



Exponent[®]
Engineering & Scientific Consulting

Thomas Russell, Ph.D.

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Professional Profile

Dr. Russell's background is in mechanical engineering with a focus on the tribology of industrial machinery. He has experience in the design and operation of custom test fixtures to investigate the fatigue, friction, lubrication, and wear of bearings, gears, and other machine components. He also has expertise in the analysis and simulation of lubricant flow in rolling element bearings. Dr. Russell has applied his expertise in the bearing, lubrication, automotive, aerospace, agriculture, turf care, and nuclear industries.

Test stands constructed by Dr. Russell have ranged from relatively simple fixtures for the evaluation of mechanical properties of materials to fully custom apparatuses for the detailed investigation of in-situ component behavior. Additionally, Dr. Russell has experience in the operation of manufacturing equipment including manual and CNC mills, lathes, waterjet cutters, laser cutters, and 3D printers. He is experienced in the use of LabView, Matlab, Python, and C for data collection, data analysis, custom test operation, and the simulation of tribological phenomena.

Prior to joining Exponent, Dr. Russell was a Research Assistant in the Mechanical Engineering Tribology Laboratory (METL) at Purdue University. His Ph.D. research was focused on experimentally and analytically characterizing the lubrication mechanism of ball bearing cages. He constructed a one-of-a-kind test rig for the study of ball bearing cage friction and developed a series of models of cage performance including cage pocket lubrication, external drag force, and dynamic motion in a full bearing. In addition to his thesis research, Dr. Russell assisted with projects studying lubricant viscosity at high pressure, lubricant behavior in anoxic environments, and the friction and wear behavior of nickel-based superalloys at elevated temperature. Experimental techniques employed by Mr. Russell include single and multi-axis sensing, thin-film pressure sensing, standard and high-speed videography, computer vision, optical profilometry, viscometry, and the operation of various commercial tribological test stands.

Dr. Russell also served as a Journal Assistant to the Editor in Chief of the ASME Journal of Tribology from 2022-2023, where he provided production support to the journal and aided in the distribution of articles to a worldwide network of technical experts across the field of tribology.

Dr. Russell's publication on the Bearing Cage Friction Test Rig received the Captain Alfred E. Hunt Best Paper award from the Society of Tribologists and Lubrication Engineers (STLE) in 2023. He was awarded the Young Presenter Award in the Rolling Element Bearing Section at the STLE annual meeting in 2023 and received the STLE Chicago Section Student Scholarship in 2021 and 2022.

Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, Purdue University, 2023

MSME, Mechanical Engineering, Purdue University, 2021

B.S., Mechanical Engineering, Purdue University, 2018

STLE Captain Alfred E. Hunt Best Paper Award, 2023

Young Presenter Award, Rolling Element Bearing Section, STLE Annual Meeting 2023

Society of Tribologists and Lubrication Engineers Chicago Section Scholarship, 2022

Society of Tribologists and Lubrication Engineers Chicago Section Scholarship, 2021

Prior Experience

Research Assistant, Mechanical Engineering Tribology Laboratory, Purdue University, 2018 – 2023

Journal Assistant to the Editor in Chief, ASME Journal of Tribology, 2022 – 2023

Analysis Intern, John Deere, 2018

Product Design Intern, John Deere, 2017

Professional Affiliations

American Society of Mechanical Engineers (ASME), 2019 - Present

Society of Tribologists and Lubrication Engineers (STLE), 2019 - Present

Publications

Russell, T., Sadeghi, F., Kang, Y.S. and Mazzitelli, I., 2024. The influence of cage pocket lubrication on the simulation of deep groove ball bearing cage motion. *Journal of Tribology*, 146(2).

Shafiee, A., Russell, T., Lorenz, S.J., Sadeghi, F. and Wilmer, M.G., 2023. Optical measurement of roller slip, tilt, and skew in a spherical roller bearing. *Journal of Tribology*, 145(4), p.044302.

Arya, U., Sadeghi, F., Conley, B., Russell, T., Peterson, W. and Meinel, A., 2022. Experimental investigation of cage dynamics and ball-cage contact forces in an angular contact ball bearing. *Proceedings of the Institution of Mechanical Engineers, Part J: Journal of Engineering Tribology*, 236(12), pp.2522-2534.

Aamer, S., Sadeghi, F., Russell, T., Peterson, W., Meinel, A. and Grillenberger, H., 2022. Lubrication, flow visualization, and multiphase CFD modeling of ball bearing cage. *Tribology Transactions*, 65(6), pp.1088-1098.

Russell, T. and Sadeghi, F., 2022. The effects of lubricant starvation on ball bearing cage pocket friction. *Tribology International*, 173, p.107630.

Shafiee, A., Russell, T., Sadeghi, F. and Wilmer, M.G., 2022. Analytical investigation of roller skew and tilt in a spherical roller bearing. *Journal of Tribology*, 144(7), p.071201.

Russell, T., Shafiee, A., Conley, B. and Sadeghi, F., 2022. Evaluating load distribution at the bearing-housing interface using thin film pressure sensors. *Tribology International*, 165, p.107293.

Russell, T., Sadeghi, F., Peterson, W., Aamer, S. and Arya, U., 2021. A novel test rig for the investigation of ball bearing cage friction. *Tribology Transactions*, 64(5), pp.943-955.

Peterson, W., Russell, T., Sadeghi, F. and Berhan, M.T., 2021. Experimental and analytical investigation of fluid drag losses in rolling element bearings. *Tribology International*, 161, p.107106.

Singh, K., Sadeghi, F., Russell, T., Lorenz, S.J., Peterson, W., Villarreal, J. and Jinmon, T., 2021. Fluid-structure interaction modeling of elastohydrodynamically lubricated line contacts. *Journal of Tribology*, 143(9), p.091602.

Peterson, W., Russell, T., Sadeghi, F., Berhan, M.T., Stacke, L.E. and Ståhl, J., 2021. A CFD investigation of lubricant flow in deep groove ball bearings. *Tribology International*, 154, p.106735.

Peterson, W., Russell, T., Sadeghi, F. and Berhan, M.T., 2020. A strongly coupled finite difference method-finite element method model for two-dimensional elastohydrodynamically lubricated contact. *Journal of Tribology*, 142(5), p.051601.

Presentations

Russell, T., Sadeghi, F. An Improved Dynamic Bearing Model Considering Cage Lubrication. Society of Tribology and Lubrication Engineers Annual Meeting, Long Beach, CA, 2023.

Russell, T., Sadeghi, F. An Experimental and Analytical Investigation of Cage Pocket Lubrication. Bearing World Conference by FVA, Würzburg, Germany, 2022

Russell, T., Sadeghi, F. An Experimental and Analytical Investigation of Cage Pocket Lubrication. Society of Tribology and Lubrication Engineers Annual Meeting, Orlando, FL, 2022.

Russell, T., Sadeghi, F. A Novel Test Rig for the Investigation of Ball Bearing Cage Friction. Society of Tribology and Lubrication Engineers Virtual Annual Meeting, 2021.

Russell, T., Sadeghi, F. A Novel Test Rig for Friction and Flow Visualization in Oil Lubricated Ball Bearing Cages, European Lubrication and Grease Institute – Society of Tribology and Lubrication Engineers Virtual Tribology Workshop, 2021

Peer Reviews

ASME Journal of Tribology

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