

EXTENDED ABSTRACT

# Effectiveness of Managing Hazardous Waste Generation in Leather Tanning Industry in Sri Lanka

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## **ABSTRACT**

The leather tanning industry in Sri Lanka is currently localized within the Western Province, Colombo and Gampaha Districts which based on the river banks and becoming significant causes of environmental pollution. The paper has done on primary data by industrial visits, interviews and sample collection and secondary data obtained by CEA, ILTF & industrial reports , journals and other literature.

This study assesses the current waste management practices, identifying potential factors of pollution and Strength, Weaknesses, Opportunities and Threat ( SWOT) analysis for current waste management facilities in leather tanning industries in the country. The study finds that current waste management practices are not comply with the environmental regulations and legal framework which are imposed by CEA and other relevant authorities.

Accordingly leather tanneries discharge their untreated waste water to the surface water bodies and wet lands. Furthermore they dispose Hazardous Solid Waste such as Wet blue off cuts, used chemicals and contaminated containers at unsecured open dump site. With the SWOT analysis, this study discusses strengths and weaknesses within the industry and opportunities and threats which are effect to the industry from outside.

**Key Words:** Leather Tanneries, CEA, SWOT Analysis, Hazardous Solid Waste

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## **1. Background**

Tanning is the act of converting animal hides and skins into finished leather; the industry is currently localized in the Colombo and Gampaha Districts which is based on the river banks and becoming significant causes of environmental pollution. Tanning Industry is considered to be a major source of pollution and tannery wastewater in particular, is a potential environmental concern (Ros and Ganter 1998). This paper has done on primary data by industrial visits, interviews and sample collection and secondary data obtained by Central Environmental Authority (CEA), Indian Leather Tanners Foundation (ILTF) & industrial reports, journals and other literature. Medium scale tanneries are well equipped for the Chromium recovery and selected other three tanneries are carried out vegetable tanning process due to high market value for them. The selected six tanneries are located in environmentally sensitive areas and four of them are based near by the Kelani River and Dadugam Oya in Gampaha district. They all are situated within the 100 m from the water bodies. Tanning process causes serious environmental pollution due to discharge of heavy polluted waste water, containing very toxic chemicals, generation of solid wastes and malodorous emission from raw hide storage, production process and waste disposal, (with its high oxygen demand, discoloration and toxic chemical constituents terrestrial and atmospheric systems. (Song et al. 2000).

This study assesses the current waste management practices, identifying potential factors of pollution through Strength, Weaknesses, Opportunities and Threat (SWOT) analysis for current waste management facilities in leather tanning industries in the Western Province. According to the CEA reports current waste management practices of tanneries in Western Province do not comply with the environmental regulations and legal framework which is imposed by CEA and other relevant authorities. Leather tanneries discharge their untreated waste water to the surface water bodies and wet lands as Kelani River and Dadugam Oya. With the SWOT analysis, this study discusses strengths and weaknesses within the industry and opportunities and threats which affect the industry from outside.

## 2. Research Problem

Tanning industry or tanneries are one of the most polluting industries according to the CEA – Sri Lanka. Tanneries are functioning without concerning of environmental sound management practices and hazardous waste management practices. Tanneries in Western Province are mostly practice Chrome Tanning methods to tan the leather and high concentrated acids<sup>1</sup>, Salts and Sulphur based chemicals are used in large quantities in the beam house operations. Hence Surface water courses which are nearby tanneries are heavily contaminated by heavy metals as Chromium, Sulphides and Chlorides due to direct discharge of untreated waste waters. Those water courses flows through the highly populated area and water is used for drinking and other livelihood activities. Accordingly untreated waste water discharge of leather tanning industries creates significant environmental and socio-economical issues. All tanneries in Western Province have not obtained Environmental Protection License (NEA 2008) and Schedule Waste Management license ( NEA 2008) from CEA due to unsatisfactory waste management.

### Research Objectives

Main research objective of study is to examine the current hazardous waste management practices existing in tanning industry in Western Province and it needs to identify the types of hazardous wastes that are generated in the tanning process and what are the disposal methods for hazardous waste. Furthermore study is to analyse the strengths, weakness, opportunities and threats in the disposal mechanism of leather tanning industries in Sri Lanka.

## 4. Research Methods

Primary data known data is collected from the source. This study designs can be described as multiple attributes or dimensions. Primary Data collected through Interviewing, Observing, Sample collecting and laboratory analyzing from industries. Secondary data is collected by someone other than the user. Data analysis has been carried out by using Strengths, Weaknesses Opportunities and Threats analysing method (SWOT)<sup>2</sup>. Selected tanneries considered as a one industry and apply SWOT techniques to analyse the data. Studies on SWOT analysis about tanning industry are very limited in Sri Lanka as a developing country.

