment; the worker must be able to communicate and perform required job duties;
- ☐ acceptability to the workers (comfort, type of activity);
- ☐ proper respirator fit (Careful check is required when you have workers with beards!).

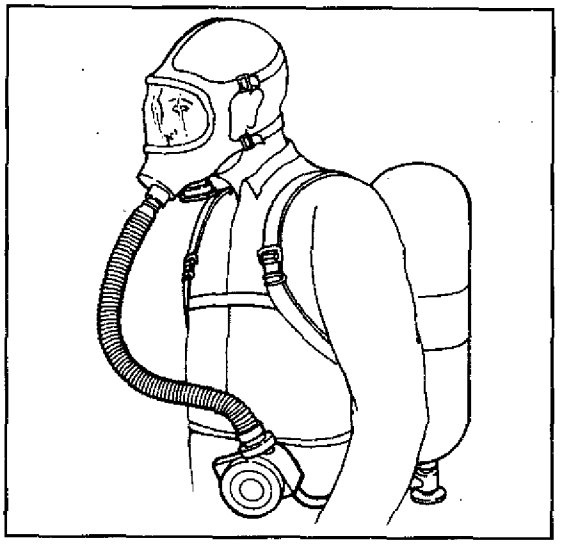
The most common respirators required in tanneries for day-to-day operations are *air purifying respirators* which clean the air by filtering or absorbing contaminants before the respiratory system.



Half masks respirator (Source: ILO)

The masks either come in form of half-face masks (covering mouth, nose, chin) or full-face mask.

Air-supply respirators provide a continous supply of uncontaminated air and offer the highest level of respiratory protection. The



Self contained breathing apparatus (Source: ILO)

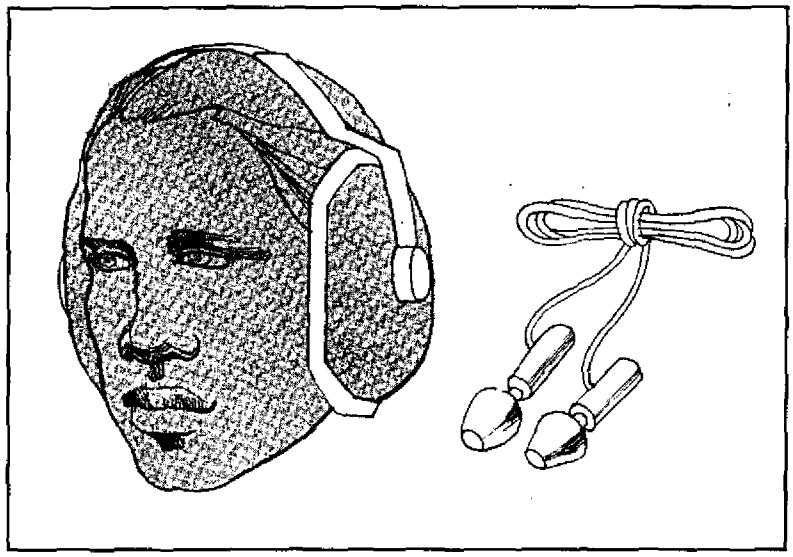
air is supplied by a pump (air-line system) or a cylinder/tank, containing compressed air. This portable self-contained breathing apparatus (SCBA) is required for entry into any confined space (e.g. man holes, deep pits, underground tanks) where presence of toxic gas (e.g. hydrogen sulphide gas) or lack of oxygen is likely.

Eye protection

Safety glasses and safety goggles protect eyes from chemical splashes and exposure to dust, vapour, mist and fume or other foreign bodies (e.g. splinters).

Protect eyes with safety goggles. (Photo: RePO-UNIDO)

Particular areas of application in tanneries and effluent treatment plants are the handling and dilution of lime and acids/ alkalis.



Types of hearing protection (Source: ILO)

Hearing protection

Whenever the continuous noise levels cannot be contained below 85 dBA (decibel), the hearing of workers has to be protected.

In such cases, workers have to be provided with hearing protection such as ear muffs or plugs. Most available hearing protection devices enable reduction of noise by around 25 dB(A).

Wear the hearing protectors as long as you are exposed to high level of noise. Even removing them for a short period of time can involve risk of damage to hearing.

⇨ Check whether hearing protection device provides a good sealing effect. Loosely worn ear muffs or earplugs do not protect you;

⇨ Make sure that ear plugs are properly cleaned or replaced to avoid contaminants entering into the ear with the plugs.

Personal protective clothing

To prevent contact with contaminants and to protect the skin, protective clothing such as gloves, aprons, boots, overalls - made of water-proof material - should be provided and worn in all wet-processing areas of the tannery and effluent treatment plant and while handling chemicals.

As in the case of respirators the specific circumstances should be kept in mind when selecting and providing personal protective equipment.

Example - gloves:

- ☐ material of glove (natual rubber, nitrile, neoprene butyl, PVC, cotton, leather)
- ☐ thickness (durability and level of protection)
- ☐ type of grip surface
- ☐ length (wrist, elbow, full arm)
- ☐ type of cuff (rolled, etc.)

In some instances, e.g. involving electricity, special personal protective clothing is required.

Reference sheet - 6.1 provides you with an overview of personal protective equipment needed in the different areas of the tannery and effluent treatment plant.

Before procuring personal protective equipment, check whether personal protective equipment is needed at all in a specific work area.

In all cases, make sure that the equipment fits the worker.

Do your workers feel comfortable? (Photo: RePO-UNIDO)

MAINTAIN PERSONAL PROTECTIVE EQUIPMENT

As with all other equipment in use in tanneries and effluent treatment plants, personal protective equipment should be properly maintained to ensure its effectiveness and long life.

⇨ Clean, dry and store personal protective equipment in a separate place.

Store and maintain personal protective equipment properly. (Source: ILO)

⇨ Replace worn-out or damaged personal protective equipment.

Respirators have to be replaced when the workers notice

- ☐ difficulty in breathing;
- ☐ dizziness or distress;
- ☐ sensing irritation, smell or taste of contaminants;
- ☐ puncture or other damage of the respirator.

PROMOTE THE USE OF PERSONAL PROTECTIVE EQUIPMENT

It is often heard from employees:

"My workers refuse to wear the personal protective equipment."

Do they know why they should use personal protective equipment? (Photo: RePO-UNIDO)

When introducing personal protective equipment workers may be reluctant to use the same because they are not used to personal protective equipment or worried about its implication; they may feel uncomfortable due to prevailing humid and hot work conditions.

Training and information will help overcome the resistance more easily.

- Inform the workers about the possible ill-effects of exposure on their health due to not wearing personal protective equipment.

- Remove wrong perceptions about personal protective equipment.

- Clearly instruct workers when and where they have to wear personal protective equipment.

As the worker's well-being at the workplace is the management's responsibility, sometimes exercising supervisory power may be necessary.

Making use of personal protective equipment is a worker's duty.

7

DEALING WITH EMERGENCIES

Despite all precaution, occurrence of emergencies in factories cannot be ruled out. An efficient management is always prepared to deal with emergencies.

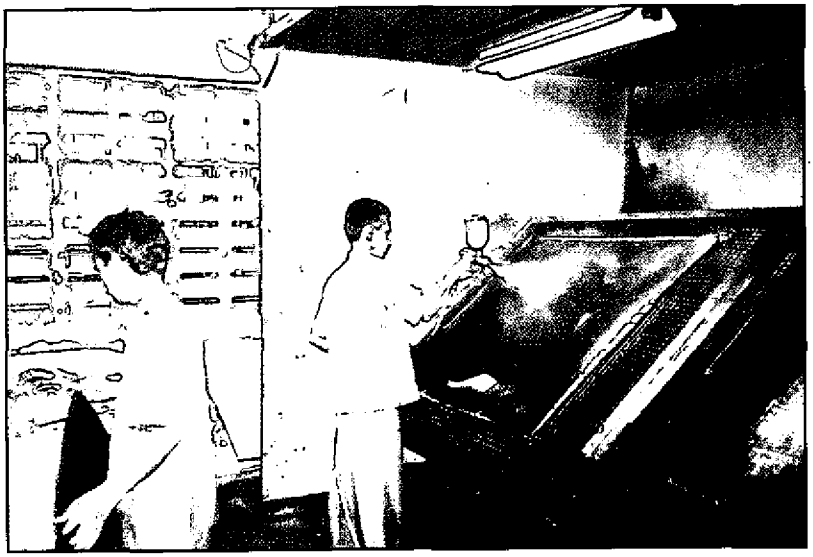
This chapter provides you guidance on how to prevent and deal with emergencies.

CONTROL FIRE AND EXPLOSION RISKS

A careful assessment of your tannery and effluent treatment plant will help you identify the locations with a high risk of fire.

To do so, one should keep in mind that fire requires three basic elements, namely

- ☞ combustible/flammable material
- ☞ a source of ignition (heat, spark)
- ☞ oxygen



Identify areas with high risk of fire. (Photo: RePO-UNIDO)

Whenever all three elements are present, a fire may start. Whenever two of the three elements are found together, high risk of fire must be assumed.

Identify the combustible/flammable material in your tannery

The most common combustible/flammable materials in tanneries are

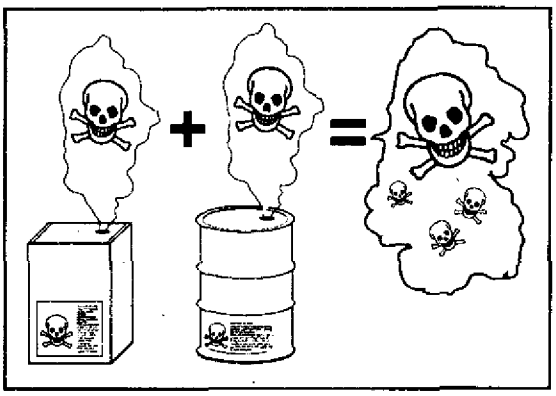
- ☐ chemicals in liquid and solid form;
- ☐ chemical fume, vapour, mist;
- ☐ wastes (dry shaving dust, buffing dust, vegetable extract);
- ☐ fuel and lubricating oil.

☞ *The material safety data sheet of chemicals usually gives detailed information on the respective risk of fire or explosion.*

When checking the material safety data sheet, keep the following in mind:

⇨ For flammable liquids, the lower the flash point, the higher the fire and explosion risk of the chemical.

⇨ A vapour heavier than air (density higher than 1) may travel along in the ground and collect in pits or below ground area, creating fire and explosion risk far away from the location of the chemical.



Mixing of chemicals can lead to spontaneous combustions. (Source: ILO)

Identify the potential sources of ignition in your tannery

For a chemical/fuel and its gaseous form to pose a fire risk, the flash point temperature has to be exceeded.

Potential sources of the heat required to ignite the flammable material are:

- ☐ sparks (at poorly made electrical connections, grinding of bladed cylinders);
- ☐ static electricity (dry belts rubbing against wooden or plastic parts or cylinder rollers e.g. driving belts, measuring machines);
- ☐ electrical short circuits;
- ☐ spontaneous combustion (oily rags in dry open air);
- ☐ chemical reactions (accidental mixing of spilled chemical in chemical store or work place);
- ☐ friction (loose drive belt rubbing against covers, rubbing of moving machine parts due to poor maintenance or missing lubrication);
- ☐ process and radiant heat (drying chamber/tunnel, steam pipes, boiler, badly ventilated electrical motors e.g. fans, exhaust ventilation);
- ☐ open flames (cigarettes, matches, candles);
- ☐ solar heat.

Since oxygen will be present in the air, the focus of preventive action should be on keeping flammable material and sources of ignition separated.

PREVENTIVE MEASURES

- ⇨ **Store chemicals properly and keep chemical containers covered.**
- ⇨ **Clean chemical spillage immediately as per the instructions of the material safety data sheet.**
- ⇨ **Ventilate chemical stores and work areas to avoid accumulation of vapour, fume, mist, etc.**
- ⇨ **Remove waste, particularly from dry shaving and huffing machines and the work area.**
- ⇨ **Store fuel for engines in separate locations away from the work area in conformity with relevant rules for fuel storage.**
- ⇨ **Keep electrical installations clean and in good order.**
- ⇨ **Ensure proper maintenance and lubrication of machines.**
- ⇨ **Prohibit smoking in fire prone areas, such as chemical stores and all work areas.**

Prepare for a possible fire

While the preventive measures as listed minimise the risk of fire, further measures have to be taken to be able to respond immediately, if a fire occurs to avoid harm to plant and persons.

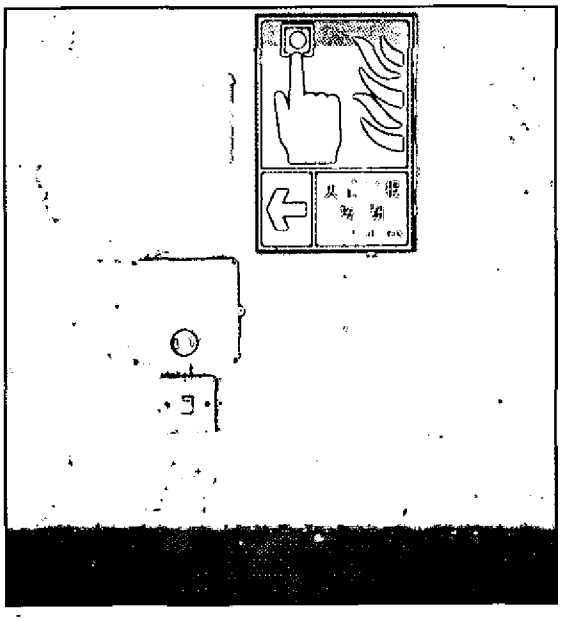
⇨ Workers should be able to escape from any part of the tannery in case of a fire.

⇨ The fire exits need to be clearly indicated and marked.

⇨ Check once a year that the fire fighting equipment is filled and ready for use. The location of the fire fighting equipment should be clearly marked as well.

⇨ Train the workers on the use of the fire fighting equipment. Everybody in the tannery should know what needs to be done in case of a fire.

Check reference sheet - 7.1 for selecting the right fire extinguisher.



Be prepared for a possible fire! (Photo: RePO-UNIDO)

Keep fire fighting equipment ready in marked locations. (Photo: RePO-UNIDO)

POINTS TO CHECK

How to select the correct fire fighting equipment using reference sheet - 7.1:

☐ Check column 1 and 2 for the type of fire to be expected in a certain area of the tannery.

☐ Check which fire extinguisher is suitable for the type of fire (tick mark for suitable).

☐ Check whether the existing fire fighting equipment is suitable for the respective area in your tannery. Cross check whether the class-of-fire abbreviations (A, B, C, E) are highlighted on your fire fighting equipment.

Thumb rules!

- One 6 litre or 6 kg fire extinguisher is suitable for 150 - 200 m^3.
- Locate fire extinguishers not farther than 15 meters from the nearest fire-prone area.
- Fire extinguishers suitable for A B C class fires can be used in chemical stores.
- Keep separate fire extinguishers for different risk areas.

BE PREPARED FOR MEDICAL EMERGENCIES

Workers, supervisors, managers and even yourself may be exposed to a variety of external safety risk and health hazards at the work place.

Check chapter 2 for safety risks and health hazards at the work place.

Though the probability of accidents can be brought down - by taking preventive and precautionary measures - one should be prepared and equipped to respond to a medical emergency. Immediate and correct (re)action with the facilities available are decisive for the rescue and full recovery of the victim. First medical aid is the first step in the line of medical emergency response.

Identify possible medical emergencies in your tannery and effluent treatment plant

The most likely medical emergencies you may come across are:

- ☐ Bleeding from cuts, bruises, abrasions, open wounds
- ☐ Broken limbs, sprains or dislocation
- ☐ Injuries from working with chemicals (spills of acids and alkalis on skin or eyes)
- ☐ Heart and breathing failure (due to inhalation of gas, lack of oxygen, electrical shock)
- ☐ Burns (from acid, fire or contact with electricity)

In the tannery, the staff should be prepared and trained to rescue and provide first medical aid to accident victims.

Check the reference sheets - 7.3, 7.4, 7.5, 7.6 and 7.7 for further useful information on how to deal with emergencies!

How will you save him from there? (Photo: RePO-UNIDO)

Keep rescuing and emergency equipment ready

Before first medical aid can be administered to the accident victim, the victim needs to be rescued and removed from the accident location first. Rescuers may have to enter the danger zone for doing so and require special facilities such as rescuing equipment and personal protective equipment.

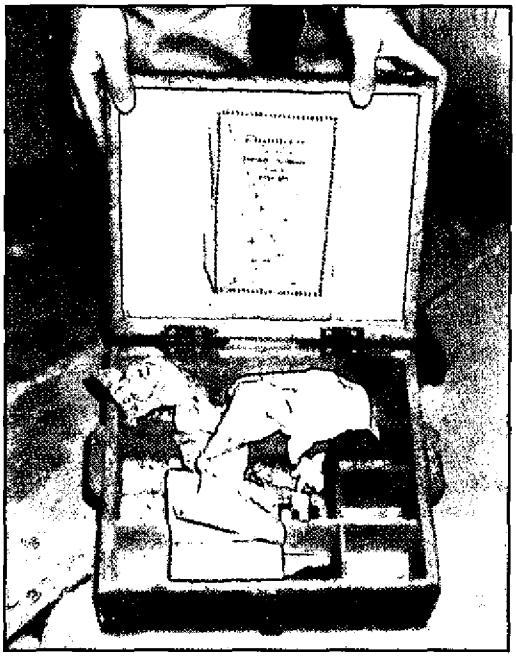
1. First medical aid box/kit

Keep a first medical aid box ready in a central location with easy access. In small tanneries, one box kept in the administration of the tannery may be sufficient. In larger tanneries, additional boxes should be kept in areas with high or special safety risks and health hazards.

Though the content needs to meet the regulatory requirements the essential items to be available are

- ☐ Antiseptic lotions, powder or cream
- ☐ Sterile dressing in dust proof packets
- ☐ Adhesive plaster
- ☐ Triangular bandage
- ☐ Scissors
- ☐ Burn cream

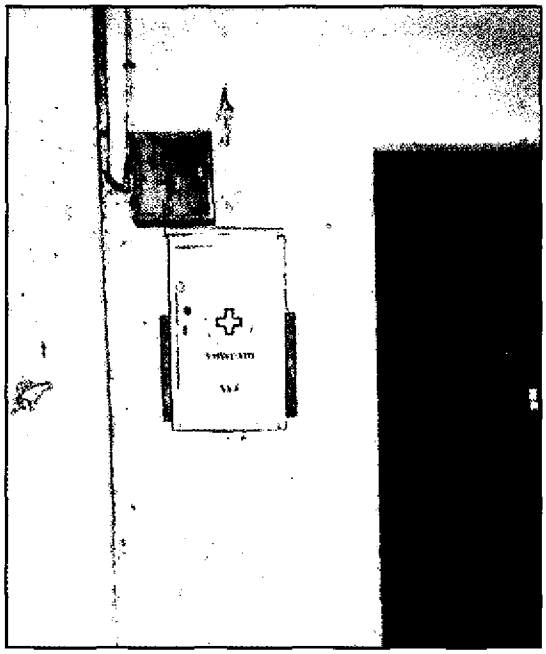
Make sure that the content of the first medical aid box is regularly checked (at least weekly) to replenish used items or to replace items past expiry date.



Ready for a medical emergency? (Photo: RePO-UNIDO)

2. Eye rinsing/safety shower/washing facilities

In cases such as spill/splashing of chemicals into eyes or on skin immediate facilities to clean the affected part of the body have to be available. Emergency washing facilities should be available in or nearby the chemical store.



Make first medical aid kits accessible and mark their location. (Photo: RePO-UNIDO)

3. Confined space rescuing equipment in effluent treatment plants

Confined space (e.g. manholes, storage tanks, underground tanks, pits, wells) in tanneries and effluent treatment plants can be risky to enter for likely presence of gas (hydrogen sulphide, methane) or lack of oxygen. There are strict rules pertaining to entry into confined space which apply equally for regular workers and rescue operators.

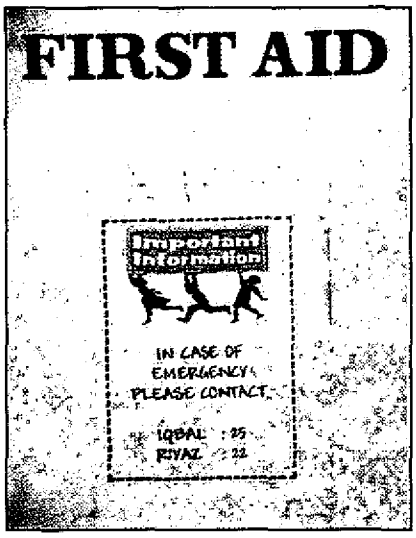
Equipment to be kept ready for rescue operations includes:

- ☐ Self contained breathing apparatus or airline supply system;
- ☐ Safety harness with life line.

For further information, get a copy of the UNIDO safety handbook "How to deal with hydrogen sulphide gas in tanneries and effluent treatment plants"

Know how to provide first medical aid

Though everybody in the tannery should be trained on basic rescuing procedures and application of basic first medical aid, at least, two staff members should be trained as certified first medical aiders.



Who and where are the trained first aid personnel? (Photo: RePO-UNIDO)

Make it a rule that one first medical aider should be present on each shift. Particularly, night shifts can be critical.

- ⇨ Display the phone number or contact address of the nearest medical doctor and the fire fighting service in a clearly visible location.
- ⇨ Keep at least one first medical aid box in the tannery and inform all workers about its location.
- ⇨ For first medical aid in case of accidents involving chemicals, check with the respective material safety data sheet.

Finally, does your medical doctor or nearest hospital know about the safety risks and health hazards in your tannery and effluent treatment plant?

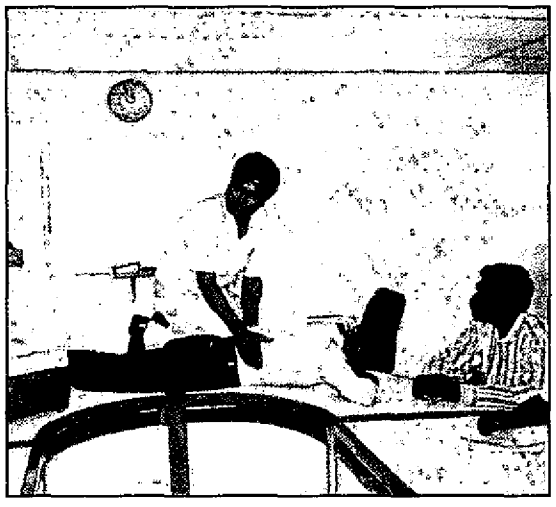
Brief your doctor or hospital, so that they are prepared as well!

LEARN FROM EMERGENCIES

Once the immediate emergency control steps have been taken, the accident should be investigated as quickly as possible, to establish the cause, not to lay blame.

You can draw useful lessons from a careful investigation of accidents.

You may use the sample accident investigation report in reference sheet - 7.2.



Train your staff on how to deal with emergency situations. (Photo: RePO-UNIDO)

Plan for emergencies

Based on the initial safety audit, identifying the potential safety risks and health hazards, you should not only plan for the improvement measures but also prepare plans on how to deal with the possible emergencies in the tannery and effluent treatment plant.

Put the emergency plan into writing and inform your staff and outside emergency services. Key elements of your plan should be training and emergency drill.

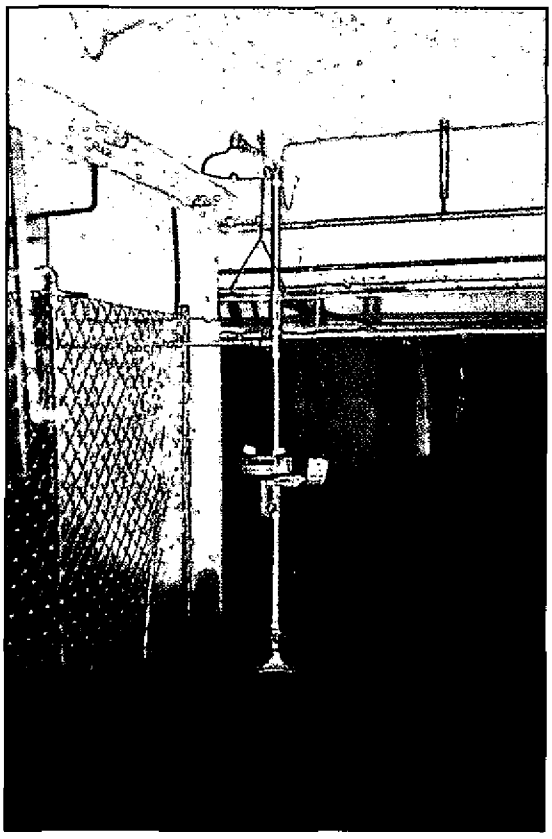
The emergency plan should include clear explanations on

- ☐ how to alarm and to evacuate;
- ☐ how to rescue accident victims and to give first medical aid;
- ☐ procedures to adopt during and after emergency.

An emergency plan without emergency training or drill is useless!

POINTS TO CHECK

- ☐ Are first aid personnel available in your tannery on each shifts?
- ☐ How far is the nearest medical facility (doctors, hospital)?
- ☐ Is transport to the nearest medical facility available?
- ☐ How do you obtain outside help?
- ☐ What rescue and emergency equipment do you have inside the tannery/effluent treatment plant?
- ☐ Are the workers trained in basic emergency procedures?



Emergency shower and eye rinsing station. (Photo: RePO-UNIDO)

THINKING OF

refilling the fire extinguisher at the time of a fire

or

replenishing the first medical aid box when an accident has happended

IS TOO LATE!

8

AUDIT AND MONITORING

Audit and monitoring are the first steps in a systematic approach to improving occupational safety and health standards at work.

A simple audit and monitoring system should be established in every tannery comprising of following elements:

- ☐ Basic work place inspection (e.g. on monthly basis);
- ☐ Accident/incident reporting system;
- ☐ Health monitoring of all workers (e.g. once a year).

The principal objectives of audit and monitoring are to:

- ⇨ identify the risks and hazards which can lead to injury, illness and unsatisfactory conditions at the work place;
- ⇨ analyse and determine the nature of risks and hazards (=> how they affect the worker and what measures have to be taken);
- ⇨ correct the situation and introduce improvements;
- ⇨ follow-up, ensuring that the measures have been properly carried out and have had the intended effect;
- ⇨ ensure that no new problems have been introduced into the work place.

A hazard identified is a hazard solved!

The systematic and detailed examination and inspection of the work place is the most important preventive step. It requires contributions from and co-operation between workers and management. This need not be a formal system.

Encourage your workers to report unsafe and hazardous conditions to their supervisors on a regular basis.

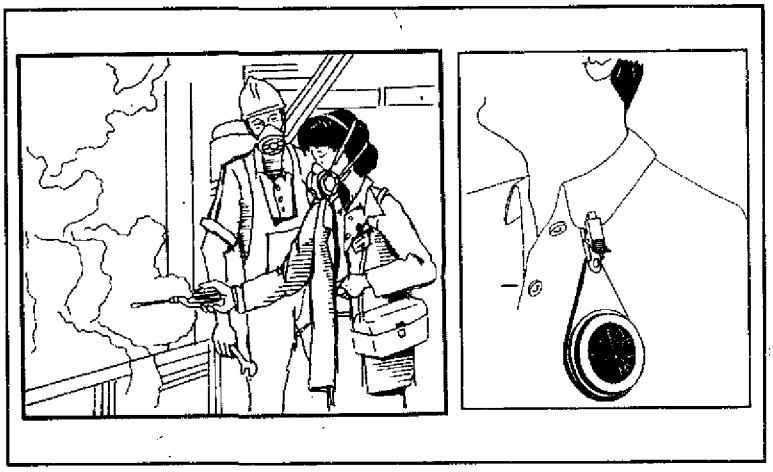
AUDIT YOUR WORK PLACE

Identify the safety risks and health hazards

A checklist is a useful tool for guidance in carrying out an audit in your tannery or effluent treatment plant. It is impossible to remember everything that has to be checked during each work place inspection.

Reference sheet - 8.1 contains a sample checklist which you may use as a reference in the different kinds of work place audits.

With the help of the audit you will be able to identify unsafe conditions and the potential sources of health hazards.



Ways of assessing the actual exposure at the workplace (Source: ILO)

Analyse and determine the nature and extent of risks and hazards

As the next step, the level of exposure needs to be determined.

Parameters relevant in tanneries and effluent treatment plants are

- ☐ concentration of dust (total and respirable);
- ☐ concentration of chemical mist / gas / vapours;
- ☐ level of noise;
- ☐ level of temperature and relative humidity, wind speed.

The measured values of these parameters will subsequently serve as comparative basis to assess the impact of improvements made and achieving satisfactory conditions in the work place.

Check reference sheet - 8.2 for detailed information on which parameters should be monitored in which location of the tannery and effluent treatment plant.

These measurements have to be cross-checked with the permissible occupational exposure limits as laid down in form of international recommendations or respective national standards in your country.

Occupational exposure limits (OEL) are grouped in three categories:

⇨ OEL over a period of eight hours (equivalent to one shift), described as time weighted average (TWA);

⇨ OEL over short period, usually 15 minutes, described as short-term exposure limit (STEL);

⇨ maximum permissible exposure.

The measurement of these environmental parameters usually requires extensive use of special monitoring instruments. In most countries, you can avail professional assistance of an outside expert or agency to carry out the monitoring for you.

For detailed information on exposure limits of chemicals commonly used in tanneries, check with reference sheet - 3.1.

In addition to these measurements, there are other methods which help find out to what extent workers in your tannery have been already exposed to certain safety risks and health hazards.

For example, to determine the overall exposure of workers through inhalation, skin contact or ingestion, samples of worker's blood and urine can be analysed in a laboratory and checked for extraordinary levels of chemical substances, for example chrome levels, pesticides, etc.. These provide complementary information to the work place monitoring.

Monitor health of your workers on regular basis (Photo: RePO-UNIDO)

Regular health checks of workers, particularly at the time of recruitment and on a regular (at least annual) basis are an important method of carrying out effective proactive health services.

These examinations take into account the possible exposure of workers to various working condition factors such as noise, climate and chemicals.

The annual examination should therefore include

- ☐ general health examination;
- ☐ routine blood test;
- ☐ lung function test;
- ☐ hearing test.

It is important that the observations made during the work place inspections are noted, so that any shortcomings or suggestions can be reported and followed up.

Information gathered from audit checklists, results from monitoring, health records and accident reports are useful inputs for planning and deciding on measures to be taken to improve the occupational safety and health standards at work.

Check with reference sheet - 8.3 for a simple method of how to assess and prioritise hazards.

MONITOR WORKPLACE ON REGULAR BASIS

Once you have implemented all planned improvement measures, the same auditing methods allow you to verify the impact and effectiveness of these measures and to decide on further measures.

Regular monitoring of the workplace will help to maintain the occupational safety and health standards at work. A general work place inspection should be carried out at least once a year by you or a staff member designated by you. Chemical stores, chemical preparation area and effluent treatment plants should be inspected more frequently, for example on a monthly basis.

On a daily basis, check with the workers in each work area whether they have any problems and suggestions regarding safety, health or working conditions.

In addition, special work place inspections are prescribed by law, such as inspection of boilers or pressure vessels.

Try to obtain experts' advice. Engineers, safety official, experienced supervisors and workers or experts outside your tannery and effluent treatment plant may be of further help to you.

9

MANAGEMENT OF SAFETY, HEALTH AND WELL BEING

Eliminating or curbing effect of safety risks and health hazards creates the basic framework for improving the occupational safety and health standards at work. Physical arrangements are not sufficient for safety, health and well-being of workers. These have to be seen in combination with safe behaviour and practices.

Thus, the focus of your efforts for ensuring a good record of safety and health practices in your company should be the worker.

- ⇨ Create general awareness on safety and health in your tannery
- ⇨ Inform workers on safety risks and health hazards at their work place
- ⇨ Train workers on safe behaviour and work practices
- ⇨ Supervise workers effectively, particularly those engaged in work involving hazardous machines, chemicals or processes.

