

GROWTH OF LEATHER SECTOR IN ASIAN COUNTRIES AND RECENT ENVIRONMENTAL DEVELOPMENTS IN WORLD LEATHER SECTOR

SENGODA GOUNDER RAJAMANI

Chairman – Asian International Union of Environment (AIUE) Commission, Chennai - 600 028, India, e- mail: dr.s.rajamani@gmail.com

The leather production activities, specifically raw to semi-finishing processes have been shifted from United States, West European countries to Asian, South American and other developing countries. Annual World Leather process is estimated at 16 million tons of hides and skins. More than 50% of World leather production is done in Asian countries such as China, India, Vietnam, Bangladesh, Pakistan, etc. Wastewater discharge from Asian tanneries is more than 350 million m³/annum. Solid waste generation is about 4 million tons/year. Safe disposal of chrome containing sludge which is about 6 million tons/year from the entire World leather sector is one of the major unresolved issues. Environmental regulations and standards are similar in developing and developed countries. Certain parameters are more stringent in developing countries when compared to the developed countries. Major investments are being made for the environmental protection systems and resettlement of tanneries from urban areas to the industrial parks with Common Effluent Treatment Plants (CETPs). New regulations such as restriction on use of chemicals, control on salinity and water recovery under zero discharge concepts, management of chrome containing sludge etc. envisage continued applied Research & Development activity. Asian International Union of Environment (AIUE) Commission has got about 30 technical members from all major Leather producing countries in Asia, Russian Federation, IULTCS, UNIDO and European Union (EU). The recent technical developments to meet the environmental challenges with specific reference to Asian countries, Europe and Latin America are dealt in this technical paper.

Keywords: AIUE, Environment, Asian Leather

INTRODUCTION

The Asian International Union of Environment (AIUE) Commission is being launched in association with 10th Asian International Conference on Leather Science and Technology (AICLST). There are 30 technical members from various countries and invitees from IULTCS, United Nations Industrial Organization (UNIDO), European Union (EU) and other relevant international organizations.

AIUE has developed the following documents and they are being updated periodically. The list of AIUE Commission documents are given in Table 1.

Table 1. Documents of AIUE Commission

Doc.No.	Title
AIUE 1	Viable cleaner technologies for leather production
AIUE 2	Management of chrome containing waste
AIUE 3	Document on total dissolved solids in tannery effluent
AIUE 4	Options for tannery solid by- product management
AIUE 5	Typical performance for tannery wastewater treatment
AIUE 6	Typical pollution values related to tannery processes
AIUE 7	Odour control options in tanneries & effluent treatment Plants
AIUE 8	Special sewer system for conveyance of tannery effluent
AIUE 9	Recommendations for occupational safety and health aspects
AIUE 10	Concept and Guidelines for Environmental Footprint for Leather Sector
AIUE 11	Environmental update in World Leather Sector

WASTE DISCHARGES FROM ASIAN TANNERIES

Annual World leather process is estimated at 16 million tons of hides and skins. More than 50% of World leather production is done in Asian countries such as China, India, Vietnam, Bangladesh, Pakistan, etc. Wastewater discharge from World tannery sector is about 600 million m³/annum. From Asian tanneries more than 350 million m³ of waste water is discharged per annum. Solid waste from Asian tanneries and sludge generation from effluent treatment plants in Asian region are comparatively higher. This is mainly due to the use of poor quality chemicals in liming and other operations and also in effluent treatment plants for physiochemical treatment.

Safe disposal of large volume of chrome containing sludge which is about 6 million tons/year from the World Leather Sector is one of the major unresolved issues. Due to this, many tanneries started using quality chemicals and adopt waste minimization practice. Many individual and Common Effluent Treatment Plants (CETPs) in Italy and other countries have avoided chemical treatment and adopted total biological oxidation system with high detention time of 4-6 days to minimize sludge generation.

