

Erosion Characteristics of Teflon Under Different Operating Conditions

Uttam Kumar Debnath^a, Mohammad Asaduzzaman Chowdhury^a, Dewan Muhammad Nuruzzaman^b,
Md. Mostafizur Rahman^a, Biplov Kumar Roy^a, Md. Arefin Kowser^a, Md. Monirul Islam^c

^aDepartment of Mechanical Engineering, Dhaka University of Engineering and Technology, Gazipur,
Gazipur-1700, Bangladesh

^bFaculty of Manufacturing Engineering, University Malaysia Pahang, Kuantan, Lebuhraya Tun Razak,
26300 Gambang, Pahang, Malaysia

^cBangladesh Chemical Industries Cooperation, Motijheel, Dhaka-1000, Bangladesh

ABSTRACT

The present study investigated the solid particle erosion characteristics of Teflon under different impingement angles (15–90°), impact velocities (30–50 m/s), erodent sizes (300–600 μm) and stand-off distances (15–25 mm) at ambient temperature. The Teflon showed ductile erosion behavior exhibited a peak erosion rate at a 30° impact angle. The design of experiments approach utilizing Taguchi's orthogonal arrays was applied to test the specimens on a compressed air jet type erosion test rig. Erosion efficiency (η) values were 0.29–16.7%, which indicates micro-plugging, plastic deformation and micro-cutting action as dominating erosion mechanisms. The experimental results are closer to the theoretical model. An optimal parameter combination was determined, which leads to minimization of erosion rate. Analysis of variance (ANOVA) was performed on the measured data and signal-to-noise (S/N) ratios. A mathematical correlation, consistent with the experimental observations, is proposed as a predictive equation for estimation of erosion rate of tested material. The morphology of erodent surfaces was examined by using scanning electron microscopy (SEM). Possible erosion mechanisms are discussed.

KEYWORDS: ANOVA; erosion efficiency; solid particle erosion; Taguchi design; Teflon; wear mechanism

DOI: [10.1515/polyeng-2014-0359](https://doi.org/10.1515/polyeng-2014-0359)