

ALEJANDRO JIMENEZ, P.E., CFPS, CCPSC, CFEI
SR. STAFF CONSULTANT, FIRES & EXPLOSIONSaljimenez@engsys.com

Alejandro is a Sr. Staff Consultant with Engineering Systems Inc. (ESI) in the fire and explosion practice group. Alejandro supports our clients with their needs in safety, hazards & risks management, and investigations services across the United States and Internationally.

Alejandro is a licensed professional engineer with over 14 years of experience in the areas of process safety, chemical safety, hazardous materials, fire protection engineering, fire dynamics, life safety, incident investigations, HSE, and hazard & risk management. His expertise includes risk management, safety system reliability, health & safety (HSE), fire protection and alarm systems, buildings & marine life safety, fire dynamics, fire & explosion modeling, process hazard analysis, dust hazard analysis, and compliance with industry codes and standards.

He has risk management and technical risk & reliability engineering experience for industrial facilities such as upstream (e.g., production, drilling, offshore, and onshore), midstream (e.g., pipeline, gathering and distribution), and downstream (e.g., refineries) oil & gas installations, chemical and petrochemical facilities, hydrogen facilities, liquified natural gas (LNG) facilities (liquefaction and regasification), food manufacturing, and manufacturing facilities. Additionally, he has experience in supporting diverse non-industrial matters that involve hazardous materials, safety systems failures, fire protection systems failures, risk assessments, and hazard evaluations.

In addition to his professional engineering (PE) license, Alejandro is a Certified Process Safety Professional (CCPSC), a Certified Fire Protection Specialist (CFPS), and a Certified Fire and Explosion Investigator (CFEI).

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.

Areas of Specialization

Risk Management & Risk Assessments
Industrial & Chemical Process Safety
Chemical and Manufacturing Processes
Major Accidents Events (MAE)/Major Hazards Events (MHE)
Safety Critical Elements (SCE) and Performance Standards
Safety Systems Reliability
Fire and Explosion
Fire Dynamics
Computational Fluid Dynamics
Gas Dispersion Analysis

Fire Modeling
Explosion Blast Effects
Fire Protection Systems
Fire & Gas Detection Systems
Combustible Dust Hazards
Process Hazards Analysis (PHA)
Dust Hazard Analysis (DHA)
Flammable and Combustible Liquids
Hazardous Materials (HAZMAT)
Escape and Evacuation Analysis
Marine Life Safety (e.g., SOLAS)
Health and Safety

Education

Ph.D., Reliability Engineering (In Progress – expected 2025), Maryland University
M.S., Safety, Risk & Reliability Engineering. Heriot-Watts University. 2014
M.S., Fire & Explosion Engineering. University of Leeds. 2009
B.S., Chemical Engineering. Simon Bolivar University. 2007

Licensed Professional Engineer (P.E.)

State of Texas License No. 125321
State of Florida License No. 93842

Other Certifications

Certified Process Safety Professional (CCPSC) Certificate No. 2019045320629707
Certified Fire and Explosion Investigator (CFEI) Certificate No. 25808-15040
Certified Fire Protection Specialist (CFPS) Certificate No. 4676

Language

English Fluent
Spanish Fluent (Native)

Professional Affiliations

Society of Fire Protection Engineers (SFPE), Professional Member
National Association of Fire Investigators (NAFI)
American Institute of Chemical Engineers (AIChE)

Positions Held

Engineering Systems Inc., Miami, Florida

Sr Staff Consultant, 2020 – Present

Baker Engineering and Risk Consultants (AKA BakerRisk), Houston, Texas

Senior Process Safety Engineer, 2019 – 2020

Bechtel Oil and Gas, Houston, Texas

Senior Process Safety Engineer, 2019

Environmental Resource Management (ERM), Houston, Texas

Senior Safety & Risk Consultant, 2013 – 2019

Arcadis, London, United Kingdom (UK)

Process Safety Analyst, 2012 – 2013

Wood Group Mustang, Woking, United Kingdom (UK)

Technical Safety Engineer, 2010 – 2012

Project Examples

Incident Investigation

Petrochemical Industry – Chemical Release

Acetic acid release during valve repair injuring three contractors. Supported data recollection after the incident and causal analysis to determine potential causes and safety management system performance.

