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Sub-sectoral Environmental and Social Guidelines: Tanneries & Leather Products

PROCESS DESCRIPTION

Tanning is the act of converting animal hides and skins into leather. Tanning and leather finishing facilities generally convert raw hides and / or skins into leather, which is then finished and used to manufacture a wide range of products. Tanning is the process used to stabilizing the raw hide or skin into leather, a non-putrescible product.

The number and type of processes will often vary from one tannery to another depending on the type of animal hide or skin processed. In general, the production processes in a tannery can be split into four main stages described as follows.

Hide and skin storage and beamhouse operations

Raw hides and skins are typically procured from the hide and skin markets or directly from the abattoirs (slaughterhouses), and delivered to the tanneries or fellmongeries (facilities that treat skins and hides, principally sheep skins, before tanning). At the tannery / fellmongery, hides and skins are preliminarily sorted, trimmed, cured (to prevent putrefaction), and stored.

Curing methods for long-term preservation (up to six months) include salting, brining, drying, or dry salting. Short-term preservation (typically two to five days) involves cooling using crushed ice, or refrigerated storage, in addition to use of biocides.

Although curing is often conducted in the abattoir, the process may be repeated in the tannery for longer and more efficient storage. Hides and skins are generally stored on pallets in ventilated or air conditioned areas.

From storage, the hides and skins are taken to the beamhouse. Processes typically carried out in the beamhouse of a tannery include:

- ***Soaking:*** to allow hides and skins to reabsorb any lost water and to clean interfibrillary material. The soak bath is often changed every 8 hours to prevent bacterial growth. Soaking additives include surfactants, enzyme preparations, bactericides, and alkali products.

- ***Dehairing and liming:*** to remove hair, interfibrillary components, and epidermis, and to open up the fiber structure. This involves the use of chemical and mechanical treatment, with or without hair destruction. Elimination of keratinous material (e.g. hair, hair roots, epidermis) and fats from the pelts involves the use of inorganic sulfides and lime treatment. Treatment with organic compounds such as mercaptans or sodium thioglycolate in combination with strong alkali and amino compounds is an alternative to sulfide treatment. Enzymatic preparations can be added to enhance dehairing and they are considered a cleaner technology when compared with the conventional dehairing-liming process.

- ***Fleshing:*** mechanical process to scrape off the excess organic material from the hide (e.g. connective tissue and fat).

Similar processes specific to sheep skins are typically carried out in fellmongeries.

Tanning

Tanyard operations transform cured hides into leather, and typically include:

- ***Deliming:*** the removal of residual lime from the pelts and preparing the pelts for bating. The conventional process involves gradually lowering pH through washing and addition of deliming chemicals (e.g. ammonium sulfate, among others); an increase in temperature; and the removal of residual chemicals and degraded skin components.

- ***Bating:*** a partial degradation of non-collagenic proteins, achieved by enzymatic preparations, which improves the grain of the hide and the subsequent run and stretch of the leather.

- ***Degreasing:*** elimination of excess grease from fatty skins. Three different methods commonly used for degreasing include degreasing in aqueous medium with nonionic surfactant and degreasing agents; degreasing in aqueous medium with organic solvents, nonionic surfactants, and degreasing agents; and degreasing in an organic solvent medium.

- ***Pickling:*** conducted to lower the pH of the pelt before tanning. Pickling floats are typically characterized by high salt concentrations, which can be reduced by using acids that lessen the water uptake of the skins.

- ***Pretanning:*** changing the physical and chemical characteristics of the leather, improving the leather quality, particularly with regard to grain tightness, and chrome uptake, thus reducing the input of chrome. Pretanning agents include aluminum salts, aluminum combined with polyacrylates, glutaraldehyde derivatives, syntans, titanium oxide and salts, or colloidal silica.

- ***Tanning:*** stabilization of the collagen fiber through a cross-linking action. The tanned hides and skins are tradable intermediate products (wet-blue). Tanning agents can be categorized in three main groups namely mineral (chrome) tanning agents; vegetable tanning agents; and alternative tanning agents (e.g. syntans, aldehydes, and oil tanning agents).

