



**Exponent**<sup>®</sup>  
Engineering & Scientific Consulting

## Mark Fecke, P.E., CFEI

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### Professional Profile

Mr. Fecke applies his experience and expertise as a mechanical engineer to solve complex technical problems involving various types of combustion, mechanical, or fluid handling equipment or systems. These engineering evaluations, root cause or failure analyses, origin and cause investigations, or risk assessments have involved the design, commissioning, operations, and/or maintenance of utility, industrial, commercial or residential system including boilers, heat exchangers, pressure vessels, combustion equipment, fluid handling systems and other types of thermal and mechanical systems.

#### Power Generation

Mr. Fecke has expertise in the use and application of current and historical standards, codes, guidelines and regulation that govern the design, commissioning, operation, and maintenance of these engineered systems both in the USA and Internationally. He has been presented as an expert and advised clients in various adjudicatory venues including federal courts, state courts, mediation, and international arbitrations.

Mr. Fecke has extensive experience in the fields of power generation and combustion equipment. He specializes in the design, commissioning, operation, maintenance, repair, and failure analysis of various types of thermal power generation systems including nearly all types of Fossil Fueled Combustion Systems (solid, liquid, and gaseous fuel), Biomass and Biogas Fueled Combustion Systems, Pumped Storage Hydropower and Concentrated Solar Power (CSP) Systems. He has assisted his clients in identifying the appropriate level of safeguards necessary for safe operation and control of their systems. He is well versed in the industry codes, standards, and guidelines and has used those in combination with process hazard analysis techniques to conduct these studies.

#### Combustion Equipment

Mr. Fecke is active in the field of combustion safety and specializes in everything from large scale combustion equipment (Utility Size) to small scale combustion systems (residential) including boilers, burners, kilns, dryers, furnaces, ovens, oxidizers, process heaters, heat exchangers, incinerators, and steam engines. He has consulted on combustion equipment that is fueled by: coal, coke, wood pellets, wood chips, refuse, bagasse, cocoa bean shells, fuel oils, biodiesel, ethanol, propane, natural gas, and biogas, just to name a few.

#### Fluid and Bulk Solid Handling

Mr. Fecke has led complex design and failure analysis investigations on various types of fluid handling equipment and systems, such as pipes, pipe supports, valves, fittings, joints, couplings, pumps, fans, compressors, evaporators, regulators, switches, and sensors. His failure analysis experience of fluid

handling systems includes wastewater, potable water, and process water systems, various types of heat transfer fluids systems, as well as industrial systems that include steam, ammonia, molten salt, and various types of process fluids. He also has experience in evaluating the design and operation of bulk solid conveying systems, such as bucket elevators, screw conveyors, drag conveyors, stoker grates, and various types of pneumatic conveying systems. His experience also includes evaluating bulk solid storage systems such as concrete and metal silos, stockpiles, and dust collection systems.

### **Pressure Vessels and General Mechanical Engineering Failure Analysis**

Mr. Fecke applies his experience and expertise as a mechanical engineer to various types of engineering evaluations involving residential, commercial, and industrial mechanical systems. These investigations include assessments of the design, installation, commissioning, operation, and maintenance of both fired and unfired ASME-listed pressure vessels, piping systems and supports, HVAC systems, other types of heating and cooling systems, marine vessels, chemical process equipment, amusement park equipment, pulverizers, mills, grinders, bearings, gears, seals, springs, packing and industrial Thermal Energy Storage (TES) systems.

### **Utility and Industrial Plant System Commissioning**

Mr. Fecke has extensive experience in the commissioning of various types of utility, industrial, and commercial systems. This experience includes the planning, execution, and closeout of the various phase of commissioning starting prior to Mechanical Completion, through both Cold and Hot Commissioning, and concluding in the Performance Test. His commissioning experience includes numerous activities spanning from the motor bumps and functional tests to signing off on system takeover or handover certificates and evaluation of punch lists. This experience spans various industries including Fossil Fuel, CSP Plants (Tower and Trough), Chemical Plants, Carbon Capture and Carbon Sequestration Facilities, LNG Facilities, Mining and Smelting Plants, Industrial Agriculture and Agrochemical Plants.

### **Fires and Explosion Investigations**

Mr. Fecke has been involved in Fire and Explosion investigations of all magnitudes in numerous industry sectors encompassing spanning from consumer products to industrial and utility size fires and explosions. His investigations have included hazardous releases, fires, combustion explosions, and mechanical overpressures. He has experience evaluating products, appliances, and industrial equipment in laboratory environments as well as performing forced-failure testing. He has performed scientific fire origin and cause investigations of industrial, commercial and residential structures.

