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SECTORAL PROGRAMME OF POLLUTION CONTROL IN THE TANNING INDUSTRY
IN THE SOUTH-EAST ASIA REGION

Executive summary on the status of the preparatory activities
under the project US/RAS/89/246*

Prepared by
the UNIDO Secretariat

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1. INTRODUCTION

Eight countries of the South-East Asia region participating in this programme, traditionally known as important suppliers of raw hides and skins, have in recent years rapidly expanded their own leather processing capacities. The most advanced among them already export not only finished leathers but also leather footwear and leather apparel. In some of them tannery input demands outstrip locally available supplies and imports of hides and skins from developed countries have become necessary.

The income created by the leather sector is of great relevance to the national economy of each of these countries. In some of them, in addition to providing employment to the weaker sections of the society, the leather sector is among the top foreign exchange earners.

The tanning industry is, however, well known as very polluting, especially through effluents with a high content of organic and inorganic, dissolved and suspended solids, accompanied by a propensity for high oxygen demand and containing potentially toxic metal salt residues. A nauseating odour emanating from the decomposition of protein solid waste, the presence of hydrogen sulphide, ammonia and volatile organic compounds are normally associated with the tanning activities.

The extent of pollution in the region emanating from tanning activities is the cause of serious concern. Untreated wastes have, in some areas, rendered rivers, lakes and underground water not usable for human consumption, for stock watering and/or for irrigation; as a consequence many tanneries, mostly small scale traditional medium and small scale units are being closed leaving jobless thousands of workers.

2. PREPARATORY ACTIVITIES

2.1 Recommendations of the UNIDO Leather Panel

An outline of a sectoral programme of technical assistance to the leather industry in selected countries of South-East Asia in the treatment of tannery effluents was presented by the UNIDO Secretariat to the Ninth Session of the Leather and Leather Products Industry Panel held in Pecs, Hungary, in October 1988.

The Leather Panel recommended that UNIDO should continue its efforts to further develop the subject project concept. The Leather Panel suggested that a preparatory assistance project could be undertaken to identify the specific needs of the countries to be covered and to present potential low-cost type solutions to minimize the environmental degradation caused by the tanning industry, with particular emphasis on the optimum utilization of by-products.

2.2 Field activities

Under the project US/RAS/89/246, entitled: "Preparatory Assistance in the Treatment of Tannery Effluents in Selected Countries of South-East Asia", which was financed through a special purpose contribution by the Government of the Federal Republic of Germany to the Industrial Development Fund of UNIDO, two UNIDO experts specialized in the treatment of tannery effluents made short, fact-finding missions to the countries concerned in October/November 1990. One of the experts visited China, Indonesia, Sri Lanka and Thailand and the other Bangladesh, India, Nepal and Pakistan.

Specifically, the experts appraised the situation concerning the methods used in leather processing and treatment of wastes, skills available, legislation on emission standards, monitoring and enforcement, and environmental impact emanating from tanning operations. Together with national counterparts, they also identified the needs for technical assistance on a priority basis.

3. CHARACTERISTICS OF THE LEATHER SECTOR - BARRIERS TO ACHIEVING ECOLOGICALLY SUSTAINABLE DEVELOPMENT IN THE REGION

3.1 Introduction of low-waste technology

Traditionally, tanning operations were a family business, carried out in small to medium scale semi-mechanized units, very frequently grouped tightly in clusters which used to be outside residential areas. Tanners in such units have no formal education and have no understanding of the complexities of the leather processing, their skills acquired from the elders with hardly any perception of environmental protection.

The quality and character of leather is prone to change when the parameters of processing are altered. Changes in the length of processes, process temperatures, float volumes, uptake of chemicals etc., all influence the ultimate character of the leather. Leather being produced from a complex, non-uniform natural protein material still requires considerable craft in its manufacture. The adoption of low waste technology often requires a radical alteration of most tannery processes, while, at the same time, ensuring that the ultimate product retains its marketable properties. Therefore, if a tanner is producing consistent quality of leather which satisfies his customers using a process which may be wasteful in water, energy and chemical utilization, he may resist altering his operations to comply with environmental demands.