PROMOTE AND RAISE AWARENESS ON OSH

Information regarding potential safety risks and health hazards, precautionary safety and emergency practices must be provided to all workers (including casual workers), contractors hired for carrying out work in the tannery and effluent treatment plant and any other visitors.

Display safety and health instructions

Visibly displaying a safety policy statement or a written commitment of the management to safety and health of the company's workers has a motivating effect on the workers. It will also contribute to a positive first impression on any visitor to your tannery.

For example, display in large figures the number of accident free workdays completed by your tannery.

The contact address and telephone numbers of the nearest medical doctor, hospital, fire fighting service, first medical aiders should be prominently displayed on an information board. In large tanneries, such information may be displayed in all sections.

Use safety signs to warn about hazards. (Photo: RePO-UNIDO)

At the work areas, particularly those involving hazardous operations, specific safety guidelines should be visibly affixed. Attaching machine operating checklists for the machine operators at the respective machine contributes to better awareness, not only in terms of safety but also in terms of better machine maintenance and general housekeeping.

Affix warning and precautionary signs

Safety and precautionary signs increase the awareness about specific potential hazards and promote adherence to safe practices.

- ⇨ Make sure that all workers understand the meaning of the signs (Use standard pictogram);
- ⇨ In case explanatory text is put on the sign board, make sure that it is in the local language.

Keep in mind that a safety sign does not protect you!

CONDUCT SAFETY TRAINING AND DRILLS

Train workers on safe work practices

Each worker in the tannery and effluent treatment plant should undergo general safety orientation and training in form of induction and refresher training. The training should cover:

- ☐ existing health hazards and safety risks in their location;
- ☐ safe behaviour and work practices;
- ☐ basic first aid;
- ☐ what to do in emergencies.

Train staff on proper safety practices. (Photo: RePO-UNIDO)

If contract workers from outside the factory are engaged, they have to be briefed by the manager/safety officer before they start their work.

Encourage your workers to follow a good personal hygiene, such as:

- ⇨ Drink clean, potable water!
- ⇨ Never eat, drink or smoke in storage or work areas!
- ⇨ Wash your hands and exposed parts of body regularly and take daily bath!
- ⇨ Clean teeth and mouth daily and have periodic dental check-ups!
- ⇨ Wear proper clothing and footwear!
- ⇨ Do not mix up working and street clothes!
- ⇨ Wear protective masks, glasses, gloves, earplugs, etc.!
- ⇨ Keep physically healthy!

A prerequisite on your side is that you provide your workers with these facilities (see section "workers' welfare").

Special training has to be provided to those workers who are engaged in hazardous operations. Their training should cover the use of special personal protective equipment and safe practices as required for the type of work.

The first medical aiders should undergo a refresher training at least once a year.

Conduct emergency drills

Regular training on the use of emergency equipment and on what to do in emergencies should be carried out as least twice a year.

Subjects to be covered in the safety training are:

- ☐ location and use of first medical aid kit;
- ☐ rescuing and attending to victims of accidents (e.g. rescue from confined space in effluent treatment plants, from electrical installations);
- ☐ checking and use of fire fighting equipment;
- ☐ use of life buoys/self contained breathing apparatus/safety harness.

Instruct contractors and visitors on safety procedures

Be aware that outsiders (e.g. contractors, visitors) may not be familiar with your tannery or effluent treatment plant.

- ⇨ Do not permit unauthorised entry to the premises!
- ⇨ Instruct contractors and visitors on precautionary measures and behaviour before entering the work areas (You may even prepare a small handout!)
- ⇨ Accompany outside contractors and visitors when they are in the tannery or effluent treatment plant.

If contractors are engaged for certain work in your tannery or effluent treatment plant, an experienced person of your staff should supervise their work.

CARE FOR WORKERS' WELFARE

Workers tend to bring their problems from home, go home with their problems at work and bring back the same problems to work.

Be aware that a worker who brings problems from home will not be able to concentrate or be fully productive. As an employer, ensure that workers do not go home with problems at work.

Besides good work conditions, availability of welfare facilities contributes not only to the welfare of your workers but also to improve production and better relations.

The type and quality of welfare facilities may differ from country to country and company to company. Facilities for workers' welfare during working hours should at least include

- ☐ facilities for personal sanitation (toilets, washing facilities, change room for drying and storing working clothes) should be provided near the work areas;
- ☐ access to drinking water and other beverages (e.g. salty drinks in hot climates or hot drinks in cold climates);
- ☐ a rest area (e.g. for taking lunch) away from work area.

Keep in mind that you need separate toilet and washing facilities for your women workers!

INFORM YOURSELF ON LAWS AND REGULATIONS

Not knowing the laws and regulations of your country which govern conditions of work does not protect you from the consequences of non-compliance.

These laws and regulations are based on the idea that the improvement of work place conditions is to be organised and performed by an employer in co-operation with the workers. These relate to the minimum requirements in terms of occupational safety and health at work, leaving you with the freedom of being better than the standards prescribed.

Your country may be a signatory to international agreements, declarations and programmes of United Nations organisations such a World Health Organisation, International Labour Organisation and others.

Though the cost of improvements in the area of work place conditions - including occupational safety and health - adds to the production cost, remember that a good work place is profitable in the long run!

PART II

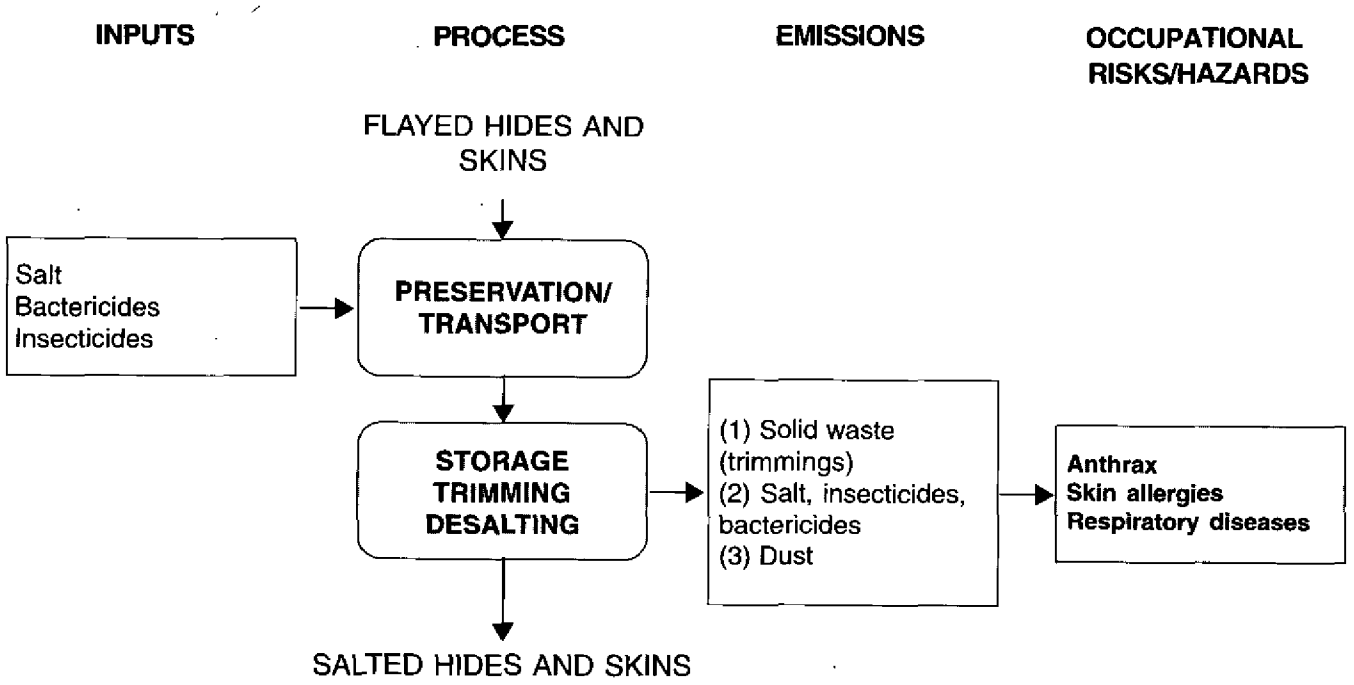
PRACTICAL HINTS AND REFERENCES

GLOSSARY

ABBREVIATIONS/ACRONYMS

BIBLIOGRAPHY

HEALTH HAZARDS AND SAFETY RISKS IN RAW MATERIAL STORAGE AND HANDLING



Curing of raw material

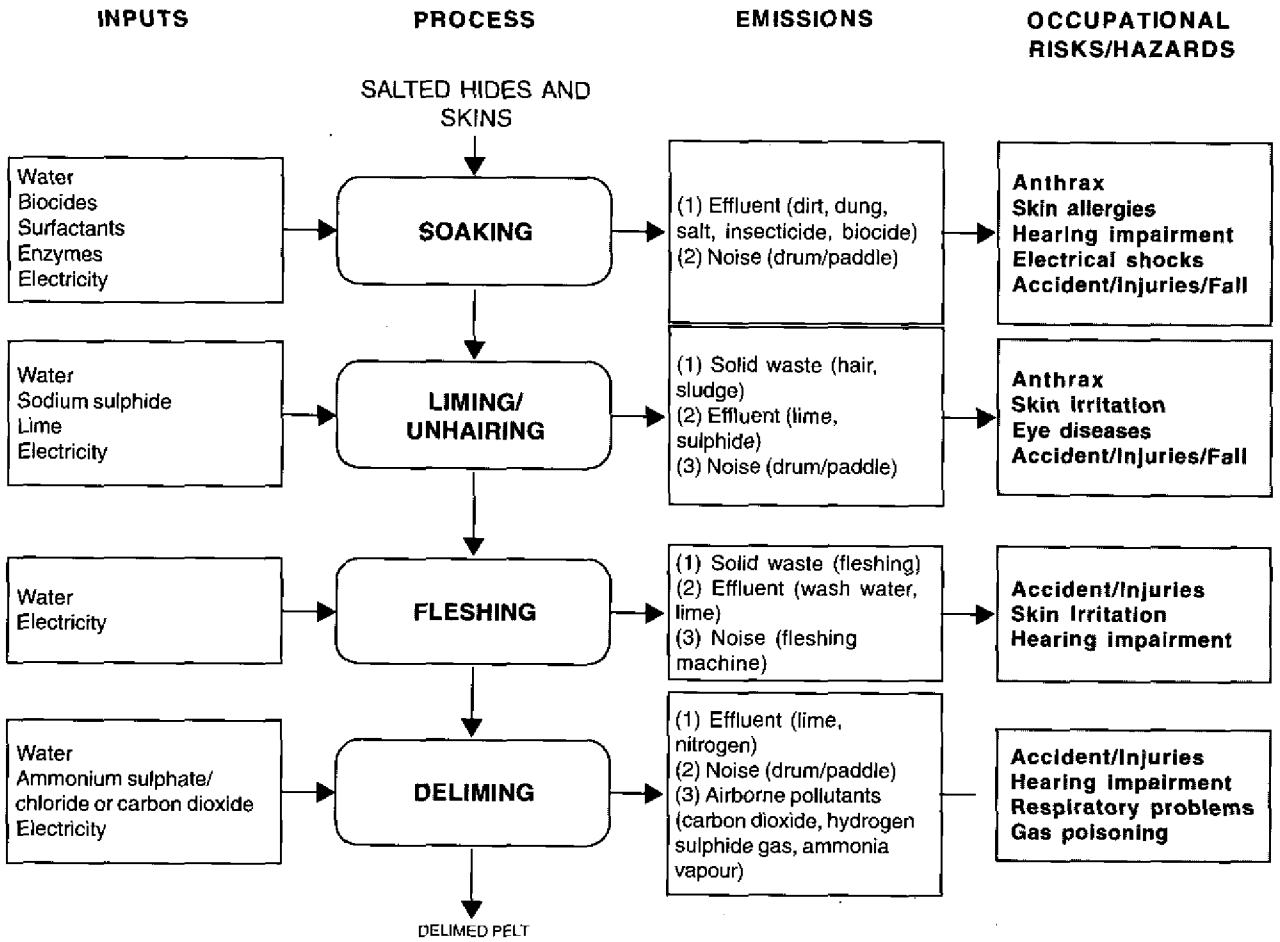
Slaughter/flaying of animals takes place, generally far away from the tannery. The hides and skins, recovered from the animals have to be preserved for the period till processing begins in the tannery. Usually, salt (sodium chloride) and occasionally also various biocides are applied to prevent attack from micro-organisms. Workers are exposed to the preservative chemicals during loading, unloading and handling of raw material in the storage area.

Desalting of raw material

In some tanneries, the surface salt is removed by manual or mechanical means e.g. loosening the salt by hitting the raw material on an empty barrel or stone, by brushing the salt or by tumbling the raw material in a specially designed wooden drum with holes on the surface.

PRODUCTION STAGE	TASKS	SAFETY RISKS/ HEALTH HAZARDS	HEALTH EFFECTS	UNSAFE WORK PRACTICES
RAW MATERIAL HANDLING/STORAGE	Unloading, turning, sorting, trimming hides/skins	Heavy load	Musculoskeletal injuries	Poor carrying practices, no use of mechanical means
		Contact with infected skins	Anthrax	Handling material without personal protective equipment
		Contact with loosened salt and insecticides	Skin allergies	No use of protective footwear
		Inhalation of dust/hair	Respiratory diseases	No use of dust mask
DESALTING	Hitting, loading, unloading hides/skins	Heavy load	Musculoskeletal injuries	Poor lifting practices
		Contact with infected skins	Anthrax	Handling material without personal protective equipment
		Contact with loosened salt and insecticides	Skin allergies	No use of protective footwear
		Inhalation of dust/hair	Respiratory diseases	No use of dust mask
		Contact with unguarded moving machine parts of desalting drum	Injuries	Missing barrier and drive guards

HEALTH HAZARDS AND SAFETY RISKS IN BEAMHOUSE OPERATIONS



The beamhouse processes have a decisive effect on the quality of the finished leather. The tasks performed are to clean the raw material of any surface contamination, rewet hides/skins, remove salt, hair and flesh. The raw material is prepared for tanning. The processes take place in generally wet and humid conditions.

Soaking

During soaking (done either in pits, paddles or drums) the natural humidity condition of hides/skins is restored and dirt, soluble proteins and curing agents removed. Auxiliary chemicals such as enzymes, wetting agents, for speeding the soaking process of salted and dried raw material or for preliminary loosening of hair may be added. Workers are mainly engaged in loading and unloading the raw material into/from pits, paddles and drums. In traditional pit tanneries, the workers enter into the pits and trample the raw material with their feet to ensure proper soaking.

Liming

At this stage hair or wool and epidermis are removed from the raw hides/skins. While doing so, the collagen fibre texture of the raw material is loosened and the raw material opened up. Liming is done in pits, paddles or drums. During the process, lime, sodium sulphide, sodium hydrosulphide and/or enzymes are added, resulting in the destruction or loosening of hair. A mixture of lime and sodium sulphide can be painted on the flesh side. Other chemicals are directly added into the float. The loosened hair is removed either manually or mechanically, the wool is plucked. Workers are mainly engaged in preparing/dosing the chemicals as well as loading and unloading the raw material into/from pits, paddles and drums. In traditional pit tanneries, the workers enter into the pits and trample the raw material with their feet to ensure better effect of chemicals on the raw material.

Fleshing

In the fleshing operation, done either manually or mechanically, flesh and grease are removed from flesh side, rendering the flesh side of the raw material more or less even. In manual fleshing, workers place the limed raw material on wooden beams and scrape off the flesh, using long curved fleshing knives. For mechanical removal of flesh, a rotating knife cylinder achieves the fleshing effect. For this purpose the operator(s) place the raw material on the feed roller of the fleshing machines, while helpers hand/take over the raw material to/from the operator.

Lime splitting

Fleshed and limed pelt can be split in two pieces. This is one way to achieve desired thickness of finished leather mainly on bovine hides. The advantage is saving of chemicals at the stage of tanning. Limed splits can be converted into useful by-products.

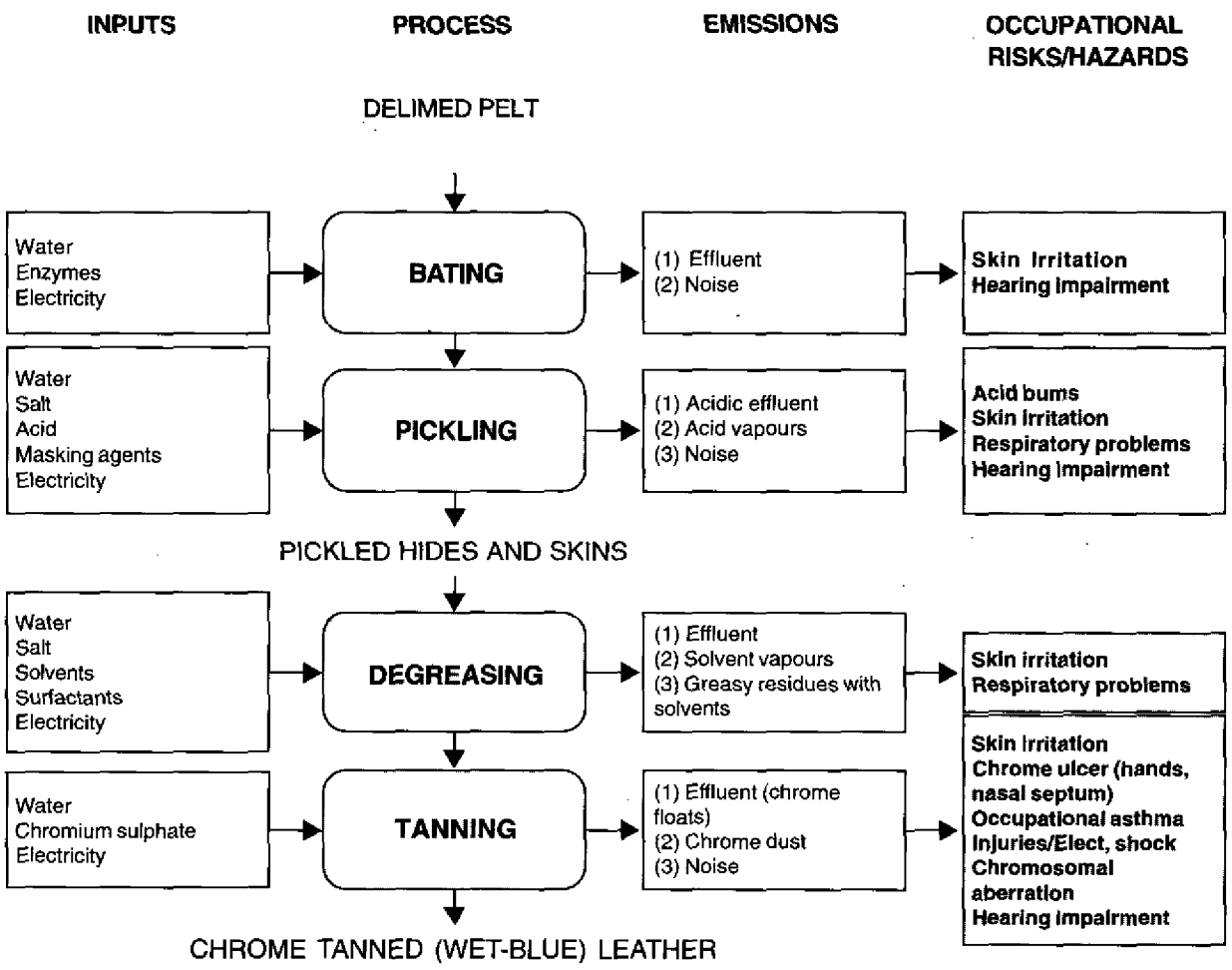
Deliming

After unhairing and fleshing, the pelt is placed in paddles or drums and chemicals added to delime and prepare it for tanning. The simplest and most common way to remove lime is to use ammonium sulphate or ammonium chloride by which the lime is converted in soluble salts. During the process a high proportion of nitrogen is discharged with the effluent. An alternative method for deliming is by using carbon dioxide. But this method requires availability of liquid carbon dioxide and additional process control equipment. Workers are mainly engaged in loading and unloading the pelt into/from paddles and drums and in adding chemicals. While checking on progress during the deliming process, workers get exposed to gas and mist generated during the process.

PRODUCTION STAGE	TASKS	SAFETY RISKS/ HEALTH HAZARDS	HEALTH EFFECTS	UNSAFE WORK PRACTICES
SOAKING	Loading, unloading, tumbling (pit soaking) hides/skins	Heavy load	Musculoskeletal injuries	Poor carrying practices, non-use of mechanical means
		Contact with infected skins/hides	Anthrax	Handling material without personal protective equipment
		Contact with soaking liquor (dirt, dung, salt, insecticides)	Skin allergies	Non-use of personal protective equipment
		Contact with moving machine parts	Injuries	Missing guards on paddle/drum drive and prime movers
		Contact with poor electrical installations	Electrical shocks	Incorrect degree of protection of electrical motors poor electrical maintenance
		Fall due to slippery floors	Injuries	Poor drainage of soaking liquors
		Fall into pits	Injuries	Unguarded pits and floor opening
LIMING/UNHAIRING	Loading, unloading, tumbling (pit liming) hides/skins	Heavy load	Musculoskeletal injuries	Poor carrying practices, non-use of mechanical means
		Contact with effluent (lime, enzymes, sodium sulphide)	Skin allergies	Non-use of personal protective equipment
			Eye irritation	Non-use of splash goggles
		Contact with moving machine parts	Injuries	Missing guards on paddle/drum drive and prime movers
		Contact with poor electrical installations	Electrical shocks	Incorrect degree of protection of electrical motors poor electrical maintenance
		Fall due to slippery floors	Injuries	Poor drainage of effluent
		Fall into pits	Injuries	Unguarded pits and floor opening
	Lime preparation and dosing	Inhalation and exposure to lime dust	Respiratory problems	Non-use of dust mask during handling of lime powder
			Eye irritation	Non-use of goggles during handling of lime powder

PRODUCTION STAGE	TASKS	SAFETY RISKS/ HEALTH HAZARDS	EFFECTS	UNSAFE WORK PRACTICES
	Wool plucking	Work posture (hand fleshing)	Low back pain	
		Contact with chemicals (lime, sodium sulphide)	Skin allergies	Non-use of personal protective equipment
FLESHING	Handling, feeding hides/skins	Work posture (hand fleshing)	Low back pain	
		Contact with fleshing cylinder	Injuries to fingers and hand	Absence of active guards on fleshing machine
		Contact with moving machine parts	Injuries	Missing passive guards on gears and prime movers
		Contact with poor electrical installations	Electrical shock	Incorrect degree of protection of electrical motors poor electrical maintenance
		Fall due to slippery floors	Injury	Poor draining of water and poor removal of fleshings
	Maintenance work	Contact with fleshing cylinder	Injuries to fingers and hands	Manual sharpening of rotating cylinder
DELIMING	Loading, unloading hides/skins	Contact with deliming liquor	Skin allergies	Non-use of personal protective equipment
		Fall due to slippery floor	Injuries	Poor drainage of liquors
	Checking/process control	Inhalation of ammonia vapour	Respiratory problems	Poor ventilation of drum and drum yard, no use of respirator
		Inhalation of carbon dioxide		
		Contact with moving machine parts	Injuries	Missing guards on paddle/drum drives and prime movers
		Contact with poor electrical installations	Electrical shocks	Incorrect degree of protection of electrical motors poor electrical maintenance
	Housekeeping	Inhalation of hydrogen sulphide gas	Gas poisoning	Uncontrolled missing of effluent streams from liming/deliming and pickling

HEALTH HAZARDS AND SAFETY RISKS IN TANYARD OPERATIONS



Before tanning the pelt, preparatory steps include bating, scudding, pickling and degreasing (the last depending on the raw material). All processes are usually carried out in drums.

Bating

During bating the fibre texture of the pelt is further loosened and peptized, while eliminating alkali swelling of the pelt. For this purpose bating agents, often fed with enzymes, are added.

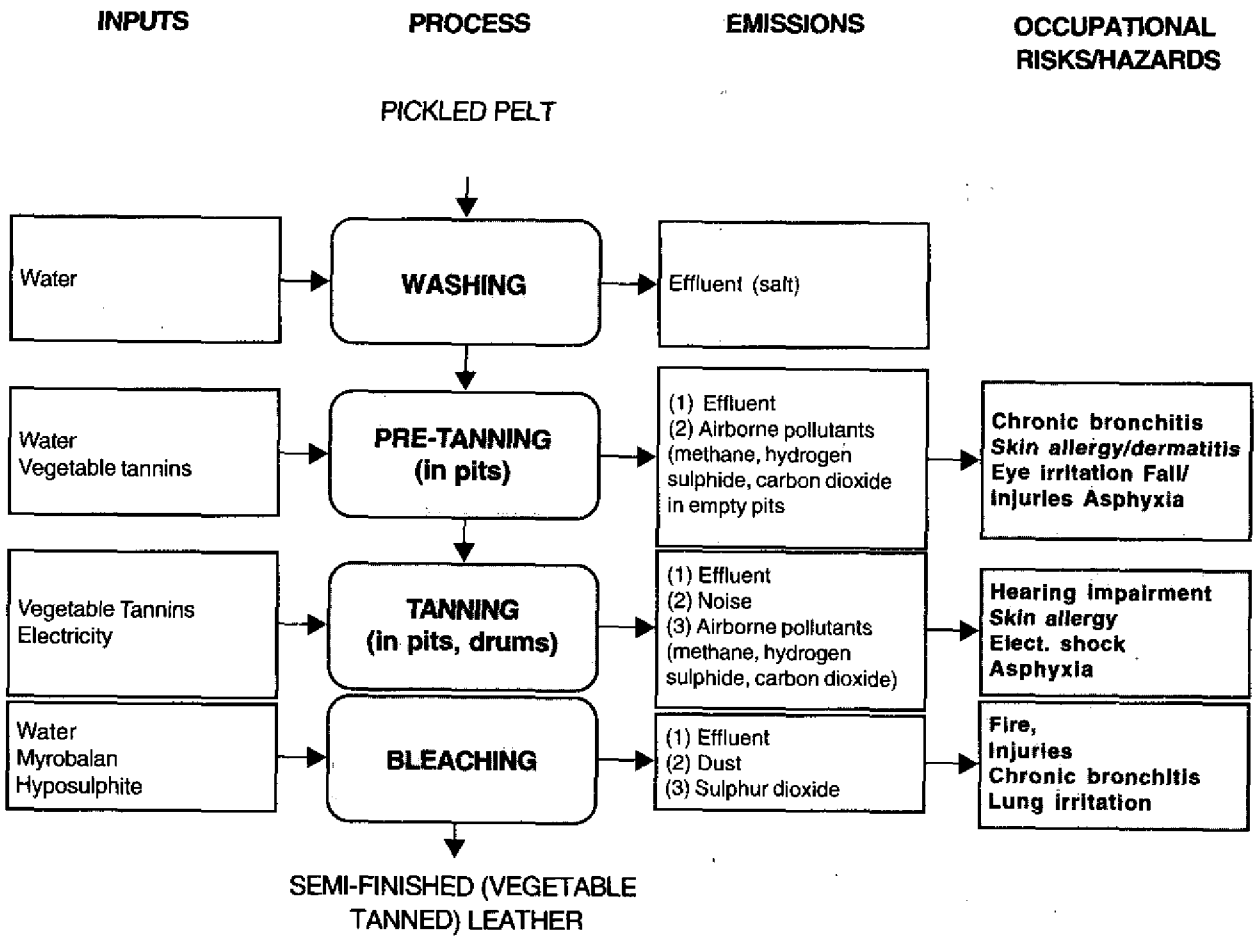
Pickling

Pickling consists of adjusting the pH of the pelts with acid in order to prepare the pelt for tanning. Conventional pickling processes employ formic acid and/or sulphuric acid as well as sodium formate and sodium chloride.

Degreasing

Sheep skins have to be degreased. For this purpose, the pelt is treated with wetting agents or emulsifiers only or in combination with heavy solvent. The process is usually done in drums.

A second method would be with the help of chlorinated solvents, using dry cleaning machines in case of wool tanning.



Tanning

The perishable pelts are converted into durable leather. A substantial quantity of leather produced in the world is tanned with chrome. The rest is either tanned using vegetable extracts or other tanning agents. The tanning agents cross-link the collagen chains of the pelt, stabilise it against enzymatic degradation, increasing its resistance to chemicals and hot water, enhancing its strength, lowering the density by isolating the fibres, reducing its deformability as well as shrinkage in volume, area and thickness. Depending on type of tannage applied, different further process steps are involved at this stage. At all these stages workers are mainly engaged in loading and unloading material into/from drums. Sometimes, workers climb into the drums to remove stuck material. Preparation of chemical recipes is mostly done near the drums. The chemicals are dosed into the drums either through the vent hole or the drum door opening.

