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Evaluation of Friction and Wear Characteristics of Electrostatic Solid Lubricant at Different Sliding Conditions

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Abstract

In modern industry, mechanical parts are subjected to friction and wear, leading to heat generation, which affects the reliability, life and power consumption of machinery. Effective cooling/lubrication in the machining zone are essential to improve friction and temperatures by efficient heat dissipation which increases tool life and surface quality. Solid lubricant additives have demonstrated better tribological performance in terms of reducing friction and sliding zone temperature without polluting the environment. With an appropriate application of solid lubricant additives in the sliding interface, the friction reduction and wear resistance properties of the lubricant have been successfully improved. Therefore, an attempt has been made in this research work with an investigation of using molybdenum disulphide suspension to reduce the friction at machining zone. To achieve this, in the present work, novel electrostatic charged solid lubricant spray technique (ECSL) has been envisaged for effective supply of solid lubricant mixture at an extreme low flow rate to the sliding interface of WC pin and Ti-6Al-4V alloy as disc materials. Excessive tribological measurements with SAE 40 oil concentrated with 20wt% of MoS_2 with micron size particles results in lower friction coefficient and wear because of the fact that particles with small size were more likely to interact with the sliding surfaces of the friction pairs to form a surface protection film, which increases anti-wear ability of sliding surface. The results indicate that the solid lubricants applied effectively with the developed experimental set-up and improve the tribological properties of the sliding surface.

Keywords: Friction, Wear, Temperature, Solid lubricant, MoS_2