10-----
(Office use only)

ICAM[5]

An analysis of dry sliding wear response of waste marble dust filled glass-polyester composites using design of experiment and neural networks

Sandip Kumar Nayak

National Institute of Technology, Rourkela, India

nayak.sandip200@gmail.com

Alok Satapathy

National Institute of Technology, Rourkela, India

ABSTRACT

Marble dust generated during processing of the marble producing rocks is a major solid waste with a detrimental impact on environment. Analysis shows that this waste has constituents having compounds like SiO_2, Al_2O_3, Fe_2O_3, CaO, MgO, etc. in different proportions. This paper explores the possible use of waste marble dust as a secondary filler in glass-polyester composites and reports on its dry sliding wear characteristics. Such hybrid composites are fabricated by keeping the woven glass fiber loading fixed and by varying the weight fraction of the particulate filler i.e marble dust through a simple hand layup route. The composites are subjected to some basic mechanical and physical characterization tests. Dry sliding wear trials are conducted under different test conditions as per ASTM G 99, following Taguchi's L_{25} orthogonal array. Significant control factors influencing the specific wear rates are identified and an optimal factor setting based on minimum wear is found out. Scanning electron microscopy of the worn composite surfaces is done to ascertain the wear mechanism. It is found that the presence of marble dust improves the wear resistance of unfilled glass-polyester composites. Further a prediction model based on artificuial neural network is developed to estimate the specific wear rate within and beyond the experimental domain.

Keywords: *Composites, Unsaturated polyester, Waste marble dust, Dry sliding wear, Taguchi method, Neural networks.*