Laboratory Aging of Ester Oils and Its Effect on Friction and Wear

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Field tests used to determine the aging of lubricants is expensive. Furthermore, it offers limited information on friction behavior of lubricants. To overcome these disadvantages, we have developed accelerated aging of lubricants in the lab by using KRL shear stability tester with tapered roller bearing, that is equipped with friction, temperature and load sensors. Aging of lubricants was confirmed by determining the deterioration of anti-wear additives in lubricants (four ball tester, FBT-3), shear stability of polymers (viscometer) and specific functional groups in the lubricants (IR spectroscopy). Lubricants from various manufacturers, used in IC engines and transmission systems, was sheared for 2 h in a controlled temperature fluctuation environment and for 200 h at a controlled fixed oil temperature. Results indicated that the friction was sensitive to changes in lubricant temperature. Friction decreased due to increase in temperature from 60 deg C to 100 deg C, this was due to shear thinning. Lubricants with mineral base oil showed a significant viscosity loss or poor shear stability compared to synthetic base oil. IR spectroscopy studies confirmed the breakdown of polymers, in the lubricants with poor shear stability. Furthermore, lubricants with synthetic base oil showed significant deterioration of antiwear additives compared to mineral base oil. A combination of KRL and FBT-3 was enough to provide first information report on the aging of oils with different formulations.

KRL Shear Stability Tester (KRL-SST-1)

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