Thomas A. Hafner

PhD, PE

Senior Staff Consultant

Dr. Hafner is a mechanical engineer focused on the analysis of mechanical systems that were involved in failures or other technical issues. He has experience investigating failures or other technical issues involving plumbing systems; piping systems; heating, ventilation, and air-conditioning (HVAC) systems; fire suppression systems; vehicles; vehicle accidents; and other systems.

He is proficient in a variety of technologies including three-dimensional (3D) scanning (e.g. Laser Scanning (LiDAR)), 3D printing, CAD (Computer-Aided Design) platforms (e.g. SOLIDWORKS), and programming platforms (e.g. MATLAB).

He earned a bachelor's degree in mechanical engineering from the University of Nebraska-Lincoln and conducted research focused on computational fluid dynamics during that time. He earned a doctorate and master's degree in mechanical engineering from Purdue University where he conducted research focused on energetic materials. He has authored or co-authored 10 different journal or conference papers and holds one patent.

Education

PhD, Mechanical Engineering. Purdue University. 2023

MS, Mechanical Engineering. Purdue University. 2022

BS, Mechanical Engineering. University of Nebraska-Lincoln. 2018

Licenses & Certifications

- State of Iowa P.E. License P29594

Positions Held

Engineering Systems Inc., Omaha, Nebraska

- Senior Staff Consultant, 2026 – Present

Rimkus, Omaha, Nebraska and New Orleans, Louisiana

- Consultant, 2024 – 2025

Contact Information

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Areas of Specialization

- Failure Analysis & Root Cause Investigations
- Mechanical Design & Evaluation
- Expert Witness & Litigation Support
- Plumbing Systems
- Piping Systems
- Heating, Ventilation, and Air-Conditioning (HVAC) Systems
- Fire Suppression Systems
- Vehicles
- Vehicle Event Data Recorder (EDR) Imaging and Evaluation
- Three-Dimensional (3D) Scanning
- Three-Dimensional (3D) Printing
- Computer-Aided Design (CAD)
- Programming Platforms

Purdue University, West Lafayette, Indiana

- Senior Staff Consultant, 2019 – 2023

University of Nebraska-Lincoln, Lincoln, Nebraska

- Teaching Assistant, 2019
- Research Assistant, 2017 – 2019

Kawasaki Motors Manufacturing Corporation, Lincoln, Nebraska

- Intern, 2016

Kidwell, Lincoln, Nebraska

- Intern, 2015

Project Experience

Investigations

As a part of investigating issues with plumbing and piping systems, he has inspected copper piping, plastic piping, toilets, faucets, ball valves, gate valves, supply lines, water heaters, drainage piping (clay, plastic, and cast iron), a sewage lift station, and natural gas piping. As a part of analyzing vehicle accidents and other vehicle incidents, he has imaged many EDRs (event data recorders) including ACMs (air bag control modules) and PCMs (power control modules). Lastly, he has inspected other systems as well such as vehicle engines, garage doors, vehicle tires, sprinkler heads, sprinkler piping, hydronic HVAC systems, and industrial compressors.

Continuing Education

- **Bosch© CDR Tool Technician Training by IPTM** – Institute of Police Technology and Management, 2024.
- **Event Data Recorder Use in Traffic Crash Reconstruction - Level I (Online)** – Institute of Police Technology and Management, 2025.

Publications

“Enhanced piezoelectric performance of Al/P(VDF-TrFE) nanocomposite films for energetic sensors and ignitors,” C.T.V. Nunes, M. Örnek, **T.A. Hafner**, and S.F. Son, Journal of Applied Physics, Vol. 138, September 2025.

“The flexoelectric properties of various polymers and energetic composites,” **T.A. Hafner**, M. Örnek, C. Costello, C.T.V. Nunes, and S.F. Son, Applied Physics Letters, Vol. 124, February 2024.

“The effect of porosity on flexoelectricity in 3D printed aluminum/polyvinylidene fluoride composites,” **T.A. Hafner**, M. Örnek, D.N. Collard, M.W. Paral, and S.F. Son, Journal of Applied Physics, Vol. 134, November 2023.

“The Effect of Porosity on Flexoelectricity in Fluoropolymer/Aluminum Films,” **T.A. Hafner**, M. Örnek, D.N. Collard, D.K. Messer, C.T.V. Nunes, M.W. Paral, and S.F. Son, 13th U.S. National Combustion Meeting, March 2023.

“Altering the Effective Burning Rate of a Propellant with Shape Memory Alloy,” D.K. Messer, C.T.V. Nunes, **T.A. Hafner**, and S.F. Son, AIAA SCITECH 2023 Forum, January 2023.

“Theoretical Conditions for Burning in Solid Propellant Slots,” **T.A. Hafner**, M. Örnek, D.K. Messer, and S.F. Son, Propellants, Explosives, Pyrotechnics, Vol. 48, December 2022.

“Effects of flexoelectric and piezoelectric properties on the impact-driven ignition sensitivity of P(VDF-TrFE)/nAl films,” D.K. Messer, J.H. Shin, M. Örnek, **T.A. Hafner**, M. Zhou, and S.F. Son, Combustion and Flame, Vol. 242, August 2022.

“Piezo-Energetic composite film fabrication and poling process for pressure sensor applications,” D.K. Messer, **T.A. Hafner**, M. Örnek, M.W. Paral, and S.F. Son, 45th International Pyrotechnics Society Seminar, July 2022.

“Altering the Impact-Driven Sensitivity and Ignition of PVDF-TrFE/nAl Composite Films with Piezoelectricity,” D.K. Messer, M. Örnek, **T.A. Hafner**, and S.F. Son, 12th U.S. National Combustion Meeting, May 2021.

“THE EFFECT OF A SPANWISE BODY FORCE ON SKIN-FRICTION REDUCTION AND ITS CONNECTIONS TO LOW-DRAG STATES IN TURBULENT FLOW,” **T.A. Hafner** and J.S. Park, Proceedings of the ASME 2018 International Mechanical Engineering Congress and Exposition, November 2018.

Patent

“THROTTLEABLE SOLID PROPELLANT SYSTEM AND METHOD”, S.F. Son, D.K. Messer, C.T.V. Nunes, **T.A. Hafner**, Pub. No. US 2024/0327313 A1, October 2024.