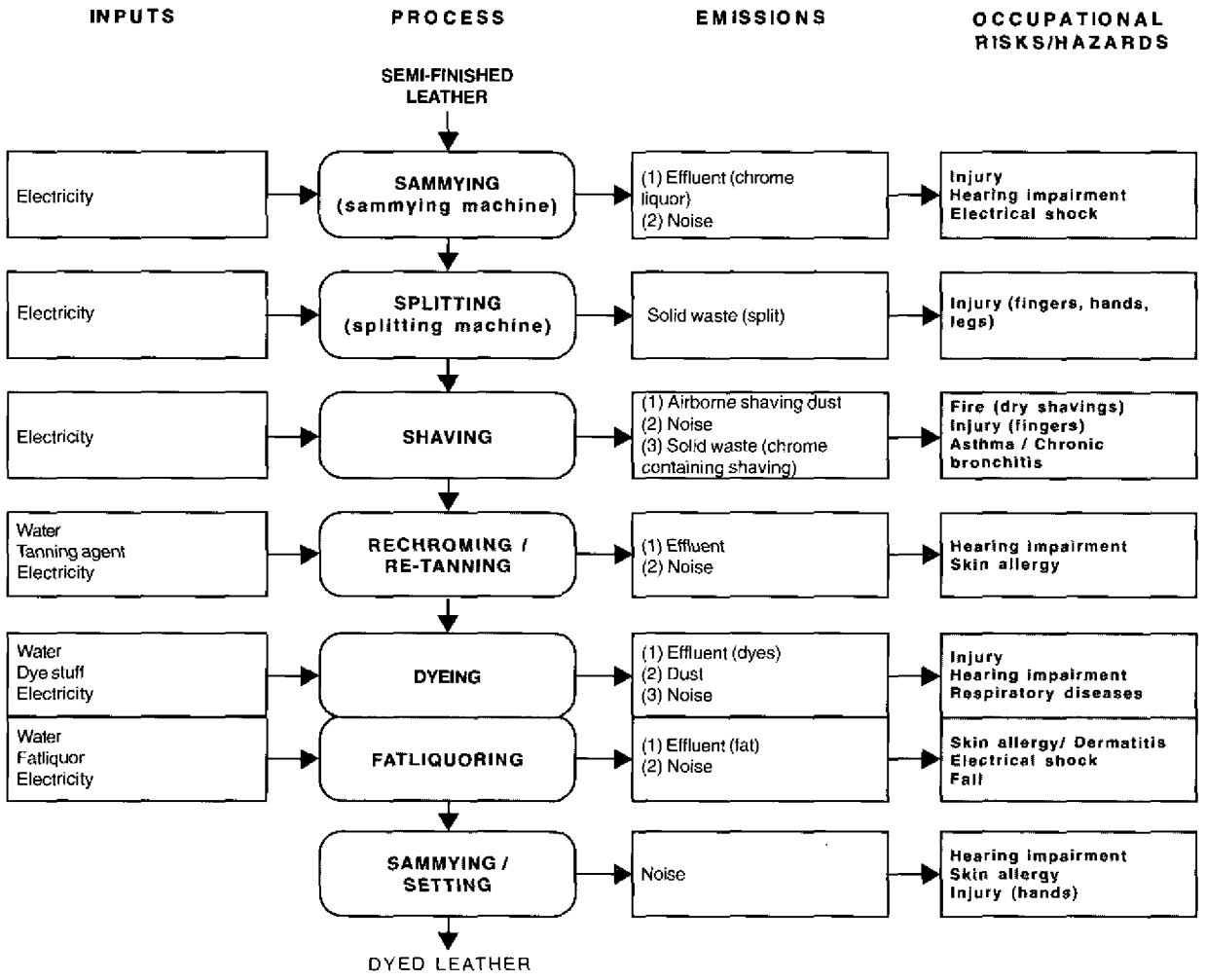
PRODUCTION STAGE	TASKS	SAFETY RISKS/ HEALTH HAZARDS	EFFECTS	UNSAFE WORK PRACTICES
BATING/PICKLING	Preparation and dosing chemicals	Contact with bating agents	Skin allergies	Poor dosing practices, non-use of personal protective equipment
		Contact with acid	Acid burns	
		Inhalation of acid fumes	Respiratory problems	Poor mixing practices, non-use of suitable respirator
		Fall due to slippery floors	Injuries	Poor drainage of bating liquors
	Housekeeping	Inhalation of hydrogen sulphide gas	Gas poisoning	Uncontrolled missing of effluent streams from liming/deliming and pickling
DECREASING (SHEEP)	Preparation and dosing of solvents	Contact with solvents	Skin allergies	Poor dosing practices, non-use of personal protective equipment
		Inhalation of solvent vapours	Respiratory problems	Poor ventilation, non-use of adequate respirator
		Accumulation of solvent vapours	Fire	Poor ventilation
		Fall due to slippery floors	Injury	Poor draining of degreasing liquor and poor removal of greasy residues

CHROME TANNING

CHROME TANNING	Loading, unloading pelts	Contact with chrome liquor	Skin allergies	Non-use of personal protective equipment
		Contact with chromium VI (dust, liquor)	Chrome ulcer (on hands and nasal septum)	Non-use of personal protective equipment
		Fall due to slippery dust	Injuries	Poor drainage of liquors
	Preparation and dosing of tanning agents	Inhalation of chrome dust	Respiratory problems asthma	Poor ventilation of preparation area, non-use of dust mask
		Contact with tanning agents	Skin allergies	Non-use of personal protective euipment
	General	Contact with moving machine parts	Injuries	Missing guards on drum drives and prime movers, missing drum barriers
		Contact with poor electrical installations	Electrical shocks	Incorrect degree of protection of electrical motors, poor electrical maintenance
		Exposure to machine noise	Hearing impairment	No noise control measures (e.g. maintenance, use of hearing protection)

PRODUCTION STAGE	TASKS	SAFETY RISKS/ HEALTH HAZARDS	EFFECTS	UNSAFE WORK PRACTICES
VEGETABLE TANNING				
WASHING	Handling pelts	Contact with salt	Skin allergies	Non-use of personal protective equipment
PRE-TANNING (VEGETABLE)	Preparation and dosing of vegetable tanning agents	Inhalation of and exposure to dust	Respiratory problems (bronchitis)	Poor ventilation, non-use of dust masks
			Eye irritation	
		Accumulation of dust	Fire	Poor housekeeping
	Loading, unloading, tumbling (pit) pelts	Contact with effluent	Skin allergies	Poor work practices, non-use of personal protective equipment
		Fall due to slippery floor	Injuries	Poor drainage of liquors
	General (in empty and stagnant pits)	Inhalation of methane, carbon dioxide and hydrogen sulphide gas	Asphyxia, respiratory problems, gas poisoning	Poor work practices, non-use of personal protective equipment
TANNING/BLEACHING/ MYROBING	Preparation and dosing of vegetable tanning agents	Inhalation of and exposure to dust	Respiratory problems (bronchitis)	Poor ventilation, non-use of dust masks
			Eye irritation	
		Accumulation of dust	Fire	Poor housekeeping
	Loading, unloading, tumbling (pit) pelts	Contact with effluent	Skin allergies	Poor work practices, non-use of personal protective equipment
		Fall due to slippery floor	Injuries	Poor drainage of liquors
	General	Contact with moving machine parts	Injuries	Missing guards on drum drives and prime movers, missing drum barriers
		Contact with poor electrical installations	Electrical shocks	Incorrect degree of protection of electrical motors, poor electrical maintenance
		Exposure to machine noise	Hearing impairment	No noise control measures (e.g. maintenance, use of hearing protection)
	General (in empty and stagnant pits)	Inhalation of methane, carbon dioxide and hydrogen sulphide gas	Asphyxia, respiratory problems, gas poisoning	Poor work practices, non-use of personal protective equipment

HEALTH HAZARDS AND SAFETY RISKS IN POST-TANNING/WET-FINISHING



While the production processes from raw to semi-finished leather do not vary much with regard to process sequence and type of inputs/chemicals, a much larger variety of processes and process chemicals are applied while converting semi-finished leather to finished leather. Some typical operations in the post-tanning/wet-finishing stage have been included.

Sammying (wet-blue leather)

Using a multi-roller type machine, excess water is squeezed out of the wet-blue leather to prepare it for wet-blue splitting (if not already done at the liming stage).

Shaving

In the shaving process, using a multi-roller type machine, the surface on the flesh side of the leather is scraped off to achieve uniform thickness of the leather. This operation is carried on dry (=> dust generation!) or wet leather.

Re-tanning

Following the grading of semi-finished leather after tanning, the various grades of leather may be found to have different chromium content in the base, resulting in unacceptable variations of coloration of leather during the dyeing process. During re-tanning, chromium salts or a variety of other tanning agents may

be applied, which facilitate the fixing of dyes in a later process.

Neutralising

After re-chroming, the pH value of the leather has to be adjusted. For this purpose, chemicals such as sodium formate, syntans or sodium bi-carbonate are added.

Dyeing

The leather is given specific coloration using a variety of dyes and pigments. A small group of azo-dyes and pigments which may form carcinogenic aromatic amines are widely prohibited. Occasionally, dye auxiliaries such as ammonia or formic acid are added.

Fatliquoring

Since the fibre elements of the leather get dehydrated during the tanning process, the leather is given some fatliquoring to lubricate the fibres and to give it already specific characteristics and tensile strength. Occasionally, water repellents based on organic solvents or organic halogen compounds are applied.

Setting

Since leather is likely to be roughed up during the drum operations (re-tanning, neutralising, dyeing and fatliquoring) the leather is passed through another multi-roller type machine, rendering the grain side flat while squeezing remaining excess moisture off the leather. This operation can be combined with sammying process.

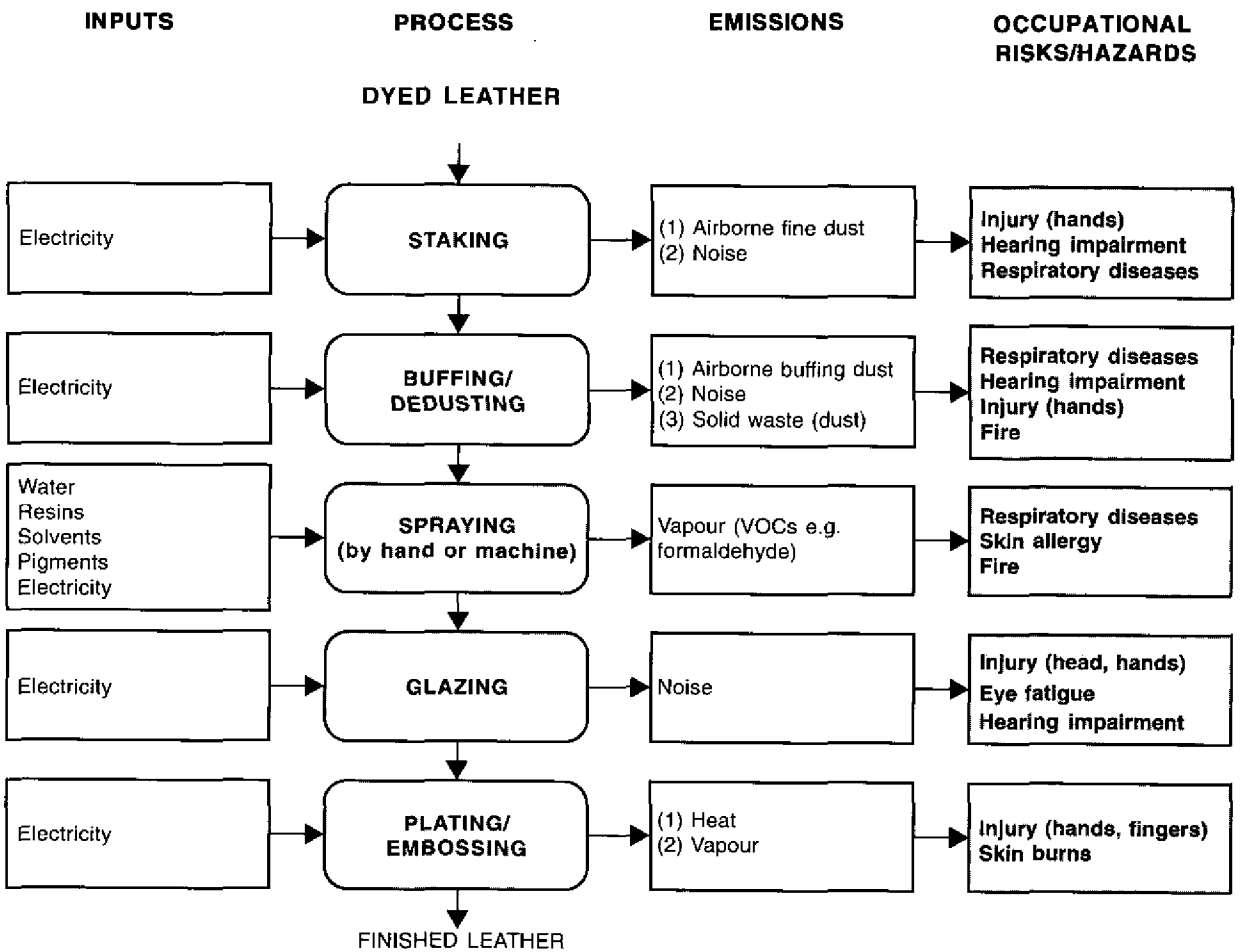
Drying

As one of the last steps in the wet-finishing operations, the leather needs to be dried, either using natural or other means of drying.

PRODUCTION STAGE	TASKS	SAFETY RISKS/ HEALTH HAZARDS	EFFECTS	UNSAFE WORK PRACTICES
SAMMYING	Handling of material in process	Contact with effluent	Skin allergies	Poor drainage, non-use of personal protective equipment
		Contact with moving machine parts	Injuries	Missing guards on gears and prime movers, no active guards on rollers
		Contact with poor electrical installations	Electrical shocks	Incorrect degree of protection of electrical motors, poor electrical maintenance
		Exposure to machine noise	Hearing impairment	Absence of noise control measures (e.g. maintenance, use of hearing protection)
SPLITTING	Handling of material in process	Contact with band knife	Injuries to tip of fingers and hands	Absence of active guard on feed rollers and band knife
		Contact with moving machine parts	Injuries	Missing passive guards on gears and prime movers
	Maintenance work	Contact with band knife	Injuries to hands and legs	Non-use of special cut-proof gloves during changing of band knife
SHAVING	Handling of material in process	Contact with shaving cylinder	Injuries to tips of fingers	Absence of active guard on shaving cylinder
		Contact with moving machine parts	Injuries	Missing guards on gears and prime movers
		Inhalation of dry shaving dust	Respiratory problems (asthma, bronchitis)	Missing or inadequate local exhaust facility, non-use of dust mask
		Accumulation of dry shaving dust	Fire	Poor housekeeping
RECHROMING/TANNING	SEE TANNING			
DYEING/ FATLIQUORING	Preparation and dosing of chemicals	Inhalation of and exposure to dust	Respiratory problems (bronchitis)	Poor ventilation, non-use of dust masks
			Eye irritation	
		Contact with dyes/ pigments	Skin allergies	Poor work practices, non-use of personal protective equipment

PRODUCTION STAGE	TASKS	SAFETY RISKS/ HEALTH HAZARDS	EFFECTS	UNSAFE WORK PRACTICES
	Loading, unloading material in process	Contact with effluent	Skin allergies	Poor work practices, non-use of personal protective equipment
		Fall due to slippery floor	Injuries	Poor drainage of liquors
	General	Contact with moving machine parts	Injuries	Missing passive guards on drum drives and prime movers, missing drum barriers
		Contact with poor electrical installations	Electrical shocks	Incorrect degree of protection of electrical motors, poor electrical maintenance
		Exposure to machine noise	Hearing impairment	Absence of noise control measures (e.g. maintenance, use of hearing protection)
SETTING	Handling of material in process	Contact with setting cylinder	Injuries to tip of fingers and hand	Absence of active guard on feed rollers
		Contact with moving machin parts	Injuries	Missing passive guards on gears and prime movers
		Exposure to machine noise	Hearing impairment	Absence of noise control measures (e.g. maintenance, use of hearing protection)
DRYING (VACUUM DRYER)	Loading, unloading of material in process	Trapping by closing platen	Injuries to hand	Missing or inadequate active guard on closing mechanism
		Contact with hot platen	Burns to fingers	Non-use of heat protecting gloves
DRYING (HOOKS)	Hanging and removing of material in process	Hitting of hooks	Injuries to head	

HEALTH HAZARDS AND SAFETY RISKS IN FINISHING



The various dry finishing operations have the purpose of improving the serviceability of the leather by protecting it from damage by water, soil and mechanical action. Finishing modifies the shade, gloss and feel of leather, improves its physical properties such as light fastness and rub fastness and hides any defects or unevenness. Furthermore, finishing is used for obtaining special fashionable effects. Of the main processes only spraying is briefly highlighted.

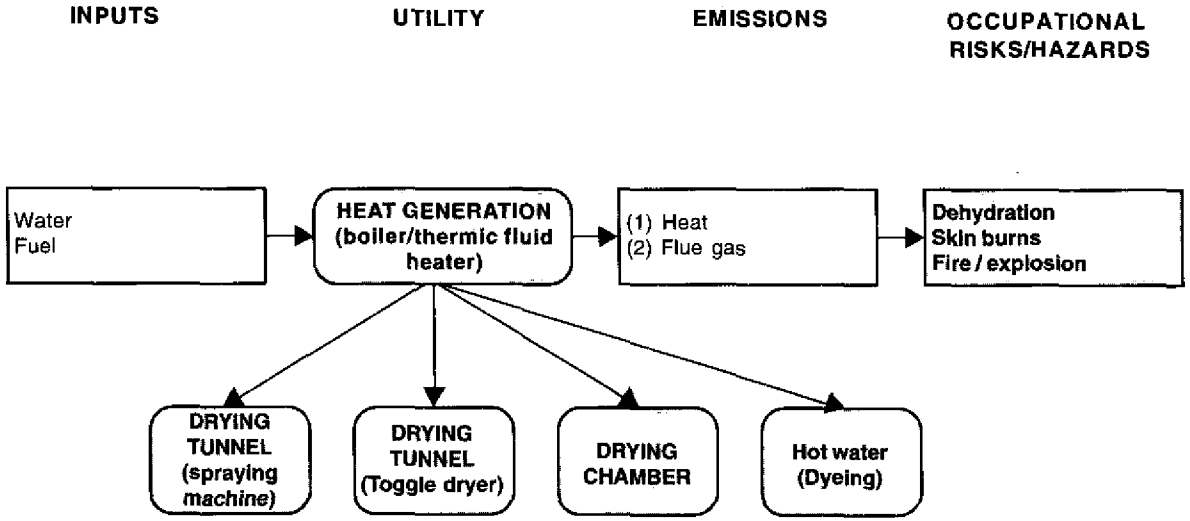
Spraying

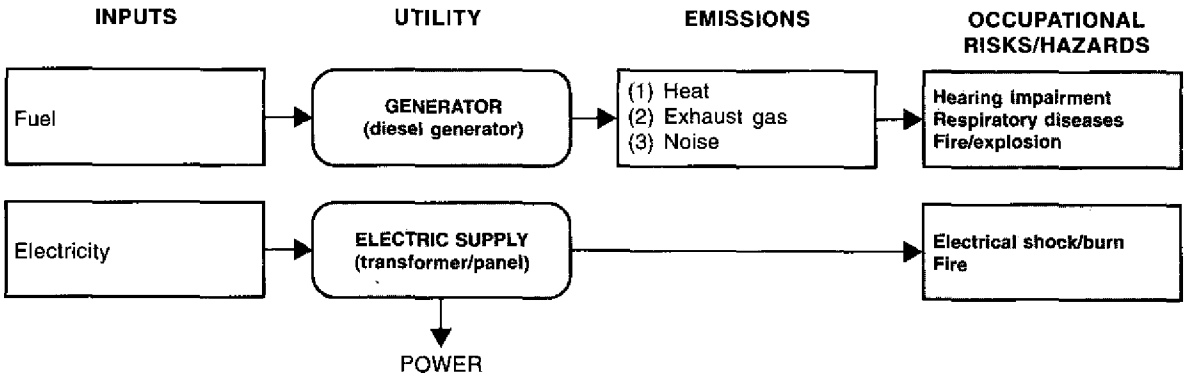
Conventional spraying operations apply resins and pigments mixed with organic solvents, using increasingly more environmental friendly aqueous based products. Small tanneries usually resort to handspraying, while larger tanneries use modern spray machines, equipped with microprocessor controlled spraying guns, or roller curtain/coating machines. Exhaust air and vapours are critical issues during spraying operations.

PRODUCTION STAGE	TASKS	SAFETY RISKS/ HEALTH HAZARDS	EFFECTS	UNSAFE WORK PRACTICES
STAKING	Handling of material in process	Inhalation of respiratory dust	Respiratory problems	Missing or inadequate extraction system, non-use of dust mask
		Contact with upper jaw arm	Injuries to fingers and hands	
		Contact with moving machine parts	Injuries	Missing passive guards on gears and prime movers
		Contact with poor electrical installations	Electrical shocks	Incorrect degree of protection of electrical motors, poor electrical maintenance
		Exposure to machine noise (vibration staking machine)	Hearing impairment	Absence of noise control measures (e.g. maintenance, use of hearing protection)
BUFFING/DEDUSTING	Handling of material in process	Inhalation of dust	Respiratory problems	Missing or inadequate extraction system, non-use of dust mask
		Accumulation of dust	Fire	Poor housekeeping
		Contact with buffing cylinder	Injuries to tips of finger	Missing active guard
		Contact with moving machine parts	Injuries	Missing passive guards on gears and prime movers
		Exposure to machine noise	Hearing impairment	Absence of noise control measures (e.g. maintenance, use of hearing protection)
SPRAYING	Preparation and dosing of chemicals	Inhalation of/exposure to solvent vapours	Respiratory problems	Poor ventilation, non-use of dust masks
			Eye irritation	
		Contact with solvents/ pigments	Skin allergies	Poor work practices, non-use of personal protective equipment
	Handling of material in process	Inhalation of solvent vapours	Respiratory problems	Missing or inadequate local exhaust ventilation, non-use of respirators
		Concentration of solvent vapours	Fire	Inadequate local exhaust ventilation and poor electrical installations

PRODUCTION STAGE	TASKS	SAFETY RISKS/ HEALTH HAZARDS	EFFECTS	UNSAFE WORK PRACTICES
GLAZING (GLAZING JACK)	Handling of material in process	Hit by moving glazing arm	Injuries to head and fingers	Absence of passive overhead guard
		Contact with moving machine parts	Injuries	Missing passive guards on gears and prime movers
		Poor quality of light	Eye fatigue	Missing or inadequate local light sources
		Contact with dyes/ pigments	Skin allergies	Poor work practices, non-use of personal protective equipment
PLATING/EMBOSSING	Loading, unloading of material in process	Trapping by plates	Injuries to hands	Absence of working interlocked active guard on closing mechanism
		Inhalation of vapours	Respiratory problems	Non-use of personal protective equipment

HEALTH HAZARDS AND SAFETY RISKS OF UTILITIES





Though utilities are not directly part of the leather production process, they form an essential component facilitating production by providing needed power/electricity, heat, steam or ensuring proper treatment of waste water generated during the production.

Heat generating facilities

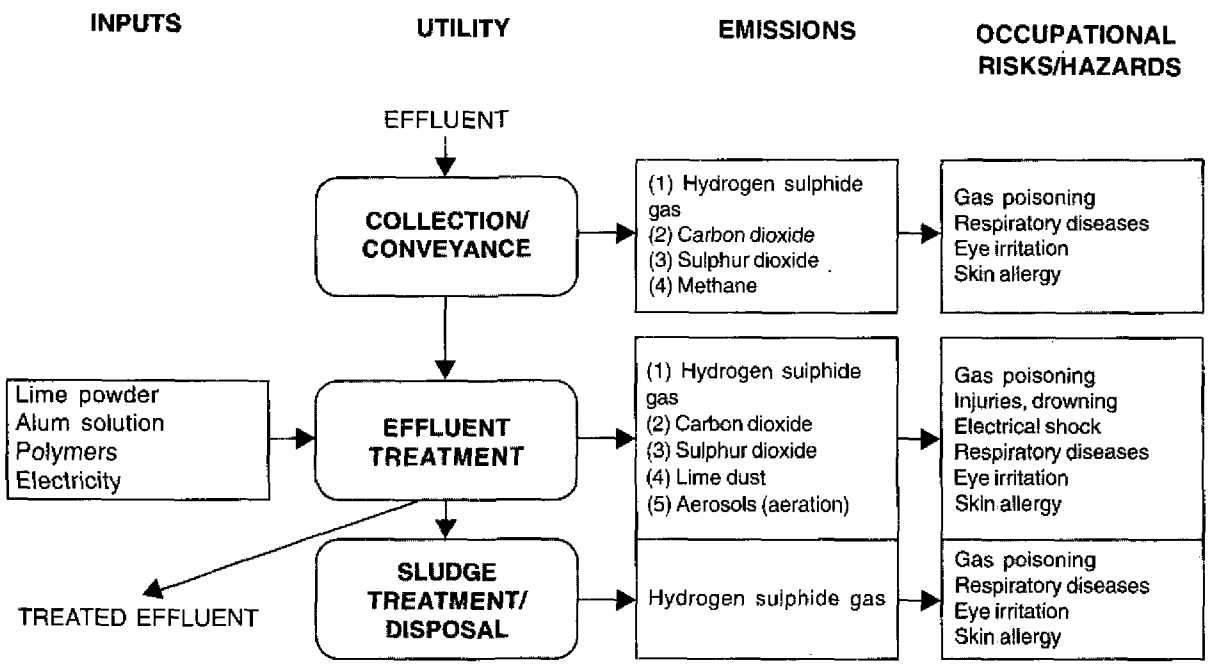
Usually, boilers or thermic fluid heaters are used in tanneries to generate heat or hot water, required for processes such as spraying, auto toggling, drying and dyeing.

Electrical power supply

The necessary power for running plant and machinery is supplied either through the public grid coming to the tannery through transformer and supply panel and/or the tannery's own generator set.

PRODUCTION STAGE	TASKS	SAFETY RISKS/ HEALTH HAZARDS	EFFECTS	UNSAFE WORK PRACTICES
BOILER SYSTEM	Operation	Exposure to radiant heat	Heat stroke/Exhaustion	Poor ventilation of work place
			Burns	Non-use of special gloves
		Contact with moving machine parts	Injuries	Missing passive guards on gears and prime movers
		Inhalation of flue gas	Respiratory problems	Missing or inadequate exhaust
	General		Fire/explosion	Poor maintenance
				Missing boiler water treatment
DIESEL GENERATOR	Operation/maintenance	Exposure to machine noise	Hearing impairment	Absence of noise control measures (e.g. maintenance, use of hearing protection)
		Inhalation of exhaust gas	Respiratory problems	Poor exhaust and ventilation
	General	Fuel	Fire/explosion	Poor storage practices
		Contact with moving machine parts	Injuries	Missing guards on gears and prime movers
		Exposure to machine noise	Hearing impairment	Absence of noise control measures (e.g. maintenance, use of hearing protection)
ELECTRICAL SUPPLY	Operation/maintenance	Transformer	Electrical shocks	Absence of proper fencing for prevention of access to transformer
		Transmission lines		Poor maintenance practices, nonuse of special personal protective equipment
			Fire	Poor housekeeping

HEALTH HAZARDS AND SAFETY RISKS IN EFFLUENT TREATMENT PLANTS



During the leather production process, various streams of wastewater are generated. If not discharged to a common treatment facility, the wastewater needs to be treated in the tannery's own treatment facility to comply with the respective national discharge standards.

Generally, while processing one kilogram of raw hides/skins into finished leather about 35 litres of wastewater is generated.

PRODUCTION STAGE	TASKS	SAFETY RISKS/ HEALTH HAZARDS	EFFECTS	UNSAFE WORK PRACTICES
COLLECTION/ CONVEYANCE	Cleaning/maintaining of manholes and pipelines	Inhalation of hydrogen sulphide gas	Gas poisoning	Non-use of air-supply systems and safety harness during entry into confined space
		Lack of oxygen	Asphyxiation	
		Contact with effluent	Skin allergies	Non-use of personal protective equipment
	Preparation dosing of treatment chemicals .	Inhalation of lime dust	Respiratory problems	Non-use of dust masks
		Contact with alum solution, polymers	Skin allergies	Non-use of personal protective equipment
TREATMENT SYSTEM	Operation	Fall/ slips	Injuries	Missing railings and guards on structures
			Drowning	Missing hand rails and toe guards on walkways and platforms, missing fencing of pits and tanks
		Contact with moving machine parts	Injuries	Missing passive guards on gears and prime movers
		Contact with corroded electrical installations	Electrical shocks	Incorrect degree of protection of electrical motors, poor electrical maintenance
	Cleaning/maintaining	*Inhalation of hydrogen* sulphide gas	*Gas poisoning*	*Non-use of air-supply systems and safety harness during* entry into confined space
SLUDGE LINE	Operation	Exposure to machine noise (centrifuge)	Hearing impairment	Absence of noise control measures (e.g. maintenance, use of hearing protection)
		Inhalation of hydrogen sulphide gas	Gas poisoning	Poor operating practices
	Cleaning/maintaining of sludge drying beds	Sludge	Skin allergies	Non-use of personal protective equipment during manual removal

CHECK FOR HAZARDOUS CHEMICALS IN YOUR TANNERY

Structure of enclosed list

The following list provides an overview of

- The main hazard associated to the substance.
- Threshold Limit Values (TLV) which are defined as
  - Time - Weighted Average: TWA (referring to permissible 8 hours continuous exposure),
  - Short - Term Exposure Limit: STEL (maximum permissible continuous exposure for a duration of 10 or 15 minutes). In the list below, STEL values refer to 10 minutes exposure.

At the end of the list of chemicals, you can find an overview of abbreviations internationally used to describe (a) risks associated with chemicals and (b) safety phrases of preventive and precautionary measures.

All chemicals are grouped according to their main use. The right hand column indicates in which processes these chemicals may be used.

Purpose of list

1. The list can be used to identify hazardous chemicals in your tannery and obtain first hand information on general hazards/risks and precautionary measures.
2. The threshold limit values (= occupational exposure limits) can be used as reference values during work place monitoring.

The list of chemicals has been based on

- *the most commonly used chemicals in the leather production*
- *various gases, fumes, vapours and mist which may be used during the process or may be released due to chemical reactions.*

The tick mark (✓) indicates that you have to pay attention whether this specific chemical is used in the tannery and how the workers are possibly exposed to it.

The list does not claim to be complete and has been prepared based on the status of 1993.

