WASTE MANAGEMENT FOR SMALL SCALE PULP AND PAPER INDUSTRY

by

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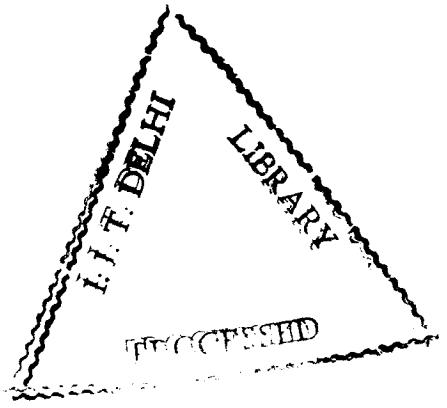

CERTIFICATE

This is to certify that the thesis entitled **"WASTE MANAGEMENT FOR SMALL SCALE PULP AND PAPER INDUSTRY"**, submitted by **Mr. Vivek Kumar** has been prepared under my guidance in conformity with the rules and regulations of Indian Institute of Technology, Delhi, India. The research report and results presented in this thesis have not been submitted for any degree or diploma in any other University or Institute.

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(Vivek Kumar)

ABSTRACT

In India there are about 406 paper mills besides five large news print mills, which are supposed to be highly polluting industries, of these 80% mills belong to small paper mills categories. The category of small agro based mill may not be able to afford any chemical recovery system due to techno-economic reasons. These mills are not having effluent treatment facilities and because of more and more stringent environmental laws they are facing closure problems.

The data obtained from the field survey of two districts, Merrut and Muzaffarnagar, U.P indicate that there is wide variation in the pollution load of small paper mills and most of the mills are discharging the wastewater in nearby nullah (sewage drain) without any treatment. It was observed during the study that variation in pollution load is mainly due to use of non-conventional raw material, non standardization of manufacturing process and lack of proper floor management. Various shortcomings were also observed in all the three (i) Raw material preparation, (ii) Pulping, (iii) Paper machine sections. Various process modifications were suggested with negligible equipment modification or addition. A decrease in the pollution load was observed after the implementation of few of them. Blow heat recovery and couch pit modification in paper machine section were two cleaner production options, which require equipment modification.

Shake flask study's results show that there is remarkable improvement in the removal efficiency, while using adsorbents or chelated copper compounds in biological treatment. Activated Bagasse Carbon was found to be the most efficient. Percentage COD reduction was 85%, 82% and 83.5%, incase of activated bagasse carbon (0.4 g/L) addition, Tamrian (2ppm) addition and Earthtec (2ppm), respectively, while initial COD was 1056 mg/L. It

is also reported that COD removal efficiency is higher at low values of COD, Kinetic studies also indicate that first order rate of reaction improve, while using additives in aerobic treatment.

Design data obtained from the bench scale studies indicate that oxygen requirement goes down by 28% and 21% in case of activated bagasse carbon and 'Tamrian' respectively. Analysis of effluent after every stage of treatment shows that the toxicity level of effluent remain high except in the case of thermal power plant ash addition, which shows very low mortality on local fish. But results indicate that wastewater, given biological treatment with additives, can be used for irrigation of tolerant crops.

During the waste assessment study of the selected mill it is observed that 90% of the pollution load comes from the pulp mill. It is suggested to segregate the wastewater in two streams i) Pulp mill effluent and ii) Paper machine effluent. Initially two-stage treatment is suggested for the pulp mill effluent, which comprises primary treatment followed by anaerobic treatment. For paper mill effluent only primary treatment is recommended before the final aerobic treatment of combined effluent/. It is suggested to use activated bagasse carbon in aeration chamber so that the final effluent can be used for irrigation purposes.

During the study it is concluded that waste management for small-scale industry can be taken p only with cluster approach. As various exercises such as commissioning of Common recovery and treatment plant. It is therefore suggested to form a Waste minimisation circle in the area to implement the waste management plan

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