

Modeling Loads Applied to Main and Crank Bearings in the Compression-Ignition Two-Stroke Engine

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Abstract : This paper discusses the AVL EXCITE Designer simulation research into loads applied to main and crank bearings in the compression-ignition two-stroke engine. There was created a model of engine lubrication system which covers the part of this system related to particular nodes of a bearing system, i.e. a connection of main bearings in an engine block with a crankshaft, a connection of crank pins with a connecting rod. The analysis focused on the load given as a distribution of hydrodynamic oil film pressure corresponding different values of radial internal clearance. There was also studied the impact of gas force on minimal oil film thickness in main and crank bearings versus crankshaft rotational speed. Our model calculates oil film parameters, an oil film pressure distribution, an oil temperature change and dimensions of bearings as well as an oil temperature distribution on surfaces of bearing seats. Accordingly, it was possible to select, for example, a correct clearance for each of the node bearings. The research was performed for several values of engine crankshaft speed ranging from 800 RPM to 4000 RPM. Bearing oil pressure was changed according to engine speed ranging between 1 bar and 5 bar and an oil temperature of 90°C. The main bearing clearances made initially for the calculation and research were: 0.015 mm, 0.025 mm, 0.035 mm, 0.05 mm, 0.1 mm. The oil used for the research corresponded the SAE 5W-40 classification. The paper presents the selected research results referring to certain specific operating points and bearing radial internal clearances. Acknowledgement: This work has been realized in the cooperation with The Construction Office of WSK 'PZL-KALISZ' S.A. and is part of Grant Agreement No. POIR.01.02.00-00-0002/15 financed by the Polish National Centre for Research and Development.

Keywords : crank bearings, diesel engine, oil film, two-stroke engine

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