Substance	General hazard nature	TWA (ppm)	TWA (mg/m³)	STEL (ppm)	STEL (mg/m³)	Associated risks	Safety measures	Raw material store	Beam-house	Tanning	Dyeing and post-tanning	Finishing	(C)ETP
Antiseptics - pesticides													
4-Chloro-m-cresol	Harmful (Xn)					21/22, 38	26,28	✓					
Aldrin	Toxic (T)		0.25		0.75			✓					
Arsenic	Toxic (T)		0.02			23/25	1,2, 20/21,28, 44		✓				
Cresols	Toxic (T)	5	22			24/25/34, SK	2,28,44	✓					
DDT	Toxic (T)		1		3								
Malathion	Harmful (Xn)		10					✓					
Naphtalene		10	50	15	75			✓					
p-Nitrophenol	Harmful (Xn)								✓				
Pentachlorophenol	Toxic (T)		0.5		1..5	23/24/25, SK	28, 36/39, 44			✓			
Sodium hypochlorite (> 10%)	Corrosive (C) Oxidizing (O)					31,34	2,28	✓					
Sodium hypochlorite (5-10%)	*Irritant (Xi)*					31,36/38	2,25	✓					
Unhairing - depilation agents													
Dimethylamine	Flammable (R10) Irritant (Xi)	10	18			13,36/37	16,26,29		✓				
Mercaptoacetic acid	Toxic (T)	1	5			23/24/25, 34	2, 25,27, 28		✓				
Sodium hydrosulphide	Corrosive (C)								✓				
Sodium polysulphides	Corrosive (C)					31,34	26		✓				
Sodium sulphide	Corrosive (C)					31,34	26		✓				

Substance	General hazard nature	TWA (ppm)	TWA (mg/m^3)	STEL (ppm)	STEL (mg/m^3)	Associated risks	Safety measures	Raw material store	Beamhouse	Tanning	Dyeing and post-tanning	Finishing	(C)ETP
Alkalis													
Ammonia (solution 10-35%)	Irritant (Xi)	25	18	35	27	36/37/38	2,26				✓		
Ammonia (solution > 35%)	Corrosive (C)	25	18	35	27	34, 36/37/38	7,26		✓				
Calcium Hydroxide (lime)	Irritant (Xi)		5			32			✓				✓
Magnesium oxide - as fume			10							✓			
Potassium hydroxide	Corrosive (C)		2			35	2,26, 37/39		✓				
Sodium hydroxide (anhydrous caustic soda)	Corrosive (C)		2		2	35	2,26,27, 37/39		✓				
Sodium hydroxide (solution 1-5%)	Irritant (Xi)		2		2	36/38	2,26		✓				
Sodium hydroxide (solution > 5%)	Corrosive (C)		2		2	35	2, 26,27, 37/39		✓				
Acids													
Acetic acid (25-90%)	Corrosive (C)	10	25	15	37	34	2,23,26				✓		
Acetic acid (> 90%)	Flammable (R10) Corrosive (C)	10	25	15	37	10,35	2,23,26				✓		
Formic acid - solution (25-90%)	Corrosive (C)	5	9	10	19	34	2, 23,26			✓	✓		
Hydrochloric acid (10-25%)	Irritant (Xi)					36,38	2,28			✓			
Hydrochloric acid (> 25%)	Corrosive (C)					34,37	2,26			✓			
Sulphuric acid (5-15%)	Irritant (Xi)		1			35	2,26			✓	✓		
Sulphuric acid (> 15%)	Corrosive (C)		1			36,37,38	2, 26,30			✓	✓		
Degreasing agents													
Monochlorobenzen										✓			

Substance	General hazard nature	TWA (ppm)	TWA (mg/m³)	STEL (ppm)	STEL (mg/m³)	Asso-ciated risks	Safety mea-sures	Raw material store	Beam-house	Tanning	Dyeing and post-tanning	Finishing	(C)ETP
White spirit										✓			
Tanning agents													
Formaldehyde (solution 5-30%)	Irritant (Xi)	2	2.5	2	2.5	36/37, 43	2,26			✓			
Formaldehyde (solution >30%)	Toxic (T)	2	2.5	2	2.5	23/24/25, 43	2,26,28			✓			
Chromium (III)	Irritant (Xi)		0.5							✓			
Glutaraldehyde		0.2	0.8	0.2	0.8					✓			
Oxalolodines										✓			
Dyes													
Diphenylamine	Toxic (T)		10		20	23/24/25, 33	28, 36/37, 44				✓		
Benzidine	Toxic (T)	-	-	-	-	45,22	53,44				✓		
Fats													
Fatliquors	Irritant (Xi)										✓		
Decolouring agents													
Hydrogen peroxide (solution 20 -35%)	Corrosive (C)	1	1.5	2	3	34	28,39				✓		
Oxalic acid	Harmful (Xn)		1			21/22	2, 24/25				✓		
Solvents													
1,4-Dioxane	Highly Flammable (F) Harmful (Xn)	25	90	100	360	11,19, 20, SK	9,16,33					✓	
2-Isopropoxylethanol (Ethylene glycol monoisopropyl ether)	Irritant (Xi)					20/21,26	24/25					✓	

Substance	General hazard nature	TWA (ppm)	TWA (mg/m³)	STEL (ppm)	STEL (mg/m³)	Asso-ciated risks	Safety mea-sures	Raw material store	Beam-house	Tanning	Dyeing and post-tanning	Finishing	(C)ETP
2-Methylpropan-2-OL	Flammable (R10) Harmful (Xn)	100	300	150	450	11,20	9,16					✓	
2-Methylpropan-2-OL (tert-Butyl alcohol)	Highly Flammable (F) Harmful (Xn)	100	300	150	450	11,20	9,16					✓	
4-Hydroxy-4-Methyl-Pentan-2-ONE (Diacetone alcohol - technical)	Highly Flammable (F) Irritant (Xi)	50	240	75	360	11,36	7,16, 24/25					✓	
4-Hydroxy-4-Methyl-Pentan-2-ONE (Diacetone alcohol)	Irritant (Xi)	50	240	75	360	36	24/25					✓	
4-Methylpentan-2-ONE (Methyl isobutyl ketone)	Highly Flammable (F)	50	205	75	300	11,SK	9,16,23, 33					✓	
5-Methyl Heptan-3-ONE (Ethyl amyl ketone)	Highly Flammable (F) Irritant (Xi)	25	130			10,36/37	23					✓	
Acetone	Highly Flammable (F)	1000	2400	1250	3000	11	9,16,23, 33					✓	
Butan-1-OL		50	150	50	150							✓	
Butan-2-OL		100	300	100	300								
Butanol (all isomeres)	Flammable (R10) Harmful (Xn)	50	150	50	150	10,20	16					✓	
Butanol (all isomers)	Flammable (R10) Harmful (Xn)	50	150	50	150	11	9,16,23, 33					✓	
Butanone (Methyl ethyl ketone)	Highly Flammable (F) Irritant (Xi)	200	590	200	590	16, SK						✓	
Butyl acetate	Highly Flammable (F)	150	710	200	950	36/38						✓	
Carbon tetrachloride	Toxic (T)	10	65	20	130								
Cresols (all isomers)	Highly Flammable (F)	5	22			24/25,34, SK	2,28,44					✓	
Cyclohexane	Highly Flammable (F)	300	1050	375	1300	11	9,16,33					✓	
Cyclohexanone	Harmful (Xn)	25	100	100	400	10,20	25					✓	

Substance	General hazard nature	TWA (ppm)	TWA (mg/m³)	STEL (ppm)	STEL (mg/m³)	Asso-ciated risks	Safety mea-sures	Raw material store	Beam-house	Tanning	Dyeing and post-tanning	Finishing	(C)ETP
Dichloromethane	Harmful (Xn)	100	350	250	870								
Dimethylformamide	Harmful (Xn)	10	30	20	60	20/21,36, SK	26,28,36					✓	
Ethane-1,2-DIOL -particulate (ethylene glycol)	Harmful (Xn)		10			22	2					✓	
Ethane-1,2-DIOL -vapour (ethylene glycol)	Harmful (Xn)		60		125	22	2					✓	
Ethanol (Ethyl alcohol)	Highly Flammable (F)	1000	1900			11	7, 16					✓	
Ethyl acetate	Highly Flammable (F)	400	1400			11	16, 23, 29, 33					✓	
Ethyl formate	Highly Flammable (F)	100	300	150	450	11	9,16,33					✓	
Heptan-3-ONE (Butyl ethyl ketone)	Flammable (R10) Harmful (Xn)	50	230	75	345	10,20,36	24					✓	
N-Amyl acetate (Pentyl acetate)	Flammable (R10)	100	530	150	800	10	23					✓	
N-Butyl acetate	Flammable (R10)	150	710	200	950	11	16,23, 29,33					✓	
n-Hexane (< 5% N-Hexane)	Highly Flammable (F)	100	360	125	450	11	9,16,23 29,33					✓	
n-Hexane (5%+ N-Hexane)	Flammable (R10) Harmful (Xn)	100	360	125	450	11,20/21, 40	9,16,23					✓	
Pentan-3-ONE (Diethyl ketone)	Highly Flammable (F)	200	700	250	875	11	9,16,33					✓	
Propan-1-OL (Propyl alcohol)	Highly Flammable (F)	200	500	250	625	11,SK	7,16					✓	
Propan-2-OL (iso-propanol)		400	980	500	1225	11,SK	7,16					✓	
Toluene	Highly Flammable (F) Harmful (Xn)	100	375	150	560	11,20,SK	16,29,33					✓	
Trimethylbenzene (all isomers)	Flammable (R10) Irritant (Xi)	25	125	35	170	10,37						✓	
Xylene	Flammable (R10) Harmful (Xn)	100	435	150	650	10,20,SK	24/25					✓	

Substance	General hazard nature	TWA (ppm)	TWA (mg/m^3)	STEL (ppm)	STEL (mg/m^3)	Associated risks	Safety measures	Raw material store	Beam-house	Tanning	Dyeing and post-tanning	Finishing	(C)ETP
Pigments													
Cadmium sulphide pigments	Irritant (Xi)		0.04			20/21/22	22					✓	
Calcium sulphide	Irritant (Xi)					10						✓	
Carbon-black			3.5		7	31, 36/37/38	28					✓	
Titanium dioxide - inhalable dust			10									✓	
Titanium dioxide - respirable			5									✓	
Resins (finishing)													
Acrylates	Irritant (Xi)					36/37/38	26,28					✓	
Nitrocellulose (can also be a solvant)	Highly Flammable (F)					11	16,33, 37/39					✓	
Auxiliaries and others (finishing)													
Aziridine	Highly Flammable (F) Toxic (T)	0.5	1									✓	
Formaldehyde - solution (5-30%)	Irritant (Xi)	2	2.5	2	2.5	36/37, 43	2,26					✓	
Produced gases													
Hydrogen Sulphide (H_2S)	Toxic (T)	10	14	15	21				✓	✓			✓
Sulfur Dioxide (SO_2)	Toxic (T)	2	5.2	5	13	23,36/37	7/9-44		✓	✓			
Maintenance													
Acetylene	Highly Flammable (F)	-	-	-	-								
Tetrachloroethylene	Harmful (Xn)	50	335	150	1000								
Trichloroethylene	Harmful (Xn)	100	535	150	802								
White spirit	Flammable (R10)	100	575	125	720								

List of hazard abbreviations

INDICATION OF PARTICULAR RISKS - R

1 EXPLOSIVE WHEN DRY

2 RISK OF EXPLOSION BY SHOCK, FRICTION, FIRE OR OTHER SOURCES OF IGNITION

3 EXTREME RISK OF EXPLOSION BY SHOCK, FRICTION, FIRE OR OTHER SOURCES OF IGNITION

4 FORMS VERY SENSITIVE EXPLOSIVE METALLIC COMPOUNDS

5 HEATING MAY CAUSE AN EXPLOSION

6 EXPLOSIVE WITH OR WITHOUT CONTACT WITH AIR

7 MAY CAUSE FIRE

8 CONTACT WITH COMBUSTIBLE MATERIAL MAY CAUSE FIRE

9 EXPLOSIVE WHEN MIXED WITH COMBUSTIBLE MATERIAL

10 FLAMMABLE

11 HIGHLY FLAMMABLE

12 EXTREMELY FLAMMABLE

13 EXTREMELY FLAMMABLE LIQUEFIED GAS

14 REACT VIOLENTLY WITH WATER

15 CONTACT WITH WATER LIBERATES HIGHLY FLAMMABLE GASES

16 EXPLOSIVE WHEN MIXED WITH OXIDISING SUBSTANCES

17 SPONTANEOUSLY FLAMMABLE IN AIR

18 IN USE, MAY FORM FLAMMABLE/EXPLOSIVE VAPOUR-AIR MIXTURE

19 MAY FORM EXPLOSIVE PEROXIDES

20 HARMFUL BY INHALATION

21 HARMFUL IN CONTACT WITH SKIN

22 HARMFUL IF SWALLOWED

23 TOXIC BY INHALATION

24 TOXIC IN CONTACT WITH SKIN

25 TOXIC IF SWALLOWED

26 VERY TOXIC BY INHALATION

27 VERY TOXIC IN CONTACT WITH SKIN

28 VERY TOXIC IF SWALLOWED

29 CONTACT WITH WATER LIBERATES TOXIC GAS

30 CAN BECOME HIGHLY FLAMMABLE IN USE

31 CONTACT WITH ACIDS LIBERATES TOXIC GAS

32 CONTACT WITH ACIDS LIBERATES VERY TOXIC GAS

33 DANGER OF CUMULATIVE EFFECTS

34 CAUSES BURNS

35 CAUSES SEVERE BURNS

36 IRRITATING EYES

37 IRRITATING RESPIRATORY SYSTEMS

38 IRRITATING SKIN

39 DANGER OF VERY SERIOUS IRREVERSIBLE EFFECTS

40 POSSIBLE RISK OF IRREVERSIBLE EFFECTS

41 RISK OF DAMAGE TO EYES

42 MAY CAUSE SENSITISATION BY INHALATION

43 MAY CAUSE SENSITISATION BY SKIN CONTACT

44 RISK OF EXPLOSION IF HEATED UNDER CONFINEMENT

45 MAY CAUSE CANCER

46 MAY CAUSE HERITABLE GENETIC DAMAGE

47 MAY CAUSE BIRTH EFFECTS

48 DANGER OF SERIOUS DAMAGE TO HEALTH BY PROLONGED EXPOSURE

COMBINATION OF PARTICULAR RISKS - R

14/15 REACT VIOLENTLY WITH WATER, LIBERATING HIGHLY FLAMMABLE GASES

15/29 CONTACT WITH WATER LIBERATES TOXIC AND HIGHLY FLAMMABLE GASES

20/21 HARMFUL BY INHALATION AND IN CONTACT WITH SKIN

20/21/22 HARMFUL BY INHALATION, IN CONTACT WITH SKIN AND IF SWALLOWED

20/22 HARMFUL IF SWALLOWED

21/22 HARMFUL IN CONTACT WITH SKIN AND IF SWALLOWED

23/24 TOXIC BY INHALATION AND IN CONTACT WITH SKIN

23/24/25 TOXIC BY INHALATION, IN CONTACT WITH SKIN AND IF SWALLOWED

23/25 TOXIC BY INHALATION AND IF SWALLOWED

24/25 TOXIC IN CONTACT WITH SKIN AND IF SWALLOWED

26/27 VERY TOXIC BY INHALATION AND IN CONTACT WITH SKIN

26/27/28 VERY TOXIC BY INHALATION AND IN CONTACT WITH SKIN INHALATION AND IF SWALLOWED

26/28 VERY TOXIC BY INHALATION AND IF SWALLOWED

27/28 VERY TOXIC IN CONTACT WITH SKIN AND IF SWALLOWED

36/37 IRRITATING EYES AND RESPIRATORY SYSTEMS

36/37/38 IRRITATING EYES, RESPIRATORY SYSTEMS AND SKIN

36/38 IRRITATING EYES AND SKIN

37/38 IRRITATING RESPIRATORY SYSTEMS AND SKIN

42/43 MAY CAUSE SENSITISATION BY INHALATION AND BY SKIN CONTACT

SAFETY PRECAUTIONS REQUIRED - S

1	KEEP LOCKED UP
2	KEEP OUT OF REACH OF CHILDREN
3	KEEP IN COOL PLACE
4	KEEP AWAY FROM LIVING QUARTERS
5	KEEP CONTENTS UNDER (APPROPRIATE LIQUID TO BE SPECIFIED BY THE MANUFACTURER)
6	KEEP UNDER (INERT GAS TO BE SPECIFIED BY MANUFACTURER)
7	KEEP CONTAINER TIGHTLY CLOSED
8	KEEP CONTAINER DRY
9	KEEP CONTAINER IN A WELL VENTILATED PLACE
12	DO NO KEEP THE CONTAINER SEALED
13	KEEP AWAY FROM FOOD, DRINK AND ANIMAL FEEDING STUFFS
14	KEEP AWAY FROM (INCOMPATIBLE MATERIAL TO BE INDICATED BY MANUFACTURER)
15	KEEP AWAY FROM HEAT
16	KEEP AWAY FROM SOURCES OF IGNITION - NO SMOKING
17	KEEP AWAY FROM COMBUSTIBLE MATERIAL
18	HANDLE AND OPEN CONTAINER WITH CARE
20	WHEN USING DO NOT EAT AND DRINK
21	WHEN USING DO NOT SMOKE
22	DO NOT BREATHE DUST
23	DO NOT BREATHE GAS/FUMES/VAPOURS/SPRAY
24	AVOID CONTACT WITH SKIN
25	AVOID CONTACT WITH EYES
26	IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF WATER AND SEEK MEDICAL ADVICE
27	TAKE OFF IMMEDIATELY ALL CONTAMINATED CLOTHING
28	AFTER CONTACT WITH SKIN, WASH IMMEDIATELY
29	DO NOT EMPTY INTO DRAINS
30	NEVER ADD WATER TO THIS PRODUCT
33	TAKE PRECAUTIONARY MEASURES AGAINST STATIC DISCHARGE
34	AVOID SHOCK AND FRICTION
35	THIS MATERIAL AND ITS CONTAINER MUST BE DISPOSED OF IN A SAFE WAY
36	WEAR SUITABLE PROTECTIVE CLOTHING
37	WEAR SUITABLE GLOVES
38	IN CASE OF INSUFFICIENT VENTILATION, WEAR SUITABLE RESPIRATORY EQUIPMENT
39	WEAR EYE/FACE PROTECTION
40	TO CLEAN FLOOR AND ALL OBJECTS CONTAMINATED BY THIS MATERIAL USE... (TO BE SPECIFIED BY MANUFACTURER)
41	IN CASE OF FIRE AND /OR EXPLOSION DO NOT BREATHE FUMES
42	DURING FUMIGATION SPRAYING WEAR SUITABLE RESPIRATORY EQUIPMENT
43	IN CASE OF FIRE, USE ... (INDICATE IN THE SPACE, PRECISE TYPE OF FIRE FIGHTING EQUIPMENT)
44	IF YOU FEEL UNWELL, SEEK MEDICAL ADVICE IMMEDIATELY
45	IN CASE OF ACCIDENT OR IF YOU FEEL UNWELL, SEEK MEDICAL ADVICE IMMEDIATELY
46	IF SWALLOWED SEEK MEDICAL ADVICE IMMEDIATELY

47 KEEP TEMPERATURE NOT EXCEEDING DEGREE CELSIUS (TO BE INDICATED BY MANUFACTURER)

48 KEEP WETTED WITH....(APPROPRIATE MATERIAL TO BE SPECIFIED BY THE MANUFACTURER)

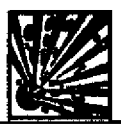
49 KEEP ONLY IN THE ORIGINAL CONTAINER

50 DO NOT MIX WITH...(TO BE SPECIFIED BY THE MANUFACTURER)

51 USE ONLY IN VENTILATED AREAS

52 NOT RECOMMENDED FOR INTERIOR USE ON LARGE SURFACE AREAS

DO YOU KNOW THESE CHEMICAL DANGER SIGNS?

DANGEROUS CHARACTERISTICS	LOGO	MEANING
Extremely Flammable (F+)		May readily catch fire after contact with a source of ignition • flash point < 0 °C • boiling point < 35 °C
Highly Flammable (F)		May readily catch fire after contact with a source of ignition • flash point < 21 °C
Flammable	(no symbol)	May catch fire after contact with a source of ignition • 21 °C < flash point < 55 °C
Oxidising (O)		Increases the intensity of the reaction in the event of a fire and also result in the fire spreading very fast; can react very violently with other stored dangerous substances including packing material and thus trigger spontaneous fire
Very Toxic (T+)		Even in small amounts may cause very serious effects on health or may result in death
Toxic (T)		May cause very serious effects on health or may result in death
Harmful (Xn)		May cause effects on health
Irritant (Xi)		In contact with the skin, eyes or mucous membranes can give rise to reddening or inflammation
Corrosive (C)		Can lead to pronounced damage to the skin, eyes and mucous membranes
Dangerous for the environment		Can cause damage to fauna or flora or can cause pollution in natural waters
Explosive		May explode under the effect of heat, shock, friction or ignition

SAFE WORK PRACTICES IN LABORATORIES OF TANNERIES AND ETPS

DO!

Use care and caution when working in the laboratory!

Store chemicals in a safe place where these are not hazardous to personnel or property!

Label all chemical containers, indicating the chemical name and date of preparation and/or container openings!

Check the labels on chemical containers before using to ensure that the right chemicals are selected for use!

Properly dispose of unlabeled or time-expired chemicals! When hazardous waste is to be disposed, contact laboratory supervisor or manager to ensure that proper disposal procedures are followed!

Read and learn the directions for each chemical's use and safety. This information is found on the chemical's Material Safety Data Sheet (MSDS)!

Follow directions carefully!

Handle chemicals carefully when pouring or measuring to prevent spillage!

TO BE COPIED AND DISPLAYED IN LABORATORIES!

SAFE WORK PRACTICES IN LABORATORIES OF TANNERIES AND ETPS

DO!

Immediately clean up chemical spillage according to the directions on the chemical's MSDS!

Wear correct gloves for the chemical being handled. Refer to the chemical's MSDS if unsure about the proper hand protection. Never touch chemicals with bare hands!

Ensure that protective gloves are free of cracks, tears and holes and the gloves fit properly before handling chemical!

Wash hands with disinfectant soap after handling chemicals!

Wash off chemical spills on skin immediately with running water!

Provide positive ventilation to laboratory work areas!

Properly dispose of all broken, chipped, or cracked glassware!

As required by the applicable MSDS, use safety goggles and/or face shield when transferring and measuring chemicals or whenever there is a potential for chemicals to be splashed in the eyes!

Use tongs or thermal gloves when handling hot utensils!

TO BE COPIED AND DISPLAYED IN LABORATORIES!

SAFE WORK PRACTICES IN LABORATORIES OF TANNERIES AND ETPS

DO!

Use only properly grounded electrical equipment!

Use carbon dioxide or dry powder type fire extinguishers to control laboratory fires!

Ensure that the laboratory is equipped with properly working emergency eye rinsing facility/shower! Laboratory workers should know the exact location of each emergency eye rinsing facility/shower.

Ensure that prominent sign warning workers against hot areas such as ovens, hot plates, water baths and digestion apparatus are posted in the laboratory!

Inspect acid-neutralising tanks and basins that service lab sinks regularly and recharge with correct neutralising agent when needed!

TO BE COPIED AND DISPLAYED IN LABORATORIES!

SAFE WORK PRACTICES IN LABORATORIES OF TANNERIES AND ETPS

DO NOT!

DO NOT allow personal/skin contact with chemicals!

DO NOT smoke or eat in the laboratory while handling chemicals or performing tests!

DO NOT place fingers into mouth, nose, ears or eyes while handling chemicals!

DO NOT breath chemical fumes, dust, or vapours!

NEVER!

NEVER use laboratory glassware as coffee/tea cups or food containers!

NEVER dispose of chemicals in common trash containers!

NEVER use mouth to suck up a fluid or chemical in a pipette! Use a suction bulb to pipette chemicals or waste water!

NEVER add water to acid, always add acid to water!

NEVER mix chemicals randomly or indiscriminately.

TO BE COPIED AND DISPLAYED IN LABORATORIES!

SAFE WORK PRACTICES WITH CHEMICALS AT WORK

DO!

Use care and caution when handling chemicals!

When transferring chemical to smaller containers, label these chemical containers, indicating the chemical name and date of preparation and/or container opening!

Check the labels on chemical containers before transferring chemicals to ensure that right chemicals are selected for use!

Handle chemicals carefully when pouring or measuring to prevent spillage and waste!

Use tools such as scoops, spatulas, measuring cups, when transferring chemicals!

Immediately clean up chemical spillage and/or report to your supervisor!

Close lids after transferring chemicals from larger containers!

Use closed containers when transporting chemicals!

Use safety goggles and other special personal protective equipment when transferring and measuring chemicals if required by the applicable Material Safety Data Sheet!

Wash hands with disinfectant soap after handling chemicals!

Wash off chemical spills on skin or eyes immediately with running water!

TO BE COPIED AND DISPLAYED IN THE WORK AREA!

SAFE WORK PRACTICES WITH CHEMICALS AT WORK

DO NOT!

DO NOT carry chemicals from store to process site, but use trolleys.

DO NOT allow any personal/skin contact with chemicals.

DO NOT smoke or eat while handling chemicals.

DO NOT breathe chemicals mist, dust or vapours. Use appropriate face mask when using chemical which emit fume, dust or vapours.

DO NOT place fingers into mouth, nose, ears or eyes while handling chemicals.

DO NOT pour or mix different waste chemical in the same waste container or barrel.

NEVER!

NEVER mix chemicals randomly or indiscriminately.

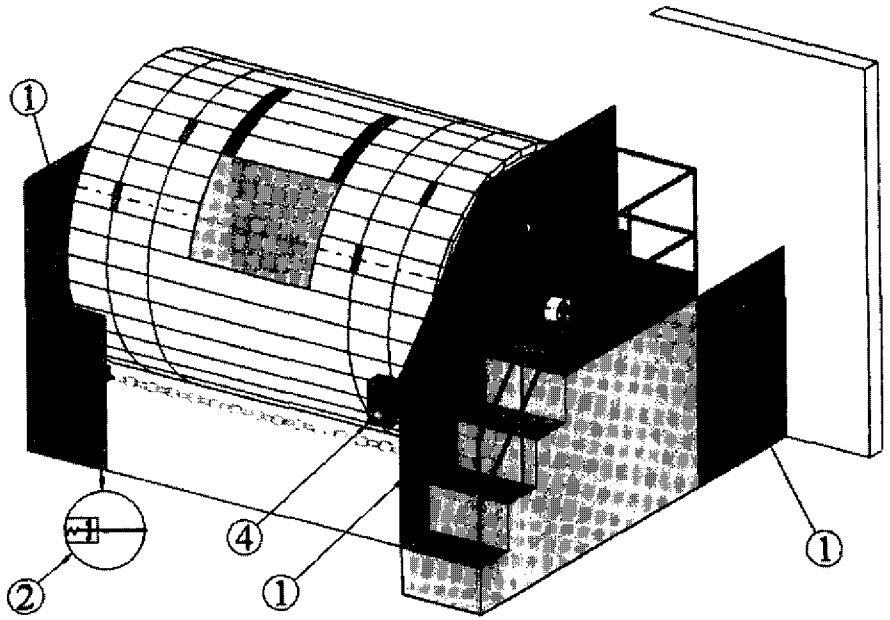
DO NOT use the same spoon, spatula or cup for taking out different chemicals to avoid cross-contamination of chemicals and spoil their quality.

NEVER add water to acid, always **acid to water!**

TO BE COPIED AND DISPLAYED IN THE WORK AREA!

SAFETY CHECKLIST – DRUM (SOAKING, LIMING, DELIMING, TANNING, DYEING)

☞ **Compare the depiction below with the machine/situation in your tannery and check with the help of the enclosed machine-specific checklist! Check each machine separately!**



(Source: CTC)

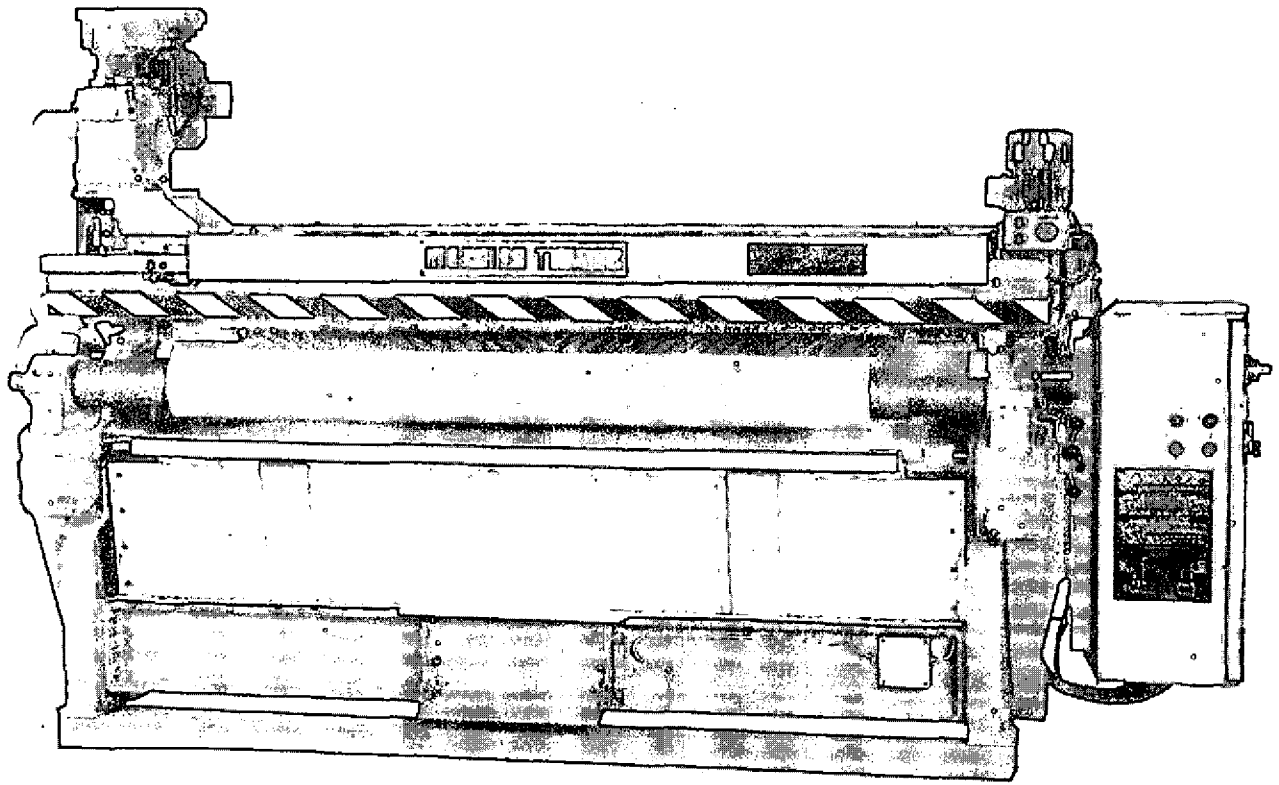
CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
AVAILABILITY OF SAFETY DEVICES			
1. Are fixed barrier guards installed on rear and side areas (1) to prevent access of workers to drum and drive during operation?	☐	☐	
2. Is a removable, interlocked safeguard (2) installed at the front/loading side, which automatically stops the rotation of the drum, if not in place or opened?	☐	☐	
SITING OF DRUM			
3. Is one meter (three feet) space provided in the rear and side of the drum?	☐	☐	
OPERATING CONTROLS			
4. Are all operating control switches (4) marked in clear local language and/or colour (e.g. red OFF and green ON)?	☐	☐	
5. Are the control switches installed close to the drum, however away from any moving drum part?	☐	☐	
ELECTRICAL INSTALLATIONS			
6. Is the electrical starter of the motor such that the motor will not restart on its own, when main's power supply is restored after a power failure?	☐	☐	
7. Are the electrical cables routed in corrosion proof conduits, unless the cable itself is armoured (The cable itself should be routed on supports from the roof and walls rather than under the floor as the cable may be easily cut or corroded.)?	☐	☐	
8. Do the electrical enclosures and motors have IP55 degree of protection?	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
9. Are motor terminal boxes covered and closed?	☐	☐	
10. Do the cable entry holes have gland fittings?			
11. Are all openings in the electrical enclosure boxes closed with tight fitting plugs to prevent the ingress of dust and water?	☐	☐	
12. Are the electric motor body and base frame earthed?			
13. Are all electrical enclosures of switch gear connected with corrosion protected earth wires (if insulated, make sure these are marked as per international standard colour code yellow and green).	☐	☐	
MAINTENANCE			
14. Are the metal holding bands, which hold the wooden blanks on wooden drums together, corrosion protected. (If corroded, replaced)?	☐	☐	
15. Is the power to the drum motor disabled or locked out (by removing fuses/locking isolator switch) before any maintenance work is carried out?	☐	☐	
16. Is a mechanical stop-device (brake) used on the drum to prevent accidental drum rotation during repair and maintenance work?	☐	☐	
17. Do you use a sign board "under repair" or " men at work" to further ensure that nobody attempts to start the drum?	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
OPERATING PRACTICES			
18. Is a mechanical stop-device (brake) used to lock the position of the drum during loading and unloading which helps to prevent hits due to accidental drum rotation?	☐	☐	
19. Do you use a flexible hose attached to fire hose type coupling fixed on a special drum door to ensure controlled draining of floats before opening of drum?	☐	☐	
20. Do the drum operators and helpers wear personal protective equipment (gloves, respirator and water proof, non-slip footwear) around drum area to avoid injuries from fall and ill effect of contact with chemicals especially when checking leather, loading and unloading drums?	☐	☐	
21. Before checking or attempting removal of entangled material from inside the drum, is time allowed for toxic gases, fumes, vapours to exit and ventilate drum well (e.g. by keeping drum door open)?	☐	☐	
22. In case a worker has to enter the drum, does a second person keep watch outside the drum?	☐	☐	

SAFETY CHECKLIST - FLESHING MACHINE

☞ Compare the depiction below with the machine/situation in your tannery and check with the help of the enclosed machine-specific checklist! Check each machine separately!



CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
AVAILABILITY OF SAFETY DEVICES			
1. Are fixed guards installed and in place on back and side areas of machine to prevent possibility of *accident from contact with moving machine parts, particularly the bladed cylinder, side gears,* prime mover?	☐	☐	
2. Is an active guard installed on the operating side with an electronic, electro-pneumatic, optical or any other type of sensing device to prevent finger, forearm etc. trapped and/or drawn into the machine? (The device must stop the machine or reverse rotation of the rollers and open immediately.)	☐	☐	
SITING OF MACHINE			
3. *Is sufficient space available around the machine to facilitate removal of fleshing waste?* (Machine is best installed on a foundation at a height of about 500 mm from ground level, to permit easy collection of fleshings at the rear of the machine. This may be done by using a perforated box trolley of fibre-glass reinforced plastic or other corrosion-resistant material.)	☐	☐	
4. Can water applied during fleshing be drained off via the chute to a separate drain below or behind the fleshing machine?	☐	☐	
OPERATING CONTROLS			
5. Are the control pedals protected with a cowl to prevent unintended activation and closure of machine?	☐	☐	
6. Are all operating controls marked in simple local language and colour (e.g. red OFF, green ON, yellow/red EMERGENCY STOP)?	☐	☐	

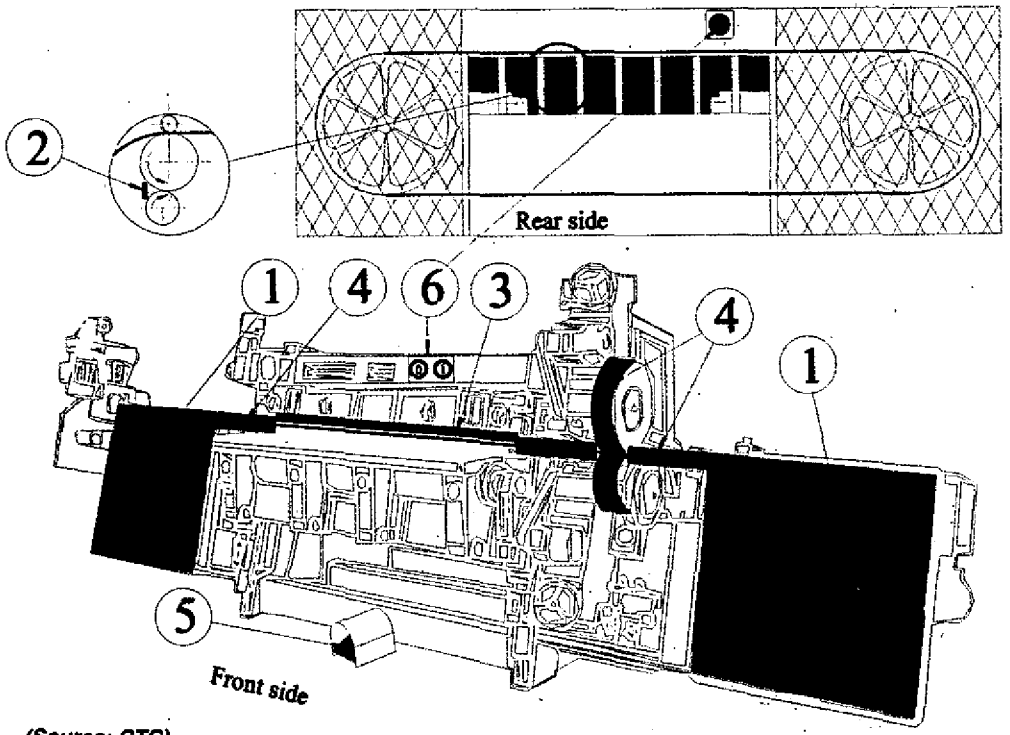
CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
7. Are the control devices (ON /OFF/EMERGENCYSTOP switches) in reach of the operator(s)?	☐	☐	
8. Can the re-engagement of work in hand only be carried out by activating the pedal or control device?	☐	☐	
ELECTRICAL INSTALLATIONS			
9. Are the electric motor bodies, base-frame and all electrical enclosures earthed with corrosion-protected wires (if insulated, make sure that these are marked as per international standard colour code green and yellow)?	☐	☐	
10. Are electrical cables routed in corrosion proof conduits, unless the cable itself is armoured? (The cable may be routed on supports from the roof and walls, rather than under the floor, which is usually very wet.)	☐	☐	
11. Do electrical enclosures and motors have IP55 degree of protection, besides being corrosion-resistant?	☐	☐	
12. Are the motor terminal boxes closed?	☐	☐	
13. Do the cable entry holes have gland fittings?	☐	☐	
14. Are all other openings in electrical enclosure boxes closed with tight fitting plugs to prevent the ingress of dust and water?	☐	☐	
15. Does the machine have electrical features that will not allow the machine to restart on its own, when power supply is restored after a power failure?	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
MAINTENANCE			
16. Is the machine properly cleaned at the end of each work day to prevent corrosion and facilitate lubrication? (This applies particularly to electric motors and switch-gear.)	☐	☐	
17. Are all wear parts lubricated with water-proof lubricants on a daily basis, ideally before machine start-up?	☐	☐	
18. Are all V-belt drives properly tensioned and in place?	☐	☐	
19. After re-blading and grinding of the fleshing cylinder and before re-installing, is any imbalance and vibration of the fleshing cylinder corrected by dynamic balancing?	☐	☐	
20. Are the rubber rollers levelled, without damage and of the correct "shore" hardness? (=> Check machine manual => usually about 75 degrees, Shore Durometer 'A' scale).	☐	☐	
21. When re-rubberising, are rollers made of chemical and oil resistant material (e.g. Neoprene)?	☐	☐	
22. Are the slide ways of the grinder mechanism in good order, clean, lubricated and corrosion-protected?	☐	☐	
23. Is the grinding stone not worn out? (=> Never grind fleshing cylinder with the stone held in hand while the fleshing cylinder is rotating.)	☐	☐	
24. Is the power to machine effectively disabled or locked out (by removing fuses or locking isolator switch) before any maintenance work is carried out?	☐	☐	
25. Are sign boards "under repair" or "men at work" used to further ensure that nobody will attempt to start the machine?	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
OPERATING PRACTICES			
26. Do the machine operator and helpers wear gloves, full-body apron and water-proof, non-slip footwear?	☐	☐	
27. Is the fleshing waste removed from the machine area periodically, even during the same shift?	☐	☐	
28. Does the operator wear tight clothes and avoid keeping hair long when working on the machine?	☐	☐	

SAFETY CHECKLIST - SPLITTING MACHINE

☞ **Compare the depiction below with the machine/situation in your tannery and check with the help of the enclosed machine-specific checklist! Check each machine separately!**



(Source: CTC)

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
AVAILABILITY OF SAFETY DEVICES			
1. Are fixed guards installed and in place on back and side areas to prevent possibility of accident caused by contact with moving part of machine, particularly, band-knife, and grinding wheels and rollers? (1)	☐	☐	
2. Is an active guard in place on the operating side with an electronic, electro-pneumatic, optical, or any other type of sensing device, to prevent risk of finger, forearm, etc. being drawn into the machine by the roller? (=> The device must stop the band knife immediately and open the rollers.) (2)	☐	☐	
OPERATING CONTROLS			
3. Are the control pedals protected with a cowl to prevent unintended start-up of feed rollers? (5)	☐	☐	
4. Are all operating controls marked in simple local language and colour (green ON, red OFF, yellow/red EMERGENCYSTOP)? (6)	☐	☐	
5. Are the control devices (ON /OFF/EMERGENCY STOP switches, pedal) in reach of operators on both sides of the machine? (6)	☐	☐	
ELECTRICAL INSTALLATIONS			
1. Does the machine have electrical features that will not allow the machine to restart on its own, when power supply is restored after a power failure?	☐	☐	
6. Are electric motor bodies, base-frame and all electrical enclosures earthed with corrosion-protected wires (if insulated, check whether these are marked as per international standard colour code green and yellow)?	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
7. Are the electrical cables routed in corrosion proof conduits, unless the cable itself is armoured? (=> The cable may be routed on supports from the roof and walls, rather than under the floor, where the cables may be easily cut or corroded.)	☐	☐	
8. Are the motor terminal boxes closed?	☐	☐	
9. Do the cable entry holes have gland fittings?	☐	☐	
10. Are all other openings in electrical enclosure boxes closed with tight fitting plugs to eliminate the ingress of dust and water?	☐	☐	
11. Do electrical enclosures and motors have IP55 degree of protection?	☐	☐	
MAINTENANCE			
12. Do the workers use cut- and abrasion- resistant gloves, preferably of polymer and stainless steel filament yarn, while handling the band-knife, especially during replacement and maintenance work? (3)	☐	☐	
13. Is the tensioning of band-knife (as per instructions in manual) checked on a daily basis, preferably before start of work?	☐	☐	
14. Is the proper working of the tracking mechanism of the band-knife checked on a daily basis?	☐	☐	
15. Is the condition of grinding wheels checked at least once a week? (=> Replace if worn excessively. Fit new grinding wheels of the correct specification such as for grit size, bond type and maximum permissible wheel speed.)	☐	☐	
16. Is the condition of flexible elements of gauge roller checked at least once a week, and adjusted, if necessary?	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
17. Is the condition of grip roller checked at least once a week? (=> Replace, if necessary.)	☐	☐	
18. Is the grinding mechanism appropriately positioned (to get the required upper and lower cutting edge bevels required for efficient splitting) and checked at least once a week?	☐	☐	
19. Is the power to machine effectively disabled or locked out (by removing fuses or locking isolator switch) before any maintenance work is carried out?	☐	☐	
20. Are sign boards "under repair" or "men at work" used to further ensure that nobody will attempt to start the machine?	☐	☐	
OPERATING PRACTICES			
21. Is the proper working of active safety guards checked before starting splitting? (=> Activate various guards and check whether band knife stops immediately!)	☐	☐	
22. Do the operators wear personal protective equipment (gloves, non-slip footwear) during work on the machine?	☐	☐	
23. Do the operators check during operation whether tracking mechanism of the band-knife is working properly?	☐	☐	
24. Do the operators wear tight clothes and avoid keeping hair long during work on the machine?	☐	☐	

SAFETY CHECKLIST - MULTI-ROLLER SAMMYING MACHINE

☞ **Check the machine/situation in your tannery with the help of the enclosed machine-specific checklist! Check each machine separately!**

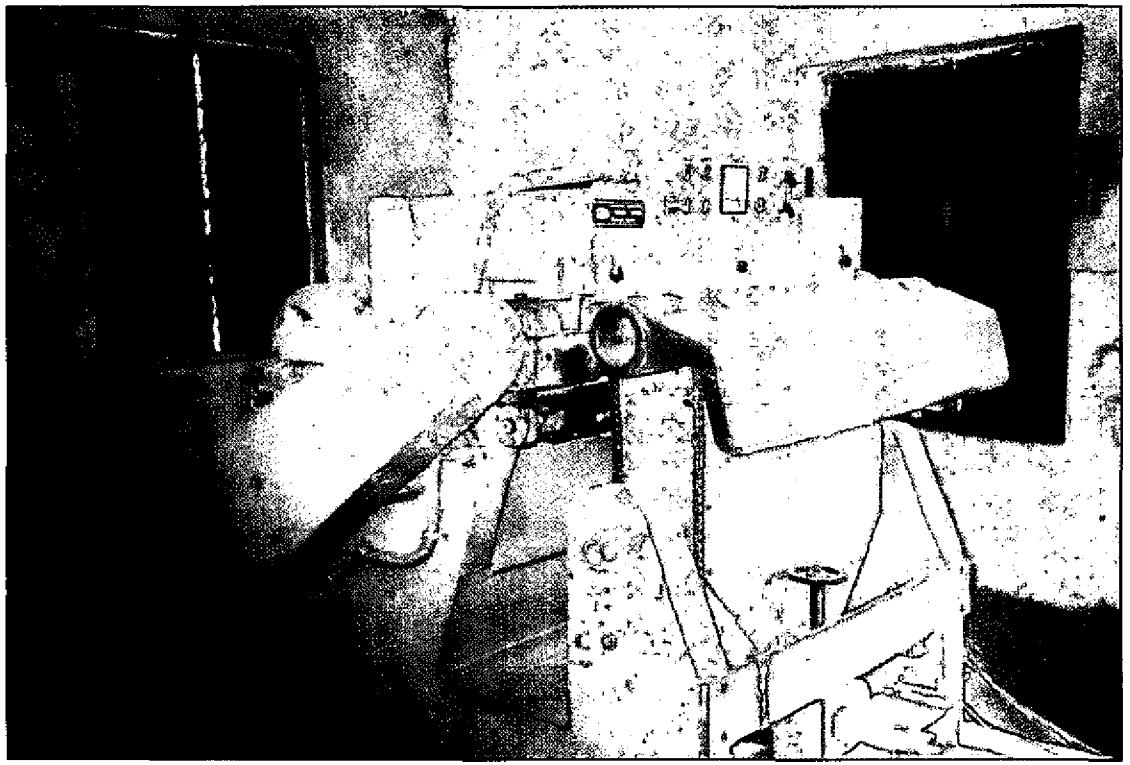
CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
AVAILABILITY OF SAFETY DEVICES			
1. Are fixed guards installed and in place on back and side areas of machine to prevent possibility of accidents caused by contact with moving parts of machine?	☐	☐	
2. Is an active guard installed on the operating side with an electronic, electro-pneumatic, optical or any other type of sensing device to prevent finger, forearm, etc. being trapped and/or drawn into machine by the rollers? (=> The device must stop and open the machine or reverse rotation of the rollers.)	☐	☐	
SITING OF MACHINE		☐	
3. Can water coming out of the leather during sammying, be drained off via a chute into a local drain below or behind the machine?	☐	☐	
OPERATING CONTROLS			
4. Are all operating control switches marked in clear local language and/or colour (e.g. red OFF, green ON, yellow red EMERGENCY STOP)?	☐	☐	
5. Is control pedal protected with a cowl to avoid unintended start-up?	☐	☐	
6. Are the control devices within reach of each operator?	☐	☐	
7. Can the re-engagement of the work in hand only be carried out by activating the pedal or control device?	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
ELECTRICAL INSTALLATIONS			
8. Do the electrical features of the machine prevent the machine to restart on its own, when power supply is restored after a power failure?	☐	☐	
9. Are the electrical motor bodies and base frame earthed?	☐	☐	
10. Are all electrical enclosures connected with corrosion protected earthing wires (if insulated, these should be marked as per international colour code yellow and green)?	☐	☐	
11. Are the electrical cables routed in corrosion proof conduits, unless cable itself is armoured (The cable may be routed on supports from the roof or walls, rather than under the floor as it may get easily cut or corrode.)?	☐	☐	
12. Do the electrical enclosures and motors have IP55 degree of protection?	☐	☐	
13. Are the motor terminal boxes closed?	☐	☐	
14. Do the cable entry holes have gland fittings?	☐	☐	
15. Are all openings in electrical enclosure boxes closed with tight fitting plugs to prevent ingress of dust and water?	☐	☐	
MAINTENANCE			
16. Is the power to the machine effectively disconnected or locked out (by removing fuses, locking isolator switch) before any maintenance work is carried out on the machine?	☐	☐	
17. Are sign boards "under repair" or " men at work" used to avoid accidental starting of the machine?	☐	☐	
18. Are rubber rollers washed and the felt sleeves (if any) cleaned regularly?	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
OPERATING PRACTICES			
19. Does the operator check operation of active guard before starting work on the machine?	☐	☐	
20. Does the operator check whether hydraulic pressure setting is suitable for the work before starting work?	☐	☐	
21. Do the operator and helpers on the sammying machine use personal protective equipment, in particular, gloves, water-proof non-slip footwear)?	☐	☐	
22. Does the operator wear tight clothes and avoid keeping hair long when working on the machine?	☐	☐	

SAFETY CHECKLIST - CYLINDER SHAVING MACHINE

☞ ***Compare the depiction below with the machine/situation in your tannery and check with the help of the enclosed machine-specific checklist! Check each machine separately!***



(Photo: RePO-UNIDO)

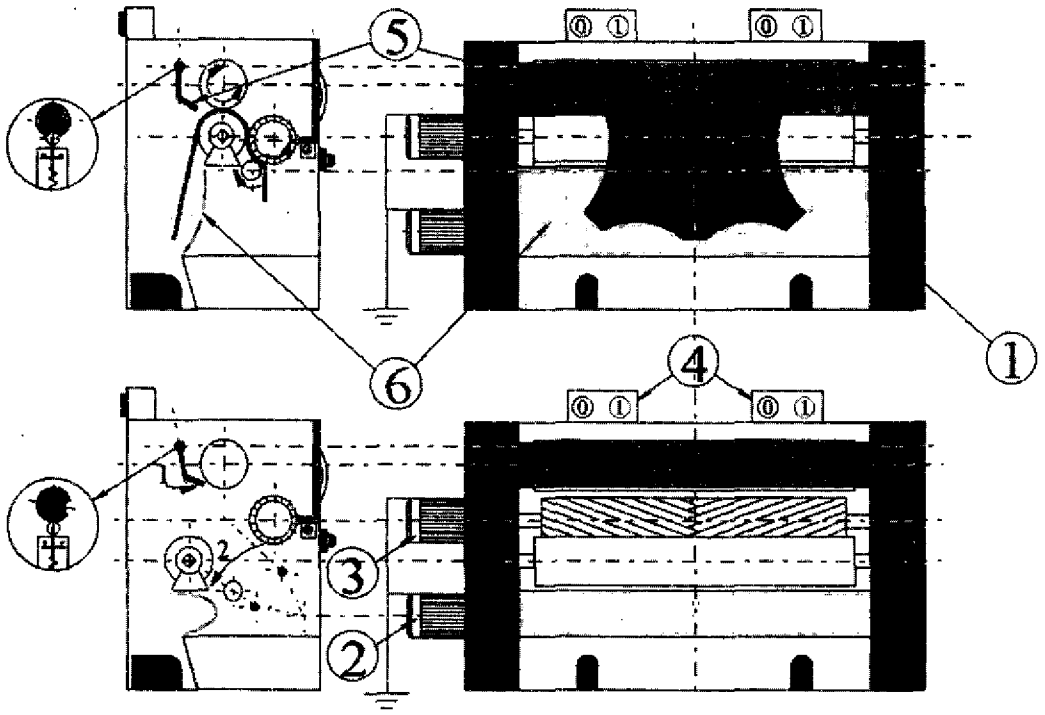
CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
AVAILABILITY OF SAFETY DEVICES			
1. Are fixed guards installed and in place on back and side areas of machine to prevent possibility of accidents caused by contact with moving parts of machine?	☐	☐	
2. Are fixed guards installed and in place on back and side areas of the machine to prevent possibility of accidents from contact with moving machine parts?	☐	☐	
3. Is an active guard installed on the operating side with an electronic, electro-pneumatic, optical or other type of sensing device to prevent risk of finger, forearm, etc. being trapped and/or drawn into machine by the shaving cylinder? (=> The device must stop and open the machine or reverse rotation of the rollers.) Ensure that the control pedal is protected with a cowl to avoid unintended start-up.	☐	☐	
4. Is an efficient dust extraction installed on the machine for (dry) shaving (Note: Total dust concentration in the air around the machine should be below 15 milligram per cubic meter of air)?	☐	☐	
5. Is the airborne (escape) dust in the dry shaving area extracted by overall exhaust ventilation?	☐	☐	
6. Is a fire extinguisher readily available near the machine?	☐	☐	
OPERATING CONTROLS			
7. Are the control pedals protected by a cowl to prevent unintended start-up of feed rollers?	☐	☐	
8. Are all operating control switches marked in simple local language and colour (red OFF, green ON and yellow/red EMERGENCY STOP)?	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
9. Are the control devices (ON/OFF and EMERGENCY STOP switches, pedal) in reach of the operator?	☐	☐	
ELECTRICAL INSTALLATIONS			
10. Does the machine have electrical features that will not allow the machine to restart on its own, when power supply is restored after a power failure?	☐	☐	
11. Are electric motor body, base frame and all electrical enclosures (of switch gear) earthed with corrosion protected earth wires (if insulated, make sure these are marked as per international standard colour code yellow and green)?	☐	☐	
12. Are electrical cables routed in corrosion proof conduits, unless cable itself is armoured. (=> The cable may be routed on supports from the roof or walls, rather than under the floor, where cables may be easily cut or corroded.)	☐	☐	
13. Do the electrical enclosures and motors have IP55 degree of protection?	☐	☐	
14. Are the motor terminal boxes closed?	☐	☐	
15. Do the cable entry holes have gland fittings?	☐	☐	
16. Are all openings in electrical enclosure boxes closed with tight fitting plugs to prevent ingress of dust?	☐	☐	
MAINTENANCE			
17. Are shaving waste and shaving dust removed from the machine parts, particularly the electrical motors and switch gear on a daily basis?	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
18. After each re-blading and grinding of the shaving cylinder, is any imbalance or vibration rectified by dynamic balancing of the shaving cylinder?	☐	☐	
19. Is the bed roller levelled and without damage?	☐	☐	
20. Is the grinding wheel of the correct specification (grit size, bond type and permissible speed limit)?	☐	☐	
21. Are the grinding wheels in good order and not worn out?	☐	☐	
22. Is the power to motor effectively disconnected or locked out (by removing fuse/locking isolator switch) before any maintenance work on the machine?	☐	☐	
23. Are sign boards "under repair" or " men at work" used to prevent accidental starting of the machine?	☐	☐	
OPERATING PRACTICES			
24. Does the operator check the active guard before starting shaving operation => Activate active guard and check whether machine opens or stops immediately!)	☐	☐	
25. Does operator wear non-slip footwear (in case of wet-shaving) and respirator suitable for leather dust (in case of dry shaving) while working on the machine?	☐	☐	
26. Does the operator wear tight clothes and avoid keeping hair long when working on the machine?	☐	☐	

SAFETY CHECKLIST - MULTI-ROLLER SETTING MACHINE

☞ **Compare the depiction below with the machine/situation in your tannery and check with the help of the enclosed machine-specific checklist! Check each machine separately!**



(Source: CTC)

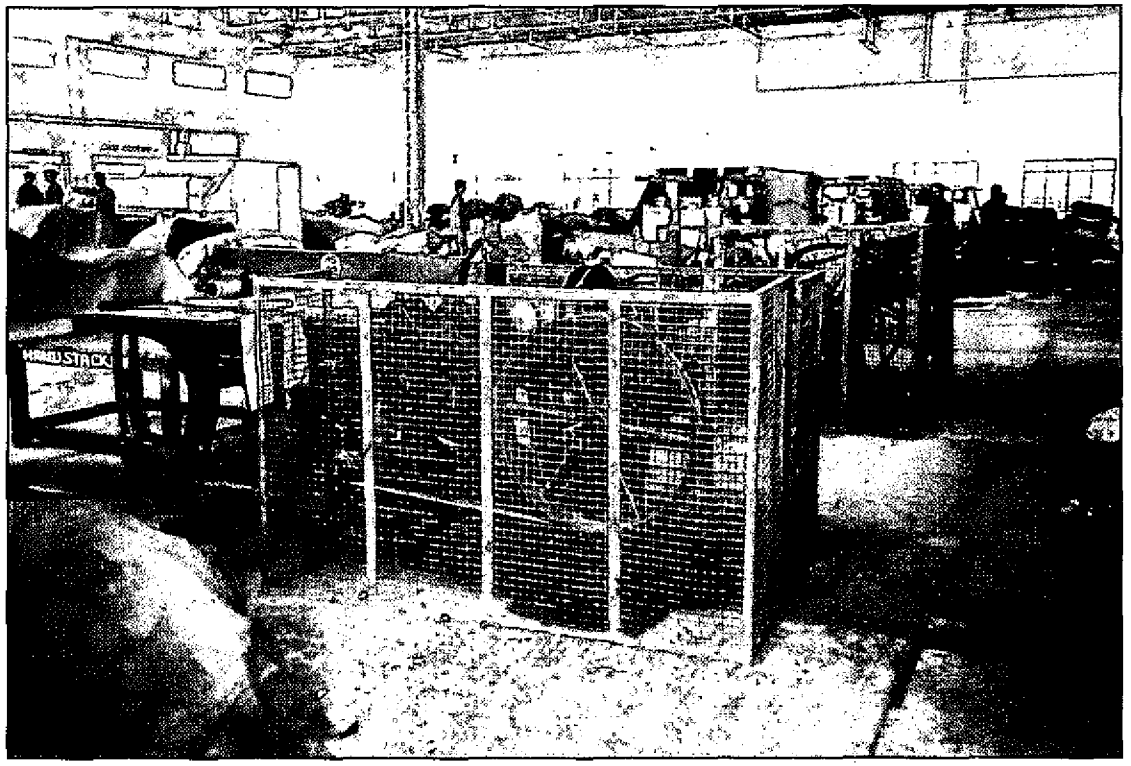
CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
AVAILABILITY OF SAFETY DEVICES			
1. Are fixed guards installed and in place on back and side areas of machine to prevent possibility of accidents caused by contact with moving machine parts? (1)	☐	☐	
2. Is an active guard installed on the operating side with an electronic, electro-pneumatic, optical or other type of sensing device to prevent finger, forearm, etc. being trapped and/or drawn into machine by the bladed cylinder? (The device must immediately stop and open the machine or reverse rotation of the rollers.) (5)	☐	☐	
SITING OF MACHINE			
3. Can water coming out of the leather during setting, be drained off via a chute into a local drain?	☐	☐	
OPERATING CONTROLS			
4. Are all operating control switches marked in clear local language and/or colour (e.g. red OFF, green ON, yellow red EMERGENCY STOP)? (4)	☐	☐	
5. Is control pedal protected with a cowl to avoid unintended start-up?	☐	☐	
6. Are the control devices within reach of each operator?	☐	☐	
7. Can the re-engagement of the work in hand only be carried out by activating the pedal or control device?	☐	☐	
ELECTRICAL INSTALLATIONS			
8. Do the electrical features of the machine prevent the machine to restart on its own, when power supply is restored after a power failure? (3)	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
9. Are the electrical motor bodies and base frame earthed?	☐	☐	
10. Are all electrical enclosures connected with corrosion protected earthing wires (if insulated, these should be marked as per international colour code yellow and green)? (2)	☐	☐	
11. Are the electrical cables routed in corrosion proof conduits, unless cable itself is armoured (The cable may be routed on supports from the roof or walls, rather than under the floor as it may get easily cut or corrode.)?	☐	☐	
12. Do the electrical enclosures and motors have IP55 degree of protection?	☐	☐	
13. Are the motor terminal boxes closed?	☐	☐	
14. Do the cable entry holes have gland fittings?	☐	☐	
15. Are all openings in electrical enclosure boxes closed with tight fitting plugs to prevent ingress of dust and water?	☐	☐	
MAINTENANCE			
16. Is the power to the machine effectively disconnected or locked out (by removing fuses, locking isolator switch) before any maintenance work is carried out on the machine?	☐	☐	
17. Are sign boards "under repair" or " men at work" used to avoid accidental starting of the machine?	☐	☐	
18. Are rubber rollers washed and the felt sleeves (if any) cleaned regularly?	☐	☐	
OPERATING PRACTICES			
19. Does the operator check operation of active guard before starting work on the machine?	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
20. Does the operator check whether hydraulic pressure setting is suitable for the work before starting work?	☐	☐	
21. Do the operator and helpers on the setting machine use personal protective equipment, in particular, hearing protection, gloves, water-proof non-slip footwear)?	☐	☐	
22. Does the operator wear tight clothes and avoid keeping hair long when working on the machine?	☐	☐	

SAFETY CHECKLIST - SLOCOMB STAKING MACHINES

☞ **Compare the depiction below with the machine/situation in your tannery and check with the help of the enclosed machine-specific checklist! Check each machine separately!**



(Photo: RePO-UNIDO)

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
AVAILABILITY OF SAFETY DEVICES			
1. Are fixed guards installed and in place to prevent possibility of accident from contact with moving parts of machine, particularly the reciprocating arms, driving cranks and belt drives (as far as practicable)?	☐	☐	
2. Is an effective local dust extraction installed for the staking machine (particularly in view of the very fine hazardous dust emitted during staking)? (=> Extraction hoods must be properly positioned on sides to achieve good extraction results.)	☐	☐	
3. Is airborne dust in the staking area extracted by exhaust fans of adequate capacity?	☐	☐	
4. Is the work area on and around the machine well-lit? (Check with reference sheet - 5.1 for required light quality!)	☐	☐	
OPERATING CONTROLS			
5. Are operating controls marked in simple local language and colour (green ON, red OFF, yellow/red EMERGENCY STOP).	☐	☐	
6. Are the control devices (ON /OFF/EMERGENCY STOP switches) in reach of the operator, but away from any moving part?	☐	☐	
ELECTRICAL INSTALLATIONS			
7. Does the machine have electrical features that will not allow the machine to restart on its own, when power supply is restored after a power failure?	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
8. Are electric motor bodies, base-frame and all electrical enclosures earthed with corrosion-protected wires (if insulated, make sure that these are marked as per international standard colour code green and yellow)?	☐	☐	
9. Are the electrical cables routed in conduits, unless the cable itself is armoured?	☐	☐	
10. Do the electrical enclosures and motors have IP55 degree of protection?	☐	☐	
11. Are the motor terminal boxes closed?	☐	☐	
12. Do the cable entry holes have gland fittings?	☐	☐	
13. Are all other openings in electrical enclosure boxes closed with tight fitting plugs to prevent the ingress of dust?	☐	☐	
MAINTENANCE PRACTICES			
14. Are the V-belts checked for correct tension on weekly basis?	☐	☐	
15. Is the mechanism checked for any undue wear on weekly basis?	☐	☐	
16. Are all sliding parts lubricated on a daily basis to reduce wear? (=> Make sure that the lubricant is not applied to the area where the leather is placed during staking.)	☐	☐	
17. Are staking head rollers and blades checked and, if necessary, correctly adjusted on daily basis?	☐	☐	
18. Is the power to machine effectively disabled or locked out (e.g. by removing fuses or locking isolator switch) before any maintenance work is carried out?	☐	☐	

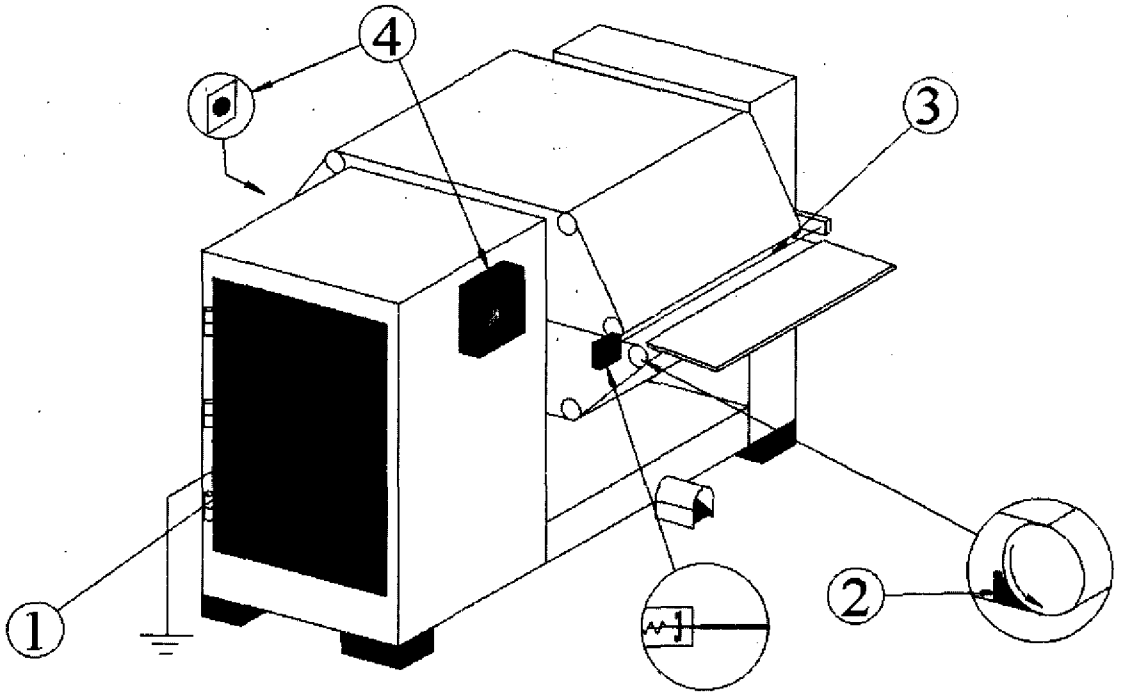
CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
19. Are sign boards "under repair" or "men at work" used to ensure that nobody will attempt to start the machine?	☐	☐	
OPERATING PRACTICES			
20. Does the operator start dust extraction system and mechanical exhaust ventilation in the area before starting staking operation?	☐	☐	
21. Does the operator wear a HEPA respirator suitable for fine leather dust (HEPA = high efficiency particulate air filter)?	☐	☐	
22. Does the operator adjust the staking intensity for desired staking effect required for the leather during the operation?	☐	☐	
23. Is the operator allowed frequent rests to relax eyes and body? (=> This will help to improve the operator's level of concentration!)	☐	☐	

Note:

Since it is very difficult to install active safety guards on a traditional Slo-comb staking machine, special emphasis should be put on the proper training of the operator.

