Alejandro Jimenez

PhD, PE, CFEI, CCPSC, CFPS

Sr Staff Consultant

Alejandro Jimenez is a Senior Staff Consultant at Engineering Systems Inc. (ESi), specializing in explosions, fire safety, and risk engineering. A licensed Professional Engineer with 15+ years of experience, he provides consulting and investigative services in explosions, fire safety, chemical process safety, and risk management across the U.S. and internationally.

His expertise spans explosion protection and dynamics, fire safety and dynamics, risk assessments, reliability of safety systems, incident investigations, and failure analysis. He has worked extensively across the oil & gas, chemical, LNG, renewable energy (e.g., hydrogen, biofuels, lithium-ion batteries), food processing, and industrial manufacturing sectors, as well as in explosion cases in non-industrial settings. Alejandro holds diverse certifications in fire & explosion, including CCPSC, CFPS, and CFEI, and has assisted clients on projects involving fire and explosion investigations, explosion origin & cause, fire & explosion modeling, reliability and failure analysis of safety systems, and technical risk assessments.

Prior to joining ESi, he worked as a process safety and technical risk engineering consultant, where he supported the design and operation of chemical processes, oil & gas facilities, offshore platforms, pipelines, and manufacturing facilities from the fire, explosion, and acute toxic gas exposure perspective, in the US and internationally.

Education

PhD, Reliability Engineering. University of Maryland. 2025

MS, Safety, Risk, and Reliability Engineering. Heriot-Watt University, UK. 2014

MS, Fire and Explosion Engineering. University of Leeds, UK. 2009

BS, Chemical Engineering. Simon Bolivar University. Venezuela 2007

Contact Information

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ESi Miami

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Areas of Specialization

- Failure Analysis & Root Cause Investigations
- Fire & Explosion Investigation
- Explosion Cause & Origin
- Risk Management
- Risk & Reliability Engineering
- Chemical Process Safety
- Hazardous Materials
- Combustible Dust
- Process Hazard Analysis (PHA)
- Dust Hazard Analysis (DHA)
- Safety Critical Systems
- Fire Safety Engineering
- Fire Science & Fire Dynamics
- Fire, Dispersion, & Blast Modeling
- Escape & Evacuation Analysis
- Emergency Management

Licenses & Certifications

- State of Florida P.E. License 93842
- State of Texas P.E. License 125321
- Certified Fire and Explosion Investigator (CFEI), Certificate No. 25808-15040
- Certified Process Safety Professional (CCPSC), Certificate No. 2019045320629707
- Certified Fire Protection Specialist (CFPS), Certificate No. 4676

Languages

- Spanish, Native.
- English, Fluent

Positions Held

Engineering Systems Inc., Miami, Florida

- Senior Staff Consultant, 2020 – Present

Baker Risk Engineering and Risk Consultants, Houston, Texas

- Senior Process Safety Engineer, 2019 – 2020

Bechtel Oil & Gas, Houston, Texas

- Senior Process Safety Engineer, 2019

Environmental Resource Management, Houston, Texas

- Senior Safety & Risk Consultant, 2016 – 2019
- Technical Safety Engineer, 2014 – 2016
- Technical Risk Consultant, 2013 – 2014

