

Exponent®
Engineering & Scientific Consulting

Khaled Hashad, Ph.D., P.E., CFEI

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Professional Profile

Dr. Hashad is a licensed mechanical engineer who helps clients understand and solve complex engineering issues across a wide range of applications in both litigation and advisory matters. His technical consulting and engineering analysis experience includes thermal analysis of consumer electronics and medical devices; hazard analysis for liquefied natural gas (LNG) and gas processing facilities; airflow and gas dispersion modeling; indoor air quality; pollutant fate and transport; integrity and reliability assessment of industrial fluid systems; HVAC performance evaluation; battery thermal runaway assessment; risk and resilience assessment for gas and electric utilities; product safety evaluation; failure analysis; and fire and explosion investigations. Dr. Hashad's work involves determining how and why failures occur, assessing safety risks, and providing technical engineering support to help clients make informed decisions. Dr. Hashad has also provided expert testimony in legal proceedings.

Dr. Hashad's project work spans a broad range of fluid dynamics, air quality, hazard and failure analysis matters. His experience includes modeling wind patterns and airflow in complex terrain, urban environments, and around buildings and other structures. He has analyzed the dispersion, transport, and deposition of gases and aerosols, including particles and droplets, in both outdoor and indoor environments.

Dr. Hashad has performed hazard analyses for LNG facilities, including flammable and toxic gas dispersion modeling, vapor cloud explosion and overpressure assessments, and jet fire consequence analysis resulting from potential accidental releases. He has also conducted fire and explosion investigations involving residential and industrial incidents, including assessments of flammable gas concentrations and gas migration both above and underground.

His indoor air quality work includes evaluating indoor concentrations of volatile organic compounds, including formaldehyde, as well as flammable gases associated with explosion events. Dr. Hashad has also addressed HVAC related matters, including analyses of airflow and thermal behavior around outdoor HVAC units, the effect of demand controlled ventilation on indoor air quality, and airflow management in data center applications.

In addition, Dr. Hashad has evaluated leaks in underground gas and liquid pipelines in toxic tort matters. He has worked on projects involving industrial fluid systems, including issues related to cavitation, erosion, water hammer, sedimentation, and fluid transport behavior. Dr. Hashad also conducts risk and resiliency assessments for gas and electric utilities. This work includes evaluating the exposure of utility assets to wildfire risk, performing thermal analyses of utility equipment and powerline feeders, assessing odor fade, and conducting wind-loading assessments. He performs failure analyses and performance and safety assessments for a wide range of equipment and systems, including turbomachinery, pumps, pipelines, consumer products, medical devices, batteries, blenders, air purifiers, solar shingles, generators, electrolyzer systems, telecommunications equipment, and lawn mowers.

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Dr. Hashad's expertise includes computational fluid dynamics (CFD), heat transfer, aerosol science, fluid dynamics, atmospheric science, air quality, fire and explosion science, statistical analysis, and machine learning. Dr. Hashad also leverages tools such as STAR-CCM+, Ansys Fluent, FLACS, AERMOD, and MATLAB among others to conduct numerical and computational analyses across various applications.

Prior to joining Exponent, Dr. Hashad was a PhD Candidate in the Mechanical and Aerospace Department at Cornell University. There he worked on optimizing urban green designs (vegetation) to mitigate traffic-related air pollution. He used computational fluid dynamics (CFD) to assess the pollutant reduction of novel urban green designs by analyzing the physical mechanisms by which the vegetation barriers reduce pollutants and provided guidelines for optimal barrier designs. He created machine learning models trained on CFD data to capture the effects of vegetation on pollutant behavior downwind of the barrier. Dr. Hashad also developed the first dispersion model that parameterizes the Gaussian plume equations to describe the impact of vegetation on near-road pollutant deposition and dispersion. Leveraging his expertise in aerosol science and CFD, Dr. Hashad also studied airborne virus transmission to help understand the spread of SARS-CoV-2 in indoor environments. He helped develop a validated CFD model that captures the intricate behavior of droplets and aerosols in indoor environments such as deposition, evaporation, and interaction with the air flow. Dr. Hashad also has experience evaluating the heat transfer of photovoltaic solar panels and how they affect the local microclimate and utilizing CFD to model the thermal management of batteries for electric vehicles using phase changing material.

Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, Cornell University, 2021

M.S., Mechanical Engineering, Cornell University, 2019

B.S., Mechanical Engineering, University of Connecticut, 2016

The Sibley School Excellence in Graduate Teaching Assistance Award, 2021

NSF Honorable Mention, 2018

Licenses and Certifications

Professional Engineer Mechanical, California, #M 42023

Certified Fire and Explosion Investigator (CFEI)

Professional Affiliations

American Society of Mechanical Engineers (ASME)

National Associations of Fire Investigators — NAFI

Languages

Arabic

French (France)

Publications

Ramasubramanian P, Hashad K, Taparia N, Buehler C, Ramey S, Kytömaa H. What CO2 tells us about crowds: lessons from continuous monitoring in a multiuse arena. Proceedings, ASHRAE Annual Conference 2026.

Ibarreta A, Hashad K, Barry M, Myers TJ. Evaluating battery energy storage system explosion prevention and protection systems. Proceedings, AIChE Spring Meeting and 22nd Global Congress on Process Safety 2026.

Williams HJ, Hashad K, Zhang KM. Agrivoltaics wind shelter benefits with single-axis tracking solar panels. Agricultural and Forest Meteorology 2026; 380:111091.

Hashad K, Reding N, Ibarreta A, Hart R, Morrison D. Vapor cloud explosions in a series of complex geometries – application of the BST method. Proceedings. Mary Kay O'Connor Process Safety Center 2025.

Wechsung A, Dimitrakopoulos G, Hashad K, Myers TJ. Promise and potential limitations of power-to-heat technologies. Proceedings, Technical Association of the Pulp and Paper Industry Conference (TAPPICon) 2025.

Yen M, Ibarreta A, Hashad K, Myers TJ. Methods for the analysis of gas explosions. Proceedings, International Symposium on Fire Investigation Science and Technology (ISFI) 2024.

Jiang Y, Hashad KN, Lee ZE, Zhang KM. A hybrid battery thermal management system for electric vehicle operations in cold climates. ASME Journal of Engineering for Sustainable Buildings and Cities 2024; 5(1).

Hashad K, Steffens JT, Baldauf RW, Heist DK, Deshmukh P, Zhang KM. Resolving the effect of roadside vegetation barriers as a near-road air pollution mitigation strategy. Environmental Science: Advances 2024; 3(3):411–421.

Williams HJ, Weed E, Hashad K, Zhang KM. CFD-based machine learning model for agrivoltaic system design. In 2023 IEEE 50th Photovoltaic Specialists Conference (PVSC) IEEE 2023; 1–3.

Williams HJ, Hashad K, Wang H, Zhang KM. The potential for agrivoltaics to enhance solar farm cooling. Applied Energy 2023; 332: 120478

Leroy A, Hashad K, Barry M, Ibarreta A. Explosion hazard considerations for HVAC equipment serving lithium-ion battery energy storage systems. ASHRAE Transactions 2023; 129:549–557.

Hashad K, Yang B, Gallagher J, Baldauf R, Deshmukh P, Zhang KM. Impact of roadside conifers vegetation growth on air pollution mitigation. Landscape and Urban Planning 2023; 229: 104594

Hashad K, Yang B, Iskov V, Zhang KM. A Computationally Efficient Approach to Resolving Vehicle-Induced Turbulence for Near-Road Air Quality. J. Eng. Sustain. Bldgs. Cities. 3: 031001

Li AF, Zhang KM, Allen G, Zhang S, Yang B, Gu J, Hashad K, ... Rattigan O. Ambient sampling of real-world residential wood combustion plumes. Journal of the Air & Waste Management Association 2022; 72(7):710–719.

Hashad K, Gu J, Yang B, Rong M, Chen E, Ma X, Zhang KM. Designing roadside green infrastructure to mitigate traffic-related air pollution using machine learning. Science of the Total Environment 2021; 773: 144760.

Hashad K, Yang B, Baldauf RW, Deshmukh P, Isakov V, Zhang KM. Enhancing the local air quality

benefits of roadside green infrastructure using low-cost, impermeable, solid structures (LISS). Science of the Total Environment 2020; 717: 137136.

Presentations

Ramasubramanian P, Hashad K, Taparia N, Buehler C, Ramey S, Kytömaa H. What CO2 tells us about crowds: lessons from continuous monitoring in a multiuse arena. ASHRAE Annual Conference, Austin, TX, 2026.

Ibarreta A, Hashad K, Barry M, Myers TJ. Evaluating battery energy storage system explosion prevention and protection systems. AIChE Spring Meeting and 22nd Global Congress on Process Safety, Houston, TX, 2026.

Hashad K, Reding N, Ibarreta A, Hart R, Morrison D. Vapor cloud explosions in a series of complex geometries – application of the BST method. Mary Kay O'Connor Process Safety Center, Houston, TX, 2025.

Owens Z, Hashad K. Do you smell gas? Use of modeling to assess legal questions surrounding leaks, spills, and air quality. MassDLA Meeting, Boston, MA, 2025.

