2025 Training Catalog

PROCESS IMPROVEMENT INSTITUTE
Risk and Reliability Specialists

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A sample of what some of our attendees and clients have said:

"We use PII nearly exclusively for our PHA/HAZOP needs. Since 2014, PII has led and documented the PHA/HAZOPs of our existing natural gas collection sites and our large gas process plant, and are now working on the PHA/HAZOP of our natural gas liquid separation plant. PII performed the LOPA and the more than 800 SIL Verifications on the gas processing plant. And PII performed high level risk assessments of the gas plant to help us decide between alternatives for proposed expansions. PII does very thorough work and are not afraid to take a hard stance on important issues; this has helped PlusPetrol make significant improvements to process safety. We especially appreciate the way they cover PHA/HAZOP of startup, shutdown, and online maintenance; we would not want to miss possible accident scenarios for these modes of operation. The value of using PII is quite high."

Mary Stella Corsaro
Global Safety & Operations Integrity Manager
PlusPetrol (Argentina and Peru)

"PII provides outstanding process safety and loss control training and consulting services. I have worked extensively with Bill Bridges and his colleagues from 1996 until now, 2016, and have found their expertise and standard of care to be second to none. They have customized training for CCP and have provided hands-on help with PHAs (HAZOPs), PHA revalidations, and continual improvement with PSM. One aspect of PII that we greatly appreciate is that they do not charge additional licensing fees (as others do) for use of and training with standard industry methods such as Root Cause Analysis. PII is considered part of our team at CCP. We highly recommend PII."

Mike Gromacki
President, DIXIE Chemicals
(Former Vice President of Operations/Chief Sustainability Officer)

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Expertise of Process Improvement Institute

Our consultants and instructors are internationally recognized experts in risk assessments, risk management systems, PSM, and loss prevention. They are among the very best in the field because they combine complete theoretical understanding of their topic with the experience that is necessary to discriminate between something that works only in theory and something that works in practice.

Our instructors have trained over 8000 in PSM-related topics, including over 3800 investigators, 4000 PHA leaders, 3000 PSM experts and auditors, 1200 procedure writers, and many others on other topics.

Our personnel have led over 600 PHAs (qualitative risk assessments or HAZOPs; most of these were of entire units), over 150 major investigations, and over 65 major PSM audits. They have developed and implemented effective MOC programs, procedure writing protocols, and hazard review (risk assessment) methodologies. They are among the most experienced PSM experts and instructors in the world.

They have **served as chair or co-chair of 11 major international conferences on PSM** and have authored or co-authored over 50 articles/papers on PSM topics and were co-authors or primary authors of the following definitive textbooks for AIChE's Center for Chemical Process Safety (CCPS):

- **Guidelines for Initiating Events and Independent Protection Layers**, CCPS/AIChE, 2015 (Mr. Bridges was the principal author; this is an essential supplement to the original LOPA book which was co-authored by Mr. Bridges).

- **Guidelines for Conditional Modifiers and Initiating Events for LOPA**, CCPS/AIChE, 2013 (Mr. Bridges is a committee member and contributing author; this will be an essential supplement to the original LOPA book which was co-authored by Mr. Bridges).

- **Guidelines for Hazard Evaluation Procedures,** CCPS/AIChE, 2008 (3nd Edition) (this is the definitive text on performing PHAs; Mr. Bridges and Mrs. Tew were contributing authors)

- **Essential Practices for Managing Reactive Chemicals Hazards,** CCPS/AIChE, 2003 (Mr. Norsworthy was a committee member and contributing author)

- **Guidelines for Investigating Chemical Process Incidents**, 2003 (2nd Edition) (this is the definitive textbook on investigation; Mr. Bridges was a primary author)

- **Guidelines for Analyzing and Managing the Security Vulnerabilities of Fixed Chemical Sites,** CCPS/AIChE, 2002 (Mr. Norsworthy was a committee member and contributing author)

- **Layer of Protection Analysis**, CCPS/AIChE, 2001 (Mr. Bridges and Mr. Art Dowell were the inventors and primary authors; this is the definitive text on simplified quantitative risk assessment)

- **Guidelines for Hazard Evaluation Procedures,** CCPS/AIChE, 1991 (2nd Edition) (this is the definitive text on performing PHAs; Mr. Bridges was a contributing author)

