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# COMPARATIVE STUDY ON TWO DIFFERENT WASTEWATER TREATMENT PROCESSES AT CREPE RUBBER FACTORIES

**A Dissertation submitted in partial fulfillment of the requirement for the Master of Science Degree in Environmental 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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Mrs. D.D.Vithanage
March 2003

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# Abstract

In Sri Lanka most commonly used treatment methods for crepe rubber factories are pond/lagoon system and activated sludge system. The objective of this study is to identify the most cost effective and commercially viable treatment system to treat the effluent generated from crepe rubber factories. Mechanically aerated lagoon/pond system at Eheliyagoda Rubber Factory and activated sludge system at Parakaduwa Rubber Factory have been selected for this study.

The average flow rates during the study period for the ETP at Eheliyagoda Factory is $30m^3/d$ and it is $60m^3/d$ for the ETP at Parakaduwa Factory. Also it is observed that the Eheliyagoda Factory uses 19% more water and the Parakaduwa Factory uses 43% more water than the water quantity stated in the Guidelines for Natural Rubber Industry. Considerable variations of influent $BOD_5$ & COD to the treatment plants have been observed due to the changes in weather pattern and latex tapping activities are generally affected by the weather. pH of the wastewater generated in both factories is always less than 6.0 and the $BOD_5$ & COD removal efficiencies of the anaerobic treatment unit in both plants are less than 30%.

The average $BOD_5$ & COD of the treated wastewater obtained from the ETP at Eheliyagoda Factory is 53 mg/l and 229 mg/l respectively. Also the 60% of $BOD_5$ readings and 90% of COD readings of the treated wastewater obtained from the ETP at Eheliyagoda Factory meet CEA standards. The average $BOD_5$ & COD of the treated wastewater obtained from the ETP at Parakaduwa Factory is 77 mg/l and 340mg/l respectively. The 22% of $BOD_5$ readings and 78% of COD readings of the treated wastewater obtained from the ETP at Parakaduwa Factory meet CEA standards. The average TSS values of the treated wastewater obtained from the treatment plants at Eheliyagoda & Parakaduwa Factories are 315mg/l &171mg/l. Total $BOD_5$, COD & TSS removal efficiencies of the ETP at

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Eheliyagoda Factory are 93.5%, 94.5% & 67.5% respectively. Such removal efficiencies for the ETP at Parakaduwa Factory are 90.5%, 91.3% and 68.3% respectively. When considering the removal efficiencies of the aerobic/ facultative unit of each treatment system, they are higher in the MAL than the Activated sludge tank.

The initial capital cost of the activated sludge process at Parakaduwa Factory is lower than the mechanical aerated lagoon system at Eheliyagoda Factory. But when comparing the cost for operation & maintenance of the treatment systems, it is lower in the treatment plant at Eheliyagoda Factory and it is 54.5% of the cost for the treatment system at Parakaduwa Factory.

For the period of 10 years of the operation of the treatment plants, the unit cost for wastewater treatment in terms of Rs/kg at Parakaduwa Factory and Eheliyagoda Factory are Rs 1.59 and Rs 1.53 respectively. Also the one kilogram of BOD load, treatment costs for Parakaduwa Factory and Eheliyagoda Factoty are Rs 46.14 and Rs 47.11 respectively. Since the low operational & maintenance cost and high treatment efficiency of MAL system, it can be concluded that the mechanical aerated lagoon system is more cost effective wastewater treatment process for natural rubber industry where the land is available.

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Gravity flow to each treatment unit where ever possible and daily pH correction of the raw wastewater should obtained to achieve cost effective performance in both systems. It is also recommended to maintain a correct DO & MLSS in the aeration tank at Parakaduwa Factory and to install a sand bed as a last unit for the plant at Eheliyagoda Factory.

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# List of Abbreviations

| | | |
|---|---|---|
| AEC | - | Annual Equivalent Cost |
| AETU | - | Aerobic Treatment Unit |
| ANTU | - | Anaerobic Treatment Unit |
| AT | - | Aeration Tank |
| BOD | - | Biochemical Oxygen Demand |
| CEA | - | Central Environmental Authority |
| COD | - | Chemical Oxygen Demand |
| DO | - | Dissolved Oxygen |
| ETP | - | Effluent Treatment Plant |
| F/M | - | Food to Microorganism Ratio |
| MAL | - | Mechanical Aerated Lagoon |
| MLSS | - | Mixed Liquor Suspended Solids |
| MP | - | Maturation Pond |
| NEA | - | National Environmental Act |
| pH | - | Hydrogen iron concentration |
| RBC | - | Rotating Biological Contactors |
| SB | - | Sand Bed |
| SLR | - | Sri Lanka Rupees |
| ST | - | Settling Tank |
| SSVI | - | Stirred Sludge Volume Index |
| SVI | - | Sludge Volume Index |
| TSS | - | Total Suspended Solids |

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