



Exponent[®]
Engineering & Scientific Consulting

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Professional Profile

Dr. Stern is a chemical engineer in Exponent's Thermal Sciences Practice working in the areas of industrial and chemical processing, process safety, product safety, failure analysis, and incident investigation. He specializes in the areas of carbon capture and carbon abatement systems, chemical and petroleum separations, combustible dust handling and processing, consumer products with flammable liquids, electrostatic safety, reactive materials, and electrochemical systems including batteries. Specifically, Dr. Stern has investigated chemical separation systems ranging from biomedical devices to full scale industrial facilities producing a range of petroleum and chemical products. He has investigated performance issues and accidents related to carbon dioxide (CO₂), sulfur dioxide (SO₂), and hydrogen sulfide (H₂S) gas treatment systems at power plants, refineries, and chemical plants. Dr. Stern has also investigated accidents at petroleum refineries and natural gas processing facilities, designed oil/water separation equipment for the crude oil, and evaluated infringement and validity of patents for petroleum technologies. He has also performed a number of dust hazard analyses (DHA) for manufacturers handling organic and metal dusts and assisted companies cited by OSHA for combustible dust, Process Safety Management (PSM), or electrical classification violations.

Dr. Stern has performed numerous experiments and analyses to assess the feasibility of a fire or explosion scenario for consumer products, home utilities, industrial processes, power plants, refineries, and chemical plant processes. His ongoing research includes investigating the competency of ignition sources in industrial flash fires, combustible dust hazards, and mechanisms for electrical fires. Dr. Stern serves on several committees responsible for authoring standards related to flammable liquid safety with consumer products chemical hazards and electrical classification in hazardous environments.

Prior to joining Exponent, Dr. Stern was a graduate research assistant in the Department of Chemical Engineering at the Massachusetts Institute of Technology. He developed a new electrochemically-mediated technology for carbon dioxide separations from post-combustion flue gases from sources including coal-fired power plants, cement furnaces, and aluminum processing equipment.

Academic Credentials & Professional Honors

Ph.D., Chemical Engineering, Massachusetts Institute of Technology (MIT), 2014

M.S., Chemical Engineering, Massachusetts Institute of Technology (MIT), 2011

B.S., Chemical Engineering, Lehigh University, 2008

Licenses and Certifications

Licensed Chemical Engineer, California, #6730

Licensed Professional Engineer, Texas, #136150

Certified Fire and Explosion Investigator (CFEI) in accordance with the National Association of Fire Investigators National Certification Board per NFPA 921 Section 13.6.5.2

Blasting Certificate of Competency, Massachusetts, #BL-007223

Professional Affiliations

American Institute of Chemical Engineers — AIChE (Senior Member)

National Association of Fire Investigators — NAFI (Member, CFEI)

American Society for Testing and Materials — ASTM (Member of Committees E27 Hazard Potential of Chemicals and Sub-Committees 15.10 Standards for Flammable Liquid Containers and F15.72 Torch Fuels)

National Fire Protection Association — NFPA

- Alternate Member of the Committee on Electrical Equipment in Chemical Atmospheres responsible for NFPA 496 Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 497 Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, and NFPA 499 Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas

- Alternate Member of the Committee on Fundamentals of Combustible Dusts responsible for NFPA 652 Standard on the Fundamentals of Combustible Dust

Patents

Stern MC, Simeon F, Hatton TA. Methods and systems for carrying out a pH influenced chemical or biological reaction, USA Patent No.: US9302219 B2, Published April 5, 2016.

Publications

Favero, CVB., Parker, S., Stern, MC. and Kytomaa, HK., Impact of Time on Asphaltene Destabilization Detection in Unconventional Fuels. 2019 AIChE Spring Meeting. 2019.

Favero CVB, Vickery J, O'Hern SC, Stern MC, Ibarreta AF, Myers TJ. Exposure of fabrics used in personal protective equipment to combustible dust flash fires. Mary K O'Connor Process Safety Symposium, College Station, TX, 2019.