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They have co-authored six related standards for the US Department of Energy, as well as authoring or co-authoring the definitive papers on:

- How to address human error/factors during PHAs (and HAZOPs)
- How to analyze procedure steps for hazards/risks of performing steps incorrectly
- How to make your PHAs comply with US OSHA's PSM requirements
- What are the Costs/Benefits of PSM compliance
- How to get Near Misses Reported and Investigated
- How to write effective operating and maintenance procedures
- How to develop troubleshooting guides from HAZOP tables
- How to implement an effective LOPA program
- How to perform incident investigations and root cause analyses

A full résumé of each PII expert is available upon request; and we can provide you with a long list of references (your peers) that use us and can attest to the value of our services.

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PII 2025 Public Course Calendar

Course Title	Typical Course Attendees	Fees (in USD)/ Duration	Jan. '25	Feb. '25	Mar. '25	Apr. '25	May '25	June '25	July '25	Aug. '25	Sept. '25	Oct. '25	Nov. '25	Dec. '25
Course 1 **Overview of Process Safety Management (PSM)** Reviews all elements of PSM for compliance and best practices. Excellent for workers.	• Workers – Operations, Maintenance, Lab, support staff • Engineers – Process, Safety, and Mechanical • Environmental Management and Technicians	1 day	*(only offered as a private course at client site)*											
Course 2 **Process Safety Management (PSM)** Detailed description of each PSM element and how these interrelate. Some exercises and many examples. Great starter for PSM implementers.	• Managers – Operations, Safety, Environment, and Executive • Engineers – Process, Safety, and Mechanical • PSM Implementation Team Members – Anyone involved with implementation • Compliance Auditors	$1,350 – 3 days in USA or by Distance Learning $1,995 – 3 days in Dubai (UAE)		3-5 Houston		22-24 Distance Learning 27-29 Dubai					8-10 Distance Learning		3-5 Charlotte	
Course 3 **Compliance Auditing for Process Safety** Details of how to perform an audit (gather and analyzing data), using PSM elements as the focus.	• PSM Implementation Team Members • Managers – Operations, Safety, Environment, and Executive • Engineers – Process, Safety, and Mechanical • Compliance Auditors	$1,100 – 2 days in USA or by Distance Learning $1,695 – 2 days in Dubai (UAE)		6-7 Houston		25-26 Distance Learning 30-May 1 Dubai				25-26 Distance Learning			6-7 Charlotte	
Course 4 **Incident Investigation & Root Cause Analysis Leadership** In-depth explanation and hands-on workshops for perspective investigators and analysts, cover all aspects and all activities. Uses the best practices from industry.	• Engineers – process, process safety, and mechanical • Operations and Maintenance Staff – senior operators, maintenance technicians, supervisors • Process reliability staff • Process quality control/assurance staff	$1,350 – 3 days in USA or by Distance Learning $1,995 – 3 days in Dubai (UAE)			4-6 Napa		4-6 Dubai		16-18 Charlotte			8-10 Distance Learning		3-5 Napa
Course 4-O **Incident Investigation & Root Cause Analysis Overview** Overview for workers or management who may participate in investigations.	• Operations and Maintenance Staff, process reliability, and process quality control/assurance staff who may be team members • Managers who must ensure active participation on investigation and RCA processes	1 day	*(only offered as a private course at client site)*											

Houston = Houston, Texas • Charlotte = Charlotte/Gastonia, North Carolina • Napa = Napa/San Francisco, California • Dubai (UAE) •
Distance Learning* (Live, Online w/PII Expert Instructor) * NOTE: All distance learning courses will begin at 8:00 am US Central Standard Time

