

**STEVEN T. MAHER, PE, CSP**  
**Principal Consultant**

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**EXPERIENCE SUMMARY**

Mr. Maher has over 20 years of experience in safety and quantitative risk assessment. For the past 15 years, he has been responsible for the project management and technical performance of a broad spectrum of risk management and loss prevention projects for the following industries:

- petroleum (production, refining, offshore)
- chemical
- power generation
- waste repository/storage/processing
- aerospace

Mr. Maher is the Program Manager and key technical resource for a project that involves a comprehensive evaluation of all safety and environmental activities at a refinery in Los Angeles County, making necessary recommendations, and monitoring implementation. In addition to technical activities, this project also involves a high degree of interface with the court, as well as legal and political representatives. The broad scope of this project encompasses all key safety and environmental elements of plant design and operations including Process Safety Management (PSM), Risk Management and Prevention Programs (RMPP), and Risk Management Programs (RMP).

Mr. Maher has recently played a key role in the definition and implementation of a comprehensive PSM Program for several offshore and onshore exploration and production facilities for a Southern California petroleum company. As part of this project, Mr. Maher also developed comprehensive emergency response plans, supported pre-startup safety reviews, tracked and closed PHA recommendations, performed a PSM audit, and provided training for the majority of PSM elements. Mr. Maher also spearheaded PHA activities associated with the start-up of a gas processing facility.

Mr. Maher has recently performed a comprehensive HAZOP Study and supported the associated RMPP update for an offshore production and onshore processing complex in Santa Barbara County.

Mr. Maher has served as the facilitator for a number of Hazard and Operability (HAZOP) Studies. He has also been an instructor for a number of courses and focused technical seminars on topics associated with HAZOP Studies and quantitative risk assessment.

**EDUCATION**

Carnegie-Mellon University, Pittsburgh, PA: M.S. Mechanical Engineering, 1983  
Duke University, Durham, NC: B.S. Mechanical Engineering, 1979

**REGISTRATIONS**

Professional Engineer - Chemical Engineering - California  
Professional Engineer - Mechanical Engineering - Pennsylvania  
Certified Safety Professional - Systems Safety

## SELECT PROFESSIONAL EXPERIENCE

### *Petroleum, Chemical, and Aerospace*

Qualitative hazards analyses of various petroleum facilities using PHA techniques:

- Solvent Well Injection System
- Oil Field Waterflood Project
- Crude Oil Topping Plant
- Gas Conditioning Facility
- Various Drill Sites

Qualitative hazards analyses using HAZOP techniques. In addition to providing training to the engineering team, served as team leader (HAZOP Facilitator) for the following systems:

- Alkylation Units
- Butamer Unit
- Crude Units
- Sulfur Recovery Units
- Sour Water Stripping Units
- Vacuum Units
- Gas Conditioning/Processing Plants
- Offshore Platforms
- Onshore Crude Sweetening/Sulfur Removal Facility
- Field Production Facilities
- Slop Reprocessing Units
- MEK Dewaxing Unit
- Fluidized Catalytic Cracking Unit
- Hydrotreating Unit
- Platforming Unit
- Transfer and Storage
- Refinery Electric Power Distribution System
- Loading and Unloading Processes
- Chemical Storage and Transfer
- Fuel Oil Distribution System
- UO<sub>3</sub> Processing Plant

Quality Assurance review of many PHA efforts.

Formulation of multiple emergency response plans for onshore and offshore, exploration and production facilities.

PHA Revalidation and Update activities include:

- Alkylation Unit
- Butamer Unit
- Crude Units
- Vacuum Units
- Gas Conditioning/Processing Plants
- Onshore Crude Sweetening/Sulfur Removal Facility
- UO<sub>3</sub> Processing Plant

Formulation of multiple emergency response plans for onshore and offshore, exploration and production facilities:

Risk Management Programs for:

- Several Chlorine Water Treatment Facilities
- Chlorine Production/Storage Facility
- Onshore Crude Sweetening/Sulfur Removal Facility
- Refinery Sulfur Recovery Facility (hazard assessment only)

Mr. Maher was also recently involved in working with a chemical company in the Southwest, which uses “energetic materials” to manufacture consumer products, to assess the Process Safety Management Program to evaluate the validity of key PSM issues raised by an outside party. This was done in the wake of several citations by OSHA. As a result of Mr. Maher’s efforts, both Parties were able to better understand the PSM Program in light of the regulatory requirements and forged an improved relationship for addressing plant safety issues. In addition key citation items were removed or reduced.

