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# PRELIMINARY STUDY ON A COST EFFECTIVE METHOD FOR REDUCTION OF COD IN THE WASTEWATER PLANT IN ONE OF THE DAIRY PRODUCT INDUSTRIES IN SRI LANKA

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The discharges of dairy product wastewater contain a large load of organic pollutants including proteins, fat and chemicals used for sanitization and cleaning processes, giving rise to a high Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), and Total Solid (TS) content. This study is associated with one of the leading dairy-product industries in Sri Lanka containing an inbuilt water treatment plant (maximum factory wastewater output: 80000 L/day) along with an anaerobic tank, a facultative tank, an aerobic tank, settlement tanks and a constructed wetland. The main objective of the research is to suggest a cost-effective method to mitigate the exceeded values of COD, which is currently much greater than acceptable CEA standards (COD- 250 ppm, TS- 50 ppm, BOD- 30 ppm).

Chemical analysis of selected points of the wastewater treatment plant (six points were selected and three samples of each point were collected and three trials for each sample were carried out for this analysis.) was carried out to evaluate the efficiency of the current water treatment process and revealed an overall reduction of levels of BOD (1495-348) ppm, TS (1200-480) ppm and increments in $Cl^-$ (18 – 84) ppm and TDS (560-3320) ppm and, fluctuations in TS and $PO_4^{3-}$contents. Average values of the plant outlet for $BOD_5$, COD, Total Solid (TS), $Cl^-$ and $PO_4^{3-}$ were recorded as 348 ppm, 748 ppm, 2360 ppm, 84 ppm, and 2 ppm respectively.

Preliminary studies re-confirmed the deviation of COD and $BOD_5$ of the effluent. Therefore, an alternative cost-effective method for the reduction of COD was considered. Laboratory-scale filters were developed using natural abundant raw materials such as coconut shell charcoal (*rigid and extensively porous*), bamboo charcoal (*vascular structure and high carbon content*), and sand (*bio film formation and physical filtration*). Three different particle sizes of coconut shell charcoal and two sizes of sand were randomly used with different proportionate to prepare desired filters. In addition, bamboo charcoal was prepared by carbonizing bamboo stem at 250 ºC for 2.5 hours in a tube furnace. All these filters packed in a glass-column (17 cm height, 2 cm diameter). The flow rate was maintained at 0.71 $cm^3\ s^{-1}$. Initial and final COD values were determined by open reflux method. Improvement of visibility (depletion of colour) was overcome by employing $ZnCl_2$ based chemical activation method.

Filters with four alternating layers (3.5 cm of each) of sand (< 1 mm) and one of the different types of charcoal *(a, b, c* and *d*): [*a*) chemically activated charcoal (prepared), *b*) normal charcoal (<1 mm), *c*) normal charcoal (2-10 mm), *d*) bamboo charcoal (prepared) ] indicated a significant reduction of COD by: *a*) 73.8% (with significant colour removal properties), *b*) 70.7%, *c*) 69.4%, and *d*) 56.5% respectively. The reduction of TS for all the above filters was around 30%. The filter with commercial activated carbon reported a removal of TS by 44.2% but the reduction of COD was only by 22.1%. By considering the reduction of COD together with depletion of colour associated with effluents, the type (a) filter can be recommended to the dairy-product industry with some modifications such as usage of mesh for the separation of each layer.