Food manufacturing – Explosion

Explosion investigation of a food manufacturing processing plant. Activities included data collection, process engineering, process safety, and root cause analysis.

Residential Natural Gas – Explosion

Residential explosion investigation due to a natural gas leak. Activities included a site inspection, data collection, witness interviews, and cause analysis.

Dry Ice Asphyxia Assessment

A Third-party delivery contractor was injured while transporting dry ice pellets in its car. A carbon dioxide emissions and asphyxia analysis were performed.

Root Cause Analysis (RCA)

Participated in root cause analysis as a safety expert. In some cases, supported the clients in choosing the best RCA method and organizing the sessions; in other cases the scope just included the participation as an expert.

Fire & Explosion Investigation

Participate in diverse fire and explosion investigations and root cause analysis (RCA) in diverse industries, including oil & gas upstream well sites, petrochemicals, pharmaceutical pilot plants, pulp & and paper, food manufacturing, and residential gas appliances. These investigations include support due to litigation, and others supported the owner in identifying causal factors and prevention strategies. Some of these investigations involved a dispersion and fire modeling assessment.

Acute Toxic impact

Participate in diverse cases related to toxic impact, including carbon monoxide (CO), corrosive chemicals, and asphyxia for the chemical industry, and residential heating systems.

Experiment and Testing

Testing Design

Diverse fit for purpose testing design to evaluate important performance or behavior considering real exposure.

This experience also includes performing the actual test when needed.

Testing Coordination

Coordinate third party tests, e.g., with laboratory to measure combustion heat release of particular materials. Use the data obtained to model different fires in the facility using the Fire Dynamic Simulator (FDS).

Fire Protection & Life Safety

Fire Hazard Analysis (FHA)

Support major oil refineries and petrochemical facilities during expansion projects on the evaluation and optimization of fire protection systems through a fire hazard analysis (FHA). Some projects involved water-based fire protection systems, and others included fireproofing extensions and requirements in the process units.

Fire & Gas Studies

Performed diverse risk-based Fire & Gas studies according to ISA-TR84.00.07 for diverse chemical and petroleum facilities, including offshore platforms. The objective of these studies was to evaluate the system coverage and look to optimize the system layout to maximize the coverage of fires and flammable gas.

Fire protection engineering design

Engineering design of diverse fire protection systems for diverse projects, including fire & gas detection, firewater systems, deluge systems, foam suppression systems, and hazardous area classification, fire protection system layout drawing updates, define fire protection philosophy.

Implement the performance-based design approach by evaluating fire safety goals using fire and evacuation modeling.

Support the management of change (MOC) processes related to fire protection systems by reviewing changes or design systems needed due to the new risk profile.

Deluge System Operability Assessment

Operability analysis of a deluge system protecting a truck loading rack in a hydrocarbon fuel loading terminal after an accidental activation. The analysis included a hydraulic analysis of the system, a reliability assessment, and a risk assessment to understand the performance of the system as a risk control measurement. Diverse recommendations were identified and assessed through a cost-benefit analysis (CBA) to improve the system's performance and reliability.

Egress Review Evaluation

Review of egress and evacuation routes of diverse occupations, including goods manufacturing facilities, food manufacturing facilities, sports complexes, retail businesses, oil & gas compression stations, and offshore oil & gas facilities (drilling & production). The review included evaluating egress features against the life safety code (e.g., NFPA 101) and best practices.

Safety, Hazard & Risk Assessments

HSE General Support

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.