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Course 5 **Writing Effective Operating and Maintenance Procedures** Following the rules taught in this course will prevent human error. This course is designed for writers (operators, maintenance workers, etc.).	• Senior Operations and Maintenance Technicians are the primary targets of this course, since they should write their procedures and take ownership of them (maintenance technicians need only to attend the first day) • Engineers – Process, Safety, and Mechanical • PSM and Quality Compliance Auditors	$1,100 – 2 days in USA or by Distance Learning $1,695 – 2 days in Dubai (UAE)					19-20 Charlotte 7-8 Dubai				4-5 Charlotte			
Course 6 **Mechanical Integrity** Explains how to comply with the MI requirements within PSM, as well as how to mesh MI with reliability. Many workshops.	• Designated employee responsible for designing, developing, and implementing a PSM-based MI program • Engineers – Mechanical & Plant & Reliability • Managers – Plant Manager, Maintenance, and Production • PSM Manager or Coordinators	$1,100 – 2 days in USA or by Distance Learning $1,695 – 2 days in Dubai (UAE)					1-2 Distance Learning						13-14 Distance Learning	
Course 7 **Management of Change and PSSR** In-depth explanation and workshops on managing changes to procedures, equipment, etc., including how to do simple hazard reviews and explains pre-startup safety reviews.	• Technical Managers and Supervisors • HSE professionals • Quality control managers and staff • Engineers • PSM coordinators • Most other staff who are involved with designing, implementing, tracking, and evaluating MOC programs	$1,100 – 2 days in USA or by Distance Learning $1,695 – 2 days in Dubai (UAE)			11-12 Distance Learning		21-22 Charlotte 18-19 Dubai						11-12 Distance Learning	
Course 8 **PHA/HAZOP Leadership** The best course on how to lead and scribe hazard evaluations; taught by experts who have led hundreds of PHAs. For people who will be leading/scribing.	• Process engineer or project engineer • Operations supervisor • PSM coordinator • EH&S Managers & Engineers	$2,500 – 5 days in USA or by Distance Learning $2,995 – 5 days in Dubai (UAE)				14-18 Charlotte	11-15 Dubai			18-22 Distance Learning				8-12 Napa
Course 8-O **PHA/HAZOP Overview** Review of the requirements and methods. Ideal for managers or for team members.	• Operations and Maintenance Staff, process reliability, and process quality control/ assurance staff who may be team members • Managers who must ensure active participation in PHA and hazard reviews (HAZOPs, etc.)	1 day	(only offered as a private course at client site)											

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Course 9 **PHA Revalidation** Best, proven methods for revalidating PHAs/ HAZOPs. For experienced PHA leaders.	This course is primarily for PHA leaders, but anyone with the following background will also find the course valuable: • Process engineer • PHA element coordinator/manager • PSM coordinator and auditors • EH&S Managers & Engineers	$1,100 – 2 days in USA or by Distance Learning			13-14 Distance Learning						11-12 Distance Learning			
Course 10 **Human Error Prevention** Covers all of the reasons why human make mistakes and why they develop habits (good and bad) and explains how to optimize each factor to control human error.	• Managers – Operations, Safety, Environment, and Executive • Production Supervisors • Training Managers • Engineers – Process, Safety, and Mechanical • PSM Coordinators and Managers • PHA (hazard review) Leaders and Incident Investigators	$1,100 – 2 days in USA or by Distance Learning $1,695 – 2 days in Dubai (UAE)		7-8 Napa			20-21 Dubai		14-15 Charlotte			6-7 Distance Learning		1-2 Napa
Course 11 **Layer of Protection Analysis (LOPA)** Thoroughly explains how to perform LOPA to judge risk and to determine the proper SIL. Taught by one of the 3 primary authors of the industry textbook on LOPA.	This course is designed for **experienced PHA/HAZOP leaders,** however, others will benefit from learning this simpler method for estimating risk. Only individuals with a strong technical background (such as engineers and scientists) should attend. Others who may benefit from this course include: • Managers – Operations, Safety • Project Managers • Engineers – Process, Safety, and Mechanical • PSM Coordinators and Managers	$1,200 – 2 days in USA or by Distance Learning $1,795 – 2 days in Dubai (UAE)	10-11 Houston		1-2 Distance Learning						15-16 Distance Learning.			15-16 Napa

