

### **Kevin J. Mitchell, PE**

**Vice President, Kenexis Consulting Corporation**

#### **Fields of Competence**

Safety Instrumented Systems (SIS)  
Fire and Gas Systems (F&G)  
High Integrity Pressure Protection Systems (HIPPS)  
Burner Management Systems (BMS)  
Layer of Protection Analysis (LOPA)  
Process Safety Management (PSM)  
Cost Benefit Analysis (CBA)  
Consequence Analysis  
Process Hazards Analysis (PHA)  
Facility Siting Analyses  
Fire and Explosion Analysis  
Quantitative Risk Assessment (QRA)  
Fault Tree Analysis (FTA)  
Reliability Analysis  
Accident Investigation / Litigation Support

#### **Experience Summary**

**Mr. Mitchell** has worked in the risk management and process safety fields for twenty years. Involved in over 500 projects covering such diverse operations as oil & gas production, refining, petrochemical, specialty chemical and general manufacturing. Specializes in assessment of risk for toxic, flammable, and explosive hazards. Uses risk assessment and Cost-Benefit Analysis to assist in making engineering and business decisions. Mr. Mitchell has extensive experience in design of Safety Instrumented Systems (SIS) and Fire & Gas Systems (FGS). He also has extensive experience in accident investigation, root cause analysis, and litigation support.

#### **Credentials**

B.S., Chemical Engineering, University of Minnesota (1991)

Registered Professional Engineer (Chemical Engineering), State of Ohio

Certified Functional Safety Expert (CFSE)

ISA 84 SFS, SVS

DNV Process Hazards Analysis Leadership Training (40 hour)

#### **Professional Affiliations**

American Institute of Chemical Engineers (AIChE)  
The Instrumentation, Systems, and Automation Society (ISA),  
Committees – SP84, Local Section Officer

#### **Key Assignments**

Performed and managed safety instrumented system (SIS) design and verification projects at various customer sites worldwide on various process units. SIS design basis projects include identification and definition of safety instrumented functions, risk analysis to determine safety integrity level requirements using Layer of Protection Analysis (LOPA), conceptual design, quantitative reliability analysis to verify achievement of SIL targets, and Safety Requirements Specifications development.

- Hydrocracking
- Fluidized Catalytic Cracking (FCC)
- Flare System Overloading / Overpressure Protection Systems
- Delayed Coking
- HF Alkylation / Sulfuric Acid Alkylation
- Sulfur Recovery (SRU)
- Gasoline Desulfurization
- Cumene Hydroperoxide / Phenol / Acetone
- Steam-Methane Reforming / Hydrogen
- Diesel Hydrotreating
- Naphtha Reforming
- Utility Boilers
- Onshore/Offshore oil and gas production
- Gas Liquefaction and Gas-to-Liquids
- PTA/PIA Production
- Polyolefins
- Hydrocarbon Oxidation Reactions
- Utility Boilers (Gas, Oil, Pulverized Coal)
- Incinerators
- Nuclear Fuel Production
- Mining / Minerals Calciners
- Compressor Systems

Instructor for training classes.

- Safety Instrumented Systems Engineering
- Fire & Gas System Engineering

Chemical Accident Investigation, including forensic engineering, causal factors determination and root cause analysis:

- Numerous reactive chemical hazard incidents
- Nitration plant explosion
- Refinery alkylation plant fire / explosion
- Fatal incident involving fire / explosion in plastics manufacturing facility
- Boiler uncontrolled combustion / explosion
- Fatal accident involving fired heater explosion
- Injury accident at Phenolic Resins Facility

Managed Fire & Gas System (FGS) design projects for major upstream production and refining facilities. Analysis included recommendation for detector technology, analysis of detector coverage, integrity analysis of fire & gas functions, including:

- More than 50 offshore oil production platforms
- 500,000 bpd crude oil processing facility
- 10 offshore gas production platforms
- Major onshore crude oil and condensate plant
- H<sub>2</sub>S gas detection in hydrotreating units
- 200MMSCFD onshore gas plant

### Key Projects - Continued

Facilitated numerous Process Hazard Analysis (PHA) studies required under OSHA PSM. Techniques included HAZOP and What-If/Checklist. Processes ranged from large refining operations, NGL processing, olefin processing, amine treating, sulfur recovery, and tail gas units to small specialty chemical operations and purification operations

Comprehensive risk assessment studies for several major U.S. refineries, LNG facilities, offshore oil/ gas facilities, polyolefins facilities, and chemical facilities processing numerous hazardous materials such as chlorine and phosgene. Included consequence modeling, fault tree analysis, and production of quantitative risk measures. Recommended improvements in risk-reduction technologies and safety management. Many included evaluation of control room siting to ensure personnel safety and operations integrity.

