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Engineering & Scientific Consulting

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Professional Profile

Dr. Reding provides technical support for the investigation and analysis of industrial fires, explosions, and chemical process safety incidents. His investigations have concentrated around origin determination and root cause analysis, primarily within gas flaring operations and dust handling industries.

From a preventative perspective, Dr. Reding has experience reporting on code compliance, performing dust hazard analysis, and executing established process hazard analysis procedures (HAZOP, LOPA, FMEA, SIL). Further, Dr. Reding has experience with consequence and risk assessment using PHAST and FLACS computational modeling for both facility siting analysis and the proposal of performance-based explosion prevention and protection solutions.

Prior to joining Exponent's Thermal Sciences practice, Dr. Reding worked as an Explosion Protection Application Scientist at Fike Corporation where he facilitated research for application extension & new product development, managed guidelines for explosion protection design, and provided internal consultation for nonstandard hazards (dust, gas, hybrid) & unique processing applications. Dr. Reding has served as an active primary member on the NFPA 484 technical committee for Combustible Metals & Metal Dusts and as an alternate member on the NFPA 67/68/69 technical committee for Explosion Protection Systems.

During his industry-sponsored doctoral program, Dr. Reding executed a variety of research pertaining to process safety and combustion science. With interests ranging from development of numerical computation models for the prediction of contained deflagration pressure evolution to lab-scale thermal analytical experiments, Dr. Reding has maintained a principal focus on metal dust combustion dynamics and characterization of inertant powder materials for the mitigation of closed-vessel deflagration events. Results were corroborated on a large scale by applying discrete combustion and flammability testing techniques for the experimental analysis of dust/air mixture MIE, MIT, 20 L sphere explosibility, 1 m³ sphere explosibility, and active deflagration suppression efficacy.

Academic Credentials & Professional Honors

Ph.D., Chemical and Petroleum Engineering, University of Kansas, 2021

M.S., Chemical Engineering, University of Kansas, 2019

B.S., Chemical Engineering, University of Kansas, 2016

Frank Bowdish Ph.D. Research Award, 2022

Koerner Family Foundation Award, 2021

Outstanding Graduate Student Academic Achievement Award, 2019

Honors Program Scholar, 2016

Licenses and Certifications

Professional Engineer Chemical, Texas, #154351

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

Certified Fire and Explosion Investigator (CFEI)

Prior Experience

Explosion Protection Application Scientist, Fike Corporation, 2016–2022

Professional Affiliations

American Institute of Chemical Engineers – AIChE (member)

American Chemical Society – ACS (member)

National Association of Fire Investigators – NAFI (member)

National Fire Protection Association – NFPA (member)

- Technical Committee for NFPA 484 on Combustible Metals and Metal Dusts (Principal Member: 2019-2022)

- Technical Committee for NFPA 67, 68, & 69 on Explosion Protection Systems (Alternate Member: 2019-2022)

Publications

Reding, N. S.; Dufaud, O.; Shiflett, M. B. Development of a Thermodynamic Pressure Rise Model for Combustion of Variable Metal Dust Morphologies. *J. Loss Prev. Process. Ind.* 2022, 75, 104704.

Reding, N. S.; Farrell, T.; Verma, A.; Shiflett, M. B. Effect of Particle Morphology on Metal Dust Deflagration Sensitivity and Severity. *J. Loss Prev. Process. Ind.* 2021, 70, 104396.

Reding, N. S.; Shiflett, M. B. Consequence Prediction for Dust Explosions Involving Interconnected Vessels using Computational Fluid Dynamics Modeling. *J. Loss Prev. Process. Ind.* 2020, 65, 104149.

Reding, N. S.; Shiflett, M. B. Characterization of Thermal Stability and Heat Absorption for Suppressant Agent/Combustible Dust Mixtures via Thermogravimetric Analysis/Differential Scanning Calorimetry. *Ind. Eng. Chem. Res.* 2019, 58 (11), 4674-4687.

Reding, N. S.; Farrell, T.; Jackson, R.; Taveau, J.; Shiflett, M. B. Mitigation of Iron and Aluminum Powder Deflagrations Via Active Explosion Suppression in 1 m³ Sphere Vessel. *Ind. Eng. Chem. Res.* 2019, 58 (38), 18007-18019. [Awarded the journal cover art position]

Reding, N. S.; Shiflett, M. B. Metal Dust Explosion Hazards: A Technical Review. *Ind. Eng. Chem. Res.* 2018, 57 (34), 11473-11482. [Awarded the journal cover art position]

Jin, X.; Bobba, P.; Reding, N. S.; Song, Z.; Thapa, P.; Prasad, G.; Subramaniam, B.; Chaudhari, R. V. Kinetic Modeling of Carboxylation of Propylene Oxide to Propylene Carbonate using Ion-Exchange Resin Catalyst in a Semi-Batch Slurry Reactor. Chem. Eng. Sci. 2017, 168, 189-203.

Presentations

Reding, N. S.; Shiflett, M. B. Development of Pressure Evolution Modeling for the Combustion of Distinct Metal Dust Morphologies, AIChE Annual Meeting, 2021, November 18. Oral Presentation.

Reding, N. S.; Shiflett, M. B. Metal Dust Cloud Combustion & Nonstandard Explosion Protection Applications: A Comprehensive Review, AIChE Annual Meeting, 2021, November 15. Poster.

Reding, N. S.; Shiflett, M. B. Consequence Prediction for Dust Explosions Involving Interconnected Vessels using Computational Fluid Dynamics Modeling, AIChE Annual Meeting, 2020, November 17. Oral Presentation.

Reding, N. S.; Farrell, T.; Shiflett, M. B. Effect of Particle Morphology on Metal Dust Deflagration Sensitivity and Severity, AIChE Annual Meeting, 2020, November 17. Oral Presentation.

Reding, N. S.; Farrell, T.; Jackson, R.; Taveau, J.; Shiflett, M. B. Mitigation of Metal Dust Deflagrations via Active Suppression at Large Scale, Fike Corporation 18th Annual Global Technical Exchange, Blue Springs, Missouri, 2019, November 7. Oral Presentation.

Reding, N. S.; Farrell, T.; Jackson, R.; Taveau, J.; Shiflett, M. B. Mitigation of Iron and Aluminum Dust Deflagrations Via Active Explosion Suppression in 1 m³ Sphere Vessel, AIChE Annual Meeting, Orlando, Florida, 2019, November 11. Oral Presentation.

Reding, N. S.; Shiflett, M. B. Metal Dust Explosion Risks: A Hazard Analysis and Review of Contemporary Industry Protection Objectives, AIChE Annual Meeting, Orlando, Florida, 2019, November 12. Poster.

Reding, N. S.; Shiflett, M. B. Characterization of Heat Absorption and Decomposition Products for Suppressant Agent/Combustible Dust Mixtures via TGA/DSC Analysis, AIChE Annual Meeting, Pittsburgh, Pennsylvania, 2018, October 29. Poster.

Reding, N. S.; Taveau, J. Explosion Suppression of Metal Dust Deflagrations, Fike Corporation 17th Annual Global Technical Exchange, Blue Springs, Missouri, 2018, November 7. Oral Presentation.

Peer Reviews

Journal of Loss Prevention in the Process Industry