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Course 12 **Safety Instrumented Systems (SIS & SIL)** Details how to determine when a SIF is needed, determine the proper SIL, specify and design and SIS, verify the SIL, and install and maintain and validate the SIF/SIL. Taught by one of the developers of SIL verification standards.	This course is designed for those needing to learn what are SIS, and especially those wanting to learn how to verify SIL design and install and validate SIS/SIL. The course workshops focus primarily on SIL verification and design. The coverage of SIL determination is minimal since Course 8 and Course 11 cover this topic in topic in detail. Consider taking this course in conjunction with Course 11, LOPA. Those who may benefit from this course include: • Managers – Operations, Safety • Project, Engineering, and Technical Managers • Engineers – Instrumentation, Electrical, Process, Safety, and Mechanical • Technicians/Specialist – instrumentation • PSM Coordinators and Managers	$1,200 – 2 days in USA or by Distance Learning $1,795 – 2 days in Dubai (UAE)		12-13 Houston		3-4 Distance Learning.					17-18 Distance Learning.			17-18 Napa
Course 13 **Job Safety Analysis (JSA)** Detailed procedures and workshops to teach workers and supervisors how to perform JSAs.	• This course is for anyone involved in operations and maintenance that needs to know how to perform JSAs of new or existing tasks. Ideal for all operators and maintenance workers • In addition, full-time safety practitioners, safety committee members, safety coordinators, safety specialists, safety managers, loss control managers, and operations managers can benefit from this course	3.5 hours (2 sessions offered each day)	(only offered as a private course at client site)											
Course 14 **Human Error Prevention - For Workers** A customizable course to explain human errors to workers, with options to provide tools for controlling errors (such as JSA, STAR, etc.).	• This course is for anyone involved in operations, maintenance, lab, utilities, and other support areas to a process, with direct hands-on responsibilities. Ideal for all operators and maintenance workers • In addition, full-time safety practitioners, safety committee members, safety coordinators, safety specialists, safety managers, loss control managers, and operations managers can benefit from this course	1-3 days, depending on needs	(only offered as a private course at client site)											

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Course 15 **Safety Task Action Reporting (STAR)** Workshops to teach workers how to control bad habits in the workplace.	• This course is for anyone involved in operations, maintenance, lab, utilities, and other support areas to a process, with direct hands-on responsibilities. Ideal for all operators and maintenance workers • In addition, full-time safety practitioners, safety committee members, safety coordinators, safety specialists, human resources, safety managers, loss control managers, and operations managers can benefit from this course	1 day - worker course 1-day - managers course	(only offered as a private course at client site)										
Course 16 **Behavior-Based Management for Safety and Reliability (Behavior-Based Error Reduction)** Best practices from lessons learned in the past 20 years of implementing effective methods for controlling habits. Can include a module on implementing STAR.	• This course is for anyone involved in operations, maintenance, lab, utilities, and other support areas to a process, with direct hands-on responsibilities. Ideal for all operators and maintenance workers • In addition, full-time safety practitioners, safety committee members, safety coordinators, safety specialists, human resources, safety managers, loss control managers, and operations managers can benefit from this course.	2 days	(only offered as a private course at client site)										
Course 17 ***Selecting the Right Manufacturing Improvement Tools*** Compares each of the latest approaches to reliability and manufacturing improvement, such as TMP, Six Sigma, Lean Manufacturing, RCA, Predictive Maintenance, Kaizen, etc.	This course is for anyone who leads or influences the direction and success of manufacturing plants, such as VPs of manufacturing and reliability, reliability and operations management, and reliability technical staff	1-2 days, depending on needs	(only offered as a private course at client site)										
Course 18 ***Reliability Leadership for Manufacturing Excellence*** Learn excellence in manufacturing practices that are patterned after the best-in-class manufacturing companies.	• This course is for managers of production, maintenance, and corporate executives; reliability, process, and safety engineers • Anyone who leads or influences the direction and success of manufacturing plants	1-2 days, depending on needs	(only offered as a private course at client site)										

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Notes:

Schedules and course fees are subject to change. Except as indicated, all prices are for USA locations. Houston = Houston, Texas. Charlotte = Charlotte, North Carolina area. Napa/San Fran. = Napa/San Francisco Bay Area, California. Dubai (UAE) • Distance Learning (online; live streaming w/PII Instructor)

Courses with software do not include software licenses; these require separate purchase and can be licensed after the course.

Please follow the links for these locations to see full descriptions for these courses and to learn how to register.

Private (on-site) courses are usually less costly overall for class sizes larger than 6; these are priced per class-day with recommended class size limits. Call or email for details (+1-865-675-3458; ContactUs@process-improvement-institute.com).

Fees and Payments:

Fees quoted in this calendar are valid until PII's next training advertisement is issued. You may pay by company check, VISA®, MasterCard®, American Express®, or bank/wire transfer. If you register by purchase order, we will invoice upon receipt of the order. *All course fees are in US Dollars and are due before the course begins.*

If you are paying by company check, send payments to Process Improvement Institute, 1321 Waterside Lane, Knoxville, TN 37922 USA.

