Center for Process Safety Training

Process Safety Training

Course Catalog 2018

A GLOBAL PROVIDER OF INTEGRATED HSSE SOLUTIONS AND SERVICES

Table of Contents

1.Introduction

1.1. About PSRG

PSRG Inc. is a global provider of integrated Health, Safety, Security and Environmental (HSSE) operations improvement, management consulting and training services designed to help companies improve safety and security, increase productivity and reliability, and enhance overall business performance. With more than 100 highly experienced professionals averaging 29+ years of experience in industry best practices and lessons learned, we provide value-added services and solutions to a wide variety of industry, both onshore and offshore.

1.2. Mission

To provide our customers with the best quality, most responsive, and cost effective HSSE services in the industry today, and to enhance the safety, productivity and reliability of customer facilities through innovative and optimum solutions while not presuming to know their needs and concerns better than they do.

1.3. Vision

To be the preferred global HSSE services provider, helping industry to build a safe, reliable, and sustainable future.

1.4. Core Values

- Safety
- People
- Integrity
- Commitment
- Trust
- Alignment with Client Goals
- Social Responsibility

2. PSRG Training

PSRG Inc. provides both open enrollment and onsite process safety training. The objectives of our training courses are:

- To explain the business case for process safety (why one should implement a process safety management program and the case for improved overall business performance and competitiveness);
- To provide an appreciation of lessons learned from real-life accident case histories;
- To point out internationally Recognized And Generally Accepted Good Engineering Practices (RAGAGEP) and best practices related to safety and environmental risk management principles and practices;
- To provide a thorough understanding of the essential elements in identifying hazards and mitigating the risks associated with chemical, hydrocarbon and manufacturing process facilities;
- To provide an in-depth application of proven HSSE quality management principles and techniques;
- To provide hands-on experience in planning, designing and implementing an effective process safety and risk management system;
- To explain how a process safety management system can be integrated with other HSSE elements;
- To identify other internationally accepted HSSE tools and techniques that can enhance overall business performance, competitiveness, and public image.

1.5. Benefits of Onsite PSRG Training

- **Customization**: Course content and training methods are tailored to the individual needs and requirements of your organization and facilities, utilizing personnel time more efficiently, and your resources more effectively.
- **Cost Savings**: By bringing our experts to you, you realize a significant saving in travel expenses.
- **Minimal Impact to Schedule**: Your personnel are trained at your facility, thereby minimizing their time away from work.
- **Availability On-Demand**: PSRG training courses can be scheduled to the convenience of our customers.

- **Expert Training**: Receive training from experts who have worked in industry, have taught hundreds of safety and risk management professionals, and who are noted for their training effectiveness.
- **Hands-On**: Obtain hands-on experience through interactive workshops and practical examples.
- **Lessons Learned**: Learn from real-world case studies as shared by our course instructors based on their experience in government and industry. Our instructors can provide a practical and complete perspective to your training session to enable learned knowledge to be readily applied after successful completion of the training.
- **Locations**: PSRG can present any of its courses at your facility or at PSRG facilities in Houston, Chicago, Singapore, Nanjing and Bogota. Course duration typically ranges from a few hours to up to 5 days, depending on the subject. Additional courses and workshops for in-house training are also available.

1.6. Registration

Register by requesting a registration form or completing one online at:
http://www.psrgroup.com/training/
Tel: 1-800-250-8511 (in U.S.); +1-713-532-8800 (outside U.S.)
Fax: +1-713-532-8850
Email: training@psrg.com

For any questions regarding training, please contact Sonny Sachdeva, Ph.D. at training@psrg.com

3.Instructors Bios

Mr. Robert J. Weber, President/CEO, is a Registered Professional Engineer with more than 30 years' industry experience. He founded PSRG in Houston in 1997 and serves as President/CEO. In addition to managing day-to-day activities, Mr. Weber is actively engaged in ensuring PSRG's responsive, timely, and quality delivery of services providing training, quality assurance and, performing as Program Manager/Project Director and Subject Matter Expert for a variety of PSRG projects. He has experience in project management, FEED and detailed EPC, technical writing, multinational strategic planning, techno-economic analysis and feasibility studies, enterprise risk management, and safety, risk, reliability, loss prevention, incident investigation, and security planning. He is knowledgeable in regulatory requirements (COMAH, DHS, DOT, EPA, and OSHA) and RAGAGEP (e.g., API, ASHRAE, ASME, ISA/IEC, NEC, NFPA, etc.). Mr. Weber has worked on hundreds of projects in more than 70 countries worldwide.

Ms. Sonny Sachdeva, Ph.D., CCPSC, Training Director, received her Ph.D. from the Indian Institute of Technology Kanpur in Chemical Engineering. Dr. Sachdeva has over 14 years' experience as a Safety Engineer, Research Scientist and Lecturer in environmental and process safety research and training. She has led and participated in multiple process industry OSHA PSM and EPA RMP audits and Process Hazard Analysis (PHA). She is skilled in, and has led, multiple Dust Hazard Analysis (DHA) studies. Dr. Sachdeva has developed and taught courses on Inherently Safer Design, Mechanical Integrity, Process Hazard Analysis, Bow-tie Analysis, PSM Auditing, Management of Change and Development of a PSM System. She worked with the Mary Kay O'Connor Process Safety Center and the Ocean Energy Safety Institute for more than two years and worked on multiple projects related to process and offshore safety. These projects included working with the Bureau of Safety and Environmental Enforcement (BSEE) on conducting forums on shallow water blowouts, Safety & Environmental Management Systems (SEMS), human factors, data reliability, risk management and Ocean Energy Safety Research Roadmap for the 21st century. She also developed multiple white papers and proposals for BSEE on oil spill management and worked on multiple projects with government agencies, such as the National Institute of Occupational Safety & Health (NIOSH) for developing a guideline for emergency responders and the National Science Foundation (NSF) for developing fire retardant materials. Dr. Sachdeva has published over 20 journal articles including two review papers and one book chapter. She is a Certified Safety Professional through the American Institute of Chemical Engineers Center for Chemical Process Safety (AIChE CCPS).

Mr. Lawrence Warren, Senior Process Safety/Risk Management Engineer, has more than 25 years' experience in the chemical, petroleum, manufacturing, aerospace, and nuclear industries. He is an expert in Process Hazard Analysis (PHA), Process Safety Management (PSM), and incident investigation. He has managed and performed hundreds of PHAs, risk analyses, and incident investigations for a wide variety of batch and continuous processes manufacturing facilities using, separating, storing, or destroying hazardous materials. Mr. Warren participated in the Baker Panel investigations following a major refinery incident in Texas City, Texas. He has taught hazard recognition, PHA, PSM, and incident investigation analysis techniques to hundreds of engineering, operating, and maintenance personnel. Mr. Warren received his engineering degree from the University of Illinois at Chicago. Prior to joining PSRG in 2011, Mr. Warren worked for several petroleum and chemical companies including BP, Henkel, BASF, Enterprise Products, Fluor Corporation and Taknia Engineering (Libya).