- ***Draining, samming and setting:*** After tanning, leathers are drained, rinsed, and either hung up to age or unloaded into boxes and subsequently sammed to reduce the moisture content before further mechanical action. Setting (working over the grain surface of wet leather to remove excess water, to eliminate wrinkles and granulations, to give the leather a good pattern and to work out stresses so that the leather lies flat) may be carried out.

- **Splitting and Shaving:** cutting through skins and hides or leathers at a set thickness. Shaving is carried out when splitting is not possible or when minor adjustments to the thickness are required.

Post-tanning

Post-tanning operations involve neutralization and bleaching followed by retanning, dyeing, and fatliquoring. These processes are mostly undertaken in a single processing vessel. Specialized operations may also be performed to add certain properties to the leather product (e.g. water resistance).

A wide variety of chemicals may be used in this phases. For example, the re-tannage of leather, vegetable tanning extracts, syntans, aldehydes, resins, and mineral tanning agents might be

used. While weak alkalis (e.g. sodium or ammonium bicarbonate, formiate, or acetate) are used in the neutralization process.

Before leather is tradable and storable as an intermediate product (referred to as 'crust') it undergoes a drying process. Drying techniques include samming, setting, centrifuging, hang drying and vacuum drying, amongst others.

Finishing

Finishing operations enhance the appearance of the leather and provide the performance characteristics (e.g. colour, water resistance). These operations can be divided into mechanical finishing processes and surface coat applications. A wide range of process exit for both types of finishing, including, but not limited to polishing, and spray coating (spraying the finishing material with pressurized air in spray cabinets).

KEY ENVIRONMENTAL, HEALTH AND SAFETY RISK/LIABILITY ISSUES

The tannery and leather industry is characterized not only by the large volume of water required for a range of operations but also by the variety of chemicals used for various processes. There are a number of stages that require inputs of water, chemicals and energy. Waste is also generated at each stage. The key environmental health and safety issues are as follows.

Water consumption

Generally, water consumption is greatest in the pre-tanning areas, but significant amounts of water are consumed also in the post-tanning processes. Issues to consider with regards to the amount of water consumed include:

- Security and cost of water supply, from mains or via direct abstraction, may affect the viability of the business.
- Quality of process water used. This may require pre-treatment prior to use.

Water Discharge

Large volumes of effluent (wastewater) are generated, containing a wide variety of chemicals, used throughout the tannery and leather manufacturing process. The principal pollutants in wastewater discharges are from the beamhouse operations and the subsequent tanning operations.

Beamhouse flows may contain hide substance, dirt, blood, or dung and therefore have significant loads of organic matter and suspended solids. It may also contain curing salt and grease, in addition to unused process chemicals (particularly dissolved sulfides); they will also be alkaline and will have a high oxygen demand.

Tanning produces acidic effluents which when derived from chrome tanning will contain unused trivalent chromium salts.

Wastewater from tanyard processes, deliming and bating may contain sulfides, ammonium salts, and calcium salts and is weakly alkaline. After pickling and tanning processes, the main wastewater contaminants depend on the tanning techniques used. Finishing wastewaters may contain lacquer polymers, solvents, colour pigments and coagulants.

Wastewater discharge varies greatly between tanneries, based on the processes involved, raw

materials, and products. Issues to consider include:

- Consider if it is cheaper to partially/fully treat waste on site or pay (higher) fees and penalties for discharging to sewer.
- Tightening of regulatory requirements may necessitate investment in wastewater treatment or other technology in order to maintain compliance.
- Ability of industrial sewer to capture and treat all process effluents.
- Integrity of drainage system is critical when carrying chrome effluent to avoid soil and groundwater contamination.
- Possibility of accidental or environmental sensitive materials reaching local water courses.
- Runoff/stormwater drainage from raw material, production and waste holding areas.

Waste

Hair, offcuts, sludge are the main types of solid waste. Solids are usually disposed of to a landfill site. Dewatered sludges from tanneries can also be disposed of to controlled landfills without significant environmental problems being incurred. Tanning sludges should immediately be covered with inert material to avoid odour generation and insect infestation.

Landfills which receive other industrial residues, particularly acidic wastes, may not be suitable for receiving tannery wastes. Toxic hydrogen sulphide may be liberated and chromium may become soluble and hence escape to groundwater via leachate seepage.