Course fees include all manuals, course materials, lunches, and refreshments throughout the day. Fees do not include accommodations or transportation; however, course confirmation will include details regarding the host-hotel, from which registrants will call to book and pay for their guest accommodations.

Contact PII by phone at 1.865.675.3458 or by e-mail to ContactUs@process-improvement-institute.com, with any questions.

Transfers and Cancellations

Early registration helps ensure your place in our limited-enrollment courses. Registrants unable to attend a course may send a substitute, enroll in the next scheduled class, or request a refund up to 2 weeks before the class begins. If it becomes necessary to change or cancel any course, PII will notify you at least 2 weeks before the course date. If a course is cancelled, PII will promptly refund your full tuition if you do not wish to transfer to one of the next offered courses. PII reserves the right to change the date or location of a course and to substitute instructors with equivalent qualifications if unforeseen circumstances arise. We recommend you NOT make non-refundable travel plans until the course date has been confirmed to you by e-mail (no later than 2 weeks before the course start date).

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Course 1: Process Safety Management (1-Day)

Recommended prerequisites: None. However, either this course or Course 2 is a recommended before attending Courses 4 through 9 (on various PSM elements). *For a more in-depth study, you should plan to attend Course 2.*

This course introduces the PSM architecture (written programs, roles and responsibilities, implementation including training, record keeping, and auditing). The course explores all 14 key elements (parts) of a comprehensive PSM program and how the overall architecture applies to each. Links between elements and integration with existing and sometimes overlapping current company policies (such as quality and reliability programs) are also discussed.

Typical Course Candidates:

- Managers – Operations, Safety and Executive
- Engineers – Process, Safety and Mechanical
- PSM Implementation Team Members – Anyone involved with implementation including operators, maintenance personnel, and purchasing agents
- Compliance Auditors
- Environmental Management and Technicians

What You Will Learn:

- Basic performance-based requirements of PSM standards
- Jargon for communicating PSM requirements to others throughout the organization
- Specific guidelines for developing written programs tailored for each PSM element
- How to avoid costly implementation mistakes
- For each element
    - How to begin implementation at your company
    - Additional training necessary for implementation of specific elements

Take Home:

- Comprehensive course notebook containing
    - Sources of PSM information
    - Comprehensive list of key PSM performance indicators
- Certificate of Completion
- 0.8 CEUs & 0.8 COCs

1-Day PSM, Course Outline (1-day, 8:00 a.m. to 3:30 p.m.)

Introduction to PSM

- Overview of PSM standards and regulations, summary, definitions, origins, goals

Elements of PSM:

- Employee Participation
- Process Safety Information
- Operating Procedures

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- Hot Work Permit/Safe Work Practices
- Training
- Contractors
- Process Hazard Analysis
- Management of Change
- Mechanical Integrity
- Pre-Startup Safety Review
- Emergency Planning and Response
- Incident Investigation
- Compliance Auditing
- Trade Secrets
- Management Commitment and Accountability

PSM programs – Developing, Implementing and Planning

Overview of Key Performance Indicators (KPIs) for PSM elements

More Information

This course is only offered as a private offering at a client's site. Please contact PII for details about having our training provided at your site.

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Course 2: Process Safety Management (3-Day)

Recommended prerequisites: None. However, this course is a recommended before attending Course 3: PSM Auditing.

This course provides an in-depth study of each PSM element. The course introduces each PSM element and the specific guidelines for integrating PSM element requirements into other corporate programs and evaluating program compliance throughout the implementation phase.

Case Studies – Case studies and exercises are used throughout the course to illustrate interpretations of the requirements and demonstrate ways to develop an effective PSM program, including several video based case studies.

