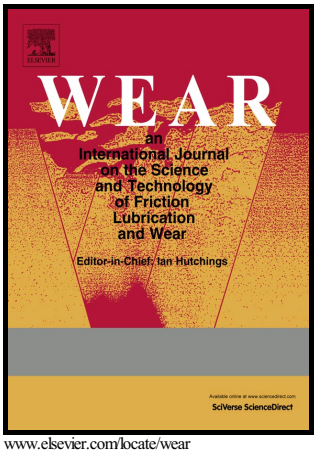

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LUBRICATED SLIDING WEAR OF SAE 1045 AND SAE 52100 STEEL AGAINST ALUMINA IN THE PRESENCE OF BIODIESEL, DIESEL AND A 50:50 BLEND OF THOSE FUELS

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ABSTRACT

The purpose of this work was to evaluate the sliding wear characteristics of SAE 1045 and SAE 52100 steels with different microstructures in the presence of pure biodiesel, a biodiesel-diesel blend (50% diesel + 50% biodiesel) and commercial diesel fuel. Non-lubricated tests (dry) were also performed for comparison. For SAE 1045, samples were given a hardening heat treatment (austenitization at 830°C and water quenching). For SAE 52100, the heat treatment was austenitization at 850°C followed by oil quenching. Tempering at 100°C and 300°C was used for SAE 1045, and tempering at 100°C and 200°C was used for SAE 52100. As a result, the samples had four different hardness and microstructure combinations: tempered martensite in SAE 1045 and tempered martensite with chromium carbides in SAE 52100. Wear testing was performed using a pin-on-disk tribometer, 1.8 m/s sliding speed, 14.7 N load and 4400 m sliding distance following the ASTM G99-04 standard. Wear track surfaces were characterized using microindentation hardness and scanning electron microscopy. The results exhibited a tendency to decrease wear width, volume loss and wear coefficient when adding biodiesel to diesel for both SAE 1045 and SAE 52100 steels. Martensite produced by heat treatments increased the wear resistance. For both SAE 1045 and SAE 52100 steels, abrasive wear is dominant in both dry and lubricated conditions.