COMPARISON AND PERFORMANCE EVALUATION OF SUBMERGED ATTACHED GROWTH AEROBIC SYSTEM VERSUS SUSPENDED GROWTH AEROBIC SYSTEM DESIGNED FOR FACTORY SEWAGE

THIS DISSERTATION IS SUBMITTED TO THE DEPARTMENT OF CIVIL ENGINEERING PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER IN ENVIRONMENTAL MANAGEMENT

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Abstract

Most factories found in Sri Lanka do not have proper sewage treatment systems and due to the high number of employees these factories are always encountered with the problem of handling large quantities of low strength sewage generated from lavatories, canteens and kitchens. In such factories sewage is usually handled using conventional septic tank - soakage pit systems. Such systems are commonly found infested with insects, and promote further breeding. They cause nuisance due to obnoxious odor, and is a major cause for severe ground and surface water pollution. It has been noted that these factories have critical problems of handling sewage during rainy season, especially when the factory is located in areas with high ground water table such as a marshy land or near a surface water body.

However, some factories consist of a conventional activated sludge system and a higher percentage of activated sludge processes found in these factories are in the malfunctional stage due to the least attention by the factory management. The activated sludge systems require a very high attention for the proper operation.

The major problem of such factories is the giving of the least priority for the above issue and therefore the allocation of competent personal to operate plant is neglected. ,.' Therefore, their key demand is to provide them a treatment system to treat sewage with minimal operational difficulties and minimal labour involvement to overcome above problem.

This research was therefore carried out with the following objectives to fulfill the above requirement. The broad objective is the study and compare the performance of aerobic attached growth and aerobic. suspended growth processes designed for factory sewage and recommend the most appropriate treatment regime for the factory sewage with regard to less operational and maintenance issues.

Therefore, BOD removal efficiency and nitrogen removal efficiency have been compared for both processes in order to evaluate the performance of the each

process. The estimation of sludge wasting, appropriation of process control parameters and operational issues in both processes are studied for the justification of the operational feasibility of each process. The land utilization and operational and maintenance cost have been estimated to identify the economical feasibility of each process.

This study has proved that the BOD removal efficiencies of each process are equal and the nitrogen removal percentages are 43 % and 37% in attached growth process and suspended growth process respectively.

Sludge production is 27 % less in attached growth process and thereby sludge handling is easy and esthetically good. The operational issues have been proved less in attached growth process.

Annual operational and maintenance cost for the attached growth aerobic process is 30 % less over suspended growth aerobic process. Land requirement (foot print) is 13 % less in attached growth process over suspended growth process. Unit cost *Rsl* m3 of treated water for attached growth process has been proved that 32% less.

Therefore, submerged attached growth system is, recommended as a less complicated, trouble free method for treatment of the factory sewage.

DECLARATION

I declare that this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any University or other institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the test.

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DECLARATION

I have supervised and accepted this thesis for the submission of the Degree

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LIST OF ABBREVIATIONS

BOD	– Bio-chemical Oxygen Demand
CEA	– Central Environmental Authority
COD	– Chemical Oxygen Demand
DO	– Dissolved Oxygen
MLSS	– Mixed Liquor Suspended Solids
MLVSS	– Mixed Liquor Volatile Suspended Solids
RBC	– Rotating Biological Reactor
SRT	– Solids Retention Time
TSS	– Total Suspended Solids
STP	– Sewage Treatment Plant
TKN	– Total Kjeldahl Nitrogen
VSS	– Volatile Suspended Solids
SVI	– Sludge Volume Index
SRR	– Sludge Return Rate
SSVI	– Stirred Sludge Volume Index

APPENDIXES