Typical Course Candidates:

- Managers – Operations, Safety, and Executive
- Engineers – Process, Safety, and Mechanical
- PSM Implementation Team Members – Anyone involved with implementation, including operators and maintenance personnel
- Compliance Auditors
- Environmental Management and Technicians

What You Will Learn:

- To interpret the performance-based requirements of the U.S. OSHA PSM and EPA risk management standards, as well as learn about related industry standards
- The elements of process safety that are missing from typical PSM systems, including Human Factors elements (communication, human system interface, work environment, staffing, and fitness for duty), Facility Siting element, Project Risk Management, Senior Leadership & Accountability. The Risk-Based Process Safety (RBPS) guide (2007) from CCPS/AIChE is reviewed so you can understand how to close critical gaps
- Multiple options for implementing an effective need-specific program
- Specific guidelines for developing cost effective written programs tailored for each PSM element, whether for a single facility or a corporation
- How to avoid costly implementation mistakes
- Jargon for communicating PSM requirements to others throughout the organization
- For each element
  - How to develop written programs to meet PSM requirements
  - How to incorporate and integrate the PSM element requirements into other corporate programs (other corporate management systems)
  - Key performance indicators
  - How to evaluate program compliance throughout implementation
  - How to begin implementation at your company
  - Additional training necessary for implementation of specific elements
- The course uses actual and generic case studies, including several video-based case studies
  - To illustrate interpretations of PSM requirements
  - To demonstrate developing an effective PSM program that can be adapted for your facility

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Take Home:

- Comprehensive course notebook containing
    - Sources of PSM information, including examples of working PSM systems
    - Clarifications and interpretations of OSHA PSM standards
    - Comprehensive list of key PSM performance indicators and how to use them
- Certificate of Completion
- 2.1 CEUs & 2.1 COCs

3-Day PSM, Course Outline

Day 1 (8:00 a.m. - 5:00 p.m.)

- Introduction to PSM and its origins and goals
- Overview of PSM standards and regulations world-wide, definitions, compliance interpretations
- Elements of PSM:
    - Human error basics
    - Elements missing from most PSM systems, including specific human factor aspects, management commitment & accountability, and project risk management
    - Employee participation
    - Trade secrets
    - Process safety information
    - Operating procedures

Day 2 (8:00 a.m. to 5:00 p.m.)

- Elements of PSM (continued):
    - Hot work permit/safe work
    - Training
    - Contractors
    - Process hazard analysis
    - Management of change
    - Mechanical integrity
    - Pre-startup safety review

Day 3 (8:00 a.m. to 3:00 p.m.)

- Elements of PSM (continued):
    - Emergency planning and response
    - Incident investigation
    - Compliance auditing
- Key Performance Indicators, Leading Indicators, and Tracking
- Summary of roles and responsibilities
- Developing PSM programs, implementation planning
- *Course examination (optional)*

Course 2 Pricing for Public Offerings (per student):
$1,350.00 USD in USA
$1,995.00 USD in Bahrain and Dubai [UAE]

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Course 3: Auditing for Process Safety/Risk Management (2-Day)

Recommended prerequisites: A thorough understanding of the PSM and RMP regulations; for a refresher course on PSM, see Course 1. Others should take Course 2 and apply PSM for at least one year before becoming a PSM/RMP auditor.

This course covers every aspect of auditing from gathering data via records and interviews, keeping notes, report writing, and making recommendations. Using all rules and methods taught in class, the second day is a workshop to audit actual PSM practices in a real-time setting.

Typical Course Candidates:

- PSM Implementation Team Members – Anyone involved with implementation, including
    - Managers – Operations, Safety, and Executive
    - Engineers – Process, Safety, and Mechanical
    - Environmental Management
- Compliance Auditors

What You Will Learn:

- Auditing fundamentals to help you structure effective PSM/RMP audits
- How to apply PSM and RMP compliance auditing to your system
- How to design audits that have dual purposes: verifying compliance with regulations and identifying weaknesses in the design and implementation of PSM/RMP programs
- How to properly document audit results for compliance and for internal purposes
- Extensive exercises and workshops are used to illustrate how to effectively perform each phase of a PSM audit
- Gain hands-on experience in:
    - Reviewing PSM/RMP programs in an audit team environment with real-time constraints and the need for team member consensus
    - Writing specific, concise audit findings and observations
    - Auditing techniques, including interviewing skills

Take Home:

- Comprehensive course notebook containing auditing tools and resources
- Electronic copies of audit tools, allowing audit checklist/protocol customizations
- Certificate of Completion
- 1.3 CEUs & 1.3 COCs

Auditing for Process Safety/Risk Management, Course Outline

Day 1 (8:00 a.m. to 5:00 p.m.)