Arcadis, London, UK

- Process Safety Analyst, 2012 – 2013

Wood Group Mustang, Woking, Surrey, UK

- Technical Safety Engineer, 2010 - 2012

Effectis Group, Madrid, Spain

- Fire Safety Consultant, 2010

Continuing Education

- **Global Congress of Process Safety (GCPS) Conference** – American Institute of Chemical Engineers (AIChE), 2018-2025
- **Forensics and Fire Protection Engineering Webinar Training** – Society of Fire Protection Engineers (SFPE), 2021
- **Fire Protection System Reliability Webinar Training** – Society of Fire Protection Engineers (SFPE), 2021
- **Advanced Fire Dynamic Simulator (FDS) with PyroSim and SmokeView Seminar** – Society of Fire Protection Engineers (SFPE), 2021
- **Fire Investigation Training Program** – National Association of Fire Investigators (NAFI), 2021
- **NSC Safety Congress & Expo Conference** – National Safety Council, Orlando, FL, 2021
- **Lithium-Ion Batteries, What Fire Protection Engineers Should Know Webinar Training** – Society of Fire Protection Engineers (SFPE), 2020
- **Using the Quantitative Risk-Based Approach for Fire Safety in Practice Webinar Training** – Society of Fire Protection Engineers (SFPE), 2020
- **75th Annual Instrumentation and Automation Symposium for the Process Industry** – Texas A&M University, College Station, Texas, 2020
- **Technical Safety Fundamentals (TSE-101) Training** – Shell, Houston, TX 2015
- **PHAST Advance Training** – Det Norske Veritas (DNV), DNV Software, Houston, TX, 2013
- **Training Course for PHAST** – Det Norske Veritas (DNV), DNV Software, London, UK, 2012
- **Fire Protection Foam Workshop** – Angus Fire, London, UK, 2011
- **Emergency Response to Hazardous Materials Technician Level Training** – Garner Environmental Services, Houston, TX, 2007

Professional Affiliations/Honors

Society of Fire Protection Engineering (SFPE)

- Professional Member since 2016
- Florida Chapter Vice-President, 2024

National Association of Fire Investigators (NAFI)

- Member since 2021

Project Experience

Investigations and Failure Analysis

Explosion Cause & Origin

- Cause & origin and analysis of diverse delayed ignition events (i.e., explosion, flash fire) of natural gas and LPG systems and appliances (e.g., grills, fryers, dryers). These investigations also included dispersion and blast modeling to understand the concentrations and overpressure generated at the time of the incidents.
- Investigation and analysis of diverse burst explosion events (i.e., internal explosion), which included blast modeling to determine the potential overpressures generated in the event.
- Investigation of an explosion in a food coloring manufacturing facility
- Cause and origin investigation of a dust collector (i.e., baghouse) explosion in a chemical facility.
- Investigation of an explosion due to a failure of a pressure relief valve in the gas dehydration unit on a gas wellhead facility
- Investigation and analysis of an explosion at an oil and gas refinery when mixing hot and cold streams in a tank. This analysis included an evaluation of the process and relief system philosophy
- Investigation of an explosion on a pharmaceutical pilot plant due to an inadequate drainage system

Failure Analysis of Safety Critical Systems

- Investigation and analysis of fire protection systems that failed to activate on demand during a fire, performed inadequately, or experienced an accidental activation leading to water loss and/or environmental impact. For example, a retail company suffered a fire where the sprinkler system did not activate, leading to a higher severity event. An analysis was performed to determine the causes of the system failure, resulting in the identification of inadequate system impairment practices during repair and maintenance.
- Performance analysis of a flame arrestor installed in several pulp & paper mills. This experience included an assessment of the flame arrestor extinguish mechanism, the development and evaluation of performance tests, and inspections at pulp & paper mills
- Investigation and analysis of the failure of the pressure relief system resulting in an explosion in a food manufacturing facility. This assessment included verifying device sizing for the overpressure scenario and coordinating the test to characterize the runaway reaction.
- Investigation and analysis of a failure of a pressure relief valve in a natural gas dehydration unit, resulting in a leak.
- Review the size of the pressure relief valve in a chlorine system to support a root cause analysis.
- Process and flare valve failure analysis of an LNG regasification facility. These valves failed in the final acceptance test after design, construction, and commissioning.