Hashad K, Wechsung A, Dimitrakopoulos G, Myers TJ. Promise and potential limitations of power-to-heat technologies. Poster presentation, TAPPICon 2025, Minneapolis, MN, 2025.

Hashad K, Yen M, Ibarreta A, Myers TJ. Methods for the analysis of gas explosions. International Symposium on Fire Investigation Science and Technology (ISFI). Orlando, FL, 2024.

Wechsung A, Dimitrakopoulos G, Hashad K, Myers T. Are Power-to-Heat Technologies Ready to Transition Your Facility?, AIChE Spring Meeting, New Orleans, LA, 2024.

Leroy A, Hashad K, Barry M, Ibarreta A. Explosion Hazard Considerations for HVAC Equipment Serving Lithium-Ion Battery Energy Storage Systems. ASHRAE Winter Conference. Orlando, FL, 2023.

Williams H, Zhang K, Sun Y, Hashad K. Analysis of the Potential for Site Ventilation to Improve Overall Efficiency of Utility-Scale Solar Farms. International Conference on Applied Energy. 2021.

Yang B, Hashad K, Rodriguez A, Zhang KM. The Effect of Plexiglass Shields on Droplet/Aerosol Transmission of Virus in Indoor Environments. American Association for Aerosol Research 39th Annual Conference. Virtual meeting. 2021.

Zhang KM, Yang B, Hashad K, Rodriguez A. On the Intricate Relationship between Ventilation, Deposition and Airborne Virus Transmission in Indoor Environments. American Association for Aerosol Research 39th Annual Conference. Virtual meeting. 2021.

Yang B, Hashad K, Zhang KM. SARS-CoV-2 aerosol transmission modeling of the in-person lecture in a classroom. American Association for Aerosol Research 38th Annual Conference. Virtual meeting. 2020.

Hashad K, Yang B, Zhang KM. Parameterizing pollutant dispersion and deposition for roadside vegetation. American Physical Society 73rd Annual Meeting of the Division of Fluid Dynamics. Virtual meeting. 2020.

Yang B, Hashad K, Zhang KM. Mixing process parameterization of a building wake impact on a turbulent jet into a crossflow. American Physical Society 73rd Annual Meeting of the Division of Fluid Dynamics. Virtual meeting. 2020.

Isakov V, Baldauf R, Hashad K, Yang B, Zhang KM. Vehicle-Induced Turbulence Characterization for Air Quality Modeling. 100th American Meteorological Society Annual Meeting. 2020.

Hashad K, Liu X, Yang B, Zhang KM. A CFD study of a vegetative barrier as a near-road pollutant mitigation strategy: an evaluation of CFD modeling techniques with field measurement. American Association for Aerosol Research (AAAR) Conference, Portland, OR. 2019.

Hashad K, Yang B, Zhang KM. The Use of Vegetative Roadside Barriers to Mitigate Traffic Related Pollution: Influence of Particle Size and Wind Speed. 41st International Fine Particle Research Institute (IFPRI) Annual General Meeting, Burlington, VT. 2019.

Yang B, Hashad K, Zhang KM. High-fidelity Modeling of NOx Chemistry On and Near a Major Highway. AGU Fall Meeting. 2019.

Hashad K, Zhang KM, Prathiba P, Turner J, Fleischer D. The Effectiveness of Roadside Vegetation Barriers as a Near-Road Air Pollution Mitigation Strategy: A Comprehensive Evaluation of the Sensitivity to Leaf Area Density. International Aerosol Conference. Saint Louis, MO. 2018.

Zhang KM, Li A, Xu W, Zhang S, Yang B, Hashad K, Sward J, Gu J, Allen G, Schwab J, Felton D, Rattigan O. “Linking light absorption properties to combustion efficiency for individual residential wood smoke sources”, American Association for Aerosol Research Conference, Raleigh, NC, October 2017.

Hashad K, Yang B, Zhang KM. Optimizing Urban Green Designs to Mitigate Traffic- Related Air Pollution. American Association for Aerosol Research Annual Conference. Rayleigh, NC. 2017.

Hashad K, Yang B, Iskov V, Zhang KM. Comparing Different Vehicle Induced Turbulence (VIT) Formulations on Near-Road Dispersion of Particulate and Gaseous Pollutants. American Association for Aerosol Research Annual Conference. Rayleigh, NC. 2017.