There is already a wide range of low-waste processing options available to the tanner: green fleshing, hair-saving beamhouse systems, ammonium-free delimiting, high chrome exhausting and/or chrome-free tannages, organic-solvent free finishing, etc., including recycling of floats and chrome recovery and transformation of wastes into valuable by-products like gelatine, glue, fodder, fertilizer, leatherboard, filter media, non-wovens etc.

Low waste technologies, generally speaking, require better skilled personnel and closer technical control than conventional processing. Thus, the lack of properly trained staff at different levels remains one of the crucial constraints.

3.2 Economic considerations

The cost of introducing a cleaner processing method may be prohibitive and beyond reach of a small scale tanner: the price of the special drum for hair save unhairing with the necessary auxiliary equipment may be as much as twice of the conventional drum. Enzyme unhairing needs very accurate control and consistency of all parameters (pH, temperature, float, etc.) which is possible to achieve only in rather sophisticated tanneries. High chrome exhaustion tanning requires very expensive specialty chemicals, normally proprietary products.

Cost of plant and chemicals for treating effluent can be another heavy burden often compounded by inordinately high cost of capital or the inflation rates unacceptable to a small or medium-scale tanner.

The consultants were unable to obtain reliable data on the treatment cost and they may considerably differ from those in the industrialized countries. In 1987, the on-cost of effluent treatment, translated into dollars per square foot, was in Hungary 2.8 - 3.5 cents per ft², in Italy 7.7 - 10.3, in the United Kingdom 8.3 - 10.0 and in the Federal Republic of Germany 8.1 - 10.0.

3.3 Inadequate legislation and lack of monitoring facilities

Pollutant discharge standards in the region are very uneven. In most cases they are rigid and have a disregard for specific site conditions. Instead of a gradual approach as called for which would phase installation of treatment facilities (for example the physical-chemical first followed by the biological treatment and appropriate sludge handling) a tanner is under pressure to put up a complete treatment system and meet all discharge limitations at once which is beyond his financial and technical means.

However, very few tanners have the necessary process and effluent treatment control facilities; legislation enforcement agencies usually lack skilled personnel to monitor the performance of the installed treatment plants.

Thus the means for proper enforcement are essential. If legal enforcement of the standards is not put into effect, it is understandable that the required environmental standards may not be observed.

3.4 Gradual Progress

Tanners can begin by adopting good housekeeping measures which require little or no capital investment, such as water conservation at all stages of wet processing. Savings in chemicals by introducing reuse-recovery-recycle systems can pay for the simple equipment needed to run them, such as collection pits, pipes and pumps. They can also reduce the pollution load by pursuing the low waste technologies mentioned earlier.

This will, in effect reduce the amount of capital investment that will be required in the treatment of effluent through a reduction in the size of facility needed. By limiting pollutants in the streams, the quantities of effluent treatment chemicals will be commensurately limited. Tanneries should also maximize their returns on residues from sludge and solid wastes; by commercializing solid wastes, the cost of effluent treatment can, to some extent, be covered.

Since over 80 per cent of the organic pollution load, in terms of BOD₅, comes from the wet processing stage in the tannery, this part of the leather production is the primary target of most pollution control measures.

Phased approach to installing effluent treatment plants, i.e. physical -chemical (primary) followed by the biological (secondary) treatment optimized on the basis of actual performance of the primary system is considered advantageous.

Joint effluent treatment plants are very often the best solution for tannery clusters (as a rule consisting of small and medium-scale type units) so typical for this region; combined with domestic waste they offer technical advantages with an economy of scale. However, in view of the lack of experience in designing and operating such systems, the installation of demonstration plants, preferably on an industrial scale, is very much needed.

