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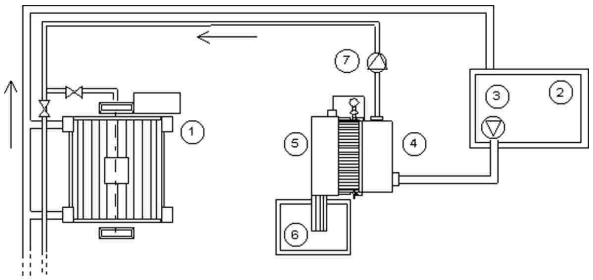
No. 60 Pollution prevention case studies

Introduction of low pollution processes in leather production

Company background	Psunj Tannery in Nova Gradiska, Zagreb (Croatia).
Industrial sector	Leather processing and manufacturing.
Environmental considerations	Chemicals such as sulphides, acids, alkalis, and chromium are used to process and manufacture leather and cause a negative impact on the environment if not handled and managed appropriately. Decomposing organic matter from raw leather materials such as skin or hide cuttings, fleshings, shavings, hair and proteins and keratin from hair, which are dissolved in the wastewater generated, take oxygen away from wastewater recipients (rivers, lakes, etc). This has an impact on the flora and fauna if the wastewater and solid waste are not treated and adequately managed before disposal.
Background	Supported by an EcoLinks Challenge Grant, the Croatian Association of Leather and Footwear Manufacturer (HDKO) collaborated with Eco-techproject Ltd. - Zagreb and a company from the Czech Republic, Ingstav Ostrava, to develop and test a strategy for reducing the environmental impact of leather production. They sought: 1) to determine the exact volume and pollution parameters of tannery effluent; 2) to select optimal methods to reduce water consumption and pollution; 3) to develop optimal effluent and sludge treatment alternatives; 4) to determine operation and maintenance costs and develop a financing programme for implementing an environmentally sensitive water management programme; 5) to establish a legislative framework that promotes discharge standards, regulations, and pricing guidelines for effluent and sludge disposal.
Summary of actions	The following actions generating low pollution were carried out: • Salt trashing: reduces chloride concentration in tannery effluent; • Green-fleshing: provides option to reuse fleshings by avoiding lime and sulphide pollution; reduces organic pollution and sludge volume; • Hair saving: when hair is removed before dissolved and discharged in sewage system, organic pollution and sludge volume are reduced; consumption of raw materials and water in this operation is reduced as well. • Chromium reduction: by using the method for recovering chromium from the tanning process, the contents of chromium both in the effluent and the sludge from wastewater treatment are reduced. Furthermore, effluent treatment and sludge treatment methods were introduced. Namely: • Removal of sulphides; • Identification of effective coagulants and flocculants; • Sludge treatment, disposal, and/or reuse; • Laboratory analysis of effluent and sludge composition.

Diagram (Hair saving process)



(1) Drum
(2) Lifting pump-station
(3) Submersible pump
(4) "Konica" screen for hair filtering/separation
(5) Screw conveyor
(6) Container
(7) Centrifugal pump

Balances

Environmental benefits

Procedure	Total effluent volume reduction (%)	Chemical consumption reduction		Total pollution factors reduction (%)		Solid waste reduction
Salt trashing	0.3-0.4%	5% (for washing and soaking)		SS	0.6%	
				BOD	4%	
				COD	3%	
				Chlorides	25%	
Green fleshing	1.4 %	9-10% (liming)		Sulfide: 9-10%		16% of the total solid waste (fleshings) could be converted to useful products (bio-gas, compost)
Hair saving	Not available	Lime	14-15 %	TS	6.7%	47 % by weight
				SS	41%	
		NaHS (72% Na_2S)	100 %	COD	25%	
				BOD	25%	
		Na_2S (62-67%)	6-7 %	S^{-2}	18%	
				N-total	35%	
				$N\text{-}NH_4$	2%	
Chrome recovery	Not available	Not available		98-99% Cr		Cr in sludge is below limits allowed to be landfilled

Economic benefits

Procedure	Economic savings	Investment	Payback period
Hair saving system	Reduced costs in chemical supplies amount to savings of €22,251.5 per year. Reduced costs in sludge effluent disposal amount to savings of €53,525.9 per year.	49,384 in equipment and civil work + €14,523.2 annual running costs	1 year
Chrome recovery system	Commercial value of about 26,400 kg of chrome recovered per year: €111,512*	Operation costs for recovery: €70,252.8-80,076.5 Chrome recovery system installation: €218,352	5-7 years (nevertheless, if indirect savings for chrome recovery are included, such as no disposal fees for sludge and lower discharge fees for effluent, the payback period decreases to 1-2 years)

*It must be taken into account that the reduction of chromium content (below 1,000 mg/l) in certain types of sludge would enable a simple sludge processing method that can be handled at farms instead of more expensive hazardous waste disposal sites.

Conclusions

The project established a model for reducing the environmental pollution associated with leather production that can be applied by other tanneries throughout Croatia. Through the implementation of certain low-pollution processes, such as salt trashing and hair saving, and a system for chrome recovery, the project demonstrated notable reductions in environmental impacts and production costs. Through hair saving alone, for example, the BOD was reduced by 25%, and savings from reduced chemical supply costs as well as lowered sludge production could amount to almost €85,000 per year. Besides, the end of pipe measures included in the project involved many benefits as well, such as the solid waste management strategy outlined in the project, which reduced uncontrolled disposal by 14,567 kg/year.

NOTE: This case study seeks only to illustrate a pollution prevention example and should not be taken as a general recommendation.

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