Cage dynamics in rolling bearings by test and simulation

Sebastian Schwarz, M.Sc.
Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU) Engineering Design,
Martensstraße 9, 91058 Erlangen, Germany schwarz@mfk.fau.de

Hannes Grillenberger, Dr. rer. nat.
Schaeffler Technologies AG & Co. KG

Stephan Tremmel, Dr.-Ing.
Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU)
Engineering Design, Martensstraße 9, 91058 Erlangen, Germany

Abstract
Rolling bearing cages perform a very high-frequency movement within their cage pocket clearance compared to the rotational speed under certain operating conditions. This is often accompanied by higher elastic deformation and noise. An unstable cage movement causes high contact forces and reduces the performance of the bearing used. The presentation gives an overview of the essential properties of the unstable cage movement derived by multi-body simulations. Based on the simulation results, an index is defined that allows the calculated or measured cage movement to be classified into different types and objectively evaluates the cage dynamics. A comparison of the calculated and experimentally measured cage dynamics for different load cases is presented to validate the simulation results.

Keywords
Rolling Bearing, Cage Instability, Dynamic Simulation

Biography
Sebastian Schwarz has been a researcher and PhD student at Engineering Design (KTmfk, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany) under supervision of Prof. Dr.-Ing. Sandro Wartzack since 2017. He obtained his Master's Degree in Industrial Engineering and Management at the Friedrich-Alexander-Universität Erlangen-Nürnberg in 2017. His research focuses on the dynamic analysis of rolling bearings, particulary of rolling bearing cages, in order to optimize the working performance, e.g. avoiding cage rattling in rolling bearings.