Toxic and Corrosive Chemicals

- Investigation of a release of caustic during an offloading operation in a chemical facility.
- Review the implementation of the emergency response plan during an ammonia release in a food manufacturing facility
- Investigation of Acetic Acid release during a valve repair on a Petrochemical facility.
- Root Cause Analysis of a fatal incident involving the cleaning of a chemical road trailer.
- Investigation and analysis of Carbon Dioxide (CO_2) impact during dry ice manipulation from an individual distributor, who was impaired due to CO_2 accumulation inside his vehicle. The analysis included modeling and a test to determine CO_2 levels.
- Analysis of carbon monoxide (CO) accumulation inside a house due to incorrect installation of a boiler. This analysis included dispersion modeling within the house to estimate concentrations expected at the time of the incident.

Flammable & Combustible Materials

- Investigation and analysis of a vehicle fire due to a gasoline leak in a fueling station. The analysis included fire modeling to determine the behavior of the pool fire formed by the leak.
- Diverse fire cause & origin investigations and analysis related to the use of flammable and combustible materials in non-industrial occupations such as warehouses, auto workshops, and laboratories.
- Investigation of a fire in the cooling system of an ice manufacturing facility.
- Root Cause Analysis of a leak in a natural gas compression terminal.

Fire Science

- Analysis of a residential fire caused by the ignition of plastic dumpsters. This analysis included the calorimetry tests for the characterization of the heat release rate of the garbage dumpster fires, and the fire modeling of these fires to understand the effect of diverse arrangements on the fire behavior.
- Analysis of potential fire spread due to rotten wood and diverse materials. The analysis consisted of coordinating a cone calorimetry test of the materials to characterize the spread potential using the Fire Growth Rate Index (FIGRA).

Risk & Reliability Engineering Experience

Risk Assessment and Analysis

- Quantitative risk analysis (QRA) for fire, explosion, and toxic events of hazardous materials for diverse facilities and operations, including pipelines, loading & offloading operations, oil & gas, offshore platforms & operations, chemical & petrochemical, and food manufacturing. These studies included diverse individual and societal risk metrics, e.g., F-N & exceedance curves, PLL, IRPA, LSIR contours, and building risks.

- Release and toxic dispersion modeling of diverse materials, including sulfur trioxide (SO_3), Ammonia, Hydrogen Sulfide (H_2S), formaldehyde, and arsenic for diverse process facilities and operations, including mining, chemicals, oil & gas, and food manufacturing facilities.
- Modeling combustible and flammable liquid and gas fires and explosion events for diverse process facilities and operations. Including pipelines, offshore platforms, oil & gas production, oil & gas drilling sites, chemical & petrochemical, food manufacturing facilities, and railcar.
- Facility siting studies for fire, explosion, and toxic events for diverse installations and operations, including loading & offloading operations, oil & gas upstream, oil & gas midstream, oil & gas downstream, chemical, petrochemical, and food manufacturing.
- Smoke dispersion analysis from fires, mainly pool fires, analyzing the potential impact on human activities for diverse facilities, including offshore drilling vessels, offshore intervention vessels, offshore production facilities, and food manufacturing facilities.
- Flammable vapor and gas dispersion modeling for diverse materials and operations to determine the potential concentration profile and extension of flammability concentrations. The operations included oil & gas, LNG facilities, LPG operations, chemical & petrochemical, and food manufacturing.
- Lead, participate, and provide technical assurance of diverse bowtie analyses for diverse projects and hazards. The assessed process included oil & gas offshore (drilling and production), oil & gas onshore-offshore loading, transmission pipelines, compression stations, and onshore facilities.
- Lead, plan, and participate in diverse process hazard analysis (PHAs) for diverse processes, including transmission pipelines, compressor stations, offshore platforms, LNG facilities, and manufacturing facilities.

Combustible Dust

- Support a metal-based manufacturing company in evaluating combustible dust hazards in the facility. The evaluation considered the production process, identifying the events that could lead to a combustible dust explosion or dust layer fire
- Grain storage fire & explosion assurance assessment. Participate as the Dust Explosion expert in the assurance activities
- Dust hazard analysis (DHA) to evaluate the dust explosion hazard in a manufacturing facility. Provide expertise in explosion dynamics, protection, and prevention measures. This activity included a facility walkthrough to observe the conditions of the process and dust collectors used in the facility.
- Combustible dust audit for a flour dryer process against the requirements of NFPA 652.

