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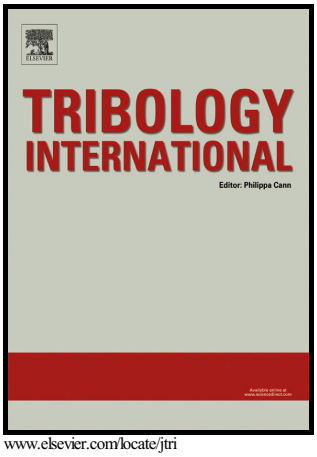

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Abstract

Wear performance of any tribological system can be influenced in a complex way by water contamination. Water can be the cause of steel corrosion which, in turn, can accelerate wear. It can decompose the additives in the oil and create a more corrosive environment which leads to the higher wear in the system. A key novelty of this study is to investigate the effect of relative humidity and the tribochemical changes on the tribological performance and tribofilm characteristics of boundary lubricated systems by means of designing a humidity control system integrated to the Mini Traction Machine (MTM) and Spacer Layer Interferometry Method (SLIM) for the first time. The system is capable of simulating rolling-sliding conditions continuously where lubricant can be contaminated with water. This paper is the first part of a two-part study and the theoretical aspects of the work is the subject of the second part of this investigation. It was observed that humidity hinders the tribofilm formation, especially at higher values of relative humidity and lower temperatures and it can significantly affect the wear process. The correlation between tribofilm thickness, water concentration, temperature and wear of the system was studied. The experimental results suggest that the higher the humidity, the higher the wear of the system and it is more noticeable at lower temperatures where the tribofilm in thinner. The surface chemistry of zinc polyphosphates was investigated as a function of humidity.

Keywords: *ZDDP, Boundary lubrication, Relative humidity, Wear*