Tannery sludges of organic composition, if free of chrome and sulphides, can have some value as a soil conditioner.

Waste should not be stored too long on site due to the nuisance effect of smells.

Occupational Health and safety

Specific occupational health and safety issues are associated with exposure to chemicals and biological hazard.

- ***Chemical storage and handling:*** workers may be exposed to chemical hazards during loading, unloading, handling, and mixing of chemicals; during the washing, and disposing of chemical containers; and during the management and disposal of chemical waste and effluent. Hazardous chemicals should be managed properly, including awareness campaigns and use of personal protective equipment (PPE).
- ***Biological Hazards:*** workers may be exposed to disease-agents such as bacteria, fungi, mites, and parasites which may be present in the hides or as part of the manufacturing process. Management measures include awareness campaigns and use of personal protective equipment (PPE).
- ***Air emissions:*** In confined areas where releases to atmosphere arise from open-topped vessels, air extraction systems need to be designed to take account not only of occupational health requirements but any local air quality standards, having particular regard to total particulate matter (from

mechanical operations), hydrogen sulphide (from deliming), volatile organic compounds (if relevant to the operations) and formaldehyde (if used for fixing resins in coatings).

- ***Odour:*** Odours may result from raw hides and skins, putrefaction, and from substances including sulfides, mercaptans, and organic solvents. Prevention and control measures for odour emissions include promptly curing raw hides, reducing the time that sludge remains in the thickener (sludge containing less than 30 percent solids may generate especially strong odours), ventilating tannery areas and controlling exhaust emissions from odourous areas.

OTHER ENVIRONMENTAL, HEALTH AND SAFETY RISK/LIABILITY ISSUES

Soil and Groundwater Contamination

Soil and groundwater contamination occurs when chemicals and wastewater seep through the soil from unlined ponds, pipes and drains, or from dumps and spills. Important pollutants include chlorides, tannins, trivalent chromium, sulphate and sulphides as well as other trace organic chemicals and chlorinated solvents. Issues to consider include:

- Secondary containment of tanks and working areas (bunds etc.) to prevent spills reaching the wider environment.
- Licensing of storage facilities.
- Age, construction details and testing programme of tanks.
- Labeling and environmentally secure storage of drums (including waste storage).
- Accident/fire precautions and emergency procedures.

Asbestos and PCBs

Asbestos and polychlorinated biphenyls (PCBs) may need to be removed from the site which can be costly. Asbestos is found in building materials, pipework and insulation. PCBs can be found in electrical equipment such as transformers/hydraulic equipment and capacitors.

KEY SOCIAL, LABOUR AND COMMUNITY RISK/LIABILITY ISSUES

Labour standards

Labour standards are rules that govern working conditions and industrial relations. They may be formal, such as national level regulation and international agreements, or informal, expressed through norms and values.

In general, developed countries have more robust labour standards than developing countries where the associated risks are higher. The commonly accepted rights and principles enshrined in the International Labour Organization conventions are:

- The right to collective bargaining.
- Elimination of forced or compulsory labour.
- Abolition of child labour
- Elimination of all forms of discrimination.

In addition, issues to consider include:

- Fair wages.
- Fair working hours.
- Acceptable working conditions.

Violations of any of these principles could potentially cause severe reputational damage to the company.

Labour standards should apply to the company's own employees as well as to all contractors and sub-contractors engaged. In addition, labour standards should be expected to be enforced by key suppliers.

The foremost issue of concern in the tanneries and leather products industry is the health and safety of workers, which is already dealt with in the environment section.

OTHER SOCIAL, LABOUR AND COMMUNITY RISK/LIABILITY ISSUES

Community Health and Safety

- ***Contamination of the surrounding land and water resources*** may have a negative impact on the health of the local community exposing the company to significant liability risk.
- ***Odours*** might preset a potential nuisance for the community if not adequately controlled.

Upstream supply chain

Labour standards and human rights violations in the company's supply chain can impact its ability to continue to serve discerning markets. Trade customers and retail consumers increasingly expect responsible practices from their suppliers.

Water scarcity

The impact of water scarcity on local communities might be accentuated with the use of large amounts of water by textile manufacturing industries.