Facility DHA

Support metal-based manufacturing company in evaluating combustible dust hazards in the facility. The assessment consisted of evaluating the thermite production process to identify the events that could lead to a combustible dust explosion or dust layer fire.

Toxic Materials Consequence Analysis

Release and toxic dispersion modeling of diverse materials, including sulfur trioxide (SO₃), Ammonia, Hydrogen Sulfide (H₂S), formaldehyde, and arsenic, for diverse process facilities and operations; including mining, chemicals, oil & gas, and food manufacturing facilities.

Fire & Explosion Consequence Analysis

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 & petrochemicals, food manufacturing facilities, and railcars.

Facility Siting Studies

Facility siting studies for fire, explosion, and toxic events for diverse installations and operations. These operations included loading & offloading operations, oil & gas upstream, oil & gas midstream, oil & gas downstream, chemical, petrochemical, and food manufacturing.

Smoke Analysis

Smoke dispersion analysis from fires, mainly pool fires, analyzing the potential smoke impact on human activities in diverse facilities, including offshore drilling vessels, offshore intervention vessels, offshore production facilities, and food manufacturing facilities.

Flammable vapor & gas dispersion

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.

Quantitative Risk Analysis (QRA)

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.

Major Accidents Events (MAE) Bowtie Study

Led, participated, and technical assurance of diverse bowties analysis for diverse projects and diverse top events. The assessed process included oil & gas offshore (drilling and production), oil & gas onshore-offshore loading, transmission pipelines, compression stations, and onshore facilities.

Flare Radiation and Dispersion Study

Flare heat radiation and dispersion analysis of a gas Semi-submersible Floating Production System (FPS) to be located in Western Australia. The analysis was intended to optimize the flare design to ensure a specific incident heat level in critical locations.

Standards compliance review

Review fire-related standards and verify compliance with diverse occupations and operations. Including laboratory against NFPA 30 & NFPA 45, Butane injection process against NFPA 58, LNG operations against NFPA 59A, Sports 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.

Flammable liquids control area determination

NFPA 30 control area determination of a quality laboratory facility to comply with Fire Marshal request. The project included a facility walkthrough to verify the usage and location of flammable materials and determine the control areas specified in NFPA 30.

Floating LNG Cryogenic Risk Assessment

Risk assessment of loss of containment of cryogenic fluids on the vessel and sea, Phast was used as the consequence analysis tool.

Process Hazard Analysis (PHA)

Lead, plan, and participate in diverse PHAs for diverse processes, including transmission pipelines, compressor stations, offshore platforms, LNG facilities, and manufacturing facilities.

Reliability Engineering

SCE & Performance Standards

Identify safety critical elements (SCE) and develop their performance standards for different offshore facilities. Some projects included drilling rigs and other processing facilities. Diverse regulations and requirements were considered based on the location of the rig; for example, the UK Health and Safety Executive (HSE), Australia National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), and the International Association of Drilling Contractor (IADC).

Reliability Operational Readiness

Support 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 the definition of inspection, testing, and maintenance (ITM) activities of the fire safety measures and assurance of their inclusion in the computational maintenance system (e.g., SAP) to ensure that the performance criteria defined in the performance standards are met.

Fire Deluge System Reliability Analysis

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.

Flame arrestor performance analysis

Performance analysis of a flame arrestor installed in diverse pulp & paper mills. This

experience included an assessment of the flame arrestor extinguish mechanism, an evaluation and development of performance tests, and inspections of pulp & paper mills.

LNG Valves failure 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.

Thermal Protection System Performance

Research project to evaluate the thermal protection system performance installed in rail car DOT-117 when exposed to ethanol pool fires. This project involved fire modeling and fire testing.

Fire Protection System Failure Analysis

Investigation and analysis of fire protection systems that failed to activate on demand during a fire, performed inadequately, or 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.

Safety & Risk Management

Technical Safety and HSE Advisor

Advisor, lead, and technical assurance for diverse capital projects on process safety, HSE, fire, and explosion aspects. Led the major accident events (MAE) management process and ALARP demonstration for several capital projects in the oil & gas industry.

