Investigation of Different Piston Ring Curvatures on Lubricant Transport along Cylinder Liner in Large Two-Stroke Marine Diesel Engines.

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Abstract

A theoretical investigation of the hydrodynamic lubrication of the top compression piston ring in a large two-stroke marine diesel engine is presented. The groove mounted piston ring is driven by the reciprocal motion of the piston. The ring shape follows a circular geometry and the effect of changes in radii is analysed.

A numerical model based on the finite difference method in 1D has been developed for solving Reynold's equation in combination with the load equilibrium equation together with flow continuity between the piston ring surface and liner for analysis of the lubricant transport.

The cyclic variation throughout one stroke is presented for the minimum film thicknesses at different interesting locations of the piston ring surface together with the friction and the pressure distribution history. The before mentioned parameters have been investigated numerically. The numerical results are presented and discussed.

Keywords: lubricant transport, Reynold's equation, piston ring lubrication, finite difference method, perturbation of Reynold's equation, hydrodynamic lubrication, flow continuity, lubricant starvation.

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