



**STEVEN J. LORENZ, Ph.D.**  
**SENIOR STAFF CONSULTANT**

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Dr. Steven Lorenz is a Senior Staff Consultant at Engineering Systems Inc. (ESi) with expertise in applied mechanics, fatigue and failure analysis, finite element analysis (FEA), machine design, probability and reliability analysis, and tribology. In addition to his analytical background, Dr. Lorenz has experience in instrumentation and testing, including custom test fixture development and data acquisition.

Dr. Lorenz has extensively investigated fatigue, friction, lubrication, reliability and wear of bearings, gears and other critical machine components in aerospace, automotive and nuclear industries. His investigative background involves research and development of material behavior models to capture the progressive damage and failure of the material, e.g. metal failure. Moreover, Dr. Lorenz has designed, developed and conducted physical testing ranging from simple fixtures to evaluate performance of a component, to bespoke apparatuses to enable detailed investigation of component behavior.

Dr. Lorenz has demonstrated commitment to the broader scientific community throughout his career. His research has been published in peer-reviewed scientific journals and presented at prestigious technical conferences. In addition to his research contributions, Dr. Lorenz actively contributes to the scientific community as a reviewer for journals specializing in general failure and fatigue analysis as well as tribology. Dr. Lorenz has also served as a Journal Assistant to the Editor in Chief of ASME's Journal of Tribology from 2022-2023, where he aided in the distribution of articles to technical experts in the field of tribology and provided production support.

Prior to joining ESi as a mechanical engineering consultant, Dr. Lorenz was a Visiting Assistant Professor of Mechanical Engineering and a part of the Mechanical Engineering Tribology Laboratory (METL) at Purdue University. His responsibilities consisted of teaching Machine Design and conducting tribological research.

## **Areas of Specialization**

Applied Mechanics  
Computational Modeling  
Custom Test Fixture Development  
Design Analysis and Optimization  
Failure Analysis  
Fatigue and Fracture Mechanics  
Finite Element Analysis  
Mechanical Engineering

Mechanical and Machine Design  
Mechanics of Materials  
Mechanical Testing  
Reliability Modeling, Simulation and Testing  
Statistical Analysis and Probability Modeling  
Stress Analysis  
Tribology

## **Education**

Ph.D., Mechanical Engineering, Purdue University

M.S., Mechanical Engineering, Purdue University

B.S., Mechanical Engineering, Purdue University

## **Professional Affiliations/Honors**

### **American Society of Mechanical Engineers (ASME)**

Member

ASME Journal of Tribology – Reviewer

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

### **Society of Tribologists and Lubrication Engineers**

Member

Chicago Section Scholarship, 2021

## **Positions Held**

### **Engineering Systems Inc., Aurora, Illinois**

Senior Staff Consultant, 2024 – Present

### **Purdue University, West Lafayette, Indiana**

Visiting Assistant Professor, 2024

### **Mechanical Engineering Tribology Laboratory, Purdue University, West Lafayette, Indiana**

Graduate Research Assistant, 2017 - 2023

### **MED Institute Inc., West Lafayette, Indiana**

Bench Testing Team Intern, 2015 - 2016

## **Continuing Education**

Society of Tribologists and Lubrication Engineers (STLE) – Advanced Lubrication: Lubrication Regimes, Wear and Failure Analysis

## Publications/Presentations

*"The Influence of Key Microstructural Features on Rolling Contact Fatigue: A Combined Experimental and Analytical Approach to Determine Life,"* presented at the Spring 2024 MAHA Webinar Series, **S.J. Lorenz**, West Lafayette, IN, April 2024.

*"Investigation of Microstructural Modifications on Rolling Contact Fatigue Performance of Aerospace Bearing Contacts,"* **S.J. Lorenz**, Doctoral Dissertation, Purdue University, 2023.

*"RCF Performance of M50 Steel: A Combined Experimental and Analytical Approach to Determine Life,"* **S.J. Lorenz**, F. Sadeghi, *International Journal of Fatigue*, Vol. 176, 2023

*"An Investigation into Various Failure Criteria on RCF Through an Improved Probabilistic Model,"* **S.J. Lorenz**, F. Sadeghi, C. Wang, B. Wang, *Tribology International*, Vol. 188, 2023

*"Investigation into Rolling Contact Fatigue Performance of Aerospace Bearing Steels,"* presented at the Society of Tribologists and Lubrication Engineers Annual Meeting, **S.J. Lorenz**, F. Sadeghi, Long Beach, CA, May 2023.

*"Investigation into Rolling Contact Fatigue Performance of Aerospace Bearing Steels,"* **S.J. Lorenz**, F. Sadeghi, H.K. Trivedi, M.S. Kirsch, *International Journal of Fatigue*, Vol. 172, 2023

*"Optical Measurement of Roller Slip, Tilt, and Skew in a Spherical Roller Bearing,"* A. Shafiee, T. Russell, **S.J. Lorenz**, F. Sadeghi and M.G. Wilmer, *Journal of Tribology*, Vol. 145(4), 2023

*"A CFD-FEM based partitioned FSI model to investigate surface cracks in EHL,"* K. Singh, F. Sadeghi, W. Peterson, **S.J. Lorenz**, J. Villarreal and T. Jinmon, *Tribology International*, Vol. 171, 2022.

*"The Effect of Spatial Microstructure – Property Relations on Rolling Contact Fatigue Life,"* presented at the 4<sup>th</sup> International Bearing World Conference by FVA, **S.J. Lorenz**, F. Sadeghi, Würzburg, Germany, July 2022.

*"Effect of Spatial Hardness Distribution in Rolling Contact Fatigue Performance of Bearing Contacts,"* **S.J. Lorenz**, F. Sadeghi, C. Wang, *Tribology International*, Vol. 171, 2022

*"An Investigation of the Effects of Grain Refinement on Rolling Contact Fatigue,"* presented at the Society of Tribologists and Lubrication Engineers Annual Meeting, **S.J. Lorenz**, F. Sadeghi, Orlando, FL, May 2022.

*"Effects of Grain Refinement on Rolling Contact Fatigue in Bearing Contacts,"* **S.J. Lorenz**, F. Sadeghi, H.K. Trivedi, M.S. Kirsch, C. Wang, *ASME Journal of Tribology*, Vol. 143(12), 2021

*“An Investigation of the Effects of Grain Refinement on Rolling Contact Fatigue,”* presented at the Inaugural Invited Speaker Series for Propulsion and Power Systems Alliance (PPSA) Mechanical Systems Technical Area Team (TAT), **S.J. Lorenz**, F. Sadeghi, (Virtual) February 2021.

*“FSI Modeling of EHL Line Contacts,”* K. Singh, F. Sadeghi, W. Peterson, T. Russell, **S.J. Lorenz**, J. Villarreal and T. Jinmon, *Journal of Tribology*, Vol. 143(9), 2021

*“An Investigation of the Effects of Surface Roughness on Rolling Contact Fatigue,”* presented at the Society of Tribologists and Lubrication Engineers Annual Meeting, **S.J. Lorenz**, F. Sadeghi, (Virtual) May 2021.

*“An approach for predicting failure mechanism in rough surface rolling contact fatigue,”* **S.J. Lorenz**, F. Sadeghi, H.K. Trivedi, L. Rosado, M.S. Kirsch, C. Wang, *Tribology International*, Vol. 158, 2021

*“A CDM-FE model for investigating effects of surface roughness on RCF,”* **S.J. Lorenz**, F. Sadeghi, H.K. Trivedi, L. Rosado, M.S. Kirsch, C. Wang, *International Journal of Fatigue*, Vol. 143, 2021