Reliability of Safety Critical Systems

- Review and analysis of relief system design for diverse facilities. These reviews included identifying an adequate relief scenario and performing sizing calculations.

- Identify safety-critical elements (SCE) and develop their performance standards for different offshore facilities. Some projects included drilling rigs and other processing facilities. Various regulations and requirements were considered based on the rig's location; for example, the UK Health and Safety Executive (HSE), the Australian National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), and the International Association of Drilling Contractors (IADC).
- Support the Reliability Engineering Group in the operational implementation of the performance standards defined during the engineering design stage for an offshore platform in the Gulf of Mexico. This support included defining inspection, testing, and maintenance (ITM) activities for the fire safety measures and ensuring their inclusion in the computational maintenance system (e.g., SAP) to ensure that the performance criteria defined in the performance standards are met.
- Deluge system reliability analysis protecting a truck loading rack in a hydrocarbon fuel loading terminal after an accidental activation. A fault tree analysis was used to estimate the probability of failure on demand (PFD) and the frequency of accidental activation.

Hydrogen Specific experience

- Analyzed the hazard and reliability of pressure relief devices (PRD) in hydrogen systems. This analysis included hazard identification and root cause analysis of diverse failures, as well as a statistical analysis to develop a probabilistic model estimating the failure probability of PRDs installed on hydrogen systems.
- Failure analysis of a liquefaction cold box explosion occurred in a liquid hydrogen facility.
- Failure mode and effect analysis (FMEA) of a hydrogen proton exchange membrane (PEM) electrolyzer prototype to identify and assess the fire and explosion hazards of the operation of this particular hydrogen production device.
- Assess the fire hazards of a refinery hydrogen plant. This study analyzed the operations of a steam reformer to produce hydrogen, identified the main fire hazards during operation, and modeled the fire scenarios.
- Failure mode and effect analysis (FMEA) of a gaseous hydrogen fueling station prototype to identify fire and explosion hazards during its operations.
- Perform a quantitative risk analysis (QRA) of a gaseous hydrogen fueling station prototype, assessing the events that contribute more to the fire and explosion risk.
- Evaluate the risk of occupied buildings from fire and explosions in the Hot Briquetted Iron facility. This study analyzed the operations of a direct reduced iron process using hydrogen to assess the fire and explosion risks associated with its operations and their potential impact on occupied buildings. The analysis included modeling the fire and explosion scenarios identified and calculating the risks of the occupied buildings.
- Evaluate the risk of occupied buildings from fire and explosions in the oxygen peroxide facility. This study included the analysis of electrolyzer (hydrogen production) and hydrogen distribution operations to assess the fire and explosion risks associated with these operations and their potential impact on

occupied buildings. The analysis included modeling the fire and explosion scenarios identified and calculating the risks of the occupied buildings.

Risk-Based Decision-Making Process

- Lead and participate in the risk-based decision-making process based on the ALARP principle (As Low As Reasonably Practicable) for diverse oil & gas facilities (offshore and onshore). These activities involved developing an ALARP Demonstration report, which in some cases was part of a Safety Case.
- Performed a risk-based cost-benefit analysis of diverse risk control options, as part of the ALARP Demonstration effort of an offshore facility in Singapore.