Risk assessment of sulfide gas venting under upset conditions at a pulp mill, including analysis of employee exposure and mitigation options. Included fault tree analysis to determine event likelihood and recommendations to upgrade safety instrumented systems.

Risk of Upset analysis for a comprehensive Environmental Impact Report (EIR) involving risk assessment of possible toxic and flammable releases from a southern California refinery prior to and following implementation of Clean Fuels Project.

Analysis and design of a High Integrity Pressure Protection Systems (HIPPS) for various clients in various locations. HIPPS project scope includes assessing the appropriateness of a HIPPS system by reviewing the flare loading scenarios that are the design basis of the flare. Subsequently, requirements were placed on the HIPPS by a combination of ISA 84 risk analysis techniques and prescriptive requirements in the ASME Boiler and Pressure Vessel Code. The projects also included a conceptual design evaluation and quantitative SIL verification, ensuring that the design was appropriate for the situation and all requirements were met. In several cases, reports generated for this project were presented to the authority having jurisdiction for approval of this alternative pressure protection scheme.

- Gasoline Desulfurization Units – Canada, Gulf Coast
- Refinery Alkylation Unit – US Gulf Coast
- Acrylonitrile Manufacturing – Midwest US
- FCC Regenerator – Northeast US
- Entire Refinery Flare System – Midwest US

Implemented and audited Process Safety Management (PSM) programs for key clients in chemicals, plastic production, power generation technology, and petroleum fuels.

Coordinated all aspects of implementing the requirements of EPA's Risk Management Program (RMP) Rule for several Fortune 500 company. The project included hazard analysis, prevention programs, and emergency response planning for 15+ sites. Business options were evaluated to minimize the compliance requirements and costs.

Development of a structured, efficient, hybrid PHA technique to be used by a U.S. chemical company to comply with OSHA's PSM standard.

Developed management guidelines for a major U.S. chemical company concerning Process Hazards Analysis and Management of Change elements of OSHA's PSM standard.

### Selected Publications

Mitchell, K.J., et.al., "Safety Instrumented System Design Handbook ", Kenexis, Columbus Ohio, 2010

Mitchell, K.J., Marszal E.M., "Justifying the Use of High Integrity Pressure Protection Systems (HIIPPS)", ASME PVP Division Conference, Long Beach CA, ASME, 2004

Marszal, Edward, et al. "Oxidation Reaction Safeguarding", Loss Prevention Symposium, New Orleans, 2004.

Mitchell, K.J., Marszal E.M., "Defining Safety Instrumented Functions (SIF)", ISA Safety Conference, Houston TX, ISA, 2003.

Mitchell, K.J., Shah, J.N., "Strategy for RMP Hazard Analysis and Communications Techniques", 31st Annual Loss Prevention Symposium, New Orleans, AIChE, 1998.

Mitchell, K.J., "Lessons Learned through Vapor Cloud Explosion Risk Assessments", Proceedings of the 1996 Process Plant Safety Symposium, AIChE, Houston, TX.

Mitchell, K.J., Morgan, R.S., Shah, J.N., "Explosion Overpressure Shielding and Channeling", 1997 International Plant Operations and Design Conference, AIChE, Houston, TX.

Mitchell, K.J., Shah, J.N., "Integrating Quality Management Principles into The Risk Management Process", 1997 International Conference - Workshop on Risk Analysis in Process Safety, Atlanta, GA.

Mitchell, K.J., Murphy, J., Joseph, G., Long, L., "Reactive Chemical Process Safety – What Do Existing Data Tell Us?" Mary Kay O'Connor Process Safety Center, October 30-31, 2001, Annual Process Safety Symposium

Mitchell, K.J., "Combustion Safety – Overview of Boiler Control and Safety Instrumented Systems in a World of Increasing Environmental Performance Requirements", ISA Section Publication, 2005

Mitchell, K.J., Marszal E.M., "Reconsidering The Need For Overpressure Protection Via Instrumentation & Controls In The Petroleum Refining Industry " 2006 Safety Division Symposium, ISA, 2006