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1. *High Concentrated Acids- Use Conc. H<sub>2</sub>SO<sub>4</sub> for soaking process*
  2. *By definition of SWOT : Strengths (S) and Weaknesses (W) are considered to be internal factors over which have some measure of control. Also, by definition, Opportunities (O) and Threats (T) are considered to be external factors over which have essentially no control.( Wikipedia)*

## 5. Key Findings

Two main polluting streams are identified as solid wastes and waste waters ( effluents). Solid waste are categorized in to two main categories as non-hazardous and hazardous. Selected large scale tanneries are used approximately 12000Kg of raw hides for chrome tanning and 100000 l of water per day. Rejected raw hids (0.001%), raw flesh, hair and fat (33.3%)are collected as non hazardous wastes . and wet blue<sup>3</sup> offcuts and splited wet blue offcuts ( 8.8 %) are collected as hazardous solid wastes and that have dumped through the Colombo Municiple Council( CMC) open dump at Meethotamulla and Karadiyana dump site. Furthermore Karadiyana is an unsecured dump site which is located near the Bolgoda River

Other main pollution factor of tanning industry is untreated waste water and the industry is highly water-intensive and each tone of hide/skin tanned requires over 40,000 liters of water. Hence even a large tannery with a capacity to process 3 to 4 tons a day uses more than 100,000 liters of water per day and selected tanneries do not comply with the standard discharge parameters of Central Environmental Authority <sup>4</sup>

According to SWOT analysis two strengths and six major weaknesses are identified. Implementation of Chrome recovery plants for effluents and reduction of chrome tanning and promoting vegetable tanning due to market conditions are recognized as strengths. Identified weaknesses are , location of large scale tanneries in the Kelani River basin which is less than 100m from the river shore, any of selected tannery in Colombo District have no proper Effluent Treatment Plant( ETP), all types of solid wastes are collected by local authorities as CMC and dumped in unsecured open dumps, have not maintain the records on wastes and lack of awareness. Biological Oxigen Demand (BOD) ( 600 - 1200mg/l) and, Chemical Oxygen Demand (COD)( 600- 2000mg/l) levels in effluent and the quality of effluent found to be exceeded the CEA tolerance limits for discharge. Also salt and sulphide have not recovered in any of these tannery; due to this conditions maintain of non-compliance discharge levels are always inevitable.

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3. *Wet Blue off cuts - Wet Blue off cuts and sanding dusts are heavily contaminated with Chromium ( $Cr^{+3}$ ), Nearly 90% of all leather produced is tanned using Cr salts (Stein and Schwedt 1994). Generally 8% of the basic chromium sulphate salt is used for conventional tanning.*
  4. *Standard discharge parameters - According to the Central Environmental Authority's tolerance limits for Waste from being discharged from Leather Tanning Industries into inland waters and seawaters total Chromium concentration is usually limited to 2.0mg/l (CEA Regulation 2008).*



Furthermore opportunities can be presented as recommendations regarding the available threats. The SWOT analysis is identified the opportunity to relocate these all tanneries in to a centralized location to a suitable part of the country as an industrial park. As a result of relocation of tanneries to a designated industrial park, it would be possible to use a centralized effluent treatment facility for total waste water treatment. That would be more economical for small and medium scaled industries for their waste management practices and other business services which could be facilitated more easily rather than having individual effluent Treatment Plants ( ETP) in location as at present. According to this study, two types of final disposal methods were identified for hazardous waste. One is thermal destruction and other one is to disposal in sanitary landfills. Sri Lanka has one thermal destruction facility in operational level which is owned by cement manufacturing private party namely Holcim Lanka Ltd. They use Cement Kiln for thermal destruction of Hazardous Solid Waste ( Co-processing) and they are the only one service provider to the whole country and they charge comparatively large amount for final disposal of Hazardous Solid Waste. (For example, LKR 25,000 per MT without transport cost) That charges cannot be bearable for small and medium scale tanneries. Although one sanitary landfill is available in Dompe area which is exclusively constructed for Municipal Solid Waste by the CEA under Korean Government assistance, but due to the distance and high transportation cost, tanneries would not be able to use this sanitary landfill for their final disposal.

## **5. Conclusion**

Tanning is the main process that converts the skin into leather material. It is evident that Tanning Industry is one of the most hazardous industries generating highly dangerous effluents containing such as chromium, and high level of sulphides BOD and COD elevating agents etc mentioned in this study disastrous to the environment and to the entire living beings. Heavy metals as Chromium are accumulated in waste waters in the process of Chrome tanning and that have contaminated with the surface water bodies due to direct discharge. Tanneries have no proper in-house efficient effluent treatment systems especially for recovery of chromium for re-usage. Furthermore industries do not maintain necessary records of chemical usage and other relevant details pertaining to the industry and do not readily available for inspection and scrutiny by relevant regulatory authorities. Chemicals consuming techniques have been practiced by all selected leather tanneries for Chrome tanning and have not maintained a record on it. EPL is not issued for any of tanneries in Colombo district by CEA because of the indexes are higher than tolerance limits for discharge of effluent in to water bodies and marine coastal areas. However there are several practical difficulties to shut down a factory through an interim order by court regarding the Cabinet Approval on Sri Lankan Government. Accordingly SWOT analysis in this study has tried to

formulate scientific implication to minimize the significant impacts on environment from Leather Tanning Industry in Sri Lanka.

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## ABBREVIATION

CEA	-	Central Environmental Authority
NEA	-	National Environmental Act
NER	-	National Environmental ( Protection & Quality) Regulation
SWOT	-	Strength, Weakness, Opportunities and Threats
BOD	-	Biological Oxygen Demand
COD	-	Chemical Oxygen Demand
BOI	-	Board Of Investment
HWS	-	Hazardous Solid Waste
MSW	-	Municipal Solid Waste
EPL	-	Environment Protection License
SWML	-	Scheduled Waste Management License
CLP	-	Ceylon Leather Products
ILIF	-	Indian Leather Industry Foundation
CP	-	Cleaner Production
ETP	-	Effluent Treatment Plant
LKR	-	Sri Lanka Rupees
MT	-	Metric Ton
CMC	-	Colombo Municipal Council