Ms. Madonna Breen, Process Improvement and Reliability Manager, received her M.S. in Chemical Engineering from the State University of New York. She has over 22 years' experience as a Process Improvement Manager in organic peroxide manufacturing. She has worked on many projects related to process safety with PSRG including facilitating Process Hazard Analyses (PHA) and leading many PSM/RMP compliance audits. While in manufacturing, she developed Management of Change (MOC) processes and procedures, led incident investigations, facilitated and participated in PHAs, developed and oversaw operator process overview training, developed and certified operating procedures, assisted with compliance, risk/behavior-based and contractor audits; developed pressure relief/pressure safety element verification to compare design with failure case, and developed process safety information involving reaction kinetics for all product lines.

Mr. Mike Munsil, Senior Project Manager (HSE) and Director (Latin America), has more than 30 years' diversified experience in training, risk engineering and environmental consulting in chemical, petrochemical, petroleum, and coal industries. He has conducted PSM studies and audits, ISO 9001 audits, EHS audits, underground storage tank investigations, design of remediations, contaminated soil remediations, soil and ground-water contamination investigations, groundwater modeling efforts, geo-physical studies, compliance audits, environmental risk audits, managed and/or executed Phase I, II, and III environmental site assessments, and prepared management plans for various facilities to comply with federal, state and local regulations. Mr. Munsil has worked in Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, the Dominican Republic, the US,

Mexico, Panama, Peru, Vietnam, and Venezuela and has represented both U.S. and Mexican clients with Mexican regulatory authorities (SEDUE, SEDESOL, CAN, SEMARNAP, SEMARNAT). He is fluent in both English and Spanish.

Mr. Sankaran Narayanan, HSE Subject Matter Expert, who received his MS and BS in Chemical Engineer from Illinois Institute of Technology, has more than 60 years' experience including positions with Shell, Unocal, UOP in many HSE roles within the petroleum and petrochemical industry. He has held managerial and supervisory positions in refinery operations, process engineering, planning and scheduling, project engineering, technical auditing, supply, and corporate risk management in petroleum, chemical, drilling, off-shore platforms, and pipelines. He performed more than 800 safety and risk management studies at UNOCAL and UOP, and is a Fellow of AIChE (CCPS) and recently authored two AIChE (CCPS) Engineering Process Safety Guideline Books. He also received the UOP TCO Jack White Leadership Award in 2009. Mr. Narayanan has been actively involved for over a decade in PHAs and risk assessment for upstream facilities including offshore platforms in California, onshore drilling activities with Unocal Corp, and risk assessment upgrading of company offshore facilities in Alaska, following the North Sea Piper Alpha incident. He also performed risk assessments for offshore and onshore facilities, including pipelines and tank farms, and acted as an adviser to new production projects in building and commissioning offshore platforms. Mr. Narayanan has assisted in the delivery of private and public training courses on Mechanical Integrity, ISD, PHA-HAZOP, Process Safety Management and Auditing for Process Safety Management.

Mr. Ken Panozzo, Mechanical Integrity and Reliability Engineer, has over 30 years' experience in the petroleum refining and petrochemical/chemical industries. Mr. Panozzo plays an integral role in improving site mechanical integrity while relentlessly promoting safety and environmental compliance. Prior to joining PSRG, he worked at the Marathon Petroleum Company for three years where he developed a 68-page site Mechanical Integrity (MI) document for Galveston Bay Refinery, and mapped 91 equipment groups to Federal, State, and Local Standards with appropriate inspections and preventative maintenance. He worked for over 30 years with BP in different roles related to maintenance, including his role as Maintenance Manager from 2009 to 2013, where he managed site budget reduction initiatives and delivered $120MM in maintenance efficiencies over a five year period. As a multi-discipline Manager at BP, he was responsible for systematic process structure in MI standards and significantly improved all process safety metrics from 60% to 94%. Mr. Panozzo has developed, and assisted in delivery of, private

and public training courses on MI and Risk Based Inspection.

Mr. Ed Lowe, Senior Safety and Reliability Engineer, has over 30 years' experience with proven performance in the refining, petrochemical, and chemical industries in the areas of refinery management, operations, maintenance, front line management, process safety, engineering, tech support, human resources, and administration (including union and business contract negotiations). His skills and expertise include operations management, strategic planning/budgeting, engineering/ maintenance management, highly hazardous material handling, process safety management, ISO 9000/product stewardship, regulatory compliance, labor/employee relations, policy and procedure development, project management, turnaround planning, and process improvement. He has held positions of PSM Manager, Plant Manager and Maintenance Manager during his career at various petrochemical companies. Mr. Lowe has taught courses on mechanical integrity and conducted numerous PSM/RMP audits.

Mr. Aaran E. Green, Process Safety Specialist, has over 10 years' industry experience including six years safety and risk experience in refining. Mr. Green has worked on multiple process safety management projects. He has facilitated many PHA studies and has worked on multiple projects with major oil and gas refineries, including five year unit re-validations/redos, FEED PHA studies, 'What-If' studies, incident investigations, RMP studies, facility siting studies, and continuous improvement assays. Mr. Green also provides Quality Assurance/ Quality Control services, expertise in HAZOP and LOPA methodology, and functions in the role of Project and Client Manager for a number of PSRG projects.

Ms. Carolina Del Din, Process Safety Engineer, holds a MS in Environmental Engineering from Padua University (Italy). She has over 10 years' experience working as a process safety and environmental consultant. During this time she has worked on a variety of environmental and process safety management projects, facilitating and scribing many PHA studies, and has participated in multiple process industry OSHA PSM and EPA RMP audits. Ms. Del Din has implemented environmental process management systems (ISO 14001), process safety management systems (PSM OSHA), and Risk Management Plans (RMP EPA). She has expertise in Geographic Information System (GIS), in particular the mapping of events related to the release of hazardous substances. Ms. Del Din has developed and assisted in delivery of training courses on Bow-Tie Analysis.

Mr. Ryan Terry, Lead Quantitative Analyst, received his BS in Chemical Engineering from Texas A&M University and his Process Safety Certification from the Mary Kay O'Conner Process Safety Center. He has nine years' experience

consulting in the process safety industry, serving as the lead technical specialist and principle contact in all QRA, Facility Siting, and Consequence Analysis projects. He has performed numerous facility siting and QRA projects for clients all over the world. Additionally, he has experience in auditing all elements of Process Safety Management (PSM) and has certifications in PSM, HAZOP, Layer of Protection Analysis (LOPA), bow-tie facilitation, incident investigation, and Computational Fluid Dynamics (CFD).

Mr. Brian Fagala, Process Safety Engineer, has over 10 years' experience, with time spent in both consulting and oil and gas operating companies. During this time, he has developed key skills in both the qualitative and quantitative sides of risk analysis. He has facilitated PHA and LOPA studies for clients such as Motiva, CB&I, Fluor, and Goodyear and performed quantitative studies including, but not limited to, facility siting and quantitative risk analysis for clients such as National Grid, KBR, and Goodyear. At Chevron he served as HES Risk Management Advisor for both operated and non-operated deep-water Gulf of Mexico major capital projects both in design and construction phases of development including Buckskin Moccasin, Jack and St. Malo Stage 2, and Stampede. His role included scheduling and facilitating iHAZID, What-if, and HAZOP-type studies for all Chevron operated projects, and developing detailed plans and reports in conjunction with other disciplines during FEED and detailed design phases of projects to improve safety and operability. Mr. Fagala has developed and assisted in delivery of private and public training courses on Mechanical Integrity, ISD, Bow-Tie Analysis, PHA-HAZOP, and LOPA in the U.S. and Singapore.