Project Experience

Wind flow modeling and Outdoor Dispersion Assessment

- Investigated wind flow patterns in complex terrains using computational modeling to assess the potential wind shear (rapid change in wind speed and direction) experienced by small aircrafts
- Simulated wind flow around a construction site to evaluate how a manmade embankment influenced the wind loads on a nearby tree that fell onto a power line.
- Conducted wind flow simulations to analyze airflow patterns and evaluate potential forces acting on building structures
- Performed computational simulations of airflow around a canopy tent exposed to wind gusts to analyze the aerodynamic loading and forces acting on the tent poles
- Simulated exhaust emission dispersion from an electricity generation substation located in an urban area using computational modeling to evaluate thermal plume behavior and its influence on surrounding buildings and the environment
- Reviewed lead dispersion studies in urban environments using Gaussian-based atmospheric modeling tools, including AERMOD, to evaluate pollutant transport

Hazard Assessment for LNG and Gas Processing Facilities

- Vapor dispersion modeling of flammable and toxic gas leaks to assess potential hazards and consequences
- Vapor cloud explosion modeling and analysis to evaluate the overpressure and potential damage

- Assessing the potential heat release from jet fires occurring from a potential leak

Fire and Explosion Investigation

- Origin and cause investigation for residential and industrial fires and explosions
- Analysis of underground gas migration and airborne flammable gaseous concentration related to explosion incidents

Indoor Air Quality: Gas Dispersion, Concentration Analysis, and Aerosol Fate and Transport

- Evaluated airborne volatile organic compounds (ex: formaldehyde) concentrations in residential settings and on aircraft
- Assessed airborne flammable gas concentrations related to explosion incidents
- Modeling the fate and transport of aerosol in indoor environments

Analysis of Industrial Fluid Systems: Flow Dynamics, integrity and Reliability Assessment

- Analyzed cavitation risks in an industrial Francis water turbine using computational analysis
- Conducted flow analysis to evaluate the potential transport and distribution of contaminants within the piping system of a food processing facility
- Conducted flow analysis of an industrial crude oil separator to investigate sand sedimentation behavior within the vessel and its contribution to corrosion related equipment failure
- Assessed the risk of water hammer/ hydraulic shock caused by the sudden change in pump speed in a wastewater facility
- Assessed erosion risk in piping systems used in various industrial applications

Pipeline Leak Assessment

- Developed computational models for gas and liquid leaks in underground pipelines, considering pipe geometry, leak area, and flow through the soil
- Hazard analysis of underground and above ground pipeline leaks by evaluating gas concentration levels around the leak sites

Heating, Ventilation, and Air Conditioning (HVAC) Assessment

- Performed CFD analyses of outdoor variable refrigerant flow (VRF) units to assess airflow patterns and thermal conditions surrounding the units under varying environmental conditions
- Analyzed HVAC performance and occupancy data to assess the impact of on demand ventilation on indoor air quality
- Performed CFD simulations of a restaurant HVAC system to evaluate natural gas dispersion and concentration buildup following a leak, assessing conditions that led to an explosion

Battery Thermal Runaway Assessment

- Analyzed energy release and vent gases from batteries undergoing thermal runaway due to various failure modes such as overheating, nail penetration, and overcharging

- Computational modeling of battery thermal runaway to assess the thermal propagation and the potential failure of neighboring cells in the battery pack

Risk and Resiliency Assessment for Gas and Electricity Utilities

- Modeling the heat release from vegetation during wildfires to evaluate its impact on neighboring utility assets
- Computational thermal modeling of utility assets to evaluate potential internal component failure due to elevated temperature exposure during wildfires
- Assessing the potential for odor fade in gas flowing through newly deployed pipes
- Wind load and safety factor analysis to assess the impact of extreme winds on electricity poles
- Assessed the ventilation of utility cabinets containing gas regulating equipment to evaluate the potential for hazardous gas concentration buildup in the event of a leak
- Conducted thermal and heat transfer analysis of underground powerline feeders cooled by circulating water to determine the cooling performance and inform the sizing of the water chiller system

Product Performance, Safety, and Failure Analysis

- Air purifier testing evaluation and standards review (ANSI/AHAM AC-1)
- Thermal analysis of wearable devices using computational modeling to assess burn injury risk
- Thermal analysis of consumer products/electronics using computational modeling
- Thermal analysis to evaluate the stresses on a failed turbine blade
- Failure analysis of solar shingles involved in fire incidents
- Evaluating the suction effects and pressure losses in medical devices
- Thermal analysis of medical devices used in applications such as cardiac ablation and diagnostic testing
- Conducted transient thermal analysis of an operating generator
- Assessed hydrogen dispersion behavior within an electrolyzer system
- Performed thermal analysis and airflow assessment of outdoor telecom equipment
- Investigation of a lawn mower fire incident
- Study of the electrification of the manufacturing processes in the paper and pulp industry