3.5 Technology transfer and human resource development

Although there are well established R & D establishments in the region like CLRI (Madras), IRDLAI (Yogyakarta), LTC (Shanghai) the technology transfer mechanism is a weakling in implementing new concepts in the environmental pollution control involving in-process, end of pipe and reuse/recycle measures in leather making.

Know-how and design engineering packages can be developed on commercial lines by involving know-how generating and project engineering firms from both developed and the more industrially advanced developing countries.

All countries of the region are facing acute shortage of technically qualified manpower for the dissemination and introduction of cleaner production methods and operation, monitoring and maintenance of effluent treatment plants. Appropriate training and education programmes are needed to cater to the need of technical personnel at various levels (operating, supervisory, managerial and design).

There is strong need for setting up demonstration plants for common effluent treatment, in-plant process controls and tannery waste utilization to enable them to see the performance of the new systems under field conditions. The demonstration plants should also be utilized for regular training of technical personnel.

4. DEVELOPMENT OF THE SECTORAL PROGRAMME

4.1 Preparation of the programme project documents - Review at the Expert Group Meeting, Madras

Based on the findings and recommendations of the experts, draft project documents were elaborated for the identified follow-up projects for technical assistance, aiming at efficiently contributing to solving the most urgent problems in this particular field in the country concerned. These projects are also expected to serve as demonstration models to be used by the leather industry elsewhere in that country, if so required.

These draft project proposals, together with a number of technical background papers, were reviewed by national experts from the countries concerned and by UNIDO consultants specializing on this subject at an Expert Group Meeting (EGM) on Pollution Control in the Tanning Industry in the South-East Asia Region held in Madras, India, from 15 to 17 February 1991. Additional, specific information and certain modifications to these proposals obtained during this EGM were subsequently taken into consideration when the individual country project documents were finalized.

In order to complement and ensure the proper co-ordination of the activities foreseen under the national projects, the project document for a regional, so-called "umbrella" project was also prepared, a copy of which is attached to this summary.

5. SALIENT FEATURES OF THE PROGRAMME

This programme is conceived in a very broad manner. It simultaneously addresses the issues of introducing low-waste, cleaner technology in all phases of leather processing, the utilization of by-products as well as end-of-pipe treatment.

"Model", cost-efficient plants for individual tanneries and joint effluent treatment plants (ETP) for clusters of smaller and medium-sized tanneries are to be set up. Disposal of solid wastes, recycling of chemicals used in tanning processes and use of appropriate low waste technology will be ensured.

The establishment of pilot and demonstration plants and a comprehensive training programme for personnel, including guidance in improving emission standards, are important components of the programme.

The strategy of this regional project is to reinforce and efficiently complement the activities of the respective national projects, particularly in the field of specialized technical advice to other parts of the participating countries not covered by the respective national project; and through the organization and implementation of training programmes, workshops, seminars, etc., at the regional level. Regional inputs in fields like tannery effluent control facilities, handling of hazardous waste materials, recycling of chemicals used in tanning processes, extension service facilities capable of providing advice on design, installation and operational training for tannery effluent treatment plants will be ensured and further developed.

The outputs for each country project and for the overall regional project are indicated in the draft umbrella project proposal.

6. COUNTRY LEVEL PROJECTS

The individual country projects under this regional project are the following:

BANGLADESH:

Establishment of a Common Effluent Treatment Plant (CETP) for the Tanneries Located in the Hazaribagh Area, Dhaka (US/BGD/91/XXX).

In addition to CETP an effluent control laboratory and a chrome recovery unit will be set; promotion of cleaner production methods.

CHINA:

Assistance in Pollution Control and in the Treatment of Effluent Emanating from the Tanning Industry in Selected Areas of China (US/CPR/91/XXX).

Direct assistance to several tanneries (Beijing, Nanjing, Shanghai, Yueyang) in optimization of ETPs; sludge handling and disposal; utilization of by-products; a very comprehensive training programme.