Southern California Petroleum Company - As part of its program to address Federal OSHA and Cal-OSHA PSM requirements, as well as its own internal initiatives, *Risk Management Professionals* helped define and implement a comprehensive PSM Program for several offshore and onshore exploration and production facilities. The specific activities involved:

- Definition of Program Plan
- Support of Periodic Business Unit PSM Status Meetings
- Resolution of PSM-related Issues with Contractors
- Facilitation of HAZOP Studies
- Development of Emergency Response Plans and Procedures
- Support of Management of Change Evaluations
- Support of Pre-Startup Safety Reviews
- Tracked and Closed PHA Recommendations
- PSM Audit
- Spearheaded PHA Activities Associated with the Start-up of a Gas Conditioning Facility
- Blanket PSM Training: PSM Overview and Regulatory Requirements, PHA, Management of Change, Management and Organizational Policies, Employee Participation, Process Safety Information, Operating Procedures, Safe Work Practices and Hot Work Permit Systems, PSM Training Requirements, Contractor Safety, Incident Investigation, Emergency Planning and Response, Compliance Auditing, Pre-Startup Safety Review, Mechanical Integrity

Another significant project involved a fault tree analysis optimizing the design of the next generation of offshore oil platform safety shut-down systems. Mr. Maher served as the program manager and technical lead for the project which involved a quantitative hazard evaluation of 3 standardized offshore platform designs. Platform risk was determined through the assignment of specific consequence categories to each hazard type. The study resulted in the determination of the impact on hazard frequency, equipment unavailability, and nuisance shut-down frequency from variances in such items as redundancy, equipment type, and test and inspection frequencies. This resulted in clear specifications to the designer and management for the optimized design and operation of the next generation of offshore platforms.

Petroleum Refinery in Louisiana - Following an accident, Mr. Maher was requested to facilitate the HAZOP Study of the redesign and rebuild of a refinery processing unit. This high profile job was able

to not only identify meaningful and sensible recommendations, but also independently identified the original hazard scenario.

Refinery Cooling Water System - This study was a quantitative availability evaluation of a cooling water system for an oil from oil sand facility using fault tree techniques. The cooling water system consists of a series of fan coolers enclosed within a cooling tower, turbine- and motor-driven pumps, and associated piping.

Risk Assessment of an Industrial Space Facility: Project to provide a quantitative risk assessment for use in design optimization and evaluating cost and weight tradeoffs. The scope of the project included: personnel & vehicle safety, loss of critical mission support capabilities, & equipment damage. The results of this project were used by management to quantitatively balance risk and reliability options. Other activities include: a comprehensive hazards identification, identification of system weaknesses, input to operator training & emergency preplanning, systems integration, and identification of limiting conditions for operation.

Mr. Maher organized a Process Safety Bulletin Board with a Process Safety Help Line.

#### *Commercial Nuclear and DOE Projects*

Individual Plant Evaluations: Quantitative Risk Assessments of two 4-loop commercial nuclear power facilities to calculate the impact (risk) on the public from severe accidents. The methodology employed was consistent with that endorsed by industry experts as the most current and up-to-date recommended for commercial nuclear power facilities for this application. As part of this assignment, a new approach for treating the impact of cooling tower performance on the unavailability of the Cooling Water System was employed.

Level 1 PRA: Quantitative Risk Assessment of a 4 loop European commercial nuclear power facility. The primary approach for this project was based on fault tree linking.

Level 3 PRA: Served as Technical Project Manager and Analyst for a rigorous 2-year, multi-phase project involving the Quantitative Risk Assessment of a 4 loop US commercial nuclear power facility to calculate total risk to the public. Fault tree linking methods were used to calculate the frequency of severe damage to the reactor core and overall plant risk.

DOE Nuclear Waste Isolation Site: Quantitative risk and operability analysis to be used by plant management prior to start-up. The results of this project were used to prioritize design, construction, and operations changes during the startup phase and later to optimize reliability and maintain risk at an acceptable level during operation of the facility.

#### **TRAINING**

Development and implementation of complete courses and focused seminars on the following topics:

- Process Safety Management (PSM)
- Hazard and Operability (HAZOP) Studies
- PHA Facilitation
- Compliance Auditing
- Emergency Response Planning
- Management of Change
- Fault Tree Analysis
- Event Tree Analysis
- Data Base Development (API Workshop)

- Fault Tree and Event Tree Analysis Software
- Quantitative Risk Assessment (QRA)
- Risk-Based Decision-Making for Power and Process Facilities (ASME Short Course)
- Probability and Statistics
- Common Cause Failure Analysis
- Contractor Safety
- Safe Work Practices & Hot Work Permit Systems
- Operating Procedures
- Pre-Startup Safety Review
- PSM Training
- Mechanical Integrity
- Incident Investigation
- Process Safety Information
- QRA Software Training

Mr. Maher was a key Instructor for the “Overview of Process Safety Management” course at the University of Southern California’s Institute of Safety and Systems Management.

