RECENT DEVELOPMENTS IN CLEANER PRODUCTION AND ENVIRONMENT PROTECTION IN WORLD LEATHER SECTOR

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International Union of Environment (IUE) Commission of IULTCS has got 40 technical members from all major Leather producing countries, UNIDO and European Union (EU). The recent environmental regulations and systems developed in world leather sector with specific reference to Europe, India, China and Latin America are dealt in this technical paper. The safe disposal of sludge which is estimated about 5 million tons/year from the world leather sector is one of the major unresolved issues in many countries. The leather production activities, especially raw to semi finishing processes are being shifted from United States, West European countries and Japan to Asian and South American countries. 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 systems and resettlement of tanneries from the urban areas to the industrial parks. New regulations such as restriction on use of chemicals, control on salinity and water recovery under zero discharge concepts, management of chromium containing sludge etc. envisage continued Research & Development activity.

Keywords: Environment, IUE Commission, World Leather

INTRODUCTION

The International Union of Environment IUE Commission is a vibrant wing of IULTCS with about 40 technical members from 32 countries and invitees from United Nations Industrial Organization (UNIDO), European Union (EU) and other relevant international organizations. The IUE Commission regularly meets every year in one of the member countries and update the development. The meeting for the year 2011 was held during September 2011 in Valencia, Spain. The next meeting is scheduled during October 2012 in Montevideo, Uruguay. The lists of IUE members are given in Table 1.

Table 1. Members of IUE Commission

S.No.	Country	Representatives
1.	Argentina	Ms. Patricia CASEY / Mr. Carlos CANTERA
2.	Australia	Ms. Catherine MONEY
3.	Austria	Dr. Hans ANDRES
4.	Brazil	Ms. Katia Fernanda STREIT, Prof. Dr. Mariliz Gutterres
5.	China	Mr. Chen ZHANGUANG / Madam ZHANG SHUHUA / Mr Su CHAOYING
6.	Colombia	Mr. Juan Manuel SALAZAR
7.	Croatia	Mr. Jakov BULJAN
8.	Czech republic	Prof. Dr. Karel KOLOMAZNIK
9.	Denmark	Mr. Johannes O. Borge
10.	European Union	Mr. Gustavo Gonzalez Quijano, Bruxelles, Belgium
11.	France	Mr. Thierry PONCET, Secretary IUE
12.	Germany	Dr. Heinz Peter GERMANN
13.	Greece	Mr. Pantelis PANTELARAS
14.	India	Dr. S. Rajamani, Chairman, IUE Commission

S.No.	Country	Representatives
15.	Italy	Dr. Gianluigi Calvanese
16.	International Tanners Council, UK	Mr. Paul Pearson
17.	Japan	Dr. Keiji Yoshimura
18.	Mexico	Mr. Ricardo Weiss
19.	New Zealand	Ms. Ngaire Foster
20.	Poland	Dr. Maciej URBANIAK
21.	Portugal	Mr. Filipe Crispim
22.	Romania	Dr. Luminita Albu / Dr.Loannis Loannidis
23.	Slovenia	Dr. Anton GANTAR
24.	Spain	Dr. Rita Puig / Dr.Lluis Labastida Azemer
25.	Switzerland	Dr. Campbell Page / Dr Jens FENNEN
26.	The Netherland	Mr. Arnold Mulder
27.	Taiwan	Mr. George Huang / Mr.Thomas Yu
28.	Tunisia	Dr. Abdessatar TOUMI
29.	Turkey	Dr. Volkan CANDAR / Dr Murat TOZAN
30.	UNIDO, Vienna	Mr. Ivan Kral
31.	United Kingdom	Dr. Wolfram SCHOLZ / Ms.Christine Ohren-Bird
32.	United States	Mr. E Hurlow / Mr.Mainul Haque
33.	Uruguay	Mr. Ricardo Hourdebaigt

WASTE DISCHARGES AND ENVIRONMENTAL MANAGEMENT

The capacity of world leather process is 15 million tons of hides and skins per year. Wastewater discharge from tanneries is more than 600 million m^3/ year. The estimated solid waste generation from tannery process is about 6 million tons/year. The disposal of large quantity of sludge which is about 5 million tons/year from effluent treatment plants is one of the major unresolved issues in many countries.

The IUE commission has developed essential guidelines and practices adopted in cleaner production, treatment of effluent, solid waste management and environmental regulations. The updated IUE documents with number and title are given in Table 2.