Animal Rights and Animal Welfare

Major retailers and brands are beginning to design animal welfare policies for the textile industry in response to consumer and NGO pressure. These policies may include the rejection of the use of fur or skins from animals which are not a by-product of the meat industry, the banning of endangered or exotic species from their product range and basic requirements around the welfare of the animals used in their products.

FINANCIAL IMPLICATIONS

Water Supply

Tannery and leather manufacture uses significant amounts of water, a resource that is increasingly becoming scarce worldwide. The severe weather events caused by climate change may accentuate this trend. Security and cost of water supply may affect the viability of the business, depending on local water resource availability.

Regulatory compliance

There are costs associated with ensuring compliance with regulatory requirements. Stricter legislation will increase the costs of other environment-related expenditure such as waste disposal, water supply and water abstraction, and

control of air emissions. Although environmental standards in developing countries tend to be less strict than in developed countries, these are increasingly being tightened. Examples of environmental compliance costs include:

- Investments in pollution abatement technology.
- Investments in wastewater control equipment. Even where wastewater is discharged to a wastewater treatment plant, some form of pre-treatment is likely to be necessary.
- Fines may be imposed for persistent breaches of regulation.
- Administrative costs (human resources) of training and time to complete the required paperwork.
- Drainage systems may need to be inspected, upgraded, replaced or re-routed.

Litigation

Litigation costs may be significant depending on the degree of the damage and the number of plaintiffs. Causes for legal action could include health and safety incidents (loss of hearing, serious injuries or death, respiratory diseases through inhalation of chemicals), damage to neighbouring property through accidental fires and impacts on community well-being through air or water pollution.

Reputational risk

Damage to reputation (due to either environmental or social impacts or failures) could involve costly and long-running efforts to mitigate damage and reassure stakeholders such as investors, shareholders, customers and the public. This is in addition to associated litigation costs and compensation payments that might be incurred.

Moreover, specific products might become less desirable as a result of damaged reputation, possibly leading to a reduction of demand and fall of the product's market value, impacting the industry's financial performance.

Upstream supply chain

Low environmental, health, safety, social, labour and community standards in the supply chain might impact the industry's ability to continuously trade with key customer who are increasing their screening criteria on these issues. Loss of key customer accounts might have a significant impact on the industry's financial performance.

Consumers' changing expectations

Over recent years, there has been a rise in the demand for clothes which are not made from skins, fur, leather and wools, ie "humane clothing". Retail and consumer companies, particularly in Europe and the US have responded to this trend by targeting top end-consumers, who are willing to pay a premium for such clothes.

At the moment, the risks of a considerable shrink of traditional clothes market remain small. However, tanneries and leather industries should consider the financial implications of such threats – and any opportunities – in their business plans.

Soil and Groundwater Contamination

Where contamination has been identified on or off-site, the actions required (which may include clean up of the site) could have significant cost implications. The amount of financial and human resources required will depend upon the regulatory authorities, the local regulations and the specific site circumstances (including local geological/hydrogeological conditions).

IMPROVEMENTS

Environmental, Health and Safety Improvements

The potential for increased efficiency through process change is significant and, where possible, should be clearly identified in the design of the facilities and processes. General wastewater management measures and process optimization in tanning facilities should aim to reduce the need and intensity of end-of-pipe treatment through implementation of wastewater prevention measures, including:

- Reduction of water consumption, through recycling of process streams.
- Use of 'batch" instead of 'running water' washes.
- Segregation of wastewater streams (e.g. soaking liquors, sulfide-rich lime liquors, and chrome-containing liquors) to improve treatment speed and efficiency. Segregation of water streams also helps to isolate particularly concentrated or toxic compounds, such that they can be removed separately and possibly recovered for reuse.
- Chemical substitution for less toxic and more biodegradable chemicals where possible.

