

WASTE WATER RECYCLING
IN A
PAINT MANUFACTURING PLANT

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DISSERTATION SUBMITTED TO THE
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ABSTRACT

Waste minimisation can be effected through programmes such as waste reduction at source, recycling and reclamation; and careful control of manufacturing procedures with emphasis on wastage reduction and safety. This study focuses on waste reduction through recycling of waste water for reuse within a paint manufacturing plant. Currently, the effluent stream emanating from the plant's waste water treatment plant (WWTP) contains BOD, COD and suspended solids, concentrations of which are above legislative limits imposed by the Department of Environment (DOE).

The possibility of recycling waste water emanating from a paint factory's waste water treatment plant was evaluated. The existing waste water treatment facility provides preliminary, primary and secondary treatment. The present study focuses on further treatment of the effluent via coagulation - flocculation processes prior to membrane applications.

In recent years, polymer applications in industrial wastewater treatment have become very important due to the increased pollutant removal efficiencies, easier sludge disposal, economy in chemicals consumption and other advantages. Polymers are used either as coagulants or coagulant aids for the aggregation of colloidal particles.

Coagulation - flocculation efficiencies were studied using a combination of alum and lime with and without addition of a polyelectrolyte. Optimum dose of coagulant and coagulant aid were determined based on removal efficiencies measured in terms of turbidity and COD. Increased turbidity removal efficiency of 99.6% was observed from effluent treated with alum, lime and polyelectrolyte. Considerable reduction of organic and inorganic loads were also recorded. Maximum removal efficiency of 74% COD was documented.

The performance of a cross-flow membrane filtration (CMF) unit was evaluated using pre-treated and untreated effluent from the WWTP. Pre-treated effluent increased the limiting flux by 100%. The study also showed that CMF was able to remove all microbiological contaminants in the waste water.

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ABBREVIATIONS

APHA	: American Public Health Association
BOD	: Biological Oxygen Demand
COD	: Chemical Oxygen Demand
CFU	: Colony Forming Units
CMF	: Cross-Flow Microfiltration
DOE	: Department of Environment
ED	: Electrodialysis
EDR	: Electrodialysis Reversal
EDTA	: Ethylene Diamine Tetra-Acetic Acid
EPA	: Environmental Protection Agency
EMSs	: Environmental Management Systems
EMAS	: Eco-Management and Audit Scheme
HEC	: Hydroxy Ethyl Cellulose
HSWA	: Hazardous and Solid Waste Amendments
ISO	: International Standards Organisation
ISA	: Iron Sulphate Media
IPC	: Integrated Pollution Control
IPPC	: Integrated Pollution Prevention and Control
MS	: Malaysian Standard
MAC	: Malaysian Accreditation Council
MAWAR	: Malaysian Agenda for Waste Reduction
Mgd	: million gallons per day
MW	: Mega Watt

MLPD	:	Mega Litres Per Day
Mol. Wt.	:	Molecular Weight
ND	:	Not Detected
NEERI	:	National Environmental Engineering Research Institute
NTU	:	Nephelo Turbidity Unit
bgd	:	billion gallons per day
OPP	:	Outline Perspective Plan
P2	:	Pollution Prevention
RCEP	:	Royal Commission on Environmental Protection
RCRA	:	Resource Conservation and recovery Act
R & D	:	Research and Development
RO	:	Reverse Osmosis
rpm	:	revolutions per minute
SS	:	Suspended Solids
Std. B	:	Standard B
SIM	:	Sulphate Iron Media
SRB	:	Sulphate Reducing Bacteria
SIRIM	:	Standards Institute of Research Malaysia
TC	:	Technical Committee
TDS	:	Total Dissolved Solids
TRI	:	Toxic Release Inventory
UNCED	:	United Nations Conference on Environment and Development
WWTP	:	Waste Water Treatment Plant
Zr.	:	Zirconium