Management of Change (MOC) reviewer

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.

Review and update Safety Management System (SMS)

Evaluate the SMS implemented against the international standard ISO 45001 and propose updates to improve. Develop the SMS risk management framework and perform a hazard identification study as an initial baseline for the improved SMS.

Process Safety Management (PSM) Audit

Perform diverse PSM audits against 29 CFR 1910.119 (AKA OSHA PSM) and good practices (e.g., CCPS).

Technical Safety Engineering

Engineering design of diverse technical safety aspects, including hazardous area classification, HSE Plan, HSE Premise, safety system design philosophy, area safety charts, fire & gas systems, firewater design, deluge system, passive fire protection, and Safety Action Monitoring System (SAMS).

Emergency Management

Emergency Response Plans (ERP)

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

Marine Safety

Offshore Dropped Object Analysis

Review and perform diverse dropped object analysis for offshore rigs. These studies included the drop object risk estimation during a mechanical handling activity using the rig cranes.

Marine Life Safety Review

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 included different offshore platform types (e.g., fix jacket, drilling ships, Tension Leg Platforms (TLP), and Float Production Storage and Offloading (FPSO) ship).

Hazard Identifications

Led, reviewed, and participated in diverse hazard identification (HAZID) studies for construction and engineering activities on marine setups. During these evaluations, the marine hazards were evaluated, and safety measures were defined.

Escape and Evacuation Analysis

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, moving time was modeled by different evacuation models.

Hydrogen Safety, Risk, & Reliability**Pressure Relief Device Analysis**

Analyzed the hazard and reliability of pressure relief devices in hydrogen systems. This analysis included a hazard identification and root cause analysis of diverse failures and a statistical analysis to determine a probabilistic model that estimates the probability of failure of PRDs installed on hydrogen systems.

Liquefaction – Cold Box Explosion

Failure analysis of a liquefaction cold box explosion occurred in a liquid hydrogen facility.

Electrolyzer Failure mode and effect analysis

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.

Refinery hydrogen plant – Fire hazard analysis (FHA)

Assess the fire hazards of a refinery hydrogen plant. This study included the analysis of the operations of a steam reformer to produce hydrogen to identify the main fire hazards during its operations and the modeling of the fire scenarios identified.

Fueling station – Fire Investigation

Analysis of hydrogen fueling station operations after a fire to determine potential causes.

Fueling station – Failure mode and effect analysis

Failure mode and effect analysis (FMEA) of a gaseous hydrogen fueling station prototype to identify fire and explosion hazards during its operations.

Hot briquetted iron (HBI) facility – Facility Siting analysis

Evaluate the risk of occupied buildings from fire and explosions in the HBI facility. This study included the analysis of the operations of a direct reduced iron process with hydrogen to analyze the fire and explosion risks during its operations and their impact on occupied buildings. The analysis included modeling the fire and explosion scenarios identified and calculating the risks of the occupied buildings.

Hydrogen peroxide facility – Facility Siting analysis

Evaluate the risk of occupied buildings from fire and explosions in the oxygen peroxide facility. This study included the analysis of the electrolyzer (hydrogen production) and hydrogen distribution operations to analyze the fire and explosion risks during its operations and their impact on occupied buildings. The analysis included modeling the fire and explosion scenarios identified and calculating the risks of the occupied buildings.

