Lubricity Behavior of HVOs

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Hydrotreated Vegetable Oils (HVOs) are straight chain paraffinic hydrocarbons without oxygen, sulfur and aromatics that can deliver high energy content, superior cold operability, and low pollution. HVOs without oxygen and sulfur has its benefits but it has contributed to poor lubricity. In this study, we have used Ducom HFRR to investigate the friction and wear behavior of neat HVOs and additized HVOs (Ex. Fatty Acid Methyl Esters). The test method followed ISO 12156. There were 10 tests conducted for each fuel type to determine the statistical significance and precision limits. The ball mean wear scar diameter was 617 µm ± 14 µm and 374 µm ± 18µm for neat HVOs and additized HVOs, respectively. The friction coefficient was 0.80 ± 0.12 and 0.22 ± 0.01 for neat HVOs and additized HVOs, respectively. Additives enhanced the lubricity behavior of HVOs and they help HVOs comply with the EN 590 standard (i.e. MWSD < 450 µm). Wear topography for neat HVOs represented adhesion and abrasion mechanism whereas the additized HVOs showed only adhesion. At mild wear conditions (MWSD < 450 µm) the friction coefficient had direct influence on wear whereas at high wear conditions (MWSD > 550 µm) the friction coefficient had no influence on wear. This relationship between friction and wear can be related to low shear boundary layer composed of fatty acids and polar carboxyl groups. If its ability to dissipate energy decreases (i.e. increase in friction) then it also reduces the load bearing capacity of the protective films (i.e. increase in wear). In conclusion the methyl esters enhance lubricity of HVOs and it provides flexibility to control the friction within mild wear conditions. Low wear is essential to increase service life of engine components and the low friction characteristics can help in reducing the power consumption.

High Frequency Reciprocating Rig (HFRR 4.2)

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