Ms. Annie Nguyen, Director for PSRG Asia Pacific Pte. Ltd, holds a B.S. in Bio-Engineering from University of Minnesota, Twin Cities. Ms. Nguyen is responsible for managing and supporting safety services to clients in the Asia Pacific region. She has facilitated a number of PHA studies (HAZOP/HAZID, LOPA, bow-tie etc.) from FEED to detailed design for clients including Fluor, GE, CB&I, KBR, and CPCHEM. She is knowledgeable of process safety management standards (US OSHA, Singapore Standard 506 Part 3). Ms. Nguyen was lead auditor for numerous compliance audits for clients including Lopez Foods, Noltex, Nova Molecular, and Stolthaven Terminal. Ms. Nguyen has conducted PHA-HAZOP Training and other PSM Training Courses in the Asia Pacific Region. Ms. Nguyen is bilingual; she is fluent in English and Vietnamese.

4. Process Safety Courses

PSM 101:	Developing an Effective Process Safety Management System
PHA 102:	Principles of Process Hazards Analysis
PHA 203:	PHA Team Leader Training
LOPA 104:	Layer of Protection Analysis
PSM 105:	Auditing for Process Safety Management
PSM 106:	Mechanical Integrity and RAGAGEPs for Process Safety Management
PSM 107:	Management of Change for Process Safety
PSM 108:	Incident Investigation
PSM 309:	Facility Siting
PSM 110:	Risk Analysis and Decision Making
PSM 311:	Bow-Tie Analysis
PSM 312:	Failure Modes Effect Analysis
PSM 113:	Human Error Analysis and Human Factors
LOC 314:	Prevention of Loss of Containment
ISD 315:	Inherently Safer Design
PSM 216:	Quantitative Risk Assessment
PSM 217:	Safety and Operability Studies on Electrical Power Systems
PSM 118:	Hazardous Area Classification
PSM 219:	Developing Effective Standard Operating Procedures
PSM 220:	Pressure Relief and Flare Analysis

Course Description **Accreditation**: **14 PDHs** **Duration**: **2 Days**

This course provides an overview of the elements of Process Safety Management (PSM) covered under the U.S. Occupational & Safety Administration (OSHA) PSM Standard, 29 CFR1910.119, and the U.S. Environmental Protection Agency (EPA) Risk Management Program (RMP) Rule, 40 CFR 68, established to reduce chemical accidents and manage the release of highly hazardous flammable and toxic chemicals. This course will demonstrate how to interpret these 'performance-based' regulations, and develop and implement a PSM program for a covered process required by the OSHA PSM regulation and the EPA RMP rule. Participants will be provided information on how to ensure your PSM program is designed to meet regulatory requirements and implemented through an effective management system to improve business performance. There will be discussion on the latest changes being proposed, and their status in the rule making process, to better equip you for upcoming changes. This course will go beyond the regulatory compliance and cover concepts on developing a culture of safety, metrics for continual improvement, and principles of inherent safety. Industry best practices and lessons learned will be shared.

Course Benefits

- Learn how to determine if your facility is covered by OSHA's 29 CFR 1910.119 and EPAs 40 CFR 68
- Learn how to develop, review, update and implement effective PSM/RMP programs that meet regulatory requirements
- Learn the principles behind each element and develop understanding to communicate and explain PSM requirements to others in your company who need to understand the issues

Who Should Attend

- Managers, Supervisors
- PSM Managers and Coordinators, Process Safety Engineers
- Anyone who is involved and responsible for satisfying OSHA PSM regulatory requirements

Prerequisites

- None

Course Content and Agenda

Day 1

- Introduction to PSM
- What is Process Safety?
- Personnel Safety vs. Process Safety
- History of Accidents (*e.g.,* Flixborough, Seveso, Bhopal, Mexico City, Pasadena, Texas City)
- Performance Based and Prescriptive Regulations
- Business Case for Process Safety
- Covered Processes and Applicability of PSM and RMP
- Elements of PSM
  - Employee Participation
  - Process Safety Information
  - Process Hazard Analysis
  - Operating Procedures
  - Training
  - Contractors

Day 2

- Elements of PSM
  - Pre-Startup Safety Review
  - Mechanical Integrity
  - Hot Work Permit
  - Management of Change
  - Incident Investigation
  - Emergency Planning and Response
  - Compliance Audits
  - Trade Secrets
- Applying PSM to Non-Regulated Processes and Operations
- Management Systems for Implementation of Prevention Programs
- Building a Culture of Safety
- Development of Effective Process Safety Metrics
- Leading and Lagging Indicators
- Introduction to Inherent Safety Principles
- Summary of Roles and Responsibilities
- Sample Process Safety Management Manual

Course Description **Accreditation**: 14 PDHs **Duration**: 2 Days

This course is designed to help the participants understand the process and regulatory requirements of a Process Hazard Analysis (PHA). It provides an overview of the various different methodologies of conducting PHA studies, including HAZOP, What-If, Checklist and other techniques. Guidance is provided on selecting the proper PHA technique and participating in a PHA. PHA techniques are described with real-life examples. Attendees will participate in demonstration PHAs led by the course instructor. After completing this course, participants will be prepared to serve as members of PHA teams.

Course Benefits

- Learn how to satisfy the commonly practiced and governed PHA requirements

Who Should Attend

- Process Safety Managers, HSE Personnel, Plant Management, Engineers, O&M staff
- Individuals leading or participating in process hazard analysis studies, scribes

Prerequisites

- None

Course Content and Agenda

Day 1

- Overview of PHAs for Engineers and Managers
  - Definitions
  - Uses
  - Benefits
  - Limitations
- PHA Regulatory Requirements [U.S. OSHA 1910.119(e), U.S. EPA 40 CFR 68]
- Guidelines and Roles of PHA Participants

Day 2

- Introduction to PHA Methods
  - 'What-If' Studies
  - 'What-If'/Checklist Studies
  - HAZOP Studies
  - Fault Tree Analysis (FTA)
  - Failure Modes & Effects Analysis (FMEA)
  - Other Methods
  - Mock-Team PHA Exercise

PHA 203: PHA Team Leader Training

Course Description **Accreditation:** 28 PDHs **Duration**: 4 Days

This course teaches Process Hazard Analysis (PHA) techniques and prepares each participant to lead teams and effectively perform and document PHA and other hazard/risk management studies. The participants will learn to organize and lead PHA studies using the HAZOP, What-If and other techniques. Participants will discover the tactics and success factors that help ensure a successful study. They will also learn about, and use, software available for documenting PHA studies. In addition, this course provides a better understanding of the importance of certain aspects of PHA facilitation and the best practices that should be used during a PHA study. Using these best practices techniques will reduce time, confusion and increase the quality of the PHA. This course will also highlight the 'dos and don'ts' in a PHA study. The content of the course will be demonstrated practically by the participants forming a study team with other participants and taking turns leading a PHA using practical exercises based on actual plant examples. These exercises will be supervised by an instructor who will give feedback on the team's performance.