- Scope of the audit
- Audit techniques
- Gathering data from people – interviewing
- Keeping notes/records
- **Workshop: Interviewing**
- Gathering data from records – reviewing documentation

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- Gathering data from field observations
- **Workshop: Gathering, cataloging, and judging data**
- The audit report
- The audit process – planning the audit
- Audit follow-up and tracking

Day 2 (8:00 a.m. to 4:00 p.m.)

- Case Studies: Auditing the PSM/RMP system and its processes and products
  - Small teams will:
    - » Determine data needs
    - » Gather data (interview role-players, get data from company files, etc.)
    - » Use techniques taught in class to determine compliance with each element of PSM
    - » Judge compliance with your PSM standard
    - » Draft effective recommendations
  - Team presentations to class
- *Course examination (optional)*

Course 3 Pricing for Public Offerings (per student):
$1,100.00 USD in USA
$1,695.00 USD in Bahrain and Dubai [UAE]

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Course 4: Incident Investigator/Root Cause Analyst Training (3-Day)

Recommended prerequisites: Participants should have practical, technical experience in design, operation, or maintenance of complex systems. Individuals with good logic skills do best in this course. Course 10 is especially helpful, but not required.

This training teaches how to lead investigations and root cause analyses using various techniques such as Causal Factor Charting, Fault Tree Analysis and Root Cause Charts. This is a "How To" course designed to teach skills. An optional part of the course can include 1 to 2 hours of software instruction.

Typical Course Candidates:

- Engineers – process, process safety, and mechanical
- Operations and Maintenance Staff
- Process reliability staff and process quality control/assurance staff

You Will Learn:

- How to meet regulatory requirements for incident investigations
- How to develop and implement a structured program
    - Designed for learning from incidents
    - Why and how to define misses
    - How to train others to recognize and report incidents
    - Includes planning for trending of data
- How to initiate and conduct an investigation
    - Establishing an effective team quickly and methods for collecting different types of data, including effective interviewing skills
- How and when to apply causal factor and root cause analysis for investigating process and non-process incidents
    - Includes event and condition charting (causal factor charting)
    - Filling data gaps using fault tree logic
    - "5-Whys" technique for finding root causes
    - PII's Root Cause Chart™ for categorizing root causes
- How to develop appropriate recommendations to address root causes at various levels and how to structure reports
- Via actual industry examples and workshops, learn key points and practice your new skills

Take Home:

- Comprehensive course notebook containing
    - Root Cause Chart™ , industry examples and solutions, and a 65-page Root Cause Analysis Guide on the use of the Root Cause Chart™
- Electronic (PDF) copy of course notebook, including the Toolkit , Root Cause Chart™, and Free Excel worksheet for documenting causal factor charts and fault trees
- Certificate of Completion and 2.0 CEUs & 2.0 COCs

PROCESS IMPROVEMENT INSTITUTE
Risk and Reliability Specialists

3-Day Incident Investigator/Root Cause Analyst, Course Outline

Day 1 (8:00 a.m. to 5:00 p.m.)

- Basics of incidents and investigations
- **Workshop: Identifying near misses (near hits)**
- Initiating the investigation
- Gathering data
    - Basics
    - Gathering data from people
    - Gathering data from documentation, parts, and chemicals
- **Workshop: Identifying key data needs**
- Analyzing data for ALL causal factors
- **Workshop: Causal factor charting**

Day 2 (8:00 a.m. to 5:00 p.m.)

- Bridging gaps in data
- **Workshop: Using fault tree analysis to find all possible scenarios and determine the most likely one**
- Determining ALL root causes of each causal factor
- **Workshop: Identifying root causes using the "Root Cause Chart" technique**
- Developing conclusions and recommendations
- **Workshop: Conclusions and recommendations based on facts**
- Overview of results trending
- Preparing for the Case Study

Day 3 (8:00 a.m. to 3:30 p.m.)

- Case Study: Using all rules and methods taught in class to investigate actual incident in real-time setting. Small teams will:
    - Determine data needs
    - Gather data (interview role-players, get data from computer control systems, etc.)
    - Use causal factor charting and fault trees to analyze data and determine ALL causal factors
    - Use PII's Root Cause Chart ™ to determine the multiple root causes of each causal factor
    - Draft effective recommendations and make presentation to class
- *Course examination (optional)*

Course 4 Pricing for Public Offerings (per student):
$1,350.00 USD in USA
$1,995.00 USD in Bahrain and Dubai [UAE]

PROCESS IMPROVEMENT INSTITUTE
Risk and Reliability Specialists

Course 4-O: Incident Investigator/Root Cause Analysis Overview (1-Day)

Recommended prerequisites: None

This training provides a general background in how investigations and root cause analysis (RCA) are performed. It explains the importance of near miss reporting and investigation as a proactive tool to control risk before losses/harm occur.   This course is for anyone who needs a general understanding of investigations, including reporting of near misses and how to interview.

