PERFORMANCE EVALUATION OF DAIRY EFFLUENTS TREATMENT PLANT

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ABSTRACT

The dairy industry, a critical sector for food production, is recognized as a significant contributor to water pollution due to its substantial water usage and high organic wastewater loads. Fonterra Brands Lanka, a leading dairy producer in Sri Lanka and a subsidiary of Fonterra, a global dairy exporter, faces the challenge of managing its wastewater effectively. This research investigated the performance of the Fonterra Brands Lanka effluent treatment plant (ETP), which employs a multi-stage process including screening, effluent collection, dissolved air flotation (DAF), anaerobic treatment, aerobic treatment, clarification, sludge treatment, and disinfection. The objectives of this study are to assess the efficiency of the effluent treatment plant in removing pollutants such as BOD, COD, pH and total nitrogen from dairy wastewater. The study evaluated four key water quality parameters: Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), Total Nitrogen (TN), and pH over four days, collecting samples from eight designated points within the ETP. Statistical analysis revealed significant variations ($p < 0.05$) in influent wastewater characteristics. The wastewater treatment system demonstrated exceptional overall removal efficiencies, achieving 100% for BOD, 99.33% for COD, and 97.29% for TN. The DAF unit achieved up to 72.09% BOD and 62.12% COD removal, although its performance dropped on certain dates, while the denitrification tank showed fluctuating results, with 60.23% COD removal and a significant drop to 36.2% for BOD removal on certain dates. The aeration tank and circular clarifier performed consistently well, achieving 77.8% and up to 95% BOD removal, respectively. pH levels fluctuated between 2.8 and 8.5 across the treatment stages, with the inlet pH ranging from 2.8 to 6.8. These findings reflect the treatment system's variable performance, largely driven by fluctuations in influent composition and the effectiveness of individual treatment units.

Keywords: Dairy Industry, Effluent Treatment Plants, Wastewater, Wastewater Characteristics

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