Heat generation in high speed rolling element bearing : the role of the cage-ring contact

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Abstract

To reduce energy consumption in mechanical systems such as flying machines (helicopters, planes), friction and heat dissipation between the rotating parts should be controlled.
In the context of high-speed rolling element bearings, the cage (silver coated steel or carbon reinforced PEEK) is a very important element as a cage failure leads to the ruin of the bearing.
Simulations at the bearing scale show that most of the heat is due to the contact between the cage and the ring (in the case of inner or outer ring guided cage).
This contact (purely sliding contact, with conform surfaces) is yet poorly studied in the literature.
We propose here a numerical model of the cage-ring contact involving mass flow rate as well as thermal equilibrium in order to identifiy the amount of heat generated in this contact.
This analysis allows to understand how heat is evacuated though the solid surfaces or transported by the lubricant to the sides, depending on the operating conditions.

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