SAFETY CHECKLIST - VIBRATION STAKING MACHINE

☞ **Compare the depiction below with the machine/situation in your tannery and check with the help of the enclosed machine-specific checklist! Check each machine separately!**



(Source: CTC)

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
AVAILABILITY OF SAFETY DEVICES			
1. Are fixed guards and covers in place to prevent the possibility of accident from contact with moving parts of machine (e.g. conveyor, conveyor roller, vibrating staking head)? (1)	☐	☐	
2. Is an active guard installed on the operating side with an electronic, electro-pneumatic, optical, or *any other type of sensing device, to prevent risk of finger, forearm, etc. being drawn into the* machine? (=> The device reverses the conveyor direction immediately and stops the machine.) (3)	☐	☐	
SITING OF MACHINE			
3. Is the machine properly levelled and mounted on proper high deflection vibration mount to provide vibration isolation and reduce noise emission?	☐	☐	
4. Is the area around staking machine well ventilated?	☐	☐	
OPERATING CONTROLS			
5. Are all operating controls marked in simple local language and colour (green ON, red OFF, yellow/red EMERGENCY)?	☐	☐	
6. Are the control devices (ON /OFF/EMERGENCY switches) installed in reach of the operator, but away from any moving part? (4)	☐	☐	
ELECTRICAL INSTALLATIONS			
7. Does the machine have electrical features that will not allow the machine to restart on its own, when power supply is restored after a power failure?	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
8. Are electric motor bodies, base-frame and all electrical enclosures earthed with corrosion-protected wires (if insulated, make sure that these are marked as per international standard colour code green and yellow)?	☐	☐	
9. Are the electrical cables routed in conduits, unless the cable itself is armoured?	☐	☐	
10. Do the electrical enclosures and motors have IP55 degree of protection?	☐	☐	
11. Are motor terminal boxes closed?	☐	☐	
12. Do the cable entry holes have gland fittings?	☐	☐	
13. Are all other openings in electrical enclosure boxes closed with tight fitting plugs to prevent the ingress of dust?	☐	☐	
MAINTENANCE			
14. Do the operators check the accurate tracking of the conveyor belt over the rollers on weekly basis or whenever the belt is drifting sideways?	☐	☐	
15. Do the operators check conveyor belt for damage on a daily basis? (=> Repair and replace, if necessary!)	☐	☐	
16. Do you check that the rubber (noise and vibration absorbing) components on the vibrating heads are in good condition, at least twice a year?	☐	☐	
17. Is power to the machine disabled or locked out (by removing fuses or locking isolator switch) before any maintenance work is carried out?	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
18. Are sign boards "under repair" or "men at work" used to ensure that nobody will attempt to start the machine?	☐	☐	

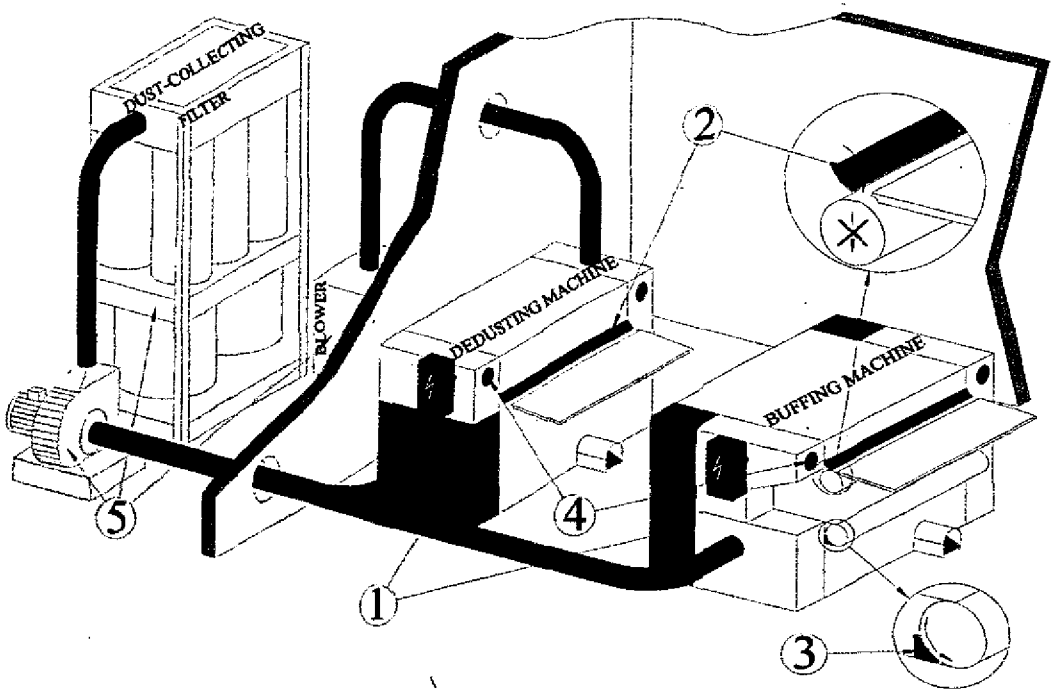
OPERATING PRACTICES

19. Do the operators wear hearing protection and HEPA respirators suitable for the fine leather dust (HEPA = high efficiency particulate air filter)?	☐	☐	
20. Did you have actual noise and dust levels checked on the machine and in the area?	☐	☐	

SAFETY CHECKLIST - BUFFING MACHINE

☞ **Compare the depiction below with the machine/situation in your tannery and check with the help of the enclosed machine-specific checklist! Check each machine separately!**

Buffing - Dedusting machine



(Source: CTC)

For further information regarding dust extraction system, please check with reference sheet 5.2.

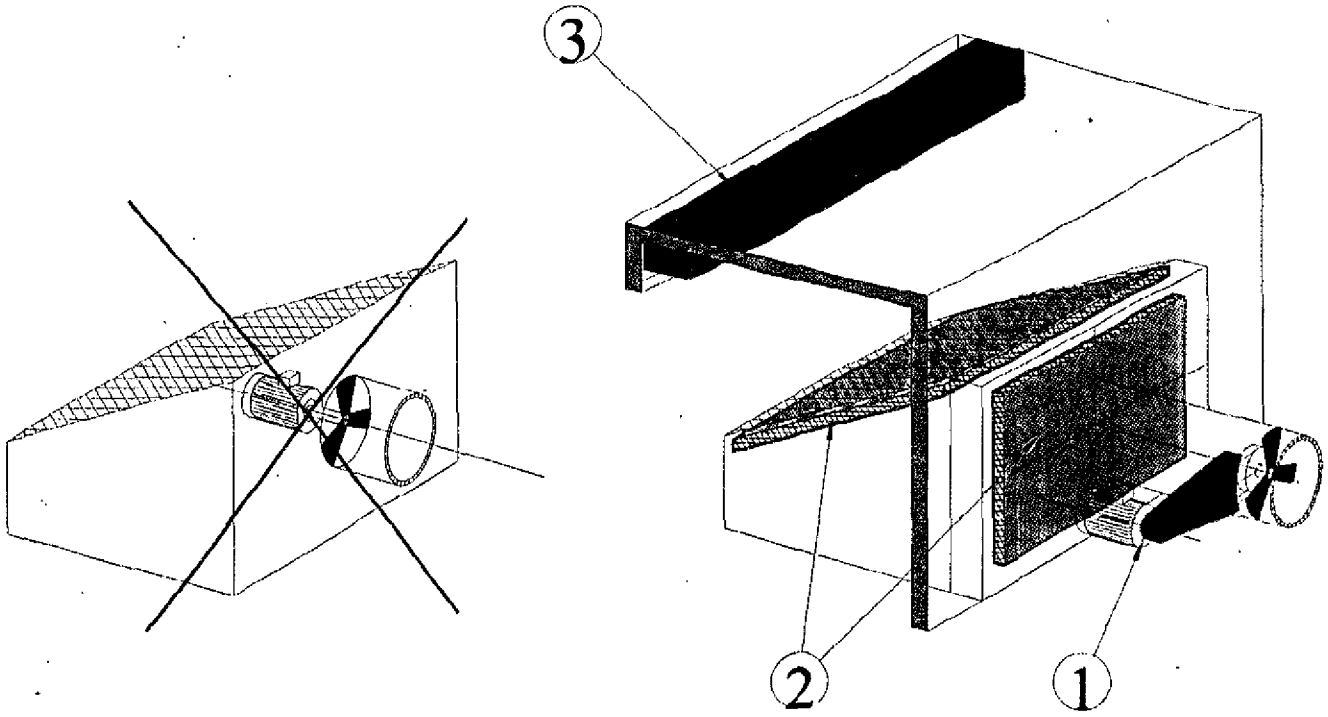
CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
AVAILABILITY OF SAFETY DEVICES			
1. Are fixed guards and covers installed and in place to prevent the possibility of accident from contact with moving parts of machine (pulley, drive, belts)? (1) (3)	☐	☐	
2. Is an active guard installed on the operating side with an electronic, electro-pneumatic, optical or any other type of sensing device to prevent finger, forearm, etc. being drawn into the machine? (=> The device opens the machine and stops the buffing cylinder.)	☐	☐	
3. Is an effective dust extraction system installed on the machine for removing buffing dust? (Check also with reference sheet - 5.2; the dust captured should be filtered and not blown out into the open.) (5)	☐	☐	
4. Is fire fighting equipment readily available near the machine?	☐	☐	
SITING OF MACHINE			
5. Is the area around buffing machine well ventilated to exhaust airborne (escape) dust?	☐	☐	
OPERATING CONTROLS			
6. Is the control pedal protected with a cowl to prevent unintended closing?	☐	☐	
7. Are all operating controls marked in simple local language and colour (green ON, red OFF, yellow/red EMERGENCY STOP)?	☐	☐	
8. Are the control devices (ON /OFF/EMERGENCY switches, pedal) in reach of the operator, but away from any moving part? (4)	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
ELECTRICAL INSTALLATIONS			
9. Does the machine have electrical features that will not allow the machine to restart on its own, when power supply is restored after a power failure?	☐	☐	
10. Are electric motor bodies, base-frame and all electrical enclosures earthed with corrosion-protected wires (if insulated, make sure that these are marked as per international standard colour code green and yellow)?	☐	☐	
11. Are the electrical cables routed in conduits, unless the cable itself is armoured?	☐	☐	
12. Do the electrical enclosures and motors have IP54 or IP55 degree of protection?	☐	☐	
13. Are motor terminal boxes closed?	☐	☐	
14. Do the cable entry holes have gland fittings?	☐	☐	
15. Are all other openings in electrical enclosure boxes closed with tight fitting plugs to prevent the ingress of dust? (=> Excessive dust on electrical installations may spark off fires, if ignited!)	☐	☐	
MAINTENANCE			
16. Is the buffing dust removed from the machine parts, particularly from the electric motors and switch gear, on a daily basis?	☐	☐	
17. Is the dust removed from within electrical enclosures on a weekly basis?	☐	☐	
18. Do you check on a weekly basis that the clamping mechanism of abrasive buffing paper is effective?	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
19. Do you re-tension all V-belts on weekly basis?	☐	☐	
20. Do you check that the felt roller is levelled and without surface damage?	☐	☐	
21. Is the power to the machine effectively disabled or locked out (by removing fuses or locking isolator switch) before any maintenance work is carried out?	☐	☐	
22. Are sign boards "under repair" or "men at work" used to ensure that nobody will attempt to start the machine?	☐	☐	
OPERATING PRACTICES			
23. Does the operator switch on the dust extraction system and mechanical exhaust ventilation in the buffing area before starting buffing operation?	☐	☐	
24. Does the operator remove buffing dust from the machine area periodically during the working day?	☐	☐	
25. Does the operator wear a respirator suitable for leather/buffing dust?	☐	☐	
26. Does the operator wear tight clothes and avoid having hairlong when working on the machine?	☐	☐	

SAFETY CHECKLIST - MANUAL SPRAYING

☞ **Compare the depiction below with the machine/situation in your tannery and check with the help of the enclosed machine-specific checklist! Check each machine separately!**



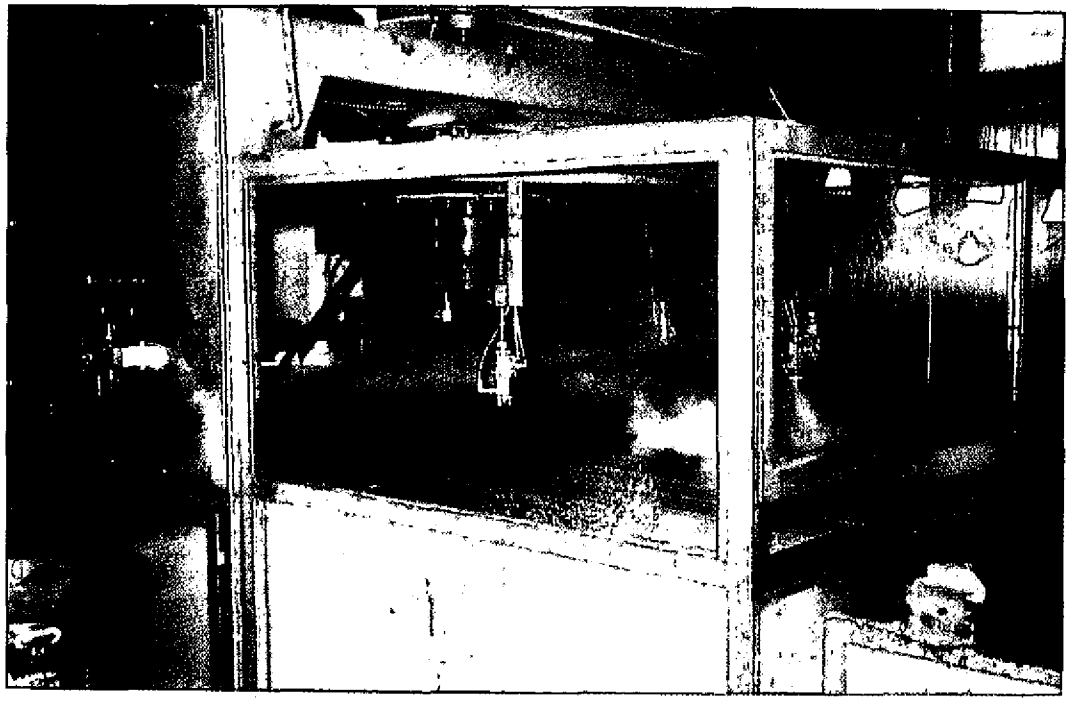
(Source: CTC)

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
AVAILABILITY OF SAFETY DEVICES			
1. Are fixed guards and covers in place to prevent the possibility of accident from contact with moving parts of machine (e.g. fan, belts, pulleys)?	☐	☐	
2. Are the exhausted spray vapours and spraying mist ducted out of the spray booth?	☐	☐	
3. Is a dry filter or water scrubber installed before the exhaust duct so that spraying particles will not accumulate in the exhaust duct or be blown out into the atmosphere? (2)	☐	☐	
4. Is the spray mist extraction fan driven by belt with the motor located outside the extraction duct to minimise fire risk? (1)	☐	☐	
5. Are the V-belts used of anti-static type?	☐	☐	
6. Is the spray area equipped with fire fighting equipment suitable for flammable solvents (class B fire)?	☐	☐	
ELECTRICAL INSTALLATIONS			
7. Are all the lighting fixtures in the area enclosed and have IP55 degree of protection? (=> In case artificial light is needed, ensure that fluorescent lamps of "daylight" colour are used.) (3)	☐	☐	
MAINTENANCE			
8. Are the compressed air regulators and pressure gauges in good working condition?	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
9. Are the spraying guns cleaned on a daily basis?	☐	☐	
10. Are the fan blades, drive belts, pulleys and the interior of the booth cleaned of paint deposits on a weekly basis?	☐	☐	
11. Are the light fittings cleaned periodically?	☐	☐	
OPERATING PRACTICES			
12. Is smoking prohibited in the area around spraying booth and relevant safety sign affixed?	☐	☐	
13. Does the worker wear personal protective equipment such as solvent-resistant gloves, boots, full body apron and respirator suitable for organic vapours?	☐	☐	
14. Is the set pressure on air pressure regulator checked before starting spraying operation?	☐	☐	

SAFETY CHECKLIST - AUTOMATIC SPRAYING MACHINE

☞ **Compare the depiction below with the machine/situation in your tannery and check with the help of the enclosed machine-specific checklist! Check each machine separately!**



Spraying chamber (Photo: RePO-UNIDO)

Drying tunnel (Photo: RePO-UNIDO)

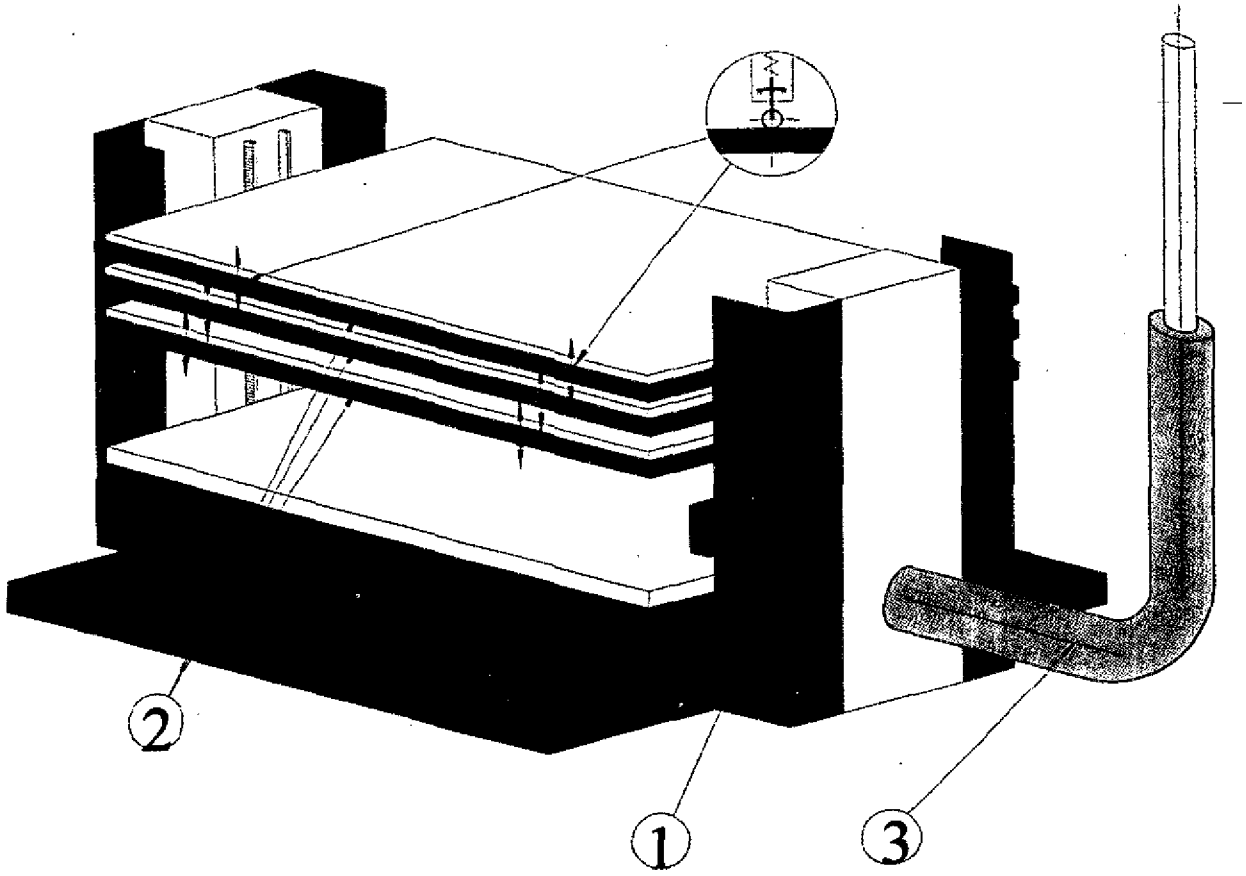
CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
AVAILABILITY OF SAFETY DEVICES			
1. Are fixed guards and covers installed and in place to prevent the possibility of accident from contact with moving parts of machine (pulley, drive, belts)?	☐	☐	
2. Are the spray vapours and spraying mist efficiently ducted out from the spraying booth **AND** the drying tunnel?	☐	☐	
3. Have you had the vapour concentration checked in the spraying area?	☐	☐	
4. Are the (glass) panels around the spraying compartment in place, in good order, tightly sealing the spraying compartment?	☐	☐	
5. Is fire fighting equipment suitable for flammable solvents (class B fire) readily available?	☐	☐	
OPERATING CONTROLS			
6. Are all operating controls marked in simple local language and colour green ON, red OFF, yellow/red EMERGENCY STOP)?	☐	☐	
ELECTRICAL INSTALLATIONS			
7. Are all electric motors in the spraying area enclosed and explosion-proof (EX rated)?	☐	☐	
8. Are electric motor bodies, base-frame and all electrical enclosures earthed with corrosion-protected wires (if insulated, these should be marked as per international standard colour code green + yellow)?	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
9. Are the electrical starters of the motors such that the motors will not restart on their own, when main's power supply is restored after a power failure?	☐	☐	
10. Are the electrical cables routed in corrosion proof conduits, unless the cable itself is armoured?	☐	☐	
11. Do the electrical enclosures and motors have IP55 degree of protection?	☐	☐	
12. Are motor terminal boxes closed?	☐	☐	
13. Do the cable entry holes have gland fittings?	☐	☐	
14. Are all other openings in electrical enclosure boxes closed with tight fitting plugs to prevent ingress of dust and water?	☐	☐	
MAINTENANCE			
15. Do the operators clean the machine before lubrication?	☐	☐	
16. Are grease nipples, breathers and filler caps in place to prevent the ingress of dust?	☐	☐	
17. Are compressed air regulators and pressure gauges in good working condition?	☐	☐	
18. Is the collection well for excess spray liquid clean?	☐	☐	
19. Are all light fittings (luminaires) in the spraying cleaned periodically?	☐	☐	
20. Is power to the machine effectively disconnected or locked out (by removing or locking isolator switch) before any maintenance work is carried out?	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
21. Are sign boards "under repair" or "men at work" used to ensure that nobody will attempt to start the machine?	☐	☐	
OPERATING PRACTICES			
22. Does the operator make sure that the glass panels of spraying compartment are closed before starting spraying operation?	☐	☐	
23. When checking inside spraying compartment, does the operator allow for adequate time for exhausting spraying mist to be exhausted before opening the spraying compartment?	☐	☐	
24. Does the operator use solvent-resistant gloves, boots and respirator suitable for organic vapours when checking the spraying compartment?	☐	☐	
25. Are the spraying compartment and drying tunnel exhaust fans programmed to stop or kept running at least 20 minutes after the spraying operation has stopped to ensure efficient spray mist and pigment extraction and exhaust?	☐	☐	

SAFETY CHECKLIST - VACUUM DRYER

☛ Compare the depiction below with the machine/situation in your tannery and check with the help of the enclosed machine-specific checklist! Check each machine separately!



(Source: CTC)

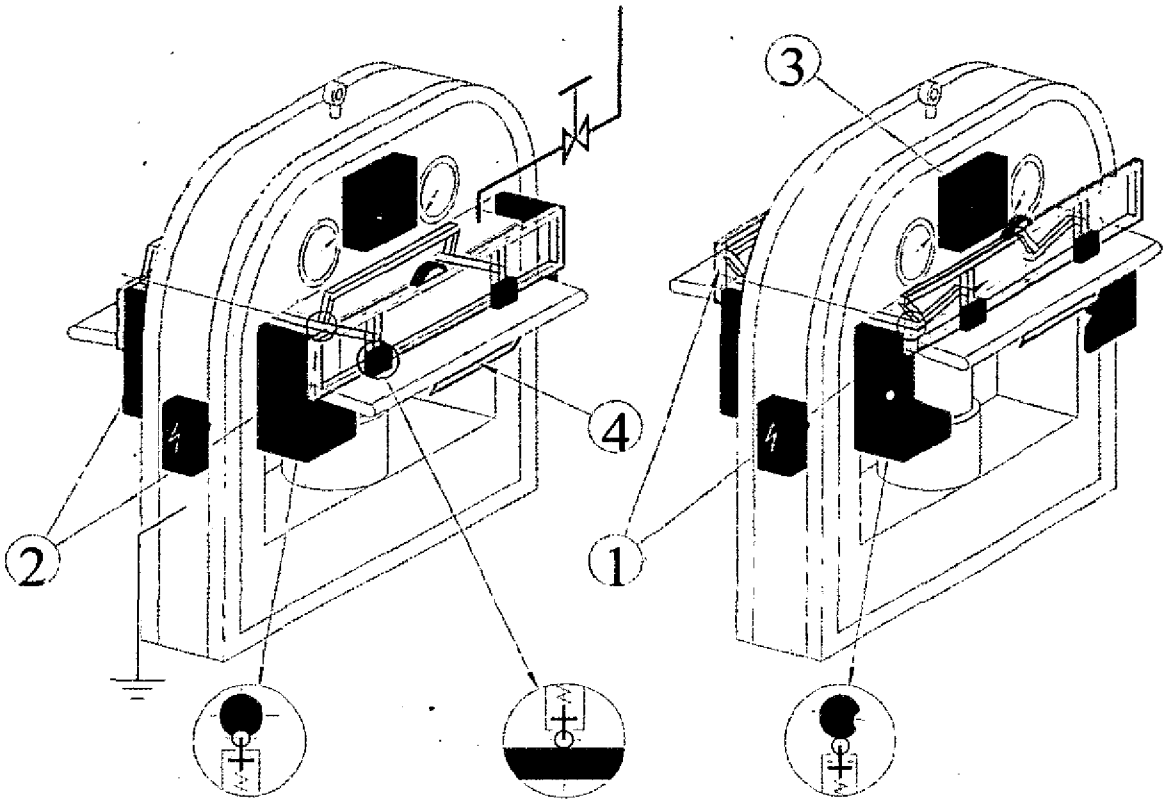
CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
AVAILABILITY OF SAFETY DEVICES			
1. Are fixed guards and covers installed and in place to prevent the possibility of accident from contact with moving parts of machine (drive couplings, platen lifting device)? (1)	☐	☐	
2. Are the steam and heating oil pipes thermally insulated? (3)	☐	☐	
3. Is an active guard in place with an electronic, electro-pneumatic, optical, or any other type of sensing device which opens the platen in case finger, forearm or tools are trapped between platens? (2)	☐	☐	
OPERATING CONTROLS			
4. Are all operating controls marked in simple local language and colour (green ON, red OFF, yellow/red EMERGENCY STOP)?	☐	☐	
5. Are the control devices (ON/OFF/EMERGENCY switches) installed in reach of the operators?	☐	☐	
6. On large machines with several operators, are the control buttons installed at each working position?	☐	☐	
ELECTRICAL INSTALLATIONS			
7. Are electric motor bodies, base-frame and all electrical enclosures earthed with corrosion-protected wires (if insulated, check whether these are marked as per international standard colour code green and yellow)?	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
8. Are electrical cables routed in corrosion proof conduits, unless the cables are armoured?	☐	☐	
9. Do the electrical enclosures and motors have IP55 degree of protection?	☐	☐	
10. Are the motor terminal boxes closed?	☐	☐	
11. Do the cable entry holes have gland fittings?	☐	☐	
12. Are all other openings in electrical enclosure boxes closed with tight fitting plugs to prevent ingress of dust, steam and water?	☐	☐	
MAINTENANCE			
13. Are the condition and performance of vacuum pump checked on a daily basis?	☐	☐	
14. Is the condition of edge rubber seals checked on a daily basis and repaired or replaced, if vacuum pressure cannot be held?	☐	☐	
15. Are the condition of felt and the cleanliness of platen checked on daily basis?	☐	☐	
16. Are the compressed air filters, pressure regulators, air line lubricants and gauges checked and serviced periodically as per supplier's manual?	☐	☐	
17. Is the power to the machine effectively disconnected or locked out (by removing fuses or locking isolator switch) before any maintenance work is carried out?	☐	☐	
18. Are sign boards "under repair" or "men at work" used to ensure that nobody will attempt to start the machine?	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
OPERATING PRACTICES			
19. Are the platen temperature and vacuum pressure checked before starting operation?	☐	☐	
20. Do the operators check that no tools or other hard materials are kept on the platen before closing?	☐	☐	
21. Is the platen cleaned during operation?	☐	☐	
22. When platens are opened, can the platens be fixed with mechanical fixing stops?	☐	☐	
23. Do the operators wear personal protective equipment (e.g. gloves, non-slip footwear)?	☐	☐	

SAFETY CHECKLIST - PLATING/EMBOSSING MACHINE

- **Compare the depiction below with the machine/situation in your tannery and check with the help of the enclosed machine-specific checklist! Check each machine separately!**



(Source: CTC)

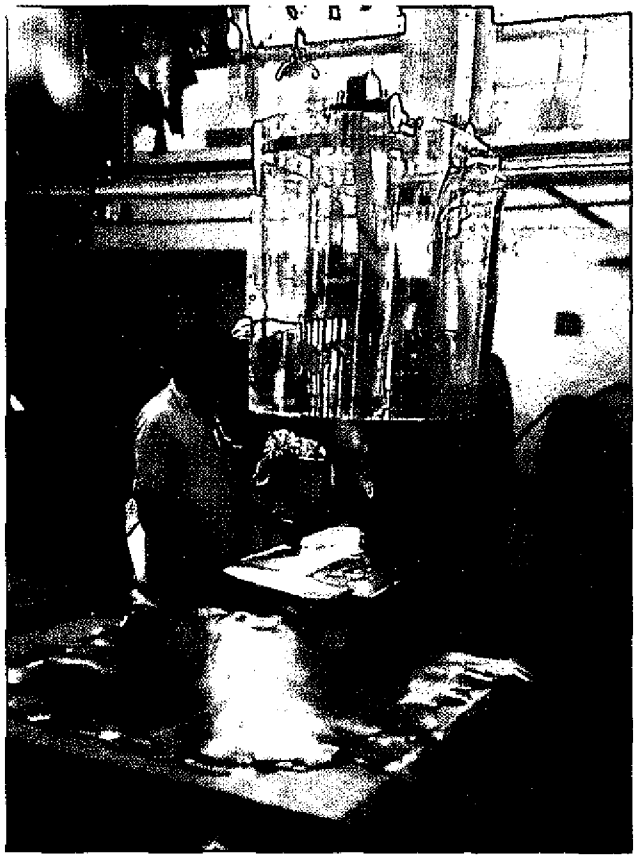
CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
AVAILABILITY OF SAFETY DEVICES			
1. Are fixed guards installed and in place to prevent the possibility of accident from contact with moving parts of machine (e.g. driving belts and pulleys and couplings of hydraulic pump)?(2)	☐	☐	
2. Are the steam/oil pipes thermally insulated?	☐	☐	
3. Are active guards in place on both operating sides with an electronic, electro-pneumatic, optical, or any other type of sensing device, which lifts the ram in case finger, forearm, tools are trapped between ram and platen? (4)	☐	☐	
4. In case of older machines, using active guard screens at the front and rear, are these mechanically linked and move simultaneously? (=> When closed, suitable position contact devices should permit the platens to operate.) (1)	☐	☐	
OPERATING CONTROLS			
5. Are all operating controls marked in simple local language and colour (green ON, red OFF, yellow/red EMERGENCY OFF)? (3)	☐	☐	
6. Do both operators have access to the closing control buttons?	☐	☐	
7. Is operation possible only when the hands of both operators are on the actuating buttons?	☐	☐	

