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## **Interaction of dispersants with anti-wear and friction modifiers in contacts representative of piston-ring liner interface [Abstract]**

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## Interaction of dispersants with anti-wear and friction modifiers in contacts representative of piston-ring liner interface

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The primary function of the piston compression ring of an internal combustion engine is to seal the combustion chamber. This is achieved through the conformity of the piston, ring and liner. The conformity between the liner and ring is improved by the radial force produced by the gas pressure and ring tension. The radial loading however creates parasitic frictional losses, particularly in the vicinity of piston reversal where lubricant entrainment reduces. The frictional losses created in this conjunction account for up to 7-8% of total engine frictional losses. During reversal, the lubrication condition becomes more severe as the entrainment speed decreases the formation of a tribofilm becomes critical for reduction of wear and friction. There are a wide range of lubricant additives, however those of particular interest in the current work are dispersants [4], organic friction modifiers, inorganic friction modifiers [7] and anti-wear additives.

The additives within a lubricant often display a complex synergistic and antagonistic relationship with each other which has been shown to influence system friction and wear [3]. For example, the dispersant concentration has been shown to interfere with surface active additives [6]. This research presents an experimental investigation of the frictional performance of the piston ring cylinder liner contact with a lubricant containing anti-wear, organic and inorganic friction modifiers (or a combination of the two) with varying dispersant concentration.

Eight lubricant samples were investigated, with varying concentrations of dispersant and either inorganic, organic friction modifiers or a combination of both. The performance of the additive pack is measured using a precision slider rig tribometer shown in figure 1. M2 tool steel flat samples are used to be representative of the cylinder liner while nitride hardened steel strips are employed to be representative of the compression ring. The generated friction is measured by load cells which constrain the motion of the plate. The test conditions are chosen to represent the loading and sliding speed of the compression ring near to top dead centre reversal at the beginning of the power stroke. The tribofilm generated from the slider rig tribometer is inspected through X-ray photoelectron spectrometry.

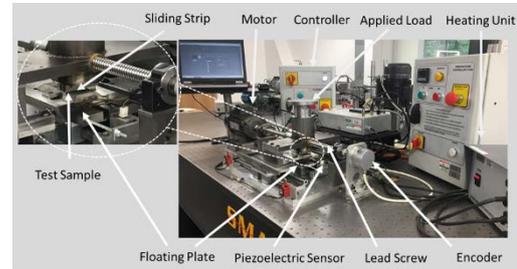


Figure 1 Slider rig tribometer

The experimental results show that the anti-wear tribofilm is strongly influenced by the concentration of dispersants, anti-wear additives films are less able to form in higher concentration of dispersants. While the dispersant shows a more complex interaction with organic friction modifiers.

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