Course Benefits

- Learn to organize, effectively and efficiently lead, and document PHA studies in accordance with local regulatory and industry best practices using the HAZOP, What-If, Checklist and other methodologies
- Learn the techniques that help ensure a successful PHA study
- Learn about, and use, software available for documenting PHA studies
- Obtain useful tools, checklists, and other aids for reference in future PHA studies

Who Should Attend

- PSM Coordinators/Managers, HSE personnel, Plant Management, O&M personnel
- Engineers, Operations and Maintenance Staff
- Others responsible for leading PHA studies

Prerequisites

- None

Course Content and Agenda

Day 1

- Overview of Process Safety Management and Risk Management
- Introduction to Process Hazard Analysis (PHA) for Engineers and Managers (Definitions, Uses, Benefits, and Limitations)
- PHA Regulatory Requirements [OSHA, EPA]
- Hazard Identification
- Design Intent, Guidewords Parameters and Deviations
- PHA Methods (Including workshop)
  - 'What-If' Studies
  - 'What-If'/Checklist Studies
  - Hazard & Operability Studies (HAZOP)
  - Fault Tree Analysis (FTA)

Day 2

- PHA Methods (Including Workshop)
  - Failure Modes and Effects Analysis (FMEA)
  - Bow-tie Analysis
  - Quantitative Risk Assessment (QRA)
  - Other Methods
- Preparing and Organizing PHA Studies
- Noding the P&IDs
- PHA Recording/Worksheets
- Facilitator/Chairman Skill Requirements
- Team Member Composition/ Roles
- Management of PHA Studies/Quality Control in PHA Studies

Day 3

- Human Factors in PHAs
- Facility Siting in PHAs
- Procedural HAZOP
- HAZOP Batch Process
- MOC HAZOP
- HAZOP for Different Modes of Operation such as Start-up and Shutdown
- Risk Ranking
- PHA Report Preparation

Day 4

- Managing the Follow-Up of PHA Results
- New PHAs vs. PHA Revalidations
- PHA Software
- Sample PHA Report/Worksheets
- Introduction Layer of Protection Analysis (LOPA)
- Mock Facilitation
- Examination

LOPA 104: Layer of Protection Analysis

Course Description **Accreditation**: 14 PDHs **Duration**: 2 Days

In this course, the participant will learn about Layer of Protection Analysis (LOPA) which is a semi-quantitative risk assessment method that lies between a qualitative Process Hazard Analysis (PHA) and a traditional Quantitative Risk Assessment (QRA). This technique also helps in determining the Safety Integrity Level (SIL) necessary for a safety instrumented system to comply with instrument standards such as ISA S84 and IEC 61511. This course will cover the LOPA methodology in detail, through practical examples and teaching of the fundamental rules of how to develop LOPA scenarios, estimate their consequences and severity, identify initiating events and frequency, and finally calculate risk and make decisions. In this course, the participants will learn about the Independent Layers of Protection (IPLs) and estimating their failure on demand. This course will also demonstrate practical examples to explain each concept and the development of a LOPA worksheet from a PHA worksheet.

Course Benefits

- Learn how and when to use LOPA
- Learn how to determine the independence and uniqueness of an IPL
- Learn how to lead a LOPA study
- Learn industry best practices for LOPA

Who Should Attend

- Experienced PHA/HAZOP Leaders and PSM Coordinators and Managers
- Operations, Safety and Project Managers; Process, Safety and Mechanical Engineers

Prerequisites

- PSM or PHA training

Course Content and Agenda

Day 1

- Process Safety Concepts
- Introduction to LOPA
  - Overview of LOPA Methodology
  - When is LOPA Used?
  - Uses and Limitations of LOPA
- Risk and Risk Tolerance Criteria
  - Examples of Common Risk Matrixes
- Development of LOPA Scenarios
  - Selection of Hazard Scenarios using Hazard Evaluation
  - Selection of Hazard Scenarios using Previous Incidents
  - Selection of Hazard Scenarios from Design Evaluation
- Estimation of Consequences and Severity of Scenarios
  - Consequence Categories
  - Defining Severity for the Consequences

Day 2

- Identification of Initiating Events
  - Understanding Initiating Events
  - Initiating Event Frequency Estimation
  - Enabling Conditions and Conditional Modifiers
- Identification of Independent Protection Layers (IPL)
  - Types of IPL
  - IPL Assessment
  - Estimating Probability of Failure on Demand of IPLs
- Calculating the Risk
  - Use of LOPA Worksheet
  - Calculation of Risk for Scenarios
- Making Risk Decisions
  - ALARP and its Typical Application
- Performing PHA to Facilitate LOPA
- Example Workshop

Course Description **Accreditation**: 14 PDHs **Duration**: 2 Days

This course provides an understanding of compliance audits, a key element of Process Safety Management under the U.S. Occupational & Safety Administration (OSHA) Process Safety Management (PSM) Standard, 29 CFR1910.119, and the U.S. Environmental Protection Agency (EPA) Risk Management Program (RMP) Rule, 40 CFR 68. In this course, the participants will learn how to develop their own audit programs. They will also learn how to prepare for and conduct a compliance audit, document the findings, develop reports and track the findings for follow-up and closure.

Course Benefits

- Learn how to develop and establish a PSM/RMP Audit Protocol to meet regulatory requirements
- Learn from experts about the methods of conducting accurate and objective audits, sampling techniques, reporting, etc.
- Use the tools learned from the course to perform efficient and effective auditing against regulatory requirements, NEP citation patterns, and enforcement statistics
- Assess your PSM/RMP program relative to the PSRG 'MaturityModel™'

Who Should Attend

- PSM Managers and Coordinators
- Process, Safety and Mechanical Engineers
- Anyone who needs to develop an audit program or for improving their existing program

Prerequisites

- Understanding of PSM/RMP Principles

Course Content and Agenda

Day 1

- Introduction to Auditing
  - Scope of the Audit
  - Audit Criteria and Protocol
  - Auditor Qualifications or Requirements
  - Frequency of Audits
- Regulatory Requirements for PSM/RMP Auditing
- Developing an Audit Program

Day 2

- Roles and Responsibilities
- Preparation for the Audit
- Conducting and Evaluating Compliance Audit of the PSM/RMP Programs, their Processes and Products
- Sampling Methods
- Interviews
- Writing Quality Recommendations
- Audit Recording and Reporting
- Audit Follow-up, Closure and Tracking
- Quality Assurance of Audits

Course Description **Accreditation**: 21 PDHs **Duration**: 3 Days

This course describes the way to develop and implement a program for a chemical process industry to maintain the integrity of its safety critical process equipment. This is important to improve the reliability of the equipment and comply with regulations. This course covers codes and standards to meet the Recognized And Generally Accepted Good Engineering Practices (RAGAGEPs) for the covered equipment. The participants will learn how to perform preventative maintenance, assign tasks, train personnel, develop procedures and maintain written documentation. This course will also provide tools on how to identify and alleviate equipment deficiencies, and assure the quality and material of equipment fabricated and installed meet the codes and standards.

