

Gary W. Carrithers

Senior Engineer, Kenexis Consulting Corporation

Fields of Competence

Process Hazards Analysis (PHA)
Layer of Protection Analysis (LOPA)
SIL Selection for SIS
Process Safety Management (PSM/RMP)
Auditing of Process Safety Management Processes
Inherently Safer Process Evaluation
Facility Siting Analyses
Fire and Explosion Consequence Analysis
Security Vulnerability Analysis
Incident Investigation
Acrylic and Methacrylic Monomer Storage and Handling Technology
Acrylic Powder Drying and Handling Technology
Continuous and Batch Acrylic Polymerization Technology

Experience Summary

Mr. Carrithers has worked in the risk management and process safety fields for over twenty years. Involved in over 100 projects covering such diverse operations as continuous and batch monomer reaction trains, distillation, production platforms, drying and separation processes, specialty chemical and general manufacturing. Specializes in state-of-the-art assessment of the risk of toxic, flammable, and explosive materials on people, property, the environment, and, ultimately, the business. Uses risk assessment to assist in making engineering and business decisions.

Credentials

M.S., Chemical Engineering, University of Virginia (1977)

B.S., Chemistry & Biology, Georgetown College (1975)

ISA84 SSS – SIL Selection Specialist, valid thru 7/2012

ISA84 SFS – SIS Fundamentals Specialist, valid thru 7/2012

RRS/Schirmer Engineering PHA and LOPA Training (40 hour), 2008

ABS Consulting Layer of Protection Analysis Training (40 hour), 2005

Apollo Root Cause Analysis Training (40 hour), 2001

DNV / Rohm and Haas Structured Root Cause Investigation (40 hour) 1999

Professional Affiliations

American Institute of Chemical Engineers (AIChE)

The Instrumentation, Systems, and Automation Society (ISA)

Key Assignments

Performed and managed Hazard and Operability Studies (HAZOP) and Layer of Protection Analyses (LOPA), and Safety Integrity Level (SIL) Selection at sites worldwide on various process units. Projects include identification and definition of hazards, consequences of those hazards, and safeguards to prevent, minimize, or mitigate those hazards.

- Continuous Acrylic Monomer Reaction Trains (emulsion and solvent)
- Continuous Distillation Trains
- Continuous Ethylene Monomer Emulsion Reaction Trains
- Continuous Coagulation Trains
- Batch Acrylic Monomer Reaction Trains (emulsion and solvent)
- Butadiene - Styrene Reaction Trains
- Utility Powerhouse
- Polyester Production
- Polyurethane Production
- Incinerators (Regenerative Thermal Oxidizer and Flares)
- Fire water protection systems
- Polymers wastewater treatment systems
- Biofiltration wastewater treatment systems
- Continuous Flash and spray dryer (once through and self – inertized) for acrylic and methacrylic powders
- Extruder and pelletizer continuous processes
- Silos and packaging systems for acrylic and methacrylic powders
- Barge, Rail and Truck Loading and Unloading Storage and Handling Facilities for major reactive monomers (acrylonitrile, butadiene, acrylic and methacrylic monomers, acrylic and methacrylic acids, styrene, vinylidene chloride, vinyl acetate)

Instructor for training classes discussing the principles and techniques employed in process safety management, hazard analysis, inherently safer process design, layer of protection analysis.

- Process Safety Management Processes
 - HAZOP / LOPA
 - Process Safety Training using Case Studies
- Mr. Carrithers collaborated with other internal safety professionals and developed and proofed HAZOP materials and trained over 30 plant HAZOP leaders.

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

- Numerous spray dryer and flash dryer fires and deflagrations
- Numerous liquid/gas toxic and flammable releases
- Thermal Oxidizer fires / deflagrations

Key Projects - Continued

Facilitated numerous Process Hazard Analysis (PHA) studies required under OSHA PSM / EPA RMP for over 15 national and international facilities by working with Plant and Technical Management to identify process safety and operability issues. Techniques included HAZOP, Siting, Human Factor and What-If/Checklists. Processes ranged from distillation operations, batch and continuous polymerization processing, integration of an entire chemical plant reactor train effluents to a regenerative thermal oxidizer, to small specialty chemical operations and purification operations. Security Vulnerability Analyses and Inherently Safe Design Analyses were conducted for several high risk processes.

Mr. Carrithers helped plants maintain and improve regulatory compliance through Process Safety Management Audits evaluating OSHA PSM and EPA RMP compliance. Audits were planned, conducted and recommendations were made to remediate deficiencies.

Managed and participated in detailed OSHA PSM and EPA Risk Management Plan (RMP) compliance services for several major midwest chemical companies. These projects included hazard assessments, including worst case scenario and alternate release scenario development and modeling, compliance minimization alternatives analysis, prevention program analysis and development, emergency response plan review and development.

Numerous Inherently Safer Design Studies of reactive, flammable and toxic hazards associated with operation of storage, handling and production facilities for several major companies. This included hazard identification, release modeling, layer of protection analyses, and risk determination. Traditionally, chemical systems with the potential for high consequence events have been studied using hazard analysis techniques which concentrate on reducing the frequency of the event. In contrast, Inherently Safer Design Studies places the emphasis on reducing the consequences. Designers and operators of chemical processing facilities are challenged to look for inherently safer design options. The consequences from possible release events are modeled using a computer software program called PHAST (Process Hazard Analysis Screening Tool). This program models the toxic and fire/explosion effects of potential loss of containment events. The Inherently Safer Design Studies Team develops strategies for reducing the consequences, tests these suggested strategies using PHAST, and guides the team to understand inherently safer design opportunities. The team then seeks effective ways to reduce residual risks. Studies include storage, handling and production facilities for acrylonitrile, butadiene, ethylene, styrene, divinyl benzene, numerous acrylic and methacrylic monomer and acids, chlorine, anhydrous ammonia, isocyanates, toluene and other flammable or toxic solvents.

Assisted several major chemical facilities in defining the classification of all instrumentation and identifying the safety instrument system loops in its reaction processes. Instrumentation was identified and classified, and safety instrumented loops were evaluated for compliance with corporate risk guidelines.

Utilizing existing HAZOP, LOPA and equipment design data, Production Safe Operating Equipment Limit Guidelines were determined for several deep water oil production platforms. These guidelines improved the safety, reliability and production operations by allowing the technical, maintenance and operating personnel a better understanding the production equipment limits and interrelationships of the system components.

As a Contractor Safety Manager, Mr. Carrithers developed and implemented a Contractor Management Program to meet OSHA Voluntary Protection Program. Contractors were qualified by conducting Process Hazard Analyses on their job functions, identifying key gaps and developing programs for compliance. Verifying audits were conducted in the field on contractors for safety compliance and permitting activities. Guidance was given to the construction and maintenance personnel on risk assessment and management protocols.

Mr. Carrithers also has a broad background in technology, production and technical management.

- Site Manager for High Pressure Ethylene Polymerization facility
- Production Supervisor, Plastics Modifiers Area
- Acrylic Monomer Technologist
- Technical and Customer Service Manager for Monomer and Solution Resins
- Technical Manager for Plastics and Resins
- Corporate Engineering Division, Chief Startup Engineer
- Senior Process Engineer for Coatings and Plastics

Selected Publications

Carrithers, G.W., A.M. Dowell III, P.E., Hendershot*, D.C., "It's Never Too Late for Inherent Safety" presented at the *International Conference and Workshop on Process Safety Management and Inherently Safer Processes* Orlando, Florida, October 8-11, 1996 sponsored by the Center for Chemical Process Safety of the American Institute of Chemical Engineers