### **RELEVANT SKILLS**

- Definition and Implementation of Process Safety Programs (e.g., RMPP, PSM, RMP)
- PSM Auditing
- HAZOP Study Facilitation
- Project Management
- Fault Tree Analysis
- Event Tree Analysis
- Fault Tree Linking
- System Reliability Analysis
- Hazard and Operability (HAZOP) Studies
- Hazards Identification Techniques
- Seismic Hazard Assessment Support
- Probability and Statistics
- Failure Modes, Effects, and Criticality Analysis
- Support State Modeling
- Data Base Development
- PRA Theory & Software Training
- NASA & Military Standards
- Common Cause Failure Analysis
- Software Development
- Human Reliability Analysis
- Implementation of DOE Regulatory Requirements (e.g., 5480.22, 5480.23, 5483.1A, 5480.4, 5480.SAP; DOE Standards 1027, 3009)

### **GUIDEBOOK DEVELOPMENT**

- Evaluation of Plant Buildings for Potential Explosions (participated)
- CCPS Book on Process Building Siting (participated)
- Co-Development of Westinghouse Guidelines for:
  - Common Cause Analysis
  - Failure Modes, Effects, and Criticality Analyses
  - Plant Walkdown Methodologies
  - Risk Assembly
- Internal Fire Walkdowns

- Internal Flooding Walkdowns
- Internal Events Walkdowns
- Other External Events Walkdowns

## SELECTED PUBLICATIONS

"Risk Management of a Fuel Gas Conditioning Facility Using Fault Tree Analysis," presented at the CSChE 35th Canadian Chemical Engineering Conference, Calgary, Alberta, October 1985 also published in the Canadian Journal of Chemical Engineering, volume 64, pgs 848\_853, October 1986.

"Reliability and Hazards Assessment of a Central Cooling Water Supply System," presented at the CSChE 36th Canadian Chemical Engineering Conference, Sarnia, Ontario, October 1986.

"Risk Management of a Petroleum Refining Facility Using Fault Tree Analysis," presented at the 6th International Symposium on Offshore Mechanics and Arctic Engineering (OMAE), Houston, Texas, March 1987.

"The Application of Risk Assessment to a Hoist Handling Radioactive Waste at a National Repository," ANS/ASME Nuclear Power Symposium, Myrtle Beach, South Carolina, April 1988.

"Relief Valve Testing Interval Optimization Program for the Cost-Effective Control of Major Hazards," Second Symposium on Preventing Major Chemical Accidents, Oslo, May 1988.

"On the Use of Training Simulators for Accident Analysis and Training", February 1990.

"Decision Analysis Using Risk Management Techniques," Twenty-First Annual Pittsburgh Conference on Modeling and Simulation, Pittsburgh, Pennsylvania, May 1990.

"Tools to Enhance the Flexibility of Risk Assessment and Hazards Identification," AIChE 1990 Summer National Meeting, San Diego, August 1990.

"Offshore Platform Safety Shutdown System Effectiveness," Safety Developments in the Offshore Oil and Gas Industry, Institution of Mechanical Engineers, Glasgow, Scotland, April 1991.

"Systematic Probabilistic Safety Assessment Overview, Ongoing Activities and Lessons Learned," Jahrestagung Kerntechnik '91, Bonn, May 1991.

"The Integration of Quantitative Risk Assessment and Reliability Centered Maintenance to Optimize Platform Design and Operations", Safety and Reliability Society Symposium 1991, London, England, September 1991.

"Using Fault Tree Analysis to Identify Cost-Effective Design Improvements in Offshore Platform Safety Shutdown Systems," Safety and Reliability Society Symposium 1991, London, England, September 1991.

"Quantitative Risk Assessment of Refinery Alkylation Processes," SCSRA Risk Resources, February 1995.

"LA Basin Geotechnical Update," SCSRA Risk Resources, February 1995.

"Joint Industry Project on Human Factors in Offshore Operations," SCSRA Risk Resources, April 1995.

"API/CMA Recommended Practice 752 - Management of Hazards Associated with Location of Process Plant Buildings," SCSRA Risk Resources, April 1995.

"Regulatory Updates - US EPA - Risk Management Programs," SCSRA Risk Resources, December 1995.

"Challenges in Risk and Safety Communication with the Public," 1996 Process Plant Safety Symposium, Houston, April 1996.

"Alternative Alkylolation Technologies in a Refinery - A Case Study in Risk-Based Decision Making," 1996 Process Plant Safety Symposium, Houston, April 1996.

"Alternative Alkylolation Technologies in a Refinery - A Case Study in Risk-Based Decision Making with an Emphasis on QRA Techniques," Third International Conference on Probabilistic Safety Assessment and Management (PSAM III), Crete, June 1996.

"SB 1889 - Updating the California RMPP," SCSRA Risk Resources, August 1996.

California Risk Management Planning 1996 Workshops, Hazard and Operability (HAZOP) Studies, October 16, 1996.

Southern California Society for Risk Analysis - Specialty Workshop on USEPA's Risk Management Program, "Prevention Program," December 14, 1996.

## **AFFILIATIONS**

Mr. Maher is actively involved in the local chapter of the Society for Risk Analysis, is a member of the American Society of Mechanical Engineers, and was a key participant in groups which have set the pace for the application of process safety and risk management in the United States, including the American Petroleum Institute's Safety and Fire Protection Subcommittee, the ASME Risk Analysis Task Force, and the Center for Chemical Process Safety.