Process Safety Management (PSM) & Safety Management Systems (SMS)

- General HSE support for capital projects and manufacturing/industrial operations. The support included OSHA requirements, safety practices, inspections, Hazard Identification (HAZID), and ISO 450001 Audits.
- Review proposed changes through the MOC process on aspects related to process safety, fire, and explosion hazards for diverse projects and operations. Review and update the MOC procedure for diverse operations.
- Evaluate the SMS implemented against the international standard ISO 450001 and propose updates to improve.
- Support an organization in integrating ISO 450001 and OSHA PSM in a single SMS
- Develop the SMS risk management framework and perform a hazard identification study as an initial baseline of the improved SMS for a manufacturing facility.
- Perform diverse PSM audits against 29 CFR 1910.119 (AKA OSHA PSM) and good practices (e.g., CCPS). Some of these audits were conducted as part of the due diligence process during an acquisition.
- Support an Oil & Gas organization in its effort to update its standard operating procedures (SOP) after a major merger.
- Review compliance against Recognized and Generally Accepted Good Engineering Practices (RAGAGEP) and implement a log to document the relevant RAGAGEP used for diverse aspects. These reviews included laboratory against NFPA 30 & NFPA 45, Butane injection process against NFPA 58, LNG operations against NFPA 59A, Sport complex against UK HSE Green Guide, chemical facilities against internal fire safety & explosion standards (FS&E), oil & gas against internal design engineering practices (DEP), and gas processing facilities against API recommended practices.
- Support diverse facilities in the EPA RMP revalidation efforts. This support included general guidance on interpreting the requirements, defining worst-case and alternative cases, and modeling them to illustrate their consequences.

Fire & Explosion Safety Experience

Fire Safety Engineering

- Perform and review escape and evacuation analysis and plans for diverse installations, including oil & gas offshore platforms, compression gas terminals, textile manufacturing facilities, and a sports complex.
- Research project to evaluate the thermal protection system performance installed in the railcar DOT-117 when exposed to ethanol pool fires. This project involved fire modeling and fire testing.
- Performed diverse fire and explosion modeling as part of a performance-based design approach

Fire & Explosion Protection Engineering

- Engineering design of diverse explosion prevention and protection measures, including hazardous area classification, area safety charts, fire & gas systems, and blast walls. These design activities included dispersion and blast modeling to feed the design.
- Engineering design of diverse fire protection systems, including design philosophy, area safety charts, fire & gas systems, firewater, deluge system, foam systems, and passive fire protection (fireproofing).
- Review the fire protection system design philosophy for diverse facilities, including oil & gas terminals, offshore platforms, gas processing facilities, storage tank terminals, LNG liquefaction facilities, and ports.

Emergency Management Experience

- Review and develop diverse emergency response plans for diverse facilities, including Liquified Natural Gas (LNG), Oil & Gas Processing offshore platforms, Oil & Gas Pipelines, ammonia refrigeration systems, terminals, and piers.

Marine Safety Experience

- Review life safety features to ensure compliance with Marine Safety Corporate requirements and IMO SOLAS. These evaluations included a review of life safety plans, engineering diagrams, and/or a survey of the offshore facilities. These reviews encompassed various offshore platform types, including fixed jackets, drilling ships, Tension Leg Platforms (TLPs), and Floating Production Storage and Offloading (FPSOs) vessels.
- Review and perform diverse dropped object analyses for offshore rigs. These studies included the estimation of drop object risk during mechanical handling activities using cranes. These mechanical handling activities encompass operations within the offshore rig itself or between a supply vessel and the rig.
- Lead, review, and participate in diverse hazard identification (HAZID) studies for construction and engineering activities on marine setups. During these evaluations, marine hazards were assessed, and safety measures were identified.

- Oil & gas offshore platforms escape and evacuation analysis. These analyses included review and impairment evaluation (smoke, thermal, & blast) of escape routes, muster stations, and Totally Enclosed Motor Propelled Survival Craft (TEMPSC) embarkation areas. Additionally, the moving time was modeled by different evacuation models.

