

## **The effectiveness of palm oil methyl ester as lubricant additive in milling and four-ball tests**

### **Abstract**

This paper examines the effectiveness of palm oil methyl ester (POME) as lubricant additive using the four-ball and milling tests. In milling 55 HRC-stavax® (modified AISI 420 stainless steel) under flood lubrication, three stages of tool wear occurred: 1) initial wear by delamination, attrition and abrasion; 2) cracking at the substrate, 3) followed by formation of individual surface fracture at the cracks which would then enlarge and coalesce to form a large fracture surface. Mineral oil sprayed in mist form was more effective in reducing the coating delamination and delaying the occurrence of cracking and fracture. The effectiveness of mineral oil in suppressing these wear modes could be enhanced by the presence of POME. The mechanism by which the POME suppressed these wear modes could be explained by the results obtained in the four-ball tests which showed that the presence of POME as additive in the mineral oil reduced the friction coefficient, severity of welding and increased the critical load for welding to occur.