Other, more specific, potential environmental, health and safety improvements may include:

- Implementation of Environmental Management System, such as ISO 14001.
- Introduction of process changes that facilitate water use reduction and/or enable water re-use/recycling.
- Sulphide substitution in dehairing.
- Recycling lime/sulphide liquors after fine (1mm) screening.
- Sulphide stripping at low pH and collection of hydrogen sulphide in caustic soda solution.
- Dehair/hair save techniques.
- Reductions in chromium discharges in tanning (improved process controls, use of self-basifying chromium compounds and dicarboxylic acids).
- Chrome tannage recycling.
- Chrome effluent recovery.
- Use of chrome substitutes (aluminium, titanium and zirconium salts, glutaraldehyde, cod oil).
- Increased bi-product possibilities (gelatine, glue, leatherboard, tallow, protein, etc.).
- Segregation and partial treatment of alkaline sulphide-containing unhairing liquors, often

by screening and subsequent catalytic oxidation (aeration in the presence of a manganese catalyst).

- Balancing of the treated alkaline liquor with screened neutral and acidic flows from all other processes.
- Chemical flocculation/precipitation of the combined balanced flows at controlled pH and subsequent settlement.
- Thickening/dewatering of primary sludges prior to off-site disposal (e.g. landfill).
- The solvent used for degreasing (e.g. paraffin, white spirit, butyl oxitol, ethyl oxitol, TCE, PCE, mono-chloro-benzene and per- chloro-benzene) can be partially recovered, the extraction brines recycled, and the natural grease recovered for commercial use. The amount of surfactant required decreases with the increased use of organic solvents.
- Secondary containment of bulk storage chemical tanks would help prevent the spread of routine spills to the wider environment. Further contamination of land could be prevented through the provision of containment for temporary storage areas of solid wastes such as empty chemical drums.
- Regular inspection of secondary containment facilities and fitting of alarms, where not regularly inspected.
- Implementation of procedures for the handling and treatment of hazardous materials in the event of spillage.

Social, Labour and Community Improvements

Potential social, labour and community improvements may include:

- Implementation of policies and practices that support international labour standards, including the right to collective bargaining, elimination of forced or compulsory labour, abolition of child labour and elimination of all forms of discrimination.
- Ensure fair wages in line with national law and sector standards average (whichever is higher).
- Ensure there are fair working hours and working conditions in place in line with national law and sector standards average (whichever is higher).
- Develop a policy covering labour practices for contractors and sub-contractors.
- Implement a formal code of business conduct, which outlines the principles by which individual employees and the organisation must conduct themselves.
- Develop a whistleblowing policy to allow anonymous reporting of any ethical violations without fear of repercussion.
- In addition to basic health and safety improvements outlined in the environment sector consideration should be given to proactive health and safety education and health screening for workers identified to be at a higher risk of exposure to chemicals.

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GUIDE TO INITIAL DUE DILIGENCE SITE VISITS

The issues and risks associated with a site will vary depending on factors including the type and size of the operation, site location, and the quality of management. However, due diligence visits should consist of a tour of the entire site.

When visiting the sites of potential borrowers or during loan supervision, financial intermediaries may wish to use the following suggestions to guide the initial due diligence process. However, note that this does not represent an exhaustive list of issues for consideration.

During the initial site visit, it will be important to assess the following:

Environmental, Health and Safety Issues

- Identify if the site has an environmental management system and possible accreditation by an independent body.
- Find out whether the site has environmental policies, objectives and performance improvement targets.
- Examine if key environmental issues are being monitored (e.g. amount of water used, air emissions and waste disposed). Compare annual data to assess if there has been an increase or reduction of the environmental impact.
- Enquire about the current status regarding pollution abatement technology.
- Inspect the effluent treatment and disposal system for waste.
- Look for signs of poor housekeeping, such as signs of spillages and leaks and uncontained piles of empty drums, especially in the vicinity of sensitive receptors such as water courses.
- Find out whether drainage systems lead to wastewater treatment systems or discharge directly.
- Note the extent of treatment systems for the different types of wastewater, including process water, surface water runoff and cleaning water.
- Look for localised spills, leaking pipes etc.
- Note the colour and appearance of adjacent water courses.
- Check for use of personal protective equipment.
- Review age and condition of process equipment.
- Find out about the history of the site and the area, particularly any previous industrial use, in order to assess the likelihood of soil and groundwater contamination.
- Note odour levels at and around the site, particularly if there are residential areas nearby.
- Assess the level of health and safety awareness at the works, for example the presence of safety notices, the general appearance of the site and the use of personal protective equipment.

- Note the location and integrity of oil and chemical storage areas. These should be located away from operational areas and have measures to contain spillages.
- Assess emergency response planning in the event of a fire, major spill etc.
- Identify the source of process water and site sanitary/domestic water supply. Determine the conditions of any abstraction licence for process.
- Find out what, if any, treatment is required for process water prior to use.
- Review historical and projected environmental fees and fines.
- It is also suggested that contact is made with local regulatory agencies to determine compliance record and whether complaints have been made by the public.

Social, Labour and Community Issues

- Check that labour standards, contracting and remuneration are in line with national law and are consistent with the average for the sector.
- Check that hours worked, including overtime, are recorded and staff should receive written details of hours worked and payment received.
- Has the Company received inspections from the local labour inspectorate in the previous three years? Have these resulted in any penalties, fines, major recommendations or corrective action plans?
- Has the Company received inspections from major customers in the previous three years? Have these resulted in any major issues, recommendations or corrective action plans?
- Does the organisation have a grievance mechanism which allows employees to raise workplace concerns?
- Are employees free to form, or join, a worker's organisation of their choosing?
- Observe working conditions through process and document review and interview staff.
- Check if the company is subject to any customer policy and/or to any monitoring reviews (e.g. supply chain audit). If so, analyse the policies and the results of customer's audits.
- Observe waste disposal procedures to identify potential soil, water or air contamination pathways that may affect local communities.
- Review company's history of community engagement and look for evidence of meaningful dialogue that takes into consideration the community's concerns about human health impacts of the facility.
- Is there an animal welfare policy? At a minimum, a policy should ensure that the species used and source is recorded.
- Is there a process to communicate progress to local communities and other relevant stakeholders (such as local government authorities, NGOs etc.)?

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ACTION PLANS

Any lending or investment should take place within the context of Environmental and Social Action Plans, which should have clear timescales and roles and responsibilities established for each action point. Typically, plans include:

Environmental, Health and Safety Issues

- Provision of a financial plan and budget for management of environmental issues and performance improvement, for example:
    - Capital investments for energy efficient technology and water efficiency systems;
    - Provision for decontamination of soil and groundwater.
- Development of key performance indicators (KPIs) and monitoring systems to allow for the setting of performance targets to meet regulatory standards and industry best practice. These indicators should allow, in particular, the continuous monitoring of: water use, energy use, water discharge and waste generation.
- Development of plans and procedures for managing risks including:
    - Occupational health and safety issues, such as chemical storage and handling, biological hazards, air emissions and odour.
    - Training for site personnel to ensure awareness of the above issues.

Social, Labour and Community Issues

- Implement best-practice labour standards (in line with International Labour Organization principles), with particular attention to fair working hours and occupational health and safety measures..
- Development of plans and procedures for managing social issues, including community health impacts due to the contamination of land and water resources.
- Design and communication of an appropriate code of business conduct that considers concerns of key stakeholders (shareholders, employees, government bodies, NGOs).
- Ensure basic considerations of animal rights and animal welfare are in place e.g. banning the use of endangered species in line with International law (see Convention on International Trade in Endangered Species, CITES) and consideration of source and treatment of animals for products.

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REFERENCES AND ADDITIONAL SOURCES

IPPC, Integrated Pollution Prevention and control, UK Environmental Agency, Guidance for tanneries sector, 2002 (IPPC S6.08) http://www.environment-agency.gov.uk

WHO, Hazardous chemicals in human and environmental health (WHO/PCS/00.1)http://www.who.int/pcs/training_material/hazardous_chemicals/section_1.htm

WHO, Information Fact Sheet N° 258 February 2001 http://www.who.int/inf-fs/en/fact258.html

International Finance Corporation Environmental, Health and Safety Guidelines - http://www.ifc.org/ifcext/sustainability.nsf/content/EnvironmentalGuidelines

International Labour Organisation - http://www.ilo.org/global/lang--en/index.htm

ISO14000 Series: Environmental Management Systems - http://www.iso14000-iso14001-environmental-management.com/

Convention on International Trade in Endangered Species of Wildlife and Fauna- http://www.cites.org/

Deeper Luxury Report, WWF - http://www.wwf.org.uk/deeperluxury