Stern MC, Bishop J, Ibarreta A, Ogle R, Myers TJ. Electrostatic hazards during pneumatic conveying of combustible dusts in flexible hoses. Proceedings, 14th Global Congress on Process Safety, American Institute of Chemical Engineers Spring Meeting, Orlando, FL, 2018.

Morrison DR, Stern M, Osorio-Amado CH. Waste Solvents to Trash Haulers: Lessons learned from hazardous waste accidents. Process Safety Progress, pre-print publishing online 18 April 2018.

Morrison DR, Stern M, Osorio-Amado CH. Handle hazardous waste safely. Chemical Engineering Progress 2018 Apr; 42-47.

Stern MC, O'Hern SC, Ibarreta AF, Ogle RA, Myers TJ. Ignitability of combustible dust fueled flash fires with industrial ignition sources. Proceedings, 13th Global Congress on Process Safety, American Institute of Chemical Engineers Spring Meeting, San Antonio, TX, 2017.

O'Hern SC, Stern MC, Ibarreta, AF, Myers TJ. Analysis of combustible dust flash fires on personal protective equipment fabrics. Proceedings of the IChemE Hazards27 Conference, Birmingham, UK, 2017. Awarded Frank Lees Medal for the most meritorious publication on the topic of safety and loss prevention in an IChemE publication.

Ibarreta AF, Myers TJ, Stern MC, O'Hern SC. Portable vacuums for AM/PM operations: The good, the bad and the ugly. Proceedings POWDERMET 2017, International Conference on Powder Metallurgy & Particulate Materials, Las Vegas, NV, 2017.

Stern MC, Rosen JS, Ibarreta, AF, Ogle RA, Myers TJ. Quantification of the thermal hazard from metallic and organic dust flash fires. Journal of Loss Prevention in the Process Industries 2016, 44: 528-537.

Stern MC, O'Hern SC, Morse TL, Bishop J, Kytomaa HK. Fire risks due to unintentionally energized metal structures. Proceedings, International Symposium of Fire Investigators, Scottsdale, AZ, 2016.

Myers TJ, Ibarreta AF, Stern MC, O'Hern SC, Page CD. Combustible dust hazards in additive manufacturing operations, Proceedings POWDERMET 2016, International Conference on Powder Metallurgy & Particulate Materials, Boston, MA 2016.

Stern MC, Budiansky N, Somandepalli V, Reza A, Myers TJ. Accidents during turnarounds, cleanings, and other infrequent operations. Proceedings, 12th Global Congress on Process Safety, American Institute of Chemical Engineers Spring Meeting, Houston, TX, 2016.

Ibarreta AF, Stern MC, Myers TJ. Fire and Explosion Hazards in Enclosed Powder Conveyors. Powder & Bulk Solids 2016, 34(6):26-30.

Stern MC, Rosen JS, Ibarreta, AF, Myers TJ, Ogle RA. Quantification of the thermal hazard of metallic and organic dust flash fires. Proceedings Mary K O'Connor Process Safety Symposium, College Station, TX, 2015.

Stern MC, Rosen JS, Ibarreta, AF, Myers TJ, Ogle RA. Unconfined deflagration testing for the assessment of combustible dust flash fire hazards. Proceedings, 11th Global Congress on Process Safety, Austin, TX, 2015.

Stern MC, Ibarreta AF, Myers TJ. Assessment and mitigation of combustible dust hazards in the plastics industry. Proceedings, 30th International Conference of the Polymer Processing Society, Cleveland, OH, 2014.

Ponchaut NF, Colella F, Somandepalli V, Stern MC. Thermal management modeling for thermal runaway avoidance in lithium-ion batteries. Proceedings, Battcon Stationary Battery Conference, Boca Raton, FL, 2014.

Stern MC, Braff W, Biteau H, Marr K, Somandepalli V. Fire safety with high energy batteries. Proceedings, 2014 AIChE Annual Meeting, Atlanta, GA, 2014.

Stern MC, Hatton TA. Bench-scale demonstration of CO₂ capture with electrochemically-mediated amine regeneration. RSC Advances 2014; 4:5906-5914.