Course Benefits

- Learn how to interpret the 'performance-based' regulations to identify safety critical equipment and to comply with Mechanical Integrity (MI) regulatory requirements
- Learn how to develop and implement a new MI program or improve an existing MI program in your company
- Learn the meaning of RAGAGEPs, how to best follow them and be informed about the recent updates from OSHA

Who Should Attend

- PSM Managers and Coordinators
- Process, Safety and Mechanical Engineers
- Anyone who needs to develop a MI program or for improving their existing program

Prerequisites

- A background in engineering, operations, and/or maintenance

Course Content and Agenda

Day 1

- Mechanical Integrity Overview
  - Meaning and Importance of MI
  - Relationship with other PSM Elements
- Regulatory Requirements for MI
  - RAGAGEPs
  - Interpretations of PSM MI Requirements
- Designing a MI Program
- Safety Critical Equipment Selection Criteria
- Codes, Standards and Best Practices for Covered Safety Critical Equipment:
  - Pressure Vessels and Storage Tanks;
  - Piping Systems (Including Piping Components such as Valves);
  - Relief and Vent Systems and Devices;
  - Emergency Shutdown Systems;

Day 2

- Codes, Standards and Best Practices for Covered Safety Critical Equipment:
  - Controls (Including Monitoring Devices and Sensors, Alarms, and Interlocks)
  - Rotating Equipment and Pumps
  - Electrical Systems
- Inspection, Testing, Preventative Maintenance
  - Tasks
  - Techniques
  - Frequencies
  - Documentation
- Risk Based Inspection (API 580, 581)
- Fitness for Service

Day 3

- Training and Qualification of Personnel
- Corrosion and Non-Destructive Testing Tools and Methods
- Identifying and Mitigating Equipment Deficiencies
- Quality Assurance/Quality Control
- Spare Parts
- Computerized Maintenance Management Systems
- Reliability Centered Maintenance
- Sample M.I. Program

Course Description **Accreditation**: 14 PDHs **Duration**: 2 Days

This course provides an understanding of a key element of Process Safety Management (PSM), Management of Change (MOC), covered under the U.S. Occupational & Safety Administration (OSHA) PSM Standard, 29 CFR1910.119, and the U.S. Environmental Protection Agency (EPA) Risk Management Program (RMP) Rule, 40 CFR 68. MOC is performed to ensure that any changes made to a process are reviewed and the hazards introduced by the change are identified, analyzed, and controlled before resuming the operation in a chemical processing facility. MOC is required for:

1. Changes in technology
2. Changes to equipment
3. Changes to procedures
4. Changes to organization

In this course, the participants will learn, with case studies and practical examples, how to recognize, initiate, review, and implement a change. They will also learn about the roles and responsibilities and the forms used for the MOC process. Further, the course will give an overview of the Pre-Startup Safety Review (PSSR) process and guidelines to establish and manage successfully the MOC/PSSR program.

Course Benefits

- Learn how even simple changes could lead to incidents through case studies
- Learn how to establish and manage a PSM compliant MOC/PSSR program
- Learn how to develop a new MOC program or review and audit an existing one

Who Should Attend

- PSM Managers and Coordinators
- Process, Safety and Mechanical Engineers
- Any other personnel who participate in decisions on process changes

Prerequisites

- None

Course Content and Agenda

Day 1

- Introduction
- Regulatory Requirements for MOC and PSSR
- Recognizing Changes
- Types of Changes (Replacement-in-Kind, Non-Like Changes)
- Reviewing Hazards
- Implementing a Change
- Roles and Responsibilities
- PSSR
- Examples of MOC Process and PSSR

Day 2

- Management Systems for Managing Change
- Designing and Developing a MOC Program
- Auditing MOC Program
- Personnel Roles and Responsibilities
- Temporary MOCs
- Emergency MOCs
- Interface with Other Facility Programs
- Elements of a MOC Program
- Implementation Guidelines
- Sample MOC Checklists / Flowchart

Course Description **Accreditation**: 14 PDHs **Duration**: 2 Days

Many incidents in chemical facilities have led to loss of life and property. This course provides the participants an understanding of which incidents to investigate and how to investigate the incidents in order to determine the underlying causes to avoid similar incidents in the future. Incident Investigations will not only help a company to learn from its incidents, but also when shared across the board can help similar industries to avoid incidents. Investigations should be performed not only for incidents, but also for positive outcomes to identify what sets the stage for positive outcomes of certain outcomes. This course provides a systematic process with practical examples and case studies where participants will be a team member for an investigation.

Course Benefits

- Learn the steps to assure a good investigation
- Learn to conduct trend analysis
- Learn how to set up a formal investigation, secure the scene, conduct interviews, and review documents
- Learn how the incident evolves and to develop a timeline for the incident
- Learn to perform basic and root cause analysis
- Learn to formulate recommendations and develop a formal report
- Learn how to manage the incident investigations

Who Should Attend

- PSM Managers and Coordinators
- Process, Safety and Mechanical Engineers
- Any technical personnel who could lead or participate in incident investigations

Prerequisites

- None

Course Content and Agenda

Day 1

- Introduction
- Incident vs Accident
- Understanding Near-miss Incidents
- Regulatory Requirements
- Incident/Accident Investigation Goals
- Human Factors and Error
  - Exercise: Interviews
- Incident Reporting (Internal and Regulatory)
- Accident/Incident Investigation Kit
- Steps in an Investigation
- Initiating an Investigation
  - What to Investigate
  - What Method(s) to Use
  - When to Do What
- Gathering and Preserving Data
  - People
    - Brainstorming
    - Interviewing
    - Facilitating Meetings
  - Physical Data
  - Paper/Electronic Data
  - Exercise: Documentation
- Developing the Timeline of the Incident
- The Investigation Team

Day 2

- Enhanced Five Why Method with Excel
  - Focal Point
  - Causal Charting Without Graphics
- Exercise: Five Why Method
- Causal Charting
  - Validating Causes
  - Terminating Causal Chains
- Exercise: Causal Charting
- IncidentXP and Exercise
- Writing Recommendations
- Reporting
- Communicating Results
  - Management
  - Staff
- Exercise: Process Safety Incident
- Learning from Incidents
- Management of Incident Investigations

Course Description **Accreditation**: 14 PDHs **Duration**: 2 Days

This course provides an overview of Facility Siting based on API standards (API 752/753/756). A facility siting study involves the spacing and placement of buildings (both permanent and temporary) and equipment at safe distances in a process plant. For regulatory compliance, facilities covered by OSHA Process Safety Management Standard, 29 CFR 1910.119, and EPA Risk Management Program Rule 40 CFR 68, must evaluate facility siting as part of the Process Hazard Analysis. Beyond regulatory compliance, it can be used for existing facilities to identify potential safety concerns and help in the placement of new buildings or equipment at optimal distances. In this course, the participants will learn the use of standard industry practice for facility siting with practical examples.

Course Benefits

- Learn the different methods, both qualitative and quantitative, used to address facility siting concerns and their benefits and limitations
- Learn how to identify hazardous scenarios that could affect occupied buildings
- Learn how facility siting study addresses spacing of process units; spacing between equipment and employees in occupied buildings, and spacing between equipment and potential ignition sources
- Learn to analyze if your facility has vulnerable locations for control rooms or other occupied buildings, and whether a building can provide shelter-in-place

Who Should Attend

- PSM Coordinators and Managers
- Anyone who conducts or approves facility siting studies.

