EFFECT OF AGED OILS ON RING-LINER WEAR

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KEYWORDS
Lubricant additives; Wear; Mixed Lubrication, Cylinder Liner

ABSTRACT
With the trends to increase drain oil interval to reduce cost of ownership of Heavy-Duty vehicles and to use low ash oils, the efficiency of lubricant additives, especially the anti-wear ones, are of great interest. However, most of tribological tests are still done with fresh oils or in a few cases with artificially aged oils.

In this work, piston ring and cylinder liner were rig tested for friction and wear on a short reciprocating tester with two oils: a fully formulated SAE 10W-40 API CI-4 / ACEA E7 and a sample of the same oil after 500h of engine test. Liner wear was evaluated by different parameters based on the Bearing Curve. Higher cylinder wear and slight lower friction values were found with aged oil. Samples of a liner with accumulated 500 engine hours were also tested with the aged oil and showed intermediate results.

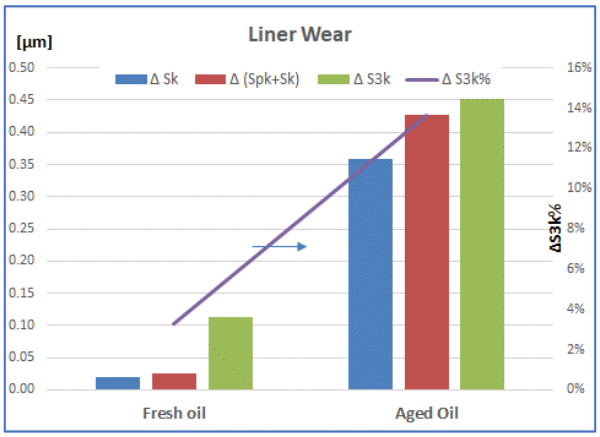

Figure 1- Liner wear.

After test, wear track of cylinder liners was analyzed by EDS (Energy Dispersive X-Ray Spectrometry) and compared with analyses of the parts before test. Much more Zinc and Phosphorus were found on the liners tested with fresh oil.

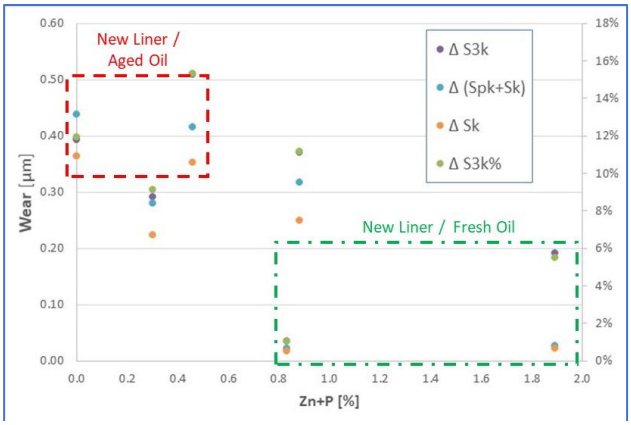

Figure 2- Liner wear and % of Zn+P found in the wear track.

CONCLUSIONS:
- Compared with the fresh oil, the aged oil showed slight lower friction but significant higher liner wear.
- More Zinc and Phosphorus were found on the liner wear track of the liners tested with the fresh oil.
- The fresh oil formed more ZZDP derived tribofilms that mitigated liner wear but increase friction.
- The used liners, tested with the aged oil presented intermediate values of friction, wear and ZDDP tribofilms.

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