ENVIRONMENTAL REGULATIONS & MANAGEMENT

Almost all the leather processing countries including Asian and African countries have introduced pollution control standards similar to the standards adopted in United States, European Union and other developed countries. In view of the serious environmental issues, cleaner production and implementation of Common Effluent Treatment Plants (CETPs) in tannery clusters, relocation and resettlement of tanneries from urban towns to designated industrial areas are the recent development in countries such as Spain, Turkey, India, China etc with major investments. Countries such as Bangladesh, Egypt etc. have planned to relocate the cluster of tanneries from the cities to new industrial zones with CETPs. In many countries including in India new tanneries or expansion of the existing tanneries are permitted only in authorized industrial parks with Common Effluent Treatment Plants (CETPs).

The sustainability of the small-scale units has become a serious issue in leather sector due to enforcement of environmental regulation in many countries 400 small-scale tannery units have been closed in China during recent years. Currently environment is the major area of research carried out by the leather research institutes and Universities. More than 50% of the research publications in the World Leather Sector deal with cleaner production & waste management.

With a view to control salinity and environmental protection in countries such as Brazil the hides and skins from the slaughter house needs to be processed immediately without preservation using common salt. During the International recession period there was no demand for the wet blue/finished leather, and the disposal of unsalted hides and skins had become a major environmental issue in Brazil. The organized slaughter houses in Brazil and other countries are building their own tanneries to process fresh hides and skins without applying salt for preservation. Management of high chlorides and salinity in the tannery effluent has become a serious environmental threat in many countries including Spain, India & China etc. They have started adopting membrane system for water recovery and costly treatment of the saline rejects from the membrane system. Multiple stage evaporators have been adopted for evaporation of the saline stream from membrane system with huge cost. Proper environmental solution is to be

developed for the disposal of the mixed contaminated salt recovered from the evaporator particularly in land locked areas.

The recent developments in cleaner production and waste management in selected leather producing countries are given in Table 2.

Table 2. Research & Development in Environmental Protection

S.No.	Country	Research & Development
1.	ARGENTINA	Cleaner Production and establishing new standard procedures through Commission of Ecology Control are current R & D activities. Restriction / Refusal for the disposal of chrome containing sludge to the common landfill “Green Peace” Movement targets for effluent treatment and management are some of the recent challenges in Argentina.
2.	BRAZIL	Applied R & D activities such as photo-electro oxidation and electro dialysis for water recovery and reuse are being carried out in Federal University of Rio Grande do Sul and SENAI Leather Center. Controlled incineration of chrome tanned wastes and development of constructed wetlands for effluent treatment in some tanneries at pilot scale are some of the recent field applications. Meeting toxicity standards, restriction in the disposal of chrome containing sludge even in common secure land fill site are some of the recent challenges.
3.	CHINA	Currently there are about 800 tanneries. Till now, about 13 CETPs are in operation, some more are under planning. Planned to reduce the volume of water usage and pollution load at source through cleaner production programme. The tanneries are permitted to expand the capacity without increase in the water usage. One of the major tanneries has implemented the MBR and RO system for water recovery and reuse. As such there is no specific restriction on the Total Dissolved Solids (TDS) or salinity norms for the disposal of treated effluent. However meeting the BOD, COD norms for the saline streams from RO is one of the issues being addressed by new technological development. As a sustainability measure new licenses are given to tanneries with a processing capacity of more than 3000 tons /year of raw hides and skins.
4.	COLOMBIA	In view of the serious environmental issues, cleaner production, implementation and maintenance of Effluent Treatment Plants have become necessary in all the tanneries in Colombia. During the recent years, there had been many changes in the regulations related to environmental impacts for the general industry in Colombia. Those changes are related to waste water discharges and now the latest addition is odour control.
5.	FRANCE	Tallow extracted from fleshing converted into alternative energy source, Reed bed system is installed for effluent treatment.
6.	INDIA	A biggest CETP in Asia with a capacity of 48,000 m ³ /day (48 MLD) for 450 tanneries is being planned with a budget of about 60 million USD in Kanpur city. Zero Liquid Discharge concepts by adopting membrane system for recovery of water from tannery effluent have been implemented in the South Indian tanneries at a cost of about 100 million USD. Disposal of the saline stream from membrane units in land locked areas is one of the unresolved technical challenges. Decentralized secure landfill system linked with CETPs for leather sector had been implemented in many tannery clusters. (First of its kind in the World). R&D activities on bio processing are under progress.

