EFFECT OF WAVINESS AND ROUGHNESS ON CYLINDER LINER FRICTION

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ABSTRACT
The study of mixed-lubrication using 3D measured topographies and deterministic computer modeling is becoming widespread in both academia and industry. However, hydrodynamic and asperity pressures depend on all scale components of the surface topography and not only on the filtered roughness commonly provided by many measuring procedures. Characterization of areal surface topographies is still a challenge, since the use of 3D filtering techniques for separating the different surface components (i.e. form, waviness and roughness), as well as the definition of proper measurement parameters, have not been well-established in the literature. Besides, due to the small size of 3D measurement regions, standard procedures designated to 2D profiles are in general not applicable for 3D topographies.

In this work, the tribological performance of piston ring - cylinder bore contacts of internal combustion engines is investigated through deterministic mixed-lubrication modeling. A set of measured bore topographies are considered, from regular honed Grey Cast Iron (GCI) to "Mirror-Like" coated bores, the latter ones currently entering in production for passenger car engines. In contrast with honed GCI bores whose regular "average" topography is composed of relatively well-distributed peaks and valleys, the coated bores are composed of a much smoother plateau and localized deep pores.

The present investigation proposes that instead of using conventional standardized cut-off values to separate the waviness and roughness components of surface topographies, the consideration of the contact width of the counter-body (e.g. piston ring) should be taken into account in the analysis, since wavelengths components that seem "waviness" for a narrow counter-body may be behave as "roughness" for a wider one.

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