

The Experimental Characteristics and Evaluation of Nylon-12 in Erosion Process

Reference

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ABSTRACT

Polymer materials are used in a wide range of applications. The erosion properties of nylon-12 were analyzed in this study. Randomly-shaped sand (SiO_2) particles of various sizes (300–355 μm , 355–500 μm , and 500–600 μm) were selected as erosive elements. Impingement angles between 15 and 90°, impingement velocities between 30 and 50 m/s, and stand-off distances 15–25 mm at ambient temperature were tested. During testing, the maximum erosion of the tested polymer composite occurred at 30° angle of impingement, indicating a ductile nature of the test material. Erosion increased with impact velocity and decreased with stand-off distance. The erosion rate varies from approximately 5 to 1600 mg/kg at different combinations of impact velocity, impact angle, and other related parameters. The mean S/N ratio was found to be -41.35 dB, which reflects the average erosion rate under different test conditions. Test results were evaluated using Taguchi's concept to minimize the observations needed, and analysis of variance (ANOVA) was used to identify interactions between tested parameters and identify the most significant parameters. Surface damage was examined using scanning electronic microscopy (SEM) to examine the nature of the wear behavior. The morphology of tested material showed micro cutting, micro cracking, ploughing, and deformation as dominating damage characteristics of impacting surfaces.

Keywords

nylon-12, erosion rate, impact velocity, impact angle, erodent size, stand-off distance, analyzing methods

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