Publications

"Evaluating the Risk of Pressure Relief Devices in Hydrogen Systems", **A. Jimenez** and K. Groth, International Journal of Hydrogen Energy, 217, 153719, March 2026

"Understanding and Preventing Failures on Pressure Relief Devices in Hydrogen Systems", **A. Jimenez** and K. Groth, 2025 IEEE Symposium on Product Compliance Engineering - (SPCE Portland), Portland, OR, 2025

"The use of risk engineering concepts to gain insight during investigations", **A. Jimenez**, 2025 IEEE Symposium on Product Compliance Engineering - (SPCE Portland), Portland, OR, 2025

"Evaluating the risk trade-offs of pressure relief devices in hydrogen systems", **A. Jimenez**, PhD Dissertation, A. James Clark School of Engineering, University of Maryland, 2025

"Quantitative risk assessment of a lab-scale hydrogen electrolyzer system", S. Wismer, A. Al-Douri, **A. Jimenez**, and K. Groth, Journal of Loss Prevention in the Process Industries, 97, 2025

"PEM electrolizer failure scenarios identified by failure modes and effects analysis (FMEA)", S. Wismer, A. Al-Douri, V. Grabovetska, **A. Jimenez**, and K. Groth, International Journal of Hydrogen Energy, 89,1280-1289, 2024

"Hazards associated with pressure relief devices in hydrogen systems", **A. Jimenez** and K. Groth, Journal of Loss Prevention in the Process Industries, 91, 2024

"Emissions from air Toxic and Particle starved Pool Fires", **A. Jimenez**, Master's Degree Dissertation, School of Process, Environmental & Material Engineering, University of Leeds, 2009

Presentations

"Understanding and Preventing Failures on Pressure Relief Devices in Hydrogen Systems", **A. Jimenez** and K. Groth, Presented at the IEEE Symposium on Product Compliance Engineering (SPCE) 2025, Portland, OR, November 12, 2025

"The use of risk engineering concepts to gain insight during investigations", **A. Jimenez**, Presented at the IEEE Symposium on Product Compliance Engineering (SPCE) 2025, Portland, OR, November 11, 2025

"Critical Systems during the Energy Transition? Reliability Analysis of Pressure Relief Devices in Hydrogen Systems", **A. Jimenez**, K. Groth, presented at 21st Global Congress on Process Safety, American Institute of Chemical Engineers (AIChE), Dallas, TX, April 7, 2025

"Pressure Relief Device Failure Taxonomy for a Proper Data Collection Strategy", **A. Jimenez**, and K. Groth, presented at the 2024 AIChE Center for Hydrogen Safety Conference, American Institute of Chemical Engineers (AIChE), Las Vegas, NV, May 23, 2024

“Hidden Hazards of Pressure Relief Devices in Hydrogen Systems”, **A. Jimenez**, and K. Groth, presented at 20th Global Congress on Process Safety, American Institute of Chemical Engineers (AIChE), New Orleans, LA, March 25, 2024

“Energy Transition? Evaluation and Challenges in Risk Analysis”, **A. Jimenez**, presented at 19th Global Congress on Process Safety, American Institute of Chemical Engineers (AIChE), Houston, TX, March 14, 2023

“Cooling hazardous material tanks. A Practical Case of a fire hazard analysis in hazardous materials rail car”, **A. Jimenez**, presented at 19th Global Congress on Process Safety, American Institute of Chemical Engineers (AIChE), Houston, TX, March 13, 2023

“Protect or not protect. Importance of fire & explosion philosophy”, **A. Jimenez**, presented at 18th Global Congress on Process Safety, American Institute of Chemical Engineers (AIChE), San Antonio, TX, April 11, 2022

“Are we correct? Risk management during incident investigations: hazard and risk understanding”, **A. Jimenez**, presented at 18th Global Congress on Process Safety, American Institute of Chemical Engineers (AIChE), San Antonio, TX, March 11, 2022

“Fire Hazard Analysis (FHA) as a tool for fire protection optimization”, **A. Jimenez**, presented at 17th Global Congress on Process Safety, American Institute of Chemical Engineers (AIChE), Virtual, April 20, 2021

“Emergency Management integration during the design phase”, **A. Jimenez**, presented at 16th Global Congress on Process Safety, American Institute of Chemical Engineers (AIChE), Virtual, August 18, 2020