Typical Course Candidates:

- Operations and Maintenance Staff, process reliability, and process quality control/assurance staff who may be team members
- Managers who must ensure active participation on investigation and RCA processes

You Will Learn:

- How to meet regulatory requirements for incident investigations
- How and why to report near misses
- How to help a team gather data, especially interviewing of peers
- Overview of cause determination methods and overview of effective root cause determination methods
- How to develop appropriate recommendations to address root causes

Take Home:

- Comprehensive course notebook containing Root Cause Chart™
- Certificate of Completion and 0.7 CEUs & 0.7 COCs

1-Day Incident Investigator/Root Cause Analysis Overview, Course Outline

Day 1 (8:00 a.m. to 4:00 p.m.)

- Basics of incidents and investigations
- **Workshop: Identifying near misses (near hits)**
- Gathering data
    - Gathering data from people
- **Workshop: Identifying key data needs**
- Analyzing data for ALL causal factors
- Determining ALL root causes of each causal factor
- **Workshop: Identifying root causes using the "Root Cause Chart" technique**
- Developing conclusions and recommendations More Information

More Information

This course is only offered as a private offering at a client's site. Please contact PII for details about having our training provided at your site.

PROCESS IMPROVEMENT INSTITUTE
Risk and Reliability Specialists

Course 5: Writing Effective Operating and Maintenance Procedures (2-Day)

Recommended prerequisites: Participants should have practical, technical experience in design, operation, or maintenance of complex systems.

This course teaches how to write effective step-by-step operating procedures and how to develop troubleshooting guides from PHA documentation. This is very much a "How To" course, designed to teach skills. The first day of the course is for both operations and maintenance personnel; the second day is mainly for operators (since they typically must write more in-depth troubleshooting guides).

Typical Course Candidates:

- Senior Operations and Maintenance Technicians are the primary targets of this course, since they should write their procedures and take ownership of them (maintenance technicians need only to attend the first day)
- Engineers – Process, Safety, and Mechanical
- PSM and Quality Compliance Auditors

What You Will Learn:

- How to comply with regulatory requirements and quality control requirements for procedures
- How to perform detailed task analysis and writing step-by–step instructions
- How to assess current procedures for addressing best practice rules
    - This will be done in class, so bring procedures for review
- How to address operating limits and process deviations
- How to develop troubleshooting guides
- How to avoid common procedural errors that can reduce safety and quality levels, leading to incidents
- How to choose the best page layout/format for the goal of each procedure
- Learn 22 rules to help you write every step-by-step procedures effectively
- Learn where/when written procedures are required

Take Home:

- Comprehensive course notebook containing
    - Examples of acceptable procedural formats
    - Checklists for identifying missing procedures, gathering procedure information, formatting procedures, and writing step-by-step instructions
    - Completed workshops from class exercises, including typical solutions for each
- Electronic (PDF) copy of course notebook
- Certificate of Completion
- 1.3 CEUs & 1.3 COCs

PROCESS IMPROVEMENT INSTITUTE
Risk and Reliability Specialists

Writing Effective Operating and Maintenance Procedures, Course Outline

Day 1 (8:00 a.m. to 5:00 p.m.)

- What is an effective procedure?
  - Goals, general concepts, definitions
  - Overview of process for developing procedures
  - Procedure requirements: industry standards for quality & safety regulations
  - Introductory Workshop: Writing effective instructions for a simple task (shows ahead of time why effective procedure writing rules are critical)
- Formatting the procedures
  - Step-by-step formats; Use of white space; Step numbering
  - Document control features — headers and footers
  - Introductory items — procedure titles, sections, and section titles
  - Use of graphics/figures
  - Review of Formatting rules and why each is important
- Writing step-by-step instructions
  - Rules for writing the most effective instructions: Using commands; keeping it simple; being consistent; being precise; use of references