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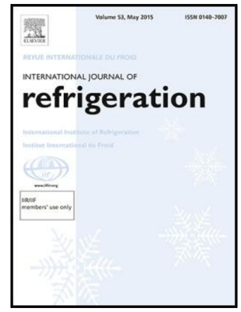

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Analysis of lubricity and cavitation problem of oil and refrigerant mixture for hermetic compressors

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Highlights:

- Oil viscosity has low influence on compressor friction losses;
- Oil holds amount of refrigerant which increases friction losses;
- Cavitation film thickness approximates to a minimum of oil film thickness;
- Cavitation intensiveness depends on value of minimum film thickness.

Abstract

The study is based on the results of experimental ant theoretic research, the aim of which was to reveal the potential for the decrease of friction losses in the refrigerator's compressors. A lower viscosity oils as well as decreasing crankshaft diameters should lower the said losses. However, these measures can cause an adverse effect, if hydrodynamic lubrication regime transforms into boundary one, and the bearing eccentricity ratio reaches unity. The main objective of the study is to explain, why the almost ideal surfaces of shaft and bush do wear when the carrying capacity of lubricating film theoretically exceeds real loads at eccentricity ratio 0.9 or even less. This disagreement, which also is presented in the study, can be explained by cavitation only partially. This study makes an assumption that the boundary value, i.e. oil film height, at which cavitation is starting, depends on a minimum height of the lubricating oil film, i.e. minimum clearance between shaft and bush.

Keywords: hermetic compressor; hydrodynamic lubrication; friction losses; cavitation.

Nomenclature

A	area of the moving surface (m^2)
c	clearance of the bearing (m)
d_1	bush diameter (m)
d_2	shaft diameter (m)
e	eccentricity of the bearing (m)
F_{ps}	force that compresses gas in the piston (N)
F_{sh}	reaction force of the short end of the crankshaft (N)