Environmental Engineering and Management Journal

August 2010, Vol.9, No. 8, 1063-1068
http://omicron.ch.tuiasi.ro/EEMJ/

"Gheorghe Asachi" Technical University of Iasi, Romania

MATHEMATICAL MODELS FOR POWER CONSUMPTION AT THE MIXING OF SOME LUBRICATING GREASES

Ancaelena Eliza Sterpu[1*], Nicoleta Teodorescu[2], Iuliana Marlena Prodea[2], Eugeniu Popescu[1], Irina Niţă[1]

[1]OVIDIUS University of Constanta, 124 Mamaia Street, 900527 Constanta, Romania
[2]Politehnica University of Bucharest, Faculty of Mechanical Engineering and Mechatronics, Department of Process Equipment, 313 Splaiul Independentei, 060042 Bucharest, Romania

Abstract

The aim of this study was to find a mathematical model for the mixing of some additive-free calcium soap lubricating greases. The base-oil is mineral paraffinic oil, known for its biodegradability and the calcium soap is less toxic than other metallic soaps, so the resulted greases are considered more environmentally friendly.
The mathematical modeling focused on finding an accurate equation linking the Power number (N_p) and the Reynolds number (Re) at various soap concentrations and temperatures.
The rheological curves indicate that the greases have non-Newtonian behaviors which are better described by the Ostwald de Waele model (power law model)**.** The mixing experiments were carried out in a laboratory autoclave equipped with an anchor impeller, without baffles, at 8 speed ratio, from 100 to 800 rpm.
The models resulted from the N_p variation versus Re are power function type $N_p = a \cdot \mathrm{Re}^b$, where the coefficients a and b are linear functions of soap concentration in base oil and the processing temperature**.**

Key words: calcium soaps, greases, power number, rheological properties

Received: March, 2010; Revised final: August, 2010; Accepted: August, 2010

[*] Author to whom all correspondence should be addressed: e-mail: asterpu@univ-ovidius.ro; Phone: +40-726-683163