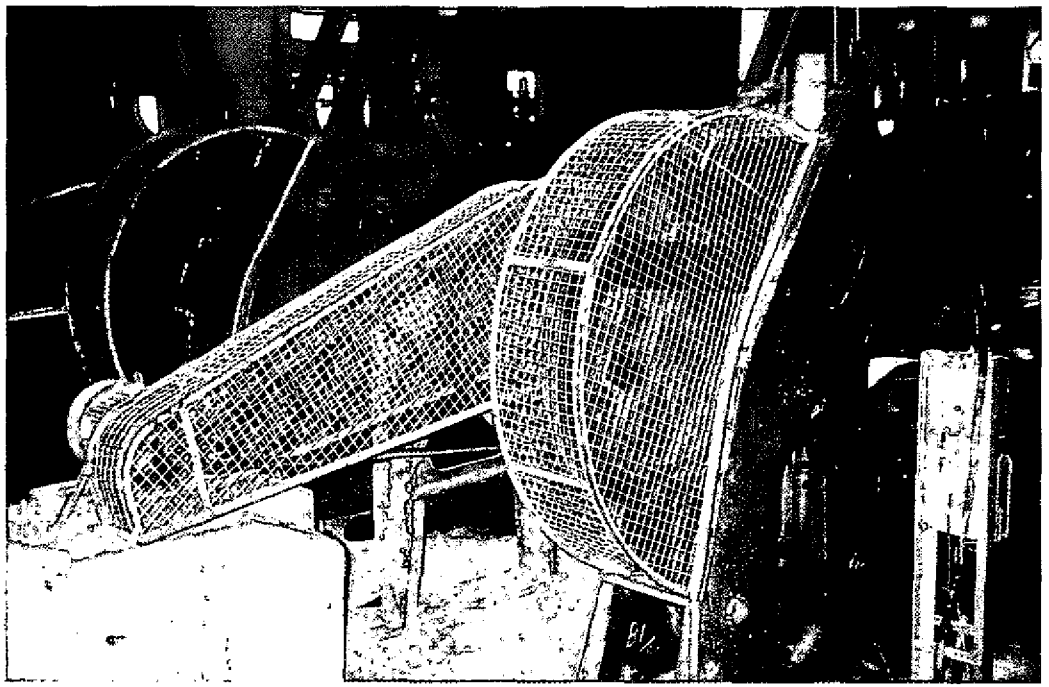
CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
ELECTRICAL INSTALLATIONS			
8. Does the machine have electrical features that will not allow the machine to restart on its own, when power supply is restored, after a power failure?	☐	☐	
9. Are electric motor bodies, base-frame and all metallic electrical enclosures earthed with corrosion-protected wires (if insulated, these should be marked as per international standard colour code green + yellow)?	☐	☐	
10. Are electrical cables routed in corrosion proof conduits, unless the cables are armoured?	☐	☐	
11. Are the motor terminal boxes closed?	☐	☐	
12. Do the cable entry holes have gland fittings?	☐	☐	
13. Are all other openings in electrical enclosure boxes closed with tight fitting plugs to eliminate the ingress of dust, steam and water?	☐	☐	
14. Do the electrical enclosures and motors have IP55 degree of protection?	☐	☐	
MAINTENANCE			
15. Is the machine checked for hydraulic oil leakage from rams on daily basis?	☐	☐	
16. Is the machine checked for heating oil/steam leaks regularly and, if necessary rectified?	☐	☐	
17. Is the condition of the felt checked on a weekly basis?	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
18. Is the hydraulic system operation checked at maximum press tonnage at periods as specified in the operating manual?	☐	☐	
19. Is the platen/embossing plate surface cleaned on daily basis?	☐	☐	
20. Is the power to the machine effectively disconnected or locked out (by removing fuses or locking isolator switch) before any maintenance work is carried out?	☐	☐	
21. Are sign boards "under repair" or "men at work" used to ensure that nobody will attempt to start the machine?	☐	☐	
OPERATING PRACTICES			
22. Does the operator adjust hydraulic pressure and embossing temperature to suit the work requirement?	☐	☐	
23. Do the operators check that no tools or other hard materials are kept on the platen before closing action is initiated?	☐	☐	

SAFETY CHECKLIST - GLAZING MACHINE

☞ ***Compare the depiction below with the machine/situation in your tannery and check with the help of the enclosed machine-specific checklist! Check each machine separately!***





(Photos: RePO-UNIDO)

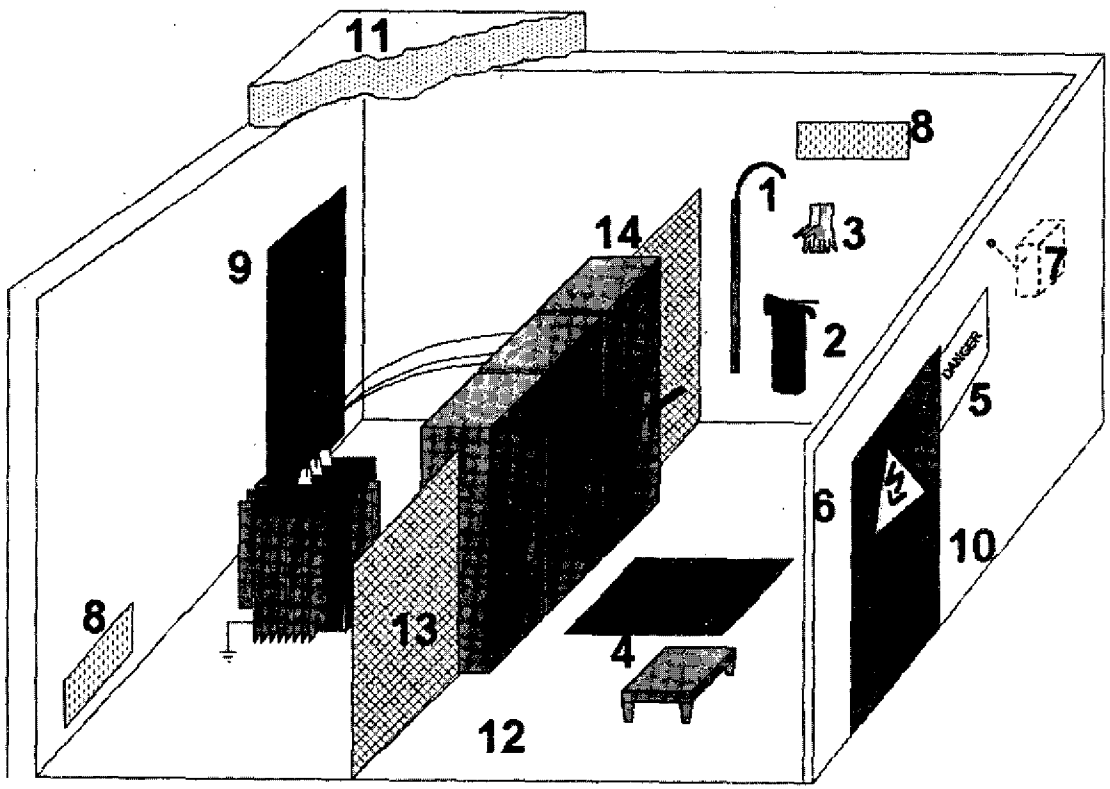
CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
AVAILABILITY OF SAFETY DEVICES			
1. Are passive guards fitted on motor drive pulleys and machine flywheel?	☐	☐	
2. Is there a passive guard on the glazing mechanism to prevent head and upper body injuries (=> This guard may be preferably made of transparent and impact-resistant material - see picture).	☐	☐	
3. Is there local lighting of adequate light quality provided on the machine? (Check with reference sheet – 5.1!)	☐	☐	
OPERATING CONTROLS			
4. Are all operating controls marked in simple local language and colour (green ON, red OFF, yellow/red EMERGENCY STOP)?	☐	☐	
5. Are the control devices (ON /OFF/EMERGENCY switches) in reach of the operator, but away from any moving part?	☐	☐	
ELECTRICAL INSTALLATIONS			
6. Does the machine have electrical features that will not allow the machine to restart on its own, when power supply is restored after a power failure?	☐	☐	
7. Are electric motor bodies, base-frame and all electrical enclosures earthed with corrosion-protected wires (if insulated, make sure that these are marked as per international standard colour code, green and yellow)?	☐	☐	
8. Are the electrical cables routed in conduits, unless the cable itself is armoured?	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
9. Do the electrical enclosures and motors have IP55 degree of protection?	☐	☐	
10. Are the motor terminal boxes closed?	☐	☐	
11. Do the cable entry holes have gland fittings?	☐	☐	
12. Are all other openings in electrical enclosure boxes closed with tight fitting plugs to prevent the ingress of dust?	☐	☐	
MAINTENANCE			
13. Do all pivot points of the mechanism have bearings that are firmly fixed to the links of the mechanism?	☐	☐	
14. Are the call pivot pins and screws secured with lock-washes, lock-nuts or other devices to ensure that they do not work loose?	☐	☐	
15. Is the glazing glass (of toughened material) without defects and firmly held in place? (=> Replace, if necessary!)	☐	☐	
16. Do you regularly adjust the glazing bed alignment for even glass?	☐	☐	
17. Is the glazing bed pressure adjusting device in good order?	☐	☐	
18. Is the V - belt tension checked on daily basis?	☐	☐	
19. Are all pivot points lubricated?	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
20. Are the bushes or bearings in good order? (=> Replace, if worn or damaged!)	☐	☐	
21. Is the proper fixing of glazing glass checked on daily basis before starting operation?	☐	☐	
22. Is the machine checked for any loose screws or pins on daily basis before starting operation?	☐	☐	
23. Is the power to the machine effectively disconnected or locked out (by removing fuses or locking isolator switch) before any maintenance work is carried out?	☐	☐	
24. Are sign boards "under repair" or "men at work" used to ensure that nobody will attempt to start the machine?	☐	☐	
OPERATING PRACTICES			
25. Does the operator check the condition of glazing glass, once a day before starting glazing operation?	☐	☐	
26. Is the operator allowed rest at pre-determined frequencies to relax eyes and arms?	☐	☐	
27. Does the operator wear tight clothes and avoid loose/long hair when working on the machine?	☐	☐	

SAFETY CHECKLIST - ELECTRICAL SUPPLY/CONTROL UTILITIES

☞ **Compare the depiction below with the situation in your tannery and check with the help of the enclosed checklist!**



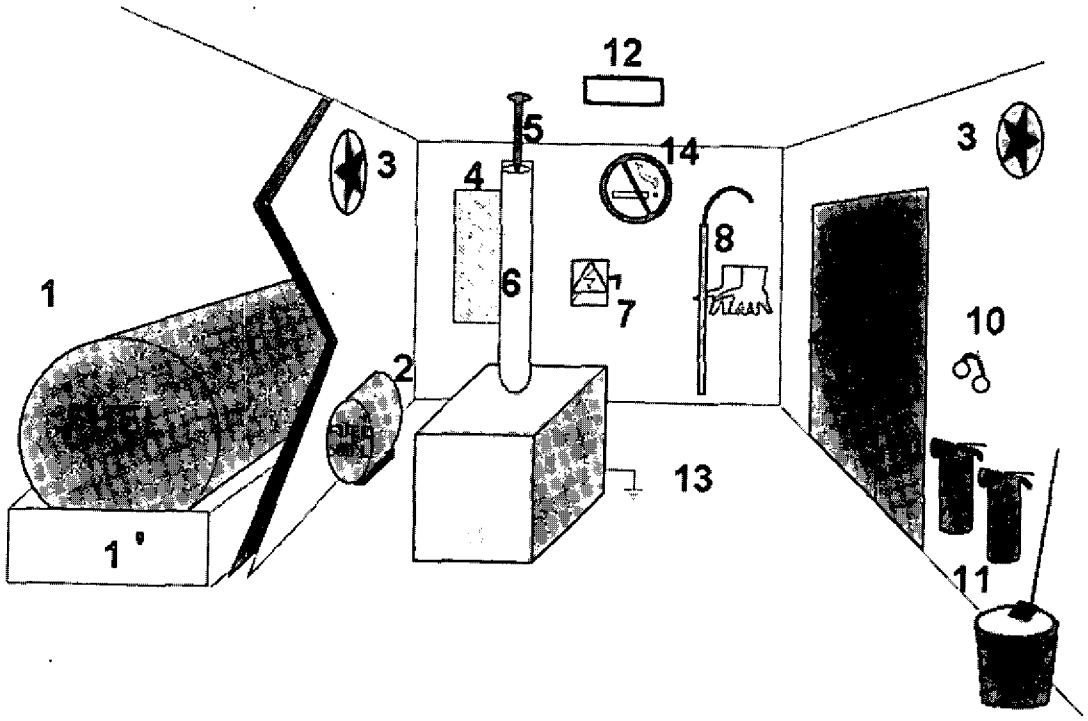
(Source: CTC)

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
SITING			
1. Is access to transformer yard prevented by a fence-type barrier? (13)	☐	☐	
2. Is the transformer yard covered with fine gravel?	☐	☐	
3. Is good ventilation provided in electrical control area/room (either using natural air flow (8) or by installing wall mounted supply air fans and exhaust fans) to keep temperature and humidity low?	☐	☐	
4. Is access to the high tension area restricted, ideally by a separate door, with a warning sign "high tension" affixed? (9)	☐	☐	
5. Is the electrical control area/room protected against leakage from outside ? (11)	☐	☐	
6. Is the floor of electrical control area/room clean and free of any spare parts, waste and other material, particularly flammable? (12)	☐	☐	
ELECTRICAL INSTALLATIONS			
7. Are insulation mats (fine fluted, 10 mm switchboard rubber matting e.g. BS 921/1976 or equivalent) placed in front of control panel? (4)	☐	☐	
8. Are electricity supply and current effectively switched off or locked out during maintenance work?	☐	☐	
9. Are all switches and buttons clearly marked and labelled (e.g. ON/OFF)?	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
10. Are special rubber gloves suitable for high tension available and always used during maintenance work? (3)	☐	☐	
11. Are warning signs for electrical danger (also indicating voltage) affixed in the electrical control area/room? (6)	☐	☐	
12. Are all fuses, overload relays and other protective devices in place and in good order?	☐	☐	
EMERGENCY PREPAREDNESS			
13. Are sign boards indicating voltage and first medical aid measures (in local language) affixed in the electrical control room/area? (5)	☐	☐	
14. Are smoking and use of open flames strictly prohibited in the control room/area or near electrical installations?	☐	☐	
15. Is an insulated stick ready for emergencies to rescue persons caught in the current? (=> **DO NOT** touch victim with bare hands or use stick, made of conductive material; see reference sheet 7.5)	☐	☐	
16. Is at least one carbon dioxide or dry chemical powder fire extinguisher kept ready in an easily accessible location (which is clearly marked) of the electrical control room/area? (2) (see also reference sheet 7.1)	☐	☐	

SAFETY CHECKLIST - POWER GENERATING FACILITIES

☞ **Compare the depiction below with the situation in your tannery and check with the help of the enclosed checklist!**



(Source: CTC)

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
SITING OF GENERATOR			
1. Is the main fuel storage of generator set located outside the generator room?	☐	☐	
2. Is access to main fuel storage restricted by a barrier or fence?	☐	☐	
3. Does the main fuel storage have a fuel catchment? (1)	☐	☐	
4. Is the immediate storage of fuel in the generator room limited to 500 litres? (2)	☐	☐	
5. Is the floor clean and free of any spare parts, waste and other material, particularly flammable? (12)	☐	☐	
6. Can the door of the generator room be easily opened outwards allowing easy escape in case of emergency (e.g. fire)?	☐	☐	
7. Does the generator area have a ventilation system to exhaust heated and polluted air using fans (3) and natural ventilation? (4) (=> Exhaust combustion gases from the generator (5) with thermally insulated exhaust pipes)	☐	☐	
8. Has the actual concentration of exhaust fumes in the generator area/room been measured?	☐	☐	
9. Is the noise of the generator set contained by a baffle enclosure over and around the generator to minimise noise pollution? (Has the actual noise level been measured?)	☐	☐	
10. In case noise cannot be contained, is hearing protection (ear muffs, ear plugs) provided and used when working in generator room while generator is running? (10)	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
ELECTRICAL INSTALLATIONS			
11. Are general circuit breakers installed, in place and well maintained?	☐	☐	
12. Is the generator properly earthed?	☐	☐	
13. Are the earthing connections tight and free of corrosion?	☐	☐	
14. Are all electrical enclosures and boxes closed, locked and labelled with electrical hazard pictograms? (7)	☐	☐	
15. Is a warning sign for electrical danger (also indicating voltage) affixed in the generator room? (6)	☐	☐	
16. Is an electrical insulation mat (fine fluted, 10 mm switchboard rubber matting, e.g. BS 921/1976 or equivalent) placed in front of control panel? (4)	☐	☐	
17. Is the current effectively switched off and locked out during maintenance work?	☐	☐	
18. Are special rubber gloves suitable for electrical work at the mains voltage available and always used during maintenance work on the electrical installations? (3)	☐	☐	
EMERGENCY PREPAREDNESS			
19. Are sign boards indicating voltage and first medical aid measures affixed in the generator room? (5)	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
20. Are an insulated stick and high tension rubber gloves kept ready for use in an emergency? (8) (=> **DO NOT** use bare hands to rescue person caught in the electrical current; see reference sheet 7.5)	☐	☐	
21. Are smoking and use of open flames strictly prohibited in the control area or close to electrical installations. (=> Affix a "no-smoking" sign!) (14)	☐	☐	
22. Are multi-purpose fire extinguishers (ABC-type) kept ready at the generator area/room with easy access and Is their location clearly marked? (11) (see reference sheet 7.1)	☐	☐	

USE STANDARD COLOUR CODES FOR ELECTRICAL CABLES

1. **Check whether the electrical wires and cables are colour coded to allow their easier identification in case of repair and maintenance work.**
2. **Check the type of electrical supply and voltage *in your tannery in column* 1 of the table below.**
3. **Compare the type of conductor with the standard colour code as listed in column 3 of the table below.**
4. ***If the colour coding used in your tannery does not conform to standard, mark the respective electrical wires by other means after testing.***

1 Type of electric supply and voltage	2 Conductor	3 Standard colour
AC, 415 Volts, 50 Hz three phase supply	• Phase L1 • Phase L2 • Phase L3 • Neutral • Protective conductor/Earth	⇨ Red ⇨ Yellow ⇨ Blue ⇨ Black ⇨ Green and Yellow
AC, 240 Volts, 50 Hz Single phase supply	• Phase • Neutral • Protective conductor / Earth	⇨ Red ⇨ Black ⇨ Green and Yellow
DC two wire system	• Positive voltage • Zero voltage • Protective conductor / Earth	⇨ Red ⇨ Black ⇨ Green and Yellow
DC three wire system	• Positive voltage • Zero voltage • Negative voltage • Protective conductor / Earth	⇨ Red ⇨ Black ⇨ Blue ⇨ Green and Yellow

UNDERSTAND THE INDEX OF PROTECTION (IP) CLASSIFICATION SYSTEM

The index of protection classification system explains the required degrees of protection for electrical motors, enclosures of electrical control switch gear, electrical distribution boards and other panels and lighting fixtures (lamp fixtures) against solid objects and water (see table)

IP 55

IP55 INDEX OF PROTECTION

IP**5**5 **The first digit indicates the level of protection against solid objects (see column 2).**

IP5**5** **The second digit indicates the level of protection against water (see column 4).**

1 First digit	2 Protection against solid objects	3 Second digit	4 Protection against water
0	No protection	0	No protection
1	Protected against solid objects larger than 50 mm (hands)	1	Vertically falling water
2	Protected against solid objects larger than 12 mm (e.g. fingers)	2	Direct spray at 15 degrees from vertical
3	Protected against objects larger than 2.5 mm (e.g. tools & wires)	3	Direct spray at 45 degrees from vertical
4	Protected against solid objects larger than 1 mm (small tools & wires)	4	Direct spray at 60 degrees from vertical
5	Protected against dust (limited ingress not harmful)	5	Water sprayed from all directions
6	Totally protected against dust	6	Low pressure jets from all directions
		7	Strong jets from all directions
		8	Protected against effect of submersion up to one meter depth
		9	Protected against effect of long submersion at "X" meters depth in water

"X" = depth of submersion to be defined by buyer

CHECK AND IMPROVE LIGHTING IN YOUR TANNERY AND ETP

Cross-check the reference numbers in column 5 and 6 with the types of lamps in table 2 (see page 3/3)

1 Area of operation	2 Lux range (lumens/m²) requirement	3 Protective measures for fittings	4 Recommended index of protection for fittings	5 Recommended type of lamp for general lighting(e.g. work area)	6 Recommended type of lamp for local lighting (e.g. on machines)
Raw leather store	150...200	Corrosion resistant	IP 54	7	1 3 4 5
Chemical store	400...750	Corrosion resistant	IP 54	7	1 3 4 5
Spare parts	400...750		IP 34		
Leather store (finished)					1 3 5
Measuring	300...500		IP 20		1 3 4 5
Sorting	750...1000		IP 20		1 3 4 5
Packing	300...500		IP 20		1 3 4 5
Finished leather store	150...200		IP 20		1 3 4 5
Beamhouse					
Soaking	150...300	Corrosion resistant	IP 55	7	1 3 5
Liming	150...300	Corrosion resistant	IP 55	7	1 3 5
Unhairing	150.. 300	Corrosion resistant	IP 55	7	1 3 5
Scudding	150...300	Corrosion resistant	IP 55	7	1 3 5
Tanyard					
Tanning	150...300	Corrosion resistant	IP 55	7	1 3 5
Wet-finishing					
Dyeing/ Fatliquoring	300...500	Corrosion resistant	IP 55	7	1 3 5
Setting	300...500	Corrosion resistant	IP 55	7	1 3 5
Sammying	300...500	Corrosion resistant	IP 55	7	1 3 5
Splitting	300...500	Corrosion resistant	IP 34	7	1 3 5
Shaving, wet	300...500	Corrosion protected	IP 34	7	1 3 5
Shaving, dry	300...500		IP 55	7	1 3 5
Toggle drying	300...500		IP 54	7	1 3 5
Buffing	300...500		IP 55	7	1 3 5

1 Area of operation	2 Lux range (lumens/m²) requirement	3 Protective measures for fittings	4 Recommended index of protection for fittings	5 Recommended type of lamp for general lighting(e.g. work area)	6 Recommended type of lamp for local lighting (e.g. on machines)
Finishing					
Staking	750... 1000		IP 54	7	1 3 5
Spraying/ roller coating	750... 1000		IP 55	7	1 3 5
Plating / Embossing	750...1000		IP 20	7	1 3 5
Glazing / Ironing	750...1000		IP 20	7	1 3 5
Utilities					
ETP					
Chemical dosing area	300...500	Corrosion protected	IP 55	7	1 3 5
Walkways in treatment plant	30...75	Corrosion protected UV protected	IP 55	7 8	4 5
Clarifiers	30...75	Corrosion protected UV protected	IP 55	7 8	4 5
Dewatering	300...500	Corrosion protected	IP 55	7 8	5
Supply transformer	150...200	Corrosion protected UV protected	IP 55	8	
Main electrical panel	150...300		IP 20	7	1 3 4 5
Boiler room	300...500	Corrosion resistant	IP 34	7	3 4 5
Fuel storage facility	150...200	Corrosion protected UV protected	IP 55	7 8	4 5
Maintenance workshop	300...500		IP 20	7	1 3 5

Note:

Where fluorescent lights are used above or around machines with moving parts, the lamps must be installed as twins in a single fitting to avoid accidents due to stroboscopic effects. (=> moving parts sometimes appearing stationary but not really so)

Thumb rule!

Choose the type of lamp for use in your tannery which has the highest lumen per Watt value. Even the initial cost might be higher, at the end the savings in energy will off set the difference of price between cheaper and more expensive but more effective lamp types.

Table 2 – Selected types of lamps for use in tanneries and effluent treatment plants

Reference number	Type of lamp	Efficacy (in lumens per Watt)[1]	Remarks
1	Incandescent lamp	11	Easily available, fair colour rendition
2	Halogen lamp	17	Good colour rendition
3	Compact fluorescent tube	43	Recommended for direct replacement for incandescent lamps for lower energy consumption
4	Fluorescent single tube	70	Available in "daylight" type version
5	Fluorescent twin tube	70	Available in "daylight" type version for good colour rendition
6	Mercury vapour lamp (high pressure)	57	Prefer metal halide type instead.
7	Metal halide lamp	95	Good colour rendition, low energy consumption, suitable for outdoor use
8	Sodium vapour lamp	112	High contrast, no glare, very low energy consumption, suitable for outdoor use

(1) Efficacy (lumen per Watt): The higher the value, the lower the energy consumption at a given light quality.

CHOOSE THE PROPER DUST CONTROL EQUIPMENT

When buying a machine for operations likely to emit dust (e.g. dry shaving, buffing, staking), make sure that the machine is provided with a built-in local extraction and collection facility. This will enable you to control the dust at source and to avoid later investment in other dust control measures.

SELECT THE RIGHT TYPE OF DUST COLLECTION EQUIPMENT TO CONTROL DUST AT SOURCE!

Table 1 - Type of dust in selected work areas

Area of operation	Coarse dust	Fine dust
Dry shaving	✓	✓
Staking		✓
Buffing	✓	✓

Cyclones

Properly designed cyclones are ideal for collection of coarse and fine dust. These are least expensive in terms of initial and running cost. Particles of 10 microns (1 micron = 0.001 mm) can be collected at an efficiency of 95% and above. Cyclones can be used alone or in combination with bag filters or wet scrubbers.

Scrubber

Modern high efficiency scrubbers come in various versions (e.g. Venturi scrubber, spray scrubber, packed static, mobile bed scrubber, cyclone scrubber). Scrubbers can be used to collect dust from 0.3 to 100 microns size. In scrubbers, water is pumped into the equipment in form of a fine spray. The spray wets the dust, which settles on the bottom of the scrubber and is discharged in form of a slurry. The water can be reused after filtering or sent to the effluent treatment plant.

Bag filters

For collecting fine dust (0.05 to 50 microns size), a standard bag filter can be an excellent solution. Choice and type and area of filter fabric are critical to the efficiency of the system (Engineered filter fabrics, yes! Jute sack, no!) In humid and corrosive conditions, materials such as needle felted poly-propylene are superior to cotton drill. Bag filters must have an automatic cleaning device (e.g. mechanical shaker, reverse pulse jets) to remove the caked-up dust from the bag fabric. Without cleaning, heavy dust loads cause increased pressure-drop across the filter resulting in reduced air flow and performance.

Examples of solutions for tanneries

1. Tanneries with only one-dust emitting machine should use a unit dust collector of the combined cyclone and bag filter type.
2. Tanneries with more than one dust emitting machine should use a centralised dust collection system for economy.
3. For centralised dust collection in a tannery having dusty operations (e.g. dry shaving, buffing), a combination system with a cyclone pre-filter followed by a bag filter or wet-scrubber is a good choice.

SUPPLEMENT THE SOURCE EXTRACTION WITH GENERAL VENTILATION!

There are minimum requirements for ventilation, depending for instance on occupancy of room/area, the volume of room, the intensity of work done, the level of pollutants, heat and humidity. The number of existing wall openings and existing natural air flow need to be taken into account. For a closed room - as a thumb rule - the product of room volume in cubic meter should equal the capacity (in cubic meter) of all ventilation fans installed in the room. Check with table 2 for the number of recommended air changes per hour required in various areas of factories.

Table 2 - Number of air changes per hour

Type of room/area	Air changes per hour
Boiler house/engine room	15...30
Lavatories and toilets	6...8
Office	4...6
Factories*	Over 4

* depending on layout, type and use.

USE PERSONAL PROTECTIVE EQUIPMENT AS LAST RESORT!

Respirators and dust masks work only when the dust concentration in the room/area has been reduced by source extraction and general ventilation first! Before using a dust mask check whether they are suitable for the type, size and quantity of dust expected in the room/area. The minimum dust size should be indicated on the mask or by the supplier.

1. Dust masks are suitable for coarse dust only.
2. Use special respirators (e.g. HEPA type) to protect yourself and your workers against lung-damaging dust.

SELECT APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT (PPE)

1. Select the area of operation from column 1 and check the type of personal equipment required (column 3).

2. Cross-check the reference code in column 4 with the respective specifications of the recommended personal protective equipment as given in table 2 (see pages 4/5 – 5/5). The letter code refers to the type of personal protective equipment; the number refers to the subtype as listed in table 2.

Explanation of letter codes					
A	Aprons, protective clothes	G	Gloves	R	Respirators
E	Eye protection	N	Hearing protection	S	Safety shoes/boots

1 Area of operation	2 Potential hazards present	3 Type of personal protective equipment required	4 PPE Type #
Raw material storage Sorting Trimming Desalting	Injuries Bacteriological toxicity Pesticide toxicity Infected hides and skins Humidity	Gloves Safety boots Respirator	G1 S1 R2
Chemical store and sub-stores Chemical store (wet processing)	Injuries Chemicals Acids Alkalis Solvent vapours Humidity Dust	Gloves Aprons Safety boots Goggles Respirator	G1 A1 S1 E1 R2
Chemical store (spraying & coating)	Dust Mists Organic vapour, Humidity	Gloves Aprons Safety boots Goggles Respirator	G2 A1 S1 E1 R3

1 Area of operation	2 Potential hazards present	3 Type of personal protective equipment required	4 PPE Type #
Beam house			
Soaking Liming Deliming Fleshing *Splitting*	Acids Alkalis Acid Gases Chemical splashes *Chemical dusts and mists* Wet and slippery conditions	Gloves Aprons Safety boots Goggles *Respirator*	G1 A1 S1 E1 R2
Tanyard			
Bating Pickling Chrome / vegetable tanning	Acids Alkalis Acid gases Chemical splashes Chemical dusts and mists Noise Wet and slippery conditions	Gloves Aprons Safety boots Goggles Respirator Noise protection	G1 A1 S1 E1 R2 N1 / N2
Wet-finishing			
Sammying Splitting Setting Shaving wet	Injuries Chemical salts Slippery conditions	Gloves Apron Safety boots	G1 A1 S1
Dyeing Fatliquoring	Injuries Chemical splashes Wet and slippery conditions Chemical dust and mist Ndse	Gloves Apron Safety boots Goggles Respirator Noise protection	G1 A1 S1 E1 R2 N1 / N2
Finishing			
Staking, Buffing, Shaving, dry	Injuries Leather dust	Goggles Respirator Ear plugs / muffs	E1 R1 N1/N2
Spraying Coating	Dust and mists, Paint spray, Organic vapour	Gloves Goggles Apron Respirator	G2 E1 A2 R3
Measuring and packing	Dust	Respirator	R1

1 Area of operation	2 Potential hazards present	3 Type of personal protective equipment required	4 PPE Type #
Utilities			
Boiler	Heat Steam Fire flammable fuels Noise	Gloves Ear plugs / muffs Safety shoes	G5 N1/N2 S2
Compressor	Noise Explosion of pressure vessel	Safety shoes Ear plugs / muffs	S2 N1/N2
Generator Electrical control panel and electrical maintenance	Electric shock Electric shock Noise	Gloves electrical Safety shoes electrical Ear plugs / muffs	G6 S4 N1/N2
Mechanical maintenance	Injuries from cuts Heat	Gloves Safety shoes	G7 S2
Welding electric	Welding fumes Eye protection Burns Electric shock	Welding gloves Welding shield Apron Safety shoes	G4 E3 A3 S3
Welding or cutting using gas	Welding fumes Eye protection Burns	Gloves Welding goggles Apron Safety shoes	G4 E2 A3 S3
Fuel Storage	Flammable fuel Slippery conditions Fire	Gloves Safety shoes	G3 S2
Effluent treatment plant			
Chemical handling dosing	Chemical dust Alkalis	Gloves Goggles Aprons Safety boots Respirator	G2 E1 A2 S1 R2
Maintenance and cleaning of collection system, tanks, pits	Ammonia Hydrogen sulphide gas CO_2 Methane	Gloves Aprons Safety boots SCBA to be used	G2 A1 S1 refer note

Table 2 - Specifications of personal protective equipment

Type of personal protective equipment	Subtype	Specification	Preferred material options
GLOVES			
	G1	Chemical resistant, with embossed or textured surface, 0.35 mm thick, 350 mm to 450 mm(14" to 18") long, rolled cuff, with optional finger-less knitted cotton liners	1. Butyl-Neoprene(outer) composite 2. Neoprene 3. Butyl 4. Natural rubber-Nitrile (outer) composite
	G2	Chemical resistant, embossed or textured surface, 0.35 mm thick, 350 mm to 450 mm(14" to 18") long, rolled cuff, with optional finger-less knitted cotton liners of the following material	1. Fluoroelastomer 2. Nitrile 3. Neoprene
	G3	Chemical resistant, embossed or textured surface, 0.35 mm thick, 350 mm to 450 mm(14" to 18") long, rolled cuff, with optional finger-less knitted cotton liners of the following material	1. Butyl-Neoprene(outer) composite 2. Butyl
	G4	Welders glove, heat resistant, 120 mm (4.1/2") long, gauntlet cuff, wing thumb, flame retardant cotton lining	Chrome tanned leather, flame-retardant cotton lining
	G5	Heat resistant mill gloves, double palm, knit wrist	100 % cotton, 18 oz. per sq. yd. (550 grams / m^2)
	G6	Electrical insulated gloves (ANSI Class 0), 265 mm (10.1/2") long	Rubber (5 kV test, 1000 Volt AC maximum usage)
	G7	Gloves cut-resistant with palm grip for handling band-knife of splitting machine	Knitted stainless steel filament-cored fabric
SAFETY SHOES/ BOOTS			
	S1	Safety boot, industrial, water-proof, non-slip sole, washable non-absorbent polyester lining, 400 mm (16") height	100 % PVC moulded with polyester lining. Use with gaiters
	S2	Safety shoes for boiler rooms with toe guard, oil-resistant, abrasion and heat resistant	Chrome-tanned leather upper, Polyurethane sole
	S3	Safety shoes for welders, non-slip, abrasion- and heat-resistant chrome leather upper and polyurethane non-slip sole with toe guard.	Chrome-tanned leather upper, Polyurethane sole
	S4	Safety shoes for electrical work, with toe guard, slip-resistant sole and heel and electric shock-resistant to 1000 Volts AC	Chrome-tanned leather upper, Polyurethane sole

Type of personal protective equipment	Subtype	Specification	Preferred material options
APRONS / CLOTHES			
	A1	Full body type with bib, Nylon waist and adjustable neck ties, 1200 mm (48") long	1. PVC coated (both sides) polyester 12 oz/sq. yd., 2. Neoprene coated (both sides) Nylon 12 oz/sq. yd.,
	A2	Full body type with bib, Nylon waist and adjustable neck ties, 1200 mm (48") long	Neoprene coated (both sides) on Nylon fabric 350 g/m^2 (12 oz / sq. yd.)
	A3	Welder's apron, full body, heat and burn resistant (from molten metal droplets)	Chrome tanned leather
RESPIRATORS			
	R1	Respirator with dust/mists pre-filter and HEPA cartridge	
	R2	Respirator with dust/mists pre-filter and acid gases cartridge	
	R3	Respirator with dust/mists/ paint spray pre-filter and organic vapour cartridge	
	R4	Self contained breathing apparatus (SCBA)	
EAR PROTECTION			
	N1	Ear plugs, reusable corded, thin 3-flange, silicone rubber non-toxic, washable, NRR21 dBA or better (ANSI-83.19-1976)	
	N2	Ear muffs, with foam cushion, pivoting ear cups for good sealing and alignment, NRR 25 dBA or better (ANSI-S3.19-1974)	
EYE PROTECTION			
	E1	Chemical and dust goggle, over-spectacle, with adjustable lateral vented side arms side shields and wide angle vision, scratch-resistant poly-carbonate lens, soft, flexible nose-piece	
	E2	Welding goggles gas welding dear and shade 5 lenses (EN 166 and EN 175 conformity)	
	E3	Welding shield arc welding, heat resistant polyester body, with dear glass and shade 10 welding glass	

SELECT THE CORRECT FIRE FIGHTING EQUIPMENT

1. Check the type of fire to be expected in a certain work area of your tannery (columns 1 and 2).
2. Check which fire extinguisher is suitable for the type of fire (✓ - **suitable**).
3. Check whether the existing fire fighting equipment is suitable for the respective area in your tannery. Cross-check whether the class-of-fire abbreviations (A, B, C, E) are highlighted on the fire fighting equipment.

