VERSITA 10.2478/auoc-2013-0019
Ovidius University Annals of Chemistry Volume 24, Number 2, pp. 115-120, 2013

Mathematical model for power consumption at mixing of industrial and domestic wastewater sludge

Ancaelena Eliza STERPU*, Claudia Irina KONCSAG Anca Iuliana DUMITRU and Alina-Daniela MIHALCEA

Department of Technology and Chemical Engineering, Ovidius University of Constanta, 124 Mamaia Blvd, 900527 Constanta, Romania

Abstract Physical investigations have been carried out to characterize the power consumption in a laboratory autoclave vessel equipped with an anchor impeller (diameter d = 0.068 mm), without baffles, at 8 speed ratio, from 100 to 800 rpm. The laminar flow regime was investigated using sludge proceeding from the treatment of mixed industrial and domestic wastewater, with a view to its subsequent processing: mixing, filtration, dewatering. The mathematical modeling focused on finding an accurate equation linking the Power number (N_p) and the Reynolds number (Re) at different levels (H) of sludge in the vessel.
The rheological curves indicate that the sludge have non-Newtonian behaviors which are better described by the Herschel-Buckley model**.** The models resulted from the N_p variation versus Re are power function type $N_p = a \cdot \mathrm{Re}^b$, where the coefficient a is a linear functions of H/d ratio and b = -1.016 have a constant value.

Keywords: wastewater sludge, mixing power, anchor impeller, Herschel-Buckley model

ISSN-1223-7221