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A STUDY OF TANNERY EFFLUENTS AND THEIR EFFECT  
ON THE RECEIVING WATERS.

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BY  
BERNARD MAINA MBUTHIA

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## ABSTRACT

Four tanneries, two in Nairobi and one each in Thika and Athi River township were identified for this study. Water samples from all the four tanneries were collected, at two different times, from the raw effluent, the treated effluent and either the receiving streams or the oxidation ponds depending on the mode of discharge of each of the tannery. The following quality parameters were determined for each sample collected:

- (a) Temperature
- (b) Hydrogen ion concentration
- (c) Total sulphides
- (d) Biochemical oxygen demand
- (e) Chemical oxygen demand
- (f) Total non-filtrable residue (suspended solids)
- (g) Total filtrable residue (dissolved solids)
- (h) Profile of the elements present with special attention to chromium using X-ray fluorescence spectrometry.

The quality parameters analysed indicated that treatment of raw tannery effluents in the selected tanneries was generally inadequate. Where the effluents are discharged into waterways, self purification of the waste waters was found to occur downstream probably through aerial oxidation and sedimentation processes. Holding the effluents in oxidation ponds without aeration was found to result in poorly treated discharges.

Main pollutants in tannery effluents include chromium, sulphides, suspended and dissolved solids. In the tanneries studied, values of these pollutants in the raw effluent varied from 22-348  $\text{mg l}^{-1}$ , 82-1600  $\text{mg l}^{-1}$ , 146-12942  $\text{mg l}^{-1}$  and 10392-86890  $\text{mg l}^{-1}$  respectively. In this study, the removal of chromium and lowering of the sulphide levels were examined.

To remove chromium, the efficiency of conventionally used and locally available precipitating agents namely magnesium oxide, lime and magadi soda (which contains about 97%  $\text{Na}_2\text{CO}_3$ ) were investigated. The percentage chromium precipitation was found to be 99.9%. Sulphuric acid was used to redissolve the dried precipitates for possible recycling in the tanning process and the chromium recovery was studied.

Advantages of the different precipitating agents were discussed.

Investigations were done to decrease the sulphide concentrations by aerating with pure oxygen and air using different flow rates. The sulphide levels were brought down to  $250 \text{ mg l}^{-1}$  in 23 hours at a flow rate of  $60 \text{ ml min}^{-1}$  of pure oxygen. The effect of  $\text{Fe}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Co}^{2+}$  and  $\text{Ni}^{2+}$  on the oxidation were compared by employing identical concentrations of the cations. At  $600 \text{ ml min}^{-1}$  flow rate of air, the sulphide levels depleted from 1590 to  $84 \text{ mg l}^{-1}$  in 23 hours.  $\text{Ni}^{2+}$  and  $\text{Co}^{2+}$  lowered the sulphide levels to  $5 \text{ mg l}^{-1}$  in 23 hours.