

Exponent®
Engineering & Scientific Consulting

In Young Hur, Ph.D., P.E., CFEI

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Professional Profile

Dr. Hur specializes in failure investigation and design/performance/safety reviews of rotating machinery, and thermal-fluid systems and processes. He applies his expertise in fluid dynamics, thermodynamics and rotor-dynamics in the analysis of rotating turbo machinery such as gas turbine engines, compressors, pumps, steam turbines, and motor vehicle components. Dr. Hur uses both experimentation and analytical/computational modeling approaches to solve engineering problems.

Dr. Hur's expertise is used in a variety of litigation and arbitration matters. Dr. Hur has investigated failures of various turbomachinery for a range of applications from small-scale kitchen blenders, to medium-scale steam turbines in process plants, to large-scale industrial gas turbines for power generation. In addition to rotating machinery, Dr. Hur applies his expertise in fluid dynamics and heat transfer across a wide range of complex engineering problems involving fires, explosions, pipe flow-induced vibrations and off-gassing of air pollutants. His project experience also includes battery systems, wearable electronics and household appliances.

Prior to joining Exponent, Dr. Hur was a PhD candidate in the Gas Turbine Laboratory at the Massachusetts Institute of Technology. At MIT, he developed a novel forced-response system identification methodology for measuring rotordynamic damping in a full gas turbine aero-engine. During this process he developed a reduced-order modeling framework that captures the full engine dynamics to simulate realistic conditions and characterized the approach using statistical analysis. He devised and proposed guidelines for designing and executing forced-response experiments for aero-engine rotors. He also designed and commissioned an experimental facility for testing a commercial turbofan engine. In addition, in the Whittle Lab at the University of Cambridge, he performed compressor stall experiments to characterize the effect of rotor blade mis-staggering on the onset of premature stall. Dr. Hur's experience also includes wind tunnel testing and experimental analysis of heat sinks for turbo-electric aircraft application.

Prior to graduate school, Dr. Hur was a research engineer at STI C&D in South Korea, where he developed optimal flow patterns in molten metal die-casting of various automobile components using computational fluid dynamics (CFD). He also has experience in analyzing and improving molten steel transport and discharge processes.

Academic Credentials & Professional Honors

Ph.D., Aeronautical and Astronautical Engineering, Massachusetts Institute of Technology (MIT), 2022

M.Eng., Aerospace Engineering, University of Cambridge, England, 2013

B.A., Aerospace Engineering, University of Cambridge, England, 2013

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Licenses and Certifications

Professional Engineer Mechanical, California, #41653

Professional Engineer Mechanical, Massachusetts, #60806

40-Hour Hazardous Waste Operation and Emergency Response Certification (HAZWOPER)

Certified Fire and Explosion Investigator (CFEI)

Prior Experience

Research Engineer, STI C&D, 2013-2016

Professional Affiliations

American Society of Mechanical Engineers (ASME)

ASTM International

National Assocation of Fire Investigators (NAFI)

Languages

Korean

Publications

Hur, I., and Spakovszky, Z. S. (September 2, 2022). "Forced Response System Identification of Full Aero-Engine Rotordynamic Systems for Prognostics and Diagnostics." ASME. J. Eng. Gas Turbines Power. October 2022; 144(10): 101008.

Harri Kytömaa, Achim Wechsung, Georgios Dimitrakopoulos, Neil Cook, Daniel Jaimes, In Young Hur, Sahand Faraji, Industry R&D needs in hydrogen safety, Applications in Energy and Combustion Science, Volume 18, 2024.

Presentations

Hur I, Spakovszky ZS. Forced Response System Identification of Full Aero-Engine Rotordynamic Systems for Prognostics and Diagnostics. GT2022-84058. ASME 2022 Turbo Expo, Rotterdam, The Netherlands, 2022.

Project Experience

Gas Turbines

- Investigated failure of an industrial power generating gas turbine engine involving compressor stall/surge.
- Investigated operation of compressors which are not meeting the contractual requirements, in a process plant.
- Investigated an incident involving partial turbine wheel liberation in an industrial gas turbine.

- Reviewed the root cause analysis of seal damage in a steam turbine observed during its commissioning.

Process Piping

- Investigated flow-induced vibrations in large cross-country natural gas pipelines during extreme pressure operations.
- Investigated the potential for flow-induced vibrations in piping for carbon capture and sequestration using the Energy Institute guidelines.
- Investigated failure of an energy-dissipating valve in a water conveyance system due to flow-induced vibrations.

Consumer Products

- Designed and executed tests to analyze potentially hazardous mechanical failures of kitchen blenders.
- Performed computational fluid dynamics (CFD) simulations using STAR-CCM+ involving consumer wearable electronics to evaluate their heat transfer characteristics and thermal management.
- Performed battery failure testing to characterize the thermal runaway profile.

Fires and Explosions

- Investigated fires and explosions due to gas leaks with model-based calculations of airborne fuel concentrations
- Performed flammability testing of various dusts using NFPA standards