### **Academic Credentials & Professional Honors**

M.S., Mechanical and Aerospace Engineering, Illinois Institute of Technology (IIT), 2010

B.S., Mechanical Engineering, University of Cincinnati, 2003

Exclusive Winner of the 2022 & 2024 Client Choice: Construction Expert Witnesses award for USA

### **Licenses and Certifications**

Professional Engineer, Illinois, #62061204

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

Certified Fire and Explosion Investigator (CFEI)

Confined Space Entry (29 CFR 1910.146)

## Prior Experience

Field Service Engineer, Babcock and Wilcox, 2003-2005

Research and Development Co-op, Cintas, 1999-2002

General Laborer, Mulhall Becker Construction, 1997-1998

Research Apprentice, Compressor Aero Research Laboratory WPAFB, 1995-1996

## Professional Affiliations

American Society of Mechanical Engineers — ASME (member)

National Fire Protection Association — NFPA (member)

National Association of Fire Investigators — NAFI (member)

Principal Member: ASME Board on Safety Codes and Standards, effective August 2017

Chair & Principal Member: Technical Committee on Stoker Operations, NFPA 85 *Boiler and Combustion Systems Hazards Code*, National Fire Protection Association International, effective July 2006

Principal Member: Technical Committee on Pulverized Fuel Systems, NFPA 85 *Boiler and Combustion Systems Hazards Code*, National Fire Protection Association International, effective July 2006

Principal Member: Technical Committee on Fundamentals of Combustion, NFPA 85 *Boiler and Combustion Systems Hazards Code*, National Fire Protection Association International, effective March 2014

Alternate Member: Technical Committee on Single Burner Boilers, NFPA 85 *Boiler and Combustion Systems Hazards Code*, National Fire Protection Association International, effective August 2015

Principal Member: ASME CSD-1 Standard, *Controls and Safety Devices for Automatically*

*Fired Boilers*, effective March 2011

Principal Member: ASME TES-1 Standard, *Safety Standard for Thermal Energy Storage Systems: Molten Salt*, effective October 2019

Principal Member: ANSI/HI 14.4 Rotodynamic Pumps Installation, Operation and Maintenance

## Publications

Lardinois TM, Hollenbach RL, Garner S, Fecke MT. Chapter 8 - Concentrating solar power and thermal energy storage system technologies and case studies. *The Sustainable Power Grid: Challenges, Applications, and Case Studies*. November 2024. Pages 165-183.

Brooke, P., Lemberg, J., Guyer, E., Fecke, M. Metallurgical Case Studies of Early-in-Life Failures in Three Watertube Boilers, *International Materials, Applications & Technologies Conference 2022*, New Orleans, LA, 2022.

Garner S, Kennett S, Fecke M. Clear Documentation Helps Avoid Power Project Disputes. *Law360*, August 20, 2021.

Bobbitt B, Garner S, Cox B, Martens J, Fecke M. Manual vs. automatic boiler controls: A historical

perspective from relevant codes and standards. Proceedings of the ASME 2017 Power and Energy Conference 2017.

Garner S, Cox B, Bishop J, Fecke M. Area zoning: Its role in a risk-based process safety programme. Institution of Chemical Engineers, Proceedings of Hazards 27, Birmingham, UK, 10-12 May 2017.

Fecke M, Garner S, Cox B. Review of global regulations for anhydrous ammonia production, use, and storage. Institution of Chemical Engineers, Proceedings of Hazards 26, Edinburgh, UK 24-26 May 2016.

Cox BL, Garner SW, Carpenter AR, Fecke M. Hazards inherent to control systems: case studies and lessons learned. American Institute of Chemical Engineers, 2016 Spring National Meeting, 12th Global Congress on Process Safety, Houston, TX, April 10-14, 2016.

Dee SJ, Fecke M, Morrison DR, Ogle RA. Becoming "wiser" in management of change. American Institute of Chemical Engineers, 2016 Spring National Meeting, 12th Global Congress on Process Safety, Houston, TX, April 10-14, 2016.

Bishop J, Fecke M, Ogle R. Explosion proof may not be the answer. Powder & Bulk Solids 2014. <http://www.powderbulksolids.com/article%5CExplosion-Proof-May-Not-Be-the-Answer-07-22-2014>.

Morrison DR, Smyth S, Ramirez JC, Fecke MT. Understanding and managing the often-ignored fire & explosion hazards of industrial air systems. American Institute of Chemical Engineers, 6th Latin American Conference on Process Safety, Buenos Aires, Argentina, September 15-17, 2014.