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S.No.	Country	Research & Development
7.	NEW ZEALAND	Enzymes and unhairing process is becoming more popular. Elimination of salting of skins by introducing chilling process in selected areas, Sulphide oxidation, pH & settleable solids control and discharge of effluent into public sewer system.
8.	POLAND	Processing of organic materials and converting into fuel called as bio-coal, Co-fermentation of chromium-free tannery wastes with municipal sewage sludge and conversion into fertilizer are the recent developments.
9.	ROMANIA	Applied R & D programme on Cleaner Production and technology dissemination are being carried out with the co-operation of INCDTP / ICPI, Institutions, Universities & organization such as COTANCE, European Union, etc.
10.	SPAIN	The tannery clusters with CETP are located in Igualada near Barcelona and Lorca near Murca a coastal town in the southern part of Spain. The CETP in Igualada with a capacity of 9 MLD has been established with a capital cost of 13 million Euros. Membrane Bio Reactor with Reverse Osmosis (RO) for water recovery has been established in the CETP near Lorca. The water recovery system from a tannery CETP is first of its kind in the world and was commissioned during 2004-2005. The system has faced with some technical and economical issues in saline water evaporation system in the landlocked area. R & D activities on cleaner production and waste minimization are being carried out by the institutions in Spain: INESCOP, AIICA and EEI (Universitat Politecnica de Catalunya)
11.	TAIWAN	Currently there are about 50 tanneries in operation in Taiwan. The tanneries are having individual treatment plants with capacities ranging from 300 m ³ -2000 m ³ /day. They adopt conventional physio-chemical and biological treatment systems.
12.	TUNISIA	Integrated cleaner production programme has been carried out for 12 vegetable tanneries in Tunisia; Research & Development on solid sludge is under progress in co-operation with CTC.
13.	TURKEY	There are about 540 tanneries existing in 14 zones viz. Tuzla(51), zmir(24), Çorlu(78), Gereede(120), Bursa(20), U ak(26), Gönen(18), Manisa(30), Biga(13), Denizli(20), Isparta(23), Bor(75), G.Antep(10) and Antakya(33). Eight Common Effluent Treatment Plants (CETPs) have been established and are in operation. The biggest CETP with a capacity of 36000 m ³ /day has been established in Tuzla Industrial estate near Istanbul. The other CETPs are having capacities ranging from 1800 m ³ /day to 36000 m ³ /day. The tanneries had been resettled in industrial zones. R&D activities on cleaner production and environmental protection are being continued in universities such as Ege University, Izmir etc.
14.	UNITED KINGDOM	Sludge disposal is a major problem similar to other countries. Bio-diesel from tallow, Bio-ethanol from protenised wastes; short-term preservation of raw hides; technical assistance on cleaner production; adoption of membrane system etc. to other countries.
15.	URUGUAY	There are about 23 working tanneries in Uruguay. Two big and some of the medium tanneries have effluent treatment plants and they have also specific secure landfill places to dispose the solid wastes. Many cleaner production projects are being carried out with the involvement of several organizations. Currently, the main environmental problem to be addressed in

S.No.	Country	Research & Development
		Uruguay is the disposal of solid waste generated by the tanneries located on the Southern part of the country.

SUSTAINABILITY IN MEETING ENVIRONMENTAL CHALLENGES

The leather production activities especially raw to semi-finishing process are being shifted from the developed nations such as United States, West European countries, to Asian, North African and Latin American countries. The major leather producing countries such as China, Italy, India etc. are facing problems due to enforcement of stringent environmental regulations. The sustainability of the small-scale units is becoming a serious issue to meet the environmental requirements. Major investment is being made for environmental protection and resettlement of tanneries from the urban areas to the industrial parks with common effluent treatment plants. New regulations and restrictions such as REACH on the use of certain chemicals, salinity and water recovery under zero discharge concept, disposal/ management of chrome containing sludge etc. envisage continued Research & Development activity. Innovative tanning processes which will greatly reduce the water and chemical usage and minimize solid waste generation are needed together with overall environmental planning and management.

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