Prerequisites

- Understanding of Process Hazard Analysis techniques

Course Content and Agenda

Day 1

- Introduction
- Regulatory Background
  - OSHA PSM regulations
  - EPA's Risk Management Rule
- Industry Standards
  - API 752/API 753/API 756
  - CCPS Guidelines
- Hazard Identification (Identifying Maximum Credible Event)
- Building Modeling
  - Building Types
  - Portable Buildings
- Congestion and Confinement Modeling
- Types of Facility Siting Analysis
  - Risk vs Consequence
- Hazard Analysis
  - Discharge
  - Dispersion
  - Toxic/Blast/Fire/Other Hazards
  - Results Analysis (Types of Models)
  - Shelter vs. Evacuation

Day 2

- Occupant Vulnerability (OV) Determination
  - Building Analysis
  - Outdoor Areas
  - Occupancy Analysis
  - Toxic/Fire/Blast
  - API 753/756 (Additional Consideration for Portable Buildings and Tents)
- Risk Analysis
  - Risk Criteria (Individual and Societal)
  - Frequency Analysis
  - Additional Factors (Weather, Alternate Operating Modes)
- Understanding and Managing Results
  - Consequence Results
  - Risk Results
  - Developing and Evaluating Mitigation Options
  - Making Decisions

PSM 110: Risk Analysis and Decision Making

Course Description **Accreditation**: 7 PDHs **Duration**: 1 Day

This course is designed to provide an overview of risk analysis techniques from qualitative to quantitative. This course also explains how risk tolerance and acceptance criteria are developed and used to make risk based decisions from incident frequencies and consequence analysis.

Course Benefits

- Learn how to differentiate between hazard and risk
- Learn different types of risk analysis methods
- Learn the meaning of As Low As Reasonably Practical (ALARP)

Who Should Attend

- PSM Managers and Coordinators
- Process Safety Engineers

Prerequisites

- None

Course Content and Agenda

- Overview of Concepts of Hazard and Risk
  - Definitions of Hazard and Risk
  - Frequency and its Relationship to Risk
  - Risk Analysis
  - Risk Perception
  - Risk Communication
- Qualitative and Quantitative Methods of Risk Assessment
  - Risk Matrix
  - Index Based Methods
  - LOPA
  - QRA
    - Consequence Analysis
    - Frequency Assessment
- Risk Measures
  - Indices
  - Individual Risk and Societal Risk
  - Aggregate Risk
- Risk Presentation and Calculation
  - Frequency Determination
  - Point Estimates and Uncertainty
  - Risk Contours
  - F-N Curves
- Risk in Decision Making
  - Risk Tolerance Criteria
  - Risk Acceptance Criteria
  - ALARP
- Risk Reduction Alternatives

Course Description **Accreditation**: 14 PDHs **Duration**: 2 Days

This course provides training on the bow-tie methodology of risk analysis that pictorially depicts causal relationship in high risk scenarios. It provides a visual representation of all likely incident scenarios around a hazard and identifies the controls that a company could use to control those scenarios. The participants will learn the fundamentals of the methodology and gain hands-on experience with BowTieXP software.

Course Benefits

- Learn to conduct qualitative risk assessments using this technique
- Learn to use this technique as an alternative to other practiced compliance methods
- Hands-on training on the software for bow-tie with examples
- Easy representation of hazards, top events and barriers to present to management

Who Should Attend

- PSM Managers and Coordinators
- Process, Safety and Mechanical Engineers
- Professionals interested in learning about risk

Prerequisites

- None

Course Content and Agenda

Day 1

- Introduction
- Risk Management
  - What is Risk?
  - Quantitative vs. Qualitative
- Industry Safety Performance Over Time
- Bow-Tie History and Methodological Parents
- Overview and Advantages of Bow-Tie
- Bow-Tie Methodology
  - Hazards
  - Top Events
  - Threats
  - Consequences
  - Barriers
  - Escalations Factors

Day 2

- Barrier Attributes
  - Accountable
  - Barrier Function and Type
  - Effectiveness
- Introduction to Bow-Tie Software
- Linking to the Management System
- Escalation Factor and the Management System
- Risk Assessments and ALARP
- Data Manipulation, Export & Import
- BowTieXP Workshop

Course Description **Accreditation**: 14 PDHs **Duration**: 2 Days

Failure Modes and Effects Analysis (FMEA) is a method for systematically determining the potential failure modes of systems, subsystems and basic components and their cause mechanisms. This helps in developing actions that can be taken to eliminate the causes before it could lead to an incident. In this course, the participants will learn about the utility and benefits as well as the methodology of conducting the different types of FMEA. This course will also talk about other techniques such Fault Tree Analysis which can be used in combination with FMEA. The participant will get hand-on experience with instructor-led FMEA facilitation and by working on examples in a team environment. Upon conclusion of the training course, participants should be prepared with the tools, checklists, and skills in order to efficiently and effectively serve as a FMEA Facilitator.

Course Benefits

- Learn to systematically determine failure modes of systems and subsystems
- Learn the best practices and how to gather an efficient team to conduct an effective FMEA
- Learn to better identify and classify risk requiring corrective actions

Who Should Attend

- Managers, Process Safety Coordinators and others responsible for satisfying OSHA PSM regulatory requirements
- Non-regulated companies desiring to design and implement a process safety management program

Prerequisites

- None

Course Content and Agenda

Day 1

- Introduction
  - Overview of FMEA
  - Importance and Utility of FMEA
  - Benefits of FMEA
- History and Purpose of FMEA
  - Identifying and Prioritizing Risks
  - Developing an Action Plan for Reducing Risks
- Standards and Guidelines
- Types of FMEA
  - Design FMEA
  - Process FMEA
- FMEA Methodology
  - Types of Results
  - Resource Requirements
  - Team Composition
  - Analysis Procedure

Day 2

- Fault Tree Analysis (Combined with FMEA)
- Keys to Success and Efficient FMEA Development
- Worked Examples
- Practice Workshops/Breakout Sessions
- Other Tools and Techniques Used or Related to FMEA

Course Description **Accreditation**: 7 PDHs **Duration**: 1 Day

Human error is determined as one of the main causes for most incidents in chemical, aviation, maritime, and other industries. Human error is a very broad term which can be further categorized into different factors affecting human performance such as the environment, the complexity of the task, organizational factors and operator characteristics. In this course, the participants will learn about these human performances impacting factors and various human performance reliability models. This course will further describe the practical ways of performing human error analysis such as checklists, guideword methods, and task analysis methods, and talk about prevention and mitigation techniques.

Course Benefits

- Learn the practical techniques to perform human error analysis
- Learn about the role of culture in preventing human error

Who Should Attend

- Managers, Process Safety Coordinators, and others responsible for addressing human factors

Prerequisites

- None

Course Content and Agenda

- What is Human Error?
- Types and Causes of Human Error
- Regulatory Requirements
- Human Contribution to Incidents
- Factors Influencing Human Performance
  - Environment and Task Characteristics
  - Operator Characteristics
  - Organizational and Social Factors
- Human Reliability Analysis Models
  - James Reason's Model
  - Human Factors Analysis and Classification - HFACS Model
  - The Systematic Error and Risk Assessment Model (SERA) Model
  - Standardized Plant Analysis Risk-Human Reliability Analysis Model
- Human Error Analysis Techniques
  - Checklist and Guideword Methods
  - Task Analysis Methods
- Human Error and Safety Culture
- Prevention and Mitigation Strategies
- Recommendations Development

Course Description **Accreditation**: 21 PDHs **Duration**: 3 Days

Loss of containment of hazardous materials, toxic or flammable, is the primary cause of process safety incidents. There are several causes which are the initiating events for loss of containment:

- Operating outside of the safe operating envelope for process equipment
- Poor management of process equipment integrity, and
- Opening piping or equipment without proper clearing of material or adequate isolation of energy sources

This course will discuss the types of events that could result in loss of containment and highlight administrative controls that can be utilized for preventing loss of containment in your plant.