When did you have the equipment checked last?

Train yourself and your workers in the correct use of fire fighting equipment!

1	2	TYPE OF SUITABLE FIRE FIGHTING EQUIPMENT					3
TYPE OF FIRE	LOCATIONS IN TANNERY	Water	Foam	Dry chemical powder	Carbon dioxide	Sand	CLASS OF FIRE
Leather Leather dust Wood Textiles	☐ Dry shaving area ☐ Buffing area ☐ Drying area ☐ Finished leather store	✓		✓	✓	✓	A
Petrol Oil Solvents Chemicals	☐ DG room ☐ Chemical store ☐ Spraying area ☐ Dyeyard ☐ Boiler room ☐ Fuel storage		✓	✓	✓		B
Cooking and welding gas	☐ Canteen ☐ Workshop	✓	✓	✓	✓	✓	C
Electricity and electrical appliances	☐ Electrical control panel ☐ Transformer			✓	✓		E

Note:

Class D fire is usually not found in tanneries.

ACCIDENT/INCIDENT REPORT

Name of person affected _____

Address _____

Copy to Manager ☐
Copy to ..... ☐

1. DETAILS

- Date of accident ..... Time .....
- Date ceased work ..... Time .....
- Time lost (to date) .....
- On-site medical treatment required .....

Date reported ..... Time .....
Supervisor.....

2. TYPE OF ACCIDENT/SERIOUS HARM

☐ Fall, trip, slip
☐ Caught in moving part
☐ Hit by (moving) part or object
☐ Hitting object with part of the body
☐ Sound
☐ Pressure
☐ Temperature (heat/cold)
☐ Electricity
☐ Inhalation of chemicals or other substances
☐ Ingestion of chemicals or other substances
☐ Body stressing (manual handling, weight)
☐ Mental stress

3. INJURY/SERIOUS HARM CAUSED BY

☐ Machine or machine part (describe) .....
☐ Powered equipment/tool/appliance .....
☐ Non-powered equipment/tool/appliance .....
☐ Chemical or chemical product (give name) .....
☐ Material/substance other than chemical .....
☐ Bacteria or virus .....

4. BODY PART:

- ☐ Head
- ☐ Neck
- ☐ Trunk
- ☐ Arm
- ☐ Hand
- ☐ Finger
- ☐ Leg
- ☐ Foot
- ☐ Toe
- ☐ Eyes
- ☐ Ears
- ☐ Internal organs

5. NATURE AND EXTENT OF INJURY/DISEASE

- ☐ Fracture
- ☐ Dislocation
- ☐ Sprain or strain
- ☐ Amputation
- ☐ Open wound (cut)
- ☐ Puncture wound
- ☐ Superficial injury (scratch)
- ☐ Bruising or crushing
- ☐ Burns
- ☐ Internal injury
- ☐ Nerves or spinal cord
- ☐ *Poisoning of toxic effect*
- ☐ Disease, nervous system
- ☐ Disease, musculo-skeletal system
- ☐ Disease, skin
- ☐ Disease, digestive system
- ☐ Disease, infectious or parasitic
- ☐ Disease, respiratory system
- ☐ *Disease, circulatory system*
- ☐ Tumor
- ☐ Mental disorder

6. WHERE AND HOW DID THE ACCIDENT/HARM HAPPEN?

7. WHICH CIRCUMSTANCES HAVE CAUSED THE ACCIDENT/HARM?

- ☐ Lack of training
- ☐ Inexperience
- ☐ Misconduct
- ☐ Safety rules not enforced
- ☐ Unsafe work practice
- ☐ Communication difficulties (language, noise)
- ☐ Ineffective preventive measures
- ☐ Lack of protective equipment
- ☐ Poor housekeeping
- ☐ Lack of maintenance
- ☐ Work place design (equipment siting, lighting, ventilation)
- ☐ Other (please specify) .....

WHAT TO DO IN CASE OF FIRE

- ☐ **Raise alarm!**
- ☐ **Clear area of personnel !**
- ☐ **Check whether everybody has safely escaped or been rescued, if possible!**
- ☐ **Provide first medical aid if required and inform medical emergency service (doctor, ambulance, hospital)!**
- ☐ **Close all vents and shut down mechanical ventilation!**
- ☐ **Fight fire using available fire fighting equipment (but check whether you are using the right type of fire fighting equipment before use)!**
- ☐ **If possible, remove other combustible/flammable material to avoid spread of fire!**
- ☐ **Call fire brigade and inform about**

  1. *location and type of fire*
  2. *missing people*
  3. *location of anyone still in the building and their condition if known*
  4. *any known dangers if a rescue attempt is made (e.g. electrical installations or hazardous chemicals in the area)*

TO BE COPIED AND DISPLAYED IN THE WORK AREAS!

FIRST MEDICAL AID IN CASE OF FIRE

- ☐ **In rescuing workers overcome by smoke, use suitable breathing apparatus or have wet handkerchief around your face before entering the danger area!**
- ☐ **Remove accident victim from danger!**
- ☐ **Hold a rug, blanket or coat in front of you, while approaching person whose clothing has caught fire!**
- ☐ **Lay down person quickly on the ground and wrap tightly with thick piece of cloth, rug or coat. Smother flames by gently rolling the person or by gentle pats over the covering.**
- ☐ **Do not remove adhering particles of charred clothes. Cover burnt area with sterile or clean dressing and bandage!**
- ☐ **Wrap victim into clean clothes. In case of vomiting, turn face towards the side and maintain clear airway!**
- ☐ **Check breathing - if stopped, apply artificial respiration!**
- ☐ **Check pulse - if absent, give artificial respiration and external heart compression!**
- ☐ **Arrest bleeding, if present!**
- ☐ **Attend to shock by keeping accident victim warm!**
- ☐ **Arrange quick transport to doctor or hospital!**
- ☐ **At hospital give attending doctor full details about accident conditions and first medical aid measures provided!**

TO BE COPIED AND DISPLAYED IN THE WORK AREAS!

WHAT TO DO IN CASE OF GAS POISONING

- ☐ **If a worker is overcome by gas or fumes, use suitable breathing apparatus before entering the danger area!**
- ☐ **Remove accident victim from danger area to uncontaminated and well ventilated place! Provide additional oxygen in case of severe poisoning!**
- ☐ **Make accident victim comfortable while giving first aid. In case of vomiting, turn face towards the side and maintain clear airway!**
- ☐ **Check breathing - if stopped, apply artificial respiration!**
- ☐ **Check pulse - if absent, give artificial respiration and external heart compression!**
- ☐ **Arrest bleeding, if present!**
- ☐ **Attend to shock by keeping accident victim warm!**
- ☐ **Arrange quick transport to doctor or hospital!**
- ☐ **At hospital give attending doctor full details about accident conditions and first medical aid measures provided!**

TO BE COPIED AND DISPLAYED IN THE WORK AREAS!

WHAT TO DO IN CASE OF GENERAL ACCIDENTS WITH MACHINES AND ELECTRICITY

- ☐ **Immediately turn off machine and power!**
- ☐ **If accident victim is caught in electrical current, do not touch person with bare hands! Use insulation stick or dry wooden stick to remove accident victim from immediate danger area!**
- ☐ **Remove accident victim from danger area (e.g. pit, machine, electrical installation)!**
- ☐ **Make accident victim comfortable while giving first aid. In case of vomiting, turn face towards the side and maintain clear airway!**
- ☐ **Check breathing – if stopped, apply artificial respiration!**
- ☐ **Check pulse - if absent, give artificial respiration and external heart compression!**
- ☐ **Arrest bleeding and attend to electrical burns, if present!**
- ☐ **Attend to shock by keeping accident victim warm!**
- ☐ **Arrange quick transport to doctor or hospital!**
- ☐ **At hospital give attending doctor full details about accident conditions and first medical aid measures provided!**

TO BE COPIED AND DISPLAYED IN THE WORK AREAS!

WHAT TO DO IN CASE OF CHEMICAL SPLASHING ON SKINS AND EYES

- ☐ **Immediately flush away hazardous substance splashed on the skin/in the eyes!**
- ☐ **Rinse skin/eye with large volume of clean water for at least 10 minutes!**
- ☐ **If skin and clothing of the worker are highly contaminated with chemicals, flush worker with water as clothing is removed!**
- ☐ **Check with material safety data sheet for further immediate measures!**
- ☐ **Inform supervisor about accident, indicating the chemical involved!**
- ☐ **Arrange quick transport to doctor or hospital.**
- ☐ **At hospital give attending doctor full details about accident conditions and first medical aid measures provided.**

TO BE COPIED AND DISPLAYED IN WORK AREAS INVOLVING CHEMICALS!

WHAT TO DO IN CASE OF ACCIDENTAL SWALLOWING OF CHEMICALS

- ☐ **Make person vomit, if conscious! NEVER induce vomiting or feed water, if person is unconscious!**
- ☐ **Check breathing - if stopped, apply artificial respiration!**
- ☐ **Check pulse - if absent, give artificial respiration and external heart compression!**
- ☐ **Inform supervisor about accident, indicating chemical involved!**
- ☐ **Check respective Material Safety Data Sheet of chemical for recommended first medical aid measures!**
- ☐ **Arrange quick transport to doctor or hospital.**
- ☐ **At hospital give attending doctor full details about accident conditions and first medical aid measures provided.**

TO BE COPIED AND DISPLAYED IN WORK AREAS INVOLVING CHEMICALS!

WHAT TO DO IN CASE OF CHEMICAL SPILL AND LEAKS

- ☐ **Evacuate any non-essential personnel to an area safe from any possible harm and provide first medical aid, if required!**
- ☐ **If the chemical is flammable or combustible, reduce risk of fire or explosion by removing or turning off any possible source of ignition in the leak/spill area!**
- ☐ **Ventilate area well, keeping in mind possible flammable fumes and vapours!**
- ☐ **Check Material Safety Data Sheet of respective chemicals before taking further action!**
- ☐ **Use personal protective equipment as specified in the Material Safety Data Sheet!**
- ☐ **Eliminate further spread of the chemical involved by controlling it at its source, if possible (e.g. close valve, seal tank or reroute)!**
- ☐ **Attempt to contain spill or leak by dyking and absorption! If appropriate, put chemical in a sealed container or neutralise as specified on the Material Safety Data Sheet!**
- ☐ **Decontaminate and clean spill area, before resuming work!**

TO BE COPIED AND DISPLAYED IN THE CHEMICAL STORES!

WORK PLACE INSPECTION CHECKLIST

This checklist has been designed to help you carry out a work place inspection. Whenever references are made check with the respective section of the OSH reference manual for further guidance.

Use this checklist as a guide for an initial audit and inspection of your tannery and effluent treatment plant or during your regular work place inspections.

Before ticking the respective boxes, consult with the supervisors and workers in the respective work place. If in doubt, check for additional hints in the respective sections of the OSH reference manual.

HOW TO USE THE CHECKLIST

1. **Make necessary number of copies corresponding to the number of distinctive work areas you want to check in your tannery! (It is recommended to use a separate copy for each work area.)**

2. **Check prevailing conditions on-site against each point in the checklist!**

☐ **OK**	No further improvement needs to be considered because it is already available.
☐ **NOT OK**	Improvement is required.

3. **If found "not OK", briefly note down reminder point in "REMARK" section.**

4. **If not applicable, make a note in the "REMARK" section.**

5. **Whenever applicable, also make use of special checklists as provided with the reference manual and attach to inspection list.**

6. **On completing the inspection list, review all reminders and "not OK" points. Try to clarify further in terms of (1) existing problem, (2) *potential hazard* and (3) hazard cause. (=> Check with reference sheets in chapter 2!)**

7. **Plan and implement remedial action. Consult with other persons or check with the respective chapters in the OSH reference manual before deciding on the remedial action!**

WORK PLACE INSPECTION CHECKLIST

Area: .....

Date: .....

Inspection carried out by:
.....
.....

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
GENERAL WORK CONDITIONS			
1. Floors (walking and working surfaces) non-slippery	☐	☐	
2. No uncovered and unguarded floor openings	☐	☐	
3. Aisles and passageways free of obstructions and stumbling hazards	☐	☐	
4. Aisles and passageways clearly marked for safe movement of persons and material	☐	☐	
5. Railings (hand and toe rail) of platforms, scaffolding, mezzanine in place and in good order	☐	☐	
6. Ladders in place and in good order (high – 3m) ladders provided with ladder guards)	☐	☐	
7. Stairs non-slippery and railings in place	☐	☐	
8. All exits unobstructed and clearly marked	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
9. Railings (hand and toe rail) on mezzanine floor in place and in good order	☐	☐	
10. Windows clean	☐	☐	
HOUSEKEEPING			
11. Solid waste removed from work area	☐	☐	
12. Empty barrels storage removed from the work area	☐	☐	
13. Floor clean and free of chemical spills	☐	☐	
14. Drains provided with covers and free of clogging	☐	☐	
WORK CLIMATE AND FACILITIES			
15. Ventilation in place and working (Verify by measuring humidity and temperature!)	☐	☐	
16. All lights working and fitting clean and free of corrosion	☐	☐	
17. Lighting of required quality (Check with reference sheet – 5.1)	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
18. Toilets clean	☐	☐	
19. Changing room clean and in good order	☐	☐	
20. Clean drinking water available for workers	☐	☐	
21. Wash room, showers clean and in good order	☐	☐	
MATERIAL HANDLING			
22. All chemical containers of chemicals used labelled and marked (see chapter 3)	☐	☐	
23. Chemical containers covered (lids, taps)	☐	☐	
24. Combustible/flammable material kept away from ignition sources	☐	☐	
25. Raw material/material in process kept on pallets/tables/stacks/racks	☐	☐	
26. Material moved using trolley	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
EMERGENCY PREPAREDNESS			
27. Emergency instructions displayed (see samples in chapter 7)	☐	☐	
28. At least two emergency exits available in the work area	☐	☐	
29. Fire fighting equipment installed and in good order (see chapter 7)	☐	☐	
30. Eyes rinsing/emergency showers installed	☐	☐	
31. First medical aids kits clean and complete	☐	☐	
32. Emergency rescue equipment readily available and its location marked	☐	☐	
33. Place of first medical aid box and first-aider known by worker(s)	☐	☐	
PERSONAL PROTECTIVE EQUIPMENT			(Always check whether PPE is of correct quality and in good order! Refer to reference sheet 6.1!)
34. Hearing protection provided and used by operator/helpers	☐	☐	
35. Safety goggles provided and used	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
36. Safety gloves provided and used	☐	☐	
37. Safety boots/shoes provided and used	☐	☐	
38. Apron provided and used	☐	☐	
39. Respirator (dust, fume, vapour, mist) provided and used	☐	☐	
40. Other PPE (Check with reference sheet – 6.1)	☐	☐	
(1)	☐	☐	
(2)	☐	☐	
(3)	☐	☐	
(4)	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
EQUIPMENT /MACHINERY			(Use machine specific checklist in chapter 4!)
41. Passive safety devices (guards, covers, fences) on prime mover/ belts/open gears/ transmission parts in place	☐	☐	
42. Active safety devices available and functional	☐	☐	
43. Adequate space availabe around machine to allow maintenance, cleaning and removal of waste	☐	☐	
44. Terminal boxes of electrical motors covered	☐	☐	
45. Wires around machine insulated and placed in cable ducts	☐	☐	
46. Earthing wires free of corrosion an connected to motor and metallic enclosures	☐	☐	
47. Operation control labelled in local language and in reach of worker	☐	☐	
48. Emission levels (noise, vibration, dust, fumes, vapours) within acceptable limits (Verify using monitoring instruments or thumb rules against occupational exposure limits to reference sheet – 3.1. and 8.1)	☐	☐	
49. Adequate extraction/control facilities available and functioning	☐	☐	

CONDITION TO BE CHECKED	OK	NOT OK	REMARKS
HAZARD CONTROLS			
50. Lock-out system used while maintenance on machine and electrical installations on-going	☐	☐	
51. Safety signboards affixed and in good order	☐	☐	
52. "No-smoking" rule followed by all workers	☐	☐	
53. Warning/alarm system tested/ operational	☐	☐	
ADDITIONAL ASPECTS			(Include additional aspects as required!)
	☐	☐	
	☐	☐	
	☐	☐	
	☐	☐	

ORGANISE WORK PLACE AND HEALTH MONITORING IN TANNERIES AND ETP

The below table contains an overview of parameters to be monitored in tanneries and effluent treatment plants.

	ENVIRONMENTAL PARAMETERS				BIOLOGICAL MARKERS		HEALTH EXAMINATION			
Area of operation	Dust (total respirable)[1] (Source)	Gas/fumes/ vapours [2]	Noise[3] (Source)	*Heat stress* [4]	*Chemical* levels in blood/urine	Chromo-somal aberrations	Clinical examination	Routine blood test	Lung-function test	Hearing test
BEAMHOUSE										
Soaking*			Paddle, drum	Humidity/ Temperature			✓	✓	✓	✓
Liming	Lime		Paddle, drum	Humidity/ Temperature			✓	✓	✓	✓
Fleshing			Fleshing machine	Humidity/ Temperature			✓	✓	✓	✓
Deliming		Ammonia, CO_2, H_2S	Drum	Humidity/ Temperature			✓	✓	✓	✓
TANYARD										
Chrome tanning		Acid vapour/ mist	Drum	Humidity/ Temperature	Chromium levels	Chromium	✓	✓	✓	✓
Vegetable tanning	Vegetable extracts		Drum	Humidity/ Temperature			✓	✓	✓	✓
WET FINISHING										
Sammying							✓	✓	✓	✓
Splitting							✓	✓	✓	✓
Shaving	Dry shaving dust		Shaving machine			Dry shaving dust	✓	✓	✓	✓
Dyeing	Dye powder	Dye vapour/ mist	Drum	Humidity/ Temperature		Solvent, dyes	✓	✓	✓	✓
Setting			Setting machine				✓	✓		✓

Area of operation	ENVIRONMENTAL PARAMETERS				BIOLOGICAL MARKERS		HEALTH EXAMINATION			
	Dust (total respirable)[1] (Source)	Gas/fumes/ vapours [2]	Noise[3] (Source)	Heat stress [4]	Chemical levels in blood/urine	Chromo-somal aberrations	Clinical examination	Routine blood test	Lung-function test	Hearing test
FINISHING										
Staking			Vibration staking machine				✓	✓		✓
Buffing	Buffing dust				Chromium		✓	✓	✓	✓
Spraying		Solvent, spraying mist	Blower	Humidity/ Temperature		Solvent, formaldehyde	✓	✓	✓	✓
Glazing							✓		✓	✓
Plating				Temperature			✓			✓
UTILITIES										
Chemical store/substore	Powdered chemicals	Acid fume, solvent					✓	✓	✓	
Raw material store*	General dust, hair						✓	✓	✓	
Boiler		Flu gas		Radiant heat			✓	✓		✓
Generator room		Exhaust fumes	DG set	Radiant heat			✓	✓		✓
Effluent treatment plant	Lime	H_2S gas, polymer vapours					✓	✓	✓	

* Check for possible anthrax infection on-site and during health examination!

Explanatory notes:

(1) **Dust:** Total dust consists of inhalable dust, thoracic and respirable dust. The total dust exposure over a period of eight hours should not exceed 10 mg/m^3. Respirable dust refers to dust with a particle size of 0.5...5 microns. The occupational exposure limit of respirable dust depends on the respective type of dust (e.g. lime, wood, etc.). Measurement is done with personal samplers using filters of various pore sizes.

(2) **Gas/fume/vapour/mist:** Check reference sheet – 3.1 for specific long-term and short term occupational exposure limits; measurement with personal samplers using different sampler media (analysis in laboratory) or gas monitoring instruments (direct reading).

(3) **Noise:** Continuous noise level should not exceed 85 dB(A); ideally noise level should be around 60 –70 dB(A); measurement with sound level meter (direct dbA reading) or noise analyser (reading in decibel and Hertz).

(4) **Heat stress:** Measurement of (1) temperature with dry-bulb thermometer, (2) humidity with wet-bulb thermometer, (3) radiant heat with globe thermometer and (4) wind speed with wind speed gauge or, alternatively, by Kata thermometer. All four parameters can be combined in a unified single indicator of heat stress. Direct-reading heat stress monitors are available. Different occupational exposure limits are recommended depending on work-rest time distribution over an hour and the type of work load (light, moderate, heavy).

Selected threshold limit values for noise (as per American Conference of Industrial Governmental Hygienists – ACGIH, 1995/96)

	Hours						Minutes			Seconds
Duration	24	16	8	4	2	1	30	15	1	0.11
Sound level in dB(A)	80	82	85	88	91	94	97	100	112	139

HOW TO ASSESS AND PRIORITISE HAZARDS/RISKS

This form may help you to assess and prioritise the health hazards and safety risks as identified during the work place inspection.

1. Review the "NOT OK" points of your work place inspection checklist and enter the same into column 1.

2. Select from table 1 the hazard category describing the prevalent/likely safety risk/health hazard best and enter into column 2.

3. Assess against each hazard listed in column 2 the risk degree (potential severity X probable frequency), selecting the corresponding value from the matrix in table 2.

4. Review hazard assessment table and prioritise your intervention (=> the higher the value against a specific hazard, the more urgently corrective/remedial action is needed).

5. Enter suggested improvement measures in column 4.

HAZARD ASSESSMENT TABLE

Area:
.....

Date:.....

Inspection carried out by:
.....
.....

1 TYPE OF HAZARD	2 POSSIBLE CAUSE IDENTIFIED	3 RISK DEGREE	4 ACTION TO BE TAKEN

TO BE COPIED AND USED!

Table 1 – Hazard categories

- ☐ Fall, trip, slip
- ☐ Caught in moving part
- ☐ Hit by (moving) part or object
- ☐ Hitting object with part of the body
- ☐ Sound
- ☐ Pressure
- ☐ Temperature (heat/cold)
- ☐ Electricity
- ☐ Inhalation of chemicals or other substances
- ☐ Ingestion of chemicals or other substances
- ☐ Body stressing (manual handling, weight)
- ☐ Mental stress

Table 2 – Risk degree matrix

What is the probability of this injury/illness/health effect?	What degree of injury/illness/health effect could occur? (SEVERITY RATING)			
	Fatality	Major illness/injury/ health effect	Minor illness/injury/ health effect	Negligible illness/injury/ health effect
Happens all the time	20	15	10	5
Has happened previously within tannery/effluent treatment plant	16	12	8	4
Strong possibility of happening	12	9	6	3
Known to have happened in the past	8	6	4	2
Remotely possible	4	3	2	1

This glossary defines many terms used in Material Safety Data Sheets as well as literature and publications on occupational safety and health.

Acid: Any of a class of substances that liberate hydrogen ions in water and have a pH of less than 7. Acids are corrosive and may cause severe burns.

Acute effect: The effect caused by a single short-term exposure to a high amount or concentration of a substance.

Aerosols: Liquid droplets or solid particles dispersed in air that are of fine enough particle size (0.01 to 100 microns) to remain dispersed for a period of time.

Alkali: Any of a class of substances that liberate hydroxide ions in and have a pH of more than 7. Strong alkalis in solution are corrosive to the skin and muscous membranes. They are also called bases, and may cause severe burns to the skins.

Anhydrous: Does not contain water (e.g. anhydrous lime!).

Asphyxiation: A condition whereby oxygen in the air is replaced by an inert gas such as nitrogen, carbon dioxide, ethane, hydrogen or helium to a level where it cannot sustain life. Normal air contains 21 percent of oxygen. If this concentration falls below about 17 percent, the human body tissue will be deprived of their supply of oxygen, causing dizziness, nausea and loss of co-ordination. This type of situation may occur in confined workplaces.

Auto-ignition temperature: The minimum temperature at which a material ignites without application of a spark or flame.

Boiling point: The temperature at which liquid changes to a vapour state at a given pressure (usually 760 mmHg or one atmosphere).

Caustic: The ability of an alkali to cause burns.

Chronic (health) effect: An adverse effect on a human body, with symptoms developing slowly over a long period of time.

Chronic toxicity: A chronic effect resulting from repeated doses of or exposure to a substance over a relatively prolonged period of time.

Combustible: A term used to describe and classify substances that burn.

Confined space: Any area that has limited openings for entry or exit that would make escape difficult in an emergency, has a lack of ventilation, contains known and potential hazards, and is not normally intended or designed for continuos human occupancy (e.g. a storage tank, manhole of collection conveyance system in effluent treatment plants)

Dust, airborne: Refers to the suspension of solid particles in the air. Invisible dust will remain airborne for a long period of time and is dangerous because of its ability to penetrate deeply into the lungs.

Explosion proof- equipment: Apparatus or device enclosed in a case capable of withstanding an explosion of specified gas or vapour and preventing the ignition of specified gas or vapour surrounding the enclosure by sparks, flash or explosion, and operating at an external temperature so that surrounding flammable atmosphere will not be ignited.

Flammable: A flammable liquid is defined as a liquid with a flash point between 21 and 55 degrees Celsius. It may catch fire on contact with a source of ignition.

Flammable/explosion limits: Flammable/explosion limits produce a minimum and a maximum concentration of gases/vapours/fumes in air that will support combustion. The lowest concentration is known as lower flammable/explosion limit (LEL), the highest concentration is known as upper flammable/explosion limit (UFL).

Flash point: Minimum temperature at which, under specific conditions, a liquid gives off sufficient flammable gas/vapour/etc to produce a flash on contact with a source of ignition.

Fume: Solid particles formed from condensation of substances from the vapour state. Fumes are normally associated with molten metals where vapours from the metal are condensed into solid particles in the space above the molten metal. The size of particles are in the range visible to the naked eye.

Hazard: A potential to cause danger to life, health, property or the environment.

General exhaust/ventilation: A system for exhausting or replacing air containing contaminants from a general work area.

IDLH, Immediate danger to life and health: The maximum concentration from which one could escape within 30 minutes without any escape-impairing symptoms or irreversible health effects. Usually used to describe a condition where self-contained breathing apparatus (SCBA) must be used.

Incompatible: Condition of materials that could cause dangerous reactions from direct contact with one another. Particularly relevant when storing different substances in the same place.

Local exhaust: A system or device for capturing and exhausting contaminants from the air at the point where the contaminants are produced (e.g. dust in shaving and buffing).

Lockout: The placement of a device on an energy isolating device, in accordance with an established procedure, to ensure that the energy isolating device cannot be operated until lockout device is removed.

MSDS, Material Safety Data Sheet: Consolidated information on specific identity of hazardous chemical substances, also including information on health effects, first medical aid, chemical and physical properties, emergency measures.

Mist: The dispersion of liquid particles in the air. Mists are normally generated by processes where liquids are sprayed, splashed or foamed.

Noise: Unwanted sound, which may cause harmful effect on human body at certain density and frequency.

OEL, Occupational exposure limit: an exposure level established by a regulatory authority (e.g. OSHA, NIOSH).

Poisoning: Normally the human body is able to cope with a variety of substances within certain limits. Poisoning occurs when these limits are exceeded and the body is unable to deal with a substance (by digestion, absorption or excretion).

Risk: The measured probability of an event to cause danger to life, health, property or the environment

TLV, threshold limit values: A concentration threshold in the atmosphere which is set specifically for each pollutant. It refers to the limit accepted in the atmosphere of a working area.

TLV-STEL, TLV short term exposure limit: Concentration threshold in an atmosphere contaminated with a specific type of pollutant for a 15 minute exposure (if not otherwise specified).

TLV-TWA, TLV time weighted average: Concentration threshold in an atmosphere contaminated with a specific type of pollutant, usually for a continuous eight hour exposure.

Toxicity: The inherent potential of a chemical substance to cause poisoning.

Vapour weight: Weight of the chemical (in gaseous form) as compared with the relative weight of air. Vapours of chemicals that are heavier than air may travel long distances and concentrate in low areas.

A	AMPERE
BOD	BIOCHEMICAL OXYGEN DEMAND
BS	BRITISH STANDARD
°C	DEGREE CELSIUS
COD	CHEMICAL OXYGEN DEMAND
CSDS	CHEMICAL SAFETY DATA SHEET
CTC	CENTRE TECHNIQUE CUIR CHAUSSURE MAROQUINERIE
dB	DECIBEL
dB(A)	DECIBEL WITHIN USUAL FREQUENCY RANGE OF HUMAN EAR
FMA	FIRST MEDICAL AID
HEPA	HIGH EFFICIENCY PARTICULATE AIR
Hz	HERTZ
IDLH	IMMEDIATE DANGER TO LIFE AND HEALTH
ILO	INTERNATIONAL LABOUR ORGANISATION
IP	INDEX OF PROTECTION
LEL	LOWER FLAMMABLE/EXPLOSION LIMIT
m	METER
m^2	SQUARE METER
mm	MILLIMETER
MSDS	MATERIAL SAFETY DATA SHEET
NIOSH	NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH
OEL	OCCUPATIONAL EXPOSURE LIMIT
OSH	OCCUPATIONAL SAFETY AND HEALTH
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (USA)
PEL	PERMISSIBLE EXPOSURE LIMIT

PPE	PERSONAL PROTECTIVE EQUIPMENT
RePO	REGIONAL PROGRAMME OFFICE
SCBA	SELF CONTAINED BREATHING APPARATUS
SIDA	SWEDISH INTERNATIONAL DEVELOPMENT AGENCY
STEL	SHORT TERM EXPOSURE LIMIT
TLV	THRESHOLD LIMIT VALUE
TWA	TIME WEIGHTED AVERAGE
UFL	UPPER FLAMMABLE LIMIT
UNIDO	UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
V	VOLT
WHO	WORLD HEALTH ORGANIZATION

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