Fecke M, Bishop J. Identifying hazards. Presentation at the PFI Annual Conference, Orlando, FL, July 28, 2014.

Fecke M, Ogle RA. Combustible dust risk evaluation made simple. Presentation at the Biomass Conference, Orlando FL, March 26, 2014

Ogle RA, Dillon SE, Fecke M. Explosion from a smoldering silo fire. Process Safety Progress 2014; 33:94-103.

Fecke M, Ogle RA, Carpenter A. Combustible dust risk evaluation made simple. Presentation at the Corn Refiners Association Safety Meeting, Washington DC, November 11, 2013.

Morrison DR, Fecke, M. Evaluating self-heating and ignition hazards in combustible dust handling equipment. 5th CCPS Latin American Process Safety Conference and Expo, Cartagena, Columbia, August 12-14, 2013.

Bishop J, Fecke M. Case study: American Wood Fibers Circleville, OH facility plant safety review—One year later. Presentation at the PFI Annual Conference, Ashville, NC, July 29-30, 2013.

Fecke M, Ogle R, Dillon S. Explosion from a smoldering silo fire. Presentation at the PFI Annual Conference, Ashville, NC, July 29-30, 2013.

Ogle RA, Dillon SE, Fecke M. Explosion from a smoldering silo fire. Presentation at the American Institute of Chemical Engineers, 2013 Spring National Meeting, 9th Global Congress on Process Safety, San Antonio, TX, April 29-May 1, 2013.

Morrison DR, Fecke M, Ramirez JC. Using LOPA to understand necessary safeguards for steam boiler operation. Process Safety Progress 2012; 31(3):248-254.

Fecke M, Bishop J, Dillon S. Case study: American Wood Fibers Circleville, OH facility plant safety review. PFI Annual Conference, Mashantucket, CT, July 30, 2012.

Martens J, Fecke M, Bishop J, Ogle R. Functional testing for industrial control systems. ASME International Engineering Congress & Exposition, Denver, CO, November 15, 2011.

Morrison DR, Fecke M, Martens, JD. Migrating an incident reporting system to a CCPS process safety metrics model. *Journal of Loss Prevention in the Process Industries* 2011; 24:819-826.

Fecke M, Morrison DR, Martens J, Cowells J. A guide to developing and implementing safety checklists: Plant steam utilities. *Process Safety Progress* Aug 2011; 30(3).

Morrison DR, Fecke M, Ramirez JC. Using LOPA to understand necessary safeguards for steam boiler operation. 3rd CCPS Latin American Process Safety Conference and Expo, Buenos Aires, Argentina, August 8-10, 2011.

Ramirez JC, Fecke M, Morrison DR, Martens J. Root cause analysis of an industrial boiler explosion (and how hazard analysis could have prevented it). ASME International Mechanical Engineering Congress & Exposition, Vancouver, B.C., November 17, 2010.

Morrison DR, Fecke M, Martens J. Migrating an organizational incident reporting system to a CCPS process safety metrics model. 2010 Annual Symposium, Mary Kay O'Connor Process Safety Center, Texas A&M University, College Station, TX, October 2010.

Fecke M, Morrison DR, Martens J, Cowells J. A guide to developing and implementing safety checklists: Plant steam utilities. American Institute of Chemical Engineers, 2010 Spring National Meeting, 25th Center for Chemical Process Safety International Conference, San Antonio, TX, March 22-24, 2010.

Morrison DR, Fecke M, Dillon SE. Lessons learned from a thermal runaway incident involving an organic peroxide intermediate during a power outage. American Institute of Chemical Engineers, 2010 Spring National Meeting, Case Histories and Lessons Learned Joint Session, San Antonio, TX, March 22-24, 2010.

Morrison DR, Su YS, Fecke M. Spontaneous combustion tendency of household chemicals and clothes dryers—Part 2. *Appliance Magazine*, July 2006.

Morrison DR, Su YS, Fecke M. Spontaneous combustion tendency of household chemicals and clothes dryers—Part 1. *Appliance Magazine*, June 2006.

Morrison DR, Su YS, Fecke M. Spontaneous combustion tendency of household chemicals and clothes dryers. 2006 International Appliance Technical Conference, March 2006. This paper received the Dana Chase Memorial Award for the Best Paper presented at the conference.

## Peer Reviews

ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference, 2013

20th International Conference on Nuclear Engineering and ASME 2012 Power Conference Process Safety Progress, 2012