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DAIRY WASTEWATER TREATMENT IN CONTINUOUS STIRRED TANK ELECTROCHEMICAL REACTOR (CSTER): PARAMETRIC OPTIMIZATION AND KINETICS

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Abstract

Dairy wastewater has been a major environmental concern because of massive wastewater characterised by high pollution load. This study reports the influence of initial pH (pH_i), residence time (τ) and elapsed time (t) on the %COD removal (Y_1) and specific energy consumed (kWh per kg of COD removed, Y_2) for real dairy industry wastewater treatment in continuous stirred tank electrochemical reactor (CSTER) using aluminum electrodes. Central composite design (CCD) was applied for designing the experiments, analyzing the experimental data and optimizing the process parameters to maximizing Y_1 and simultaneously minimizing Y_2. Important design parameters for continuous reactors like steady state time (t_S), mass transfer coefficient (k_m) and kinetics, were also estimated. Modified pseudo-first-order kinetic model was used for kinetic modeling with non-linear regression technique. Experiments conducted at optimal process parameters for CSTER (pH_i= 4.5, τ= 141 min; t= 52 min) showed Y_1 = 71.21%, Y_2 = 4.32 kWh/kg of COD removed**,** t_S= 50 min and mass transfer coefficient (k_m) = 18.1 x 10^{-6} m/s.

Key words: aluminum electrode, COD removal, continuous electrochemical treatment, dairy wastewater, specific energy consumed

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