Synthesis and experimental investigation of tribological performance of a blended (palm and mahua) bio-lubricant using the taguchi design of experiment (doe)

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Abstrak

The increasing prices of commercial lubricants and global attention towards a green environment have become the key issues to re-think about alternatives to commercially available lubricants. With these prospects in mind, vegetable oils can be utilized as an option to commercially available lubricants, due to their biodegradable and nontoxic nature. Moreover, they possess certain advantages like lower volatility and high flash/ fire points, higher viscosity index, excellent lubricity and cost savings. These properties of bio-lubricants are more often considered as important in the preparation of various bio-fuels. So far bio-lubricants have been employed in the preparation and testing of bio-fuels for various automotive applications. The primary aim of this study is to infer a novel application of bio-lubricants in the subject area of machining. During machining, machinability and performance are most frequently determined by the friction and wear characteristics of the tool and workpiece materials. In this work, first friction and wear characteristics of bio-lubricants (blended vegetable oils in various proportions) formulated from Palm and Mahua oils have been investigated using a Pin-on-Disk wear testing machine. A bio-lubricant (composed of blended vegetable oils) is synthesized by using two base oils and blending them in different possible proportions. The tribological properties have been studied over an AISI 1040 Steel disc specimen with aluminium pins under various bio-lubricant environments using the Taguchi Design of Experiment (DOE). During the study, it was observed that the abrasive and adhesive wear were the main wear mechanisms that occurred in the tests. The results have shown that total wear of the test specimens under all machining conditions for 90% Mahua and 10% Palm blended oil combination is found to be at a minimum.