Course Benefits

Learn to prevent loss of containment incidents through lessons learned from previous incidents from across industry

- Learn to prevent loss of containment through assessment of hazards, consequences, and risks
- Learn to identify, maintain, verify, and manage process safety critical elements through case study examples
- Learn the tools to conduct near-miss and incident investigations

Who Should Attend

- Managers, Process Safety Coordinators, Operators and others responsible for handling or managing hazardous materials, toxic or flammables in the plant

Prerequisites

- None

Course Content and Agenda

Day 1

- Introduction
- Loss of Containment Lessons Learned
  - Previous Incidents in Industry
- Identifying Hazardous Systems in the Plant
  - Defining Limits of the Hazardous Systems
- Safe Operating Limits
  - What is Your System Designed For?
  - Difference Between Safe Operating Limits and Maximum Allowable Pressure/Temperature
- Preventing Loss of Containment Through Assessment of Hazards, Consequences, and Risks
  - Hazard Identification Methods
  - Identify the Risks in the Process
  - What are the Consequences?
  - Are Safeguards Really Safe?
  - Independent Protection Layers

Day 2

- Identifying Process Safety Critical Elements
  - Equipment Required to Maintain System Integrity
  - Normal Operations
  - Emergency Operations
  - Start-up / Shutdown
- Maintenance and Verification of Process Safety Critical Elements
  - Bow-Tie Analysis
- Management of Process Integrity
  - Equipment Maintenance Discipline
  - Risk-Based Inspection
  - Small Bore Tubing and Piping Systems
  - Good Maintenance Records

Day 3

- Operational Discipline
  - Information, Instructions and Training
  - Isolations and Permits to Work
  - Process Plant Protection Systems
  - Change Control
  - Control of Miscellaneous Process Hazards
- Incident Investigation and Near Misses
  - Using Incident Investigation and Near Miss Reports for Measuring Success
- Near Misses as a Tool for Identifying Trends

Course Description **Accreditation**: 14 PDHs **Duration**: 2 Days

This course provides an introduction to the basic principles of Inherent Safety (IS) and highlights the differences between a traditional and inherently safer design (ISD). The participants will learn about how to implement ISD principles, where it fits best in the design life cycle, and how to measure it. They will also learn about the different techniques used to conduct IS reviews in a facility. The course describes the challenges to implementation of ISD principles and how different regulatory regimes have implemented them.

Course Benefits

- Learn to use principles of IS in new and existing facilities
- Learn about the hierarchy of controls
- Learn the benefits of ISD
- Learn from practical examples on how to implement ISD at your facility
- Learn how ISD is practiced in different regulatory regimes and new changes expected in the US

Who Should Attend

- PSM Managers and Coordinators
- Process, Safety and Mechanical Engineers
- Professionals with a background in science and engineering

Prerequisites

- None

Course Content and Agenda

Day 1

- Introduction
- What is ISD?
- Traditional vs ISD
- Hierarchy of Controls
  - Inherent
  - Passive
  - Active
  - Procedural
- Principles of ISD
  - Minimize
  - Moderate
  - Substitute
  - Simplify
- Industry Examples of Each Principle

Day 2

- IS in the Design Life Cycle
- How to Measure IS
  - ISD Indices
  - Limitations of Indices
- Implementing ISD
- IS and Security
- ISD Design Conflicts
- EPA's New Proposed Rule on Safer Technology and Alternative Analysis (STAA)
- Challenges to Application of ISD Approaches
- Case Studies

Course Description **Accreditation**: 21 PDHs **Duration**: 3 Days

This training course provides in-depth knowledge on how to perform and understand a Quantitative Risk Assessment (QRA) with the help of worked examples. In this course the participant will learn about the key components of a QRA, the expected outcomes, and how to effectively perform and audit QRA studies. The course will also cover industry best practices and lessons learned.

Upon successful conclusion of the training course, participants should be prepared, with the tools and skills, to efficiently and effectively perform and evaluate a QRA.

Course Benefits

- To introduce attendees to fundamentals of QRA technique to be used when conducting and performing QRAs
- To introduce attendees to QRA documentation techniques
- To provide an appreciation for lessons learned based on real-life incident case histories
- To point out internationally Recognized And Generally Accepted Good Engineering Practices (RAGAGEP) and best practices related to safety and environmental risk management principles and practices (i.e., CCPS Guidelines for Quantitative Safety Risk Criteria, API RP 752, and API RP 753)
- To provide an understanding of the essential elements for equipment spacing, siting and layout in hydrocarbon and chemical process facilities
- To provide an understanding of proven consequence analysis and frequency estimation techniques

Who Should Attend

- PSM Managers and Coordinators
- Process, Safety and Mechanical Engineers
- Professionals with a background in science and engineering

Prerequisites

- None

Course Content and Agenda

Day 1

- Introduction to QRA
- Origins
- Anatomy of a QRA
    - Hazard Selection
    - Consequence Assessment
    - Frequency Estimation; Risk Output
- Risk Criteria
    - Origins
    - ALARP
    - Individual Risk (IR) & Societal Risk (SR)
- Hazard Identification
    - Hazard Types
    - Historical Major Accidents
    - Deterministic Approach
    - Probabilistic Approach
- Consequence Assessment
- Fires
    - Calculate Fire Radiation Distances
    - Pool Fires and VCE
    - BLEVEs and Fireballs

Day 2

- Fires
    - Effect of Fire on People and Equipment
- Explosions
- Calculate Explosion Distances
    - TNT and TNO Multi-Energy
    - Baker-Strehlow
- Effect of Explosions on People and Equipment
- Toxics
- Gas Dispersion Principles
- Calculating Dispersion
    - Source Models
    - Pool Vaporization
    - Dense Gas Dispersion
    - Momentum Jet Dispersion
- Effect of Toxics on People
- Probability of Injury/Death
    - Effect Tables and Probits
- PHAST/SAFETI, Part 1
    - Models, Assumptions and Limitations

Day 3

- Frequency Assessment
    - Frequency Data Sources & Data Limitations
    - Fault Tree & Event Tree Analysis
- Risk
    - Calculating IR, SR and IRPA
    - Models and Tools
- Assessing QRAs
- QRA Results Reporting
    - Iso-Risk Contours & F-N curves
- Uncertainty Analysis
- QRA for Layout and Spacing

Course Description **Accreditation:** 14 PDHs **Duration:** 2 Days

This course will introduce principles of Safety and Operability Studies for high voltage Electrical Power Systems (SAFOP) to the attendees. It will describe the purpose and objectives of different SAFOP study techniques, including Safety Analysis (SAFAN), Security and Operability Analysis (SYSOP) and Operator Task Analysis (OPTAN). In the course, the participants will learn about team composition, preparatory, documenting, and reporting requirements. This course will provide the participants with a better understanding of SAFOPs so as to more effectively contribute to future studies at their workplace.

