Selman Demirtaş et al., Adv Automob Eng 2016, 5:2(Suppl)
http://dx.doi.org/10.4172/2167-7670.C1.006

Characterization of wear mechanisms occurring on piston ring and cylinder bore of the internal combustion engine

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Wear is the progressive loss of materials from contacting surfaces relative in motion. Different wear mechanisms occur during engine operation. According to the literature survey; especially, wear in the cylinder bore and on the piston ring is caused by abrasion, scuffing (adhesion), corrosion, bore polishing and delamination. One of the most critical tribological areas in an engine is the cylinder-ring interface. Cylinder-ring wear has been known to play a major role in internal combustion engine durability, performance, emissions and fuel economy. Wear in an engine cylinder liner reaches its maximum at the top ring reversal point. Wear at the top dead center (TDC) of the piston ring travel is heavy because of the high contact pressure, the thin lubricant film due to the low sliding velocity and high gas temperature. The aim of this paper is to present wear mechanisms occurred on the surface of diverse piston rings (even coated and uncoated) and cylinder liner sliding pairs which were rubbed under boundary lubricating conditions using reciprocating tribotest machine and single cylinder spark ignition Honda GX 270 test engine for 75 hours using commercial lubricating oil. Accommodating and confirming to literature survey, protective additives layer and different wear mechanisms were identified using micro- and nano-analysis. While additive layers were formed on the rubbed surface of both piston rings and cylinder liner in tribometer tests, they were only detected at the TDC of cylinder liner of engine tests. Any additive protective layers were detected on the piston ring of engine tests.

Biography

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