Eltayeb AO, Stern MC, Herzog HJ, Hatton TA, Energetics of electrochemically-mediated amine regeneration. Energy Procedia 2014; 63:595-604

Stern MC, Simeon F, Herzog HJ, Hatton TA. Post-combustion carbon dioxide capture using electrochemically-mediated amine regeneration. Energy and Environmental Science 2013, 6(8):2505-2517.

Stern MC, Simeon F, Herzog H J, Hatton TA. An electrochemically-mediated gas separation process for carbon abatement. Energy Procedia 2013; 37:1172-1179.

Stern MC, Simeon F, Hammer T, Landes H, Herzog HJ, Hatton T A. Electrochemically mediated separation for carbon capture. Energy Procedia 2011; 4:860-867.

Oral Presentations

Stern MC, Bishop J, Ibarreta A, Ogle R, Myers TJ. Electrostatic hazards during pneumatic conveying of combustible dusts in flexible hoses. 14th Global Congress on Process Safety, American Institute of Chemical Engineers Spring Meeting, Orlando, FL, 2018.

Stern MC, O'Hern SC, Ibarreta AF, Ogle RA, Myers TJ. Ignitability of combustible dust fueled flash fires with industrial ignition sources. Proceedings, 13th Global Congress on Process Safety, American Institute of Chemical Engineers Spring Meeting, San Antonio, TX, 2017.

Stern MC, O'Hern SC, Morse TL, Bishop J, Kytomaa HK. Fire risks due to unintentionally energized metal structures, International Symposium of Fire Investigators, Scottsdale, AZ. September 14, 2016.

Myers TJ, Ibarreta AF, Stern MC, O'Hern SC. Mitigating fire and explosion hazards of metal powders: update on changing consensus standards, POWDERMET 2016.

International Conference on Powder Metallurgy & Particulate Materials, Boston, MA. June 8, 2016.

Stern MC, Budiansky N, Somandepalli V, Reza A, Myers TJ. Accidents during turnarounds, cleanings, and other infrequent operations, 12th Global Congress on Process Safety, American Institute of Chemical Engineers Spring Meeting, Houston, TX,. April 6, 2016.

Stern MC, Ibarreta AF, Myers, TM.. Quantification Methods for Dust Fueled Flash Fires, POWDERMET 2016, 4C HSE Conference, Austin, TX. June 8, 2016.

Stern MC, Myers, TJ. Mitigating safety and regulatory risk in a chemical project effort. American Institute of Chemical Engineers, 2015 Annual Meeting, Salt Lake City, UT, November 9, 2015.

Stern MC, Rosen JS, Ibarreta, AF, Myers TJ, Ogle RA. Quantification of the thermal hazard of metallic and organic dust flash fires. Mary K O'Connor Process Safety Symposium, College Station, TX, October 27, 2015.

Stern MC, Rosen JS, Ibarreta, AF, Myers TJ, Ogle RA. Unconfined deflagration testing for the assessment of combustible dust flash fire hazards. 11th Global Congress on Process Safety, Austin, TX, April 28, 2015.

Stern MC, Braff W, Biteau H, Marr K, Somandepalli V. Fire safety with high energy batteries. American Institute of Chemical Engineers, 2014 Annual Meeting, Atlanta, GA, November 20, 2014.

Stern MC. Electrochemically-mediated amine regeneration for carbon dioxide scrubbing. ACS Fall Meeting, Industrial and Engineering Chemistry Division, Graduate Student Award Symposium, Indianapolis, IN, September 2013. Awarded 2nd Place.

Stern MC. Electrochemically-mediated amine regeneration for CO₂ separations. ACS Spring 2013 Meeting, New Orleans, LA, April 7, 2013.

Stern MC. Electrochemically-mediated amine regeneration for CO₂ scrubbing systems. AIChE Fall 2012 Conference, Pittsburgh, PA, October 29, 2012. Was recognized as a 'Best Paper' for session.

Stern MC. CO₂ separation using electrochemical regeneration of amine sorbents. AIChE Fall 2011 Conference, Minneapolis, MN, October 20, 2011.

Stern MC. A graduate student's perspective on carbon mitigation. Separations Technology VIII, Kona, HI, December 10, 2010.