

Refining the Composition of Recycled Spent Lubricants Mixed with Alumina Nanofluids for Machining Purpose

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Abstract:

Machining lubricant is used in the manufacturing industry for lubrication and cooling which are crucial in operations such as grinding and cutting process. However, machining lubricant lose efficiency in months due to thermal degradation and contamination. To recycle the used machining lubricants while enhancing the performance, the mixture of nanofluids (N) based Al₂O₃ with better thermal properties to synthesize with the recycled spent lubricants (RSL). This study suspended Al₂O₃ nanofluids in five base ratios of recycled spent lubricants (i.e. 40:60, 45:55, 50:50, 55:45 and 60:40) by ultrasonic homogenies. The two main parameters in cooling rate performance are thermal conductivity and dynamic viscosity. The thermal conductivity and dynamic viscosity are then measured at temperature range of 30 to 60 °C. The highest enhancement of thermal conductivity in 60:40 (N:RSL) was evaluated to be 18.5% higher than the 40:60 (N:RSL) base fluid at the temperature of 60 °C. However, the enhancement of dynamic viscosity was measured to be 2.4% for 60:40 (N:RSL) at 60 °C temperature. Therefore, this study recommends the use of recycled spent lubricants based Al₂O₃ as cutting fluid in the ratio of 60:40 for application in machining operations.

Keywords: Spent lubricants; Thermal conductivity; Dynamic viscosity

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