ENVIRONMENTAL UPDATES

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 had been done in countries such as Spain, Turkey, India, China etc with major investments. Many countries such as Bangladesh, Egypt etc. have planned to relocate the cluster of tanneries from the cities to new industrial zones with CETPs.

Table 2. IUE Commission Documents

S.No.	Doc.No.	Title
1.	IUE 1	Recommendations on cleaner technologies for leather production
2.	IUE2	Recommendations for tannery solid by-product management
3.	IUE 3	Document on total dissolved solids in tannery effluent

S.No.	Doc.No.	Title
4.	IUE 4	Assessment for chromium containing waste
5.	IUE 5	Typical performance for tannery wastewater treatment
6.	IUE 6	Typical pollution values related to tannery processes
7.	IUE 7	Chargeable effluent parameters in various countries
8.	IUE 8	Recommendations for odour control in tannery
9.	IUE 9	Recommendations for sewer adapted for tannery effluents
10.	IUE 10	Guidelines for restricted products in leather
11.	IUE 11	Recommendations for occupational safety and health aspects

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 2007 to 2009. 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. Currently 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.

The recent developments in cleaner production and waste management in selected leather producing countries are given in Table 3.

SUSTAINABILITY IN MEETING ENVIRONMENTAL CHALLENGES

The leather production activities especially raw to semi-finished leather are being shifted from the developed nations such as United States, West European countries, to North African, Asian and Latin American countries. The major leather producing countries such as China, Italy, India etc. are facing problems due to enforcement of stringent 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 such as ban on use of certain chemicals, salinity and water recovery under zero discharge concept, disposal/ management of chromium containing sludge etc. envisage continued research & development activity. Innovative tanning processes which will greatly reduce are prevent the water usage are needed together with reduction of chromium and other chemicals use.

Table 3. Research & Development in Environmental Protection

S.No.	Country	Research & Development
1.	ARGENTINA	R & D on Cleaner Production, Establishing standard procedures in analysis and publication, Environmental Regulations through Commission of Ecology Control. 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	Photo-Electro Oxidation and Electro dialysis for water recovery and reuse. R&D activities in the Federal University of Rio Grande do Sul and SENAI Leather Center. Controlled incineration of chromium 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 is one of the recent challenges.
3.	CHINA	Currently there are about 800 tanneries. Till now, about 12 CETPs are in operation, Some more are under planning. Planned to reduce volume by 10% and pollution load at source. 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 to be addressed. As a sustainability measure new license are given to tanneries with process of capacity of more than 3000 tons /year.
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	Designed to establish a biggest CETP in Asia with a budget of about 60 million USD in Kanpur city with a capacity of 48,000 m3/day (48 MLD) for 450 tanneries. Zero Liquid Discharge concept by adopting membrane system for recovery of water from tannery effluent has 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 issues. 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.

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.
9.	ROMANIA	Cleaner Production programmes are being carried out with the co-operation of INCDTP / ICPI, Institutions COTANCE etc. in Romania.
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 individual tanneries with ETPs and leather product units are located around Valencia and in Vic (Barcelona). The CETP in Igualada with a capacity of 9 MLD has been established with a capital cost of 13 million Euro. Under utilization of the CETP, high operation costs and disposal of hazardous category sludge are some of the issues to be addressed. Membrane Bio Reactor with Reverse Osmosis (RO) for water recovery has been established in a 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 300m3–2000m3/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	Two major CETPs have been established and are in operation near Istanbul (Tuzla) and Izmir. The tanneries had been resettled in industrial zones. R &D activity are being continued on cleaner production. Sludge disposal is a major problem similar to other countries.
14.	UNITED KINGDOM	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 of them are bigger ones and about six of them are medium scale units. The 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 Uruguay is the disposal of solid waste generated by the tanneries located on the Southern part of the country.

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REFERENCES

IUE Commission documents (2008), Recent developments in cleaner production and environment protection in World Leather Sector.

Milá, LL., Doménec, X. et al. (2002), "Use of LCA in the procedure for the establishment of environmental criteria in the Catalan ecolabel of leather".

Minutes of the 2011 IUE Commission Meeting held during September 2011 in Valencia, Spain.

Rajamani, S. and Casey, P. (2010), "Environmental update in Leather Producing Countries – Argentina", *Leather News India*.

Rajamani, S. et al. (2010), "Environmental Update in Leather Producing Countries – China", *Leather News India*.