PERFORMANCE OF THE BIOLOGICAL UNIT IN POLISHING THE EFFLUENT

AT

UNILEVER CEYLON (LTD)

A Dissertation submitted in partial fulfillment of the requirement for the Master's of Engineering Degree in Environmental Engineering & Management

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DECLARATION

"This dissertation has not been previously presented in whole or part to any university or Institute for a higher degree"

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Abstract

The Effluent Treatment Plant (ETP) of Unilever Ceylon Ltd. which was the basis for this study, consists of Physical , Chemical & Biological treatment units . The objective of this research study was to evaluate the performance of the biological unit of Activated Sludge. The ETP is continuously operating 24 hours a day. A number of process problems occur due to large variations of flow & characteristics of influent in the daily load. In addition to that, operational practice also contribute to the same.

Although there are some problems during the operational stage, the results indicate that the system is operating quite efficiently with respect to COD, BOD removals and also the concentrations of the above in the treated effluent meet the standards stipulated by the CEA. (ie. 70% of the data collected met the general standard of effluents discharged to inland surface waters stipulated by the CEA). Also this research study indicates that the plant can assimilate considerable high shock loads of the above pollutants without significant treatment failure. This may be due to the fact that the plant is opearing at low average design flow during the period of study.

During the study period , sudden discharges of Caustic effluents were observed. Such discharges resulted foam formation problems in the treatment plant. This has affected specially in fat removal unit which is very important for the effective performance of the biological unit. Sludge bulking and very high mixed liquor suspended solids have been identified to be contributing to the lower efficiency.

It is concluded that,

1. Dissolved Oxygen concentration is extremely low in aeration tank
2. Nitrogen availability in the aeration tank is not quite sufficient for cell synthesis
3. Low Food to Micro-Organism (F/M) values due to high mixed liquor concentration in the aeration tank etc.

Accordingly remedial measures have been recommended as follows;

1. Install a closed loop control system in pH adjustments and chemical dosing in the process
2. Increase the Dissolved Oxygen level in the aeration tank
3. Feed nutrients as required by the ratio of BOD_5:N:P: = 100:5:1
4. Maintain Mixed liquor suspended solids concentration in the range of 3000-4500 mg/l etc.

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List of Abbreviations

AS	- Activated Sludge
BOD_5^{20}	- Biochemical Oxygen Demand in five days at 20 ^0C
BNR	- Biological Nutrient Removal
COD	- Chemical Oxygen Demand
DO	- Dissolved Oxygen
ETP	- Effluent Treatment Plant
F/M	- Food to Micro-organism Ratio
MLSS	- Mixed Liquor Suspended Solids
MLVSS	- Mixed Liquor Volatile Suspended Solids
NEA	- National Environmental Act
pH	- Hydrogen Ion Concentration
SVI	- Sludge Volume Index
TSS	- Total Suspended Solids
TFM	- Total Fatty Matter
TKN	- Total Kjeldahl Nitrogen
TDS	- Total Dissolved Solids