Course Benefits

- Learn the SAFOP terminology, tools and techniques
- Gain sufficient information to conduct efficient and effective SAFOPs
- Learn team leader qualities and characteristics to effectively lead SAFOP studies

Who Should Attend

- PSM Managers and Coordinators
- Process, Safety, Electrical and Mechanical Engineers
- Professionals with a background in science and engineering

Prerequisites

- None

Course Content and Agenda

Day 1

- Introduction to SAFOP Studies
- SAFOP Studies
    - Purpose
    - Objectives
    - Terminology
- Introduction to Different Types of Studies
- Safety Analysis (SAFAN)
- Workshop 1
    - Worked Examples of SAFAN Study
- Security and Operability Analysis (SYSOP)
- Workshop 2
    - Worked Examples of SYSOP Study
- Operator Task Analysis (OPTAN)
- Workshop 3
    - Worked Examples of OPTAN Study

Day 2

- Timing of Studies
    - Initial Studies
    - Final Studies
- SAFOP Team Composition
- SAFOP Team Leader Roles and Responsibilities
- SAFOP Team Member Roles
- Study Execution
    - Scoping and Scheduling
    - Preparatory Work
    - Documentation and Reporting
    - SAFOP Study Execution Follow-Up
- SAFOP Pitfalls
- SAFOP Critical Success Factors
- SAFOP Report Example

Course Description **Accreditation**: 14 PDHs **Duration**: 2 Days

In this course, the attendees will learn how to assess and determine hazardous (electrical) area classification based on the characteristics of flammable materials, and types of equipment. Hazardous conditions can exist during normal plant operations as a result of the continuous or intermittent release of flammable materials into the atmosphere. Releases can occur due to leaks at valves and pipe flanges, from routine maintenance where a seal is being replaced, or where a process results in the regular venting of gases. Hazardous area classification is used to identify potentially hazardous zones and ignition sources in the workplace, and identify the equipment needed to prevent fires and explosions. The attendees will learn about the various classification systems for hazardous areas, including flammable gases, dusts, mists and vapors.

Course Benefits

- Learn about the different systems to classify hazardous areas
- Learn about the area classification assessment for flammable gases, mists, dusts and vapors
- Learn about the engineering best practices in hazardous area classification
- Learn about the limitations of hazardous area classification

Who Should Attend

- Fire Safety Managers, Workplace Safety and Health Professionals, Facility Managers, Workplace Managers or anyone who manages hazardous area classification.

Prerequisites

- None

Course Content and Agenda

Day 1

- Explosion Basic Requirement
  - Flammable Substance Classification
  - Ignition
  - Oxidizer
- Design Regulations for Explosion Proof Electrical Equipment
  - Industry Codes and Standards
  - Approval Agencies
- Overview of Hazardous Area Classification (HAC)
- HAC Definition and Division System
- Zone System
  - Gas Zone
  - Dust Zone
  - Electrical Equipment Group
- Protection Techniques and Methods
- Class and Zone Comparison
- Reading Marking Equipment
- Equipment Protection Level (EPL)
- ATEX Directive
- Marking
  - Gas Marking
  - Dust Marking
  - Zone Marking

Day 2

- Risk Assessment Methodology Development
- Area Classification Assessment
- Area Classification Assessment for Zone System
  - Source of Release
  - Ventilation
- Plant and Area Design
- Ignition Sources Control
- Classification of Areas Containing Liquids, Vapors and Gases
- Classification of Areas Containing Dust
  - Combustible Dust
  - Identify Zones of Risk for Combustible Dust
- Engineering Best Practices
  - Material Properties
  - Dust Layer Hazard
  - Gas and Oil-Fired Systems
  - Audit and Review
- HAC Limitations
-

Course Description **Accreditation**: 14 PDHs **Duration**: 2 Days

In this course, the participants will learn how to develop effective operating and maintenance procedures in process facilities. Well-written and effective operating procedures are essential to safe operation in process industries. Most regulatory regimes, including OSHA PSM and EPA RMP, enforce the use of written standard operating procedures. In order to comply with these requirements, many companies will have the employees develop operating procedures by simply documenting their actions which can lead to ineffective procedures. In this course, the attendees will learn about the different approaches to document and format operating procedures according to established principles and best practices. The regulatory requirements for procedures will be described along with interpretations from OSHA and the EPA. Examples will be used to demonstrate well designed and developed procedures

Course Benefits

- Learn to design and develop effective operating and maintenance procedures
- Learn about the regulatory requirements and their interpretations for operating procedures
- Learn about different approaches and industry best practices to develop operating procedures
- Learn about safe operating limits

Who Should Attend

- Operations and Maintenance Personnel
- Process Engineers
- PSM Managers and Coordinators

Prerequisites

- Experience in process industry

Course Content and Agenda

Day 1

- Introduction of Standard Operating Procedure (SOP)
  - Purpose
  - Who Should Write SOPs?
- General PSM Requirement for SOPs
- Operating Procedure Considerations
- Purpose of Establishing Upper and Lower Limits
- What Limits Should be Included?
  - Challenges of Establishing Limit
  - Information Required for Safe Operation
  - Operation Issues
  - Effective Boundary Management
  - Hierarchy Structure
- Safe Operating Limits and Consequences of Deviation
- Safety and Health Systems Considerations
- Guidelines for Writing Shutdown Procedures
- Guidelines for Preparing Operating Manuals
- Safe Work Practice
- Common Audit Findings for Operating Procedures
- Six Steps in Writing Procedures

Day 2

- Considerations Prior to Writing Operation Procedures
- Design and Operating Intent
- Structure of an Operating Manual
- Auditing the Procedures
- Details of Modular Structure
- Operating Instructions
- Making Operating Procedures User-Friendly
- Circumstances for which Operating Procedures must be Written
- Generic Procedures and Vendor Manuals
- Batch Operations
- Workplace Design
- Batch and Procedure Based PHAs

Course Description **Accreditation**: 14 PDHs **Duration**: 2 Days

In this course, the participants will be provided with an overview of pressure relief system design and requirements. In the process industry, pressure vessels and other equipment are to be protected from overpressure and vacuum scenarios through the use of relief devices/venting systems to prevent conditions that may cause serious injuries to personnel, costly mechanical damage and environmental releases. This course is designed to provide specific guidelines for evaluating the relief system design. This will entail analysis of overpressure scenarios, calculation of required relief rates, and relief device capacity and size. This course also provides engineering guidance on flare header design, e.g. flare height and heat radiation, knock-out drum disengagement analysis, flame-out prevention, smokeless combustion, etc. PSM demands adequate verification and documentation of the design basis for all new and existing pressure relief and disposal systems but it does not outline how to do this nor what constitute 'adequate' documentation. This course will cover the best practices pertaining to what constitutes adequate documentation for relief system design.

Course Benefits

- Learn about different types of relief devices
- Learn about the regulatory requirements and their interpretations for relief system design
- Learn how to analyze overpressure scenarios
- Learn how to calculate relief requirements and relief device capability
- Learn about the RAGAGEPs for flare system analysis

Who Should Attend

- Process Engineers
- PSM Managers and Coordinators
- Personnel who have the responsibility of maintaining and auditing the pressure relief system design basis documentation for OSHA 1910.119 compliance

Prerequisites

- Experience in process industry

Course Content and Agenda

Day 1

- Introduction
  - Industry Regulations, Codes and Standards
  - Pressure Relief Device Terminology
  - ASME Code Relief Device Requirements
- Types of Relief Valves
- Rupture Disks
- Relief Scenario Analysis
- Overview and Basics of Pressure Relief Valve Sizing Calculations

Day 2

- Sizing for Different Scenarios
- Mitigating relief system problems
- Low Pressure Storage Tanks and Relief Devices
- Flare Header Design
- Flare and Flare Knockout Pots
- Vent to a Safe Location Discussion
- Best Practices in Documentation of Relief System Design

Center for Process Safety Training



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