Continued Education

- Annual Global Congress of Process Safety (GCPS), American Institute of Chemical Engineers (AIChE), 2018-2024
- 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, National Safety Council, 2021
- Forensics and Fire Protection Engineering, Society of Fire Protection Engineers (SFPE), 2021
- Fire Protection System Reliability, Society of Fire Protection Engineers (SFPE), 2021
- Using the Quantitative Risk-Based Approach for Fire Safety in Practice, Society of Fire Protection Engineers (SFPE), 2020
- Lithium-Ion Batteries, What Fire Protection Engineers Should Know, 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), Shell, Houston, TX, 2015
- PHAST Advance, Det Norske Veritas (DNV), DNV Software Houston, 2013
- Training Course for PHAST, Det Norske Veritas (DNV), DNV Software, London, 2012
- Angus Fire, Angus Fire Foam Workshop, London, UK, 2011
- Emergency Response to Hazardous Materials Technician Level, Garner Environmental Services, Houston, Texas, 2007

Publications/Presentations

- Wismer, S., Al-Douri, A., Grabovetska, V, **Jimenez, A.** and Groth, K., “PEM electrolyzer failure scenarios identified by failure modes and effects analysis (FMEA),” International Journal of Hydrogen Energy, 89, 1280-1289, 2024
- **Jimenez, A.** and Groth, K.M., “Hazards associated with pressure relief devices in hydrogen systems,” Journal of Loss Prevention in the Process Industries, 91, 2024
- **Jimenez, A.** and Groth K.M., “Hidden Hazards of Pressure Relief Devices in Hydrogen Systems,” presented at the 19th Global Congress for Process Safety (GCPS), American Institute of Chemical Engineers (AIChE), New Orleans, Louisiana, 2024

- **Jimenez**, A. and Groth K.M., “Relief Devices in Hydrogen Systems, a Hidden Hazard?” presented at the Spanish session of the 19th Global Congress for Process Safety (GCPS), American Institute of Chemical Engineers (AIChE), New Orleans, Louisiana, 2024
- **Jimenez**, A. and Groth K.M., “Pressure Relief Device Failure Taxonomy for a Proper Data Collection Strategy,” Presented at the 2024 AIChE Center for Hydrogen Safety Conference, Las Vegas, Nevada, 2024
- **Jimenez**, “Energy Transition? Evaluation and Challenges in Risk Analysis”, presented at the Spanish presentations of the 19th Global Congress for Process Safety (GCPS), American Institute of Chemical Engineers (AIChE), Houston, 2023
- **Jimenez**, “Cooling hazardous material tanks. A Practical Case of a fire hazard analysis in hazardous materials rail car”, presented at the Spanish presentations of the 19th Global Congress for Process Safety (GCPS), American Institute of Chemical Engineers (AIChE), Houston, 2023
- **Jimenez**, “Protect, or not protect. Importance of fire & explosion philosophy”, presented at the Spanish presentations of the 18th Global Congress for Process Safety (GCPS), American Institute of Chemical Engineers (AIChE), San Antonio, 2022
- **Jimenez**, “Are we correct? Risk management during incident investigations: hazard and risk understanding”, presented at the Spanish presentations of the 18th Global Congress for Process Safety (GCPS), American Institute of Chemical Engineers (AIChE), San Antonio, 2022
- **Jimenez**, “Fire Hazard Analysis (FHA) as a tool for fire protection optimization”, presented at the Spanish presentations of the 17th Global Congress for Process Safety (GCPS), American Institute of Chemical Engineers (AIChE), virtual, 2021.
- **Jimenez**, “Emergency Management integration during the design phase”, presented at the Spanish presentations of the 16th Global Congress for Process Safety (GCPS), American Institute of Chemical Engineers (AIChE), virtual, 2020.
- **Jimenez**, Y. Saud, R. MacNguyen, “Facility Siting, a Practical Approach”, presented at the 15th Global Congress for Process Safety (GCPS), American Institute of Chemical Engineers (AIChE), New Orleans, LA, April 2019
- **Jimenez**, “Operability of Fire Protection Systems”, presented at ExpoFuego 2019, EnginZone, Lima, Peru, 2019.
- **Jimenez**, “Toxic and Particle Emissions from air starved Pool Fires”, Master’s Degree Dissertation, School of Process, Environmental & Material Engineering, University of Leeds, 2009.