INDIA:

Assistance in the Treatment of Tannery Effluents (in Tamil Nadu), US/IND/90/244 (already financially approved).

Establishment of a CETP for a cluster of tanneries and of a low cost ETP for an isolated medium scale tannery; chrome recovery/cleaner production; strengthening of ETP design capabilities.

INDONESIA:

Assistance in Pollution Control and in the Treatment of Effluent Emanating from the Tanning Industry in Three Selected Areas of Indonesia (US/INS/91/XXX).

Establishment of ETP at the Gambiran tannery; design of CETP for the Garut cluster; optimization of the ETP at one medium-scale tannery in East Java..

NEPAL:

Modernization of Leather Production and Establishment of Tannery Effluent Treatment Facilities at the Bansbari Leather and Shoe Factory (BLSF) at Kathmandu (US/NEP/91/XXX).

A specialized laboratory and a chrome recovery unit will also be installed; extensive training.

PAKISTAN:

Establishment of a Common Effluent Treatment Plant for the Tanneries Located at Korangi Industrial and Trading Estates, K.I.T.E., Karachi. (US/PAK/91/XXX).

A small pilot treatment unit, a laboratory and a chrome recovery unit will also be installed; extensive training.

SRI LANKA:

Assistance in the Establishment of a Common Facility Centre for Beamhouse and Tanyard Operations, with a Tannery Effluent Treatment Plant at the Selected Site in the North Western Province of Sri Lanka (US/SRL/91/XXX).

The focus is on the centralization of the most polluting part of tanning operations of several tanneries and on introduction of low waste methods and common treatment of wastes; laboratory, training.

THAILAND:

Assistance in the Establishment of a Chrome Recovery Unit, a Common Facility for Dewatering Tannery Sludge and a Specialized Tannery Pollution Control Laboratory in the Samut Prakarn Province (US/THA/91/XXX).

The aim is up-grading, rounding up and the optimization of the existing treatment system, combined with the introduction of cleaner production methods.

7. ORGANIZATIONAL SET-UP OF THE REGIONAL PROJECT

The programme is to be operated through a network of bases: CLRI, Madras is the focal point for cleaner technology, training and R&D; Shanghai and Beijing for by-products; IRDLAI, Yogyakarta for medium- and small-scale industries; KITE, Karachi for large-scale, joint effluent treatment plants. The Samut Prakarn tannery cluster near

Bangkok will serve as the administrative headquarters of the project and will be the focal point for chrome recycling and solids disposal.

NOTE: The Government of India has confirmed its agreement to using the Central Leather Research Institute (CLRI) as one of the focal points under this project.

8. COST AND FUNDING OF THE PROPOSED PROGRAMME

The project for India, US/IND/90/244, Assistance in the Treatment of Tannery Effluents (Tamil Nadu), substantively part of this programme, is already finalized and funding by the Government of Switzerland has been secured. This project is therefore already operational.

The total pipeline programme, i.e. without the India project, amounts to US \$ 14,878,258. For easy reference a financial summary of the programme is attached. The draft of the sectoral programme has been designed in such a way that the financial approval of the entire programme at the same time is not absolutely necessary.

9. FURTHER ACTION

Official Government requests for the technical assistance proposed have been received from the Governments of Nepal and Sri Lanka. In the case of Bangladesh, China and Indonesia, the Governments of these countries have requested some additional information and slight modifications in the proposed project documents. It is, therefore, expected that the official Government requests will be received soon also from these three countries.

The official Government requests from Pakistan and Thailand have not been received yet.

Upon receipt of at least five of the seven Government requests needed, the individual country project documents as well as the "umbrella" regional project document will be submitted to UNIDO's Project Review Committee for consideration and possible clearance for negotiation with the potential donor countries interested in providing the necessary special purpose contributions to one or more of the projects proposed. A possible co-financing of several donor countries may also be obtained, in view of the relatively important amount of funds required for the implementation of the entire sectoral programme.