

Development of a Compact Aerobic and Anaerobic Digestion Wastewater Treatment System for a Broiler Processing Plant

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The present study was conducted to develop a compact aerobic and anaerobic wastewater treatment system for a meat processing industry. Through this novel system, it was expected to increase the efficiency of wastewater treatment while reducing the land area utilized for the wastewater treatment plant. The treatment system was aligned vertically and consisted of four different units accordingly rotating drum bioreactor, aeration unit, screening unit, and anaerobic digester unit. The structure of the prototype was built mainly using high-density polyethylene drums. As the influent, wastewater generated at a commercial broiler processing industry was used. The experiment was consisted of 2 treatments: existing wastewater treatment plant (screening, aeration, dissolved air floatation, chemical treatment), and novel compact wastewater treatment system. Influent wastewater and the treated effluent from both treatments were analysed for Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), pH, nitrate content, nitrite content, ammonium content, and Total Suspended Solids (TSS) levels. Surface area utilized for two treatments were compared. The BOD, COD, pH and nitrate values of the treated effluent from the novel system was significantly lower than those of treated effluent from the existing system. However, NH₃ content of the treated effluent from the novel system was significantly higher than that of treated effluent from the existing system which indicated incomplete anaerobic digestion in the novel system. When comparing the land area utilization of two treatments, the novel treatment system utilized less land area for wastewater treatment (163.75 L/m² vs. 3.09 L/m²). According to the results, it could be concluded that the novel wastewater treatment system is highly efficient in reducing organic load in wastewater and land area utilization. Further studies are recommended to optimize the system for the reduction of NH₃ generated during the anaerobic digestion of the waste.

Keywords: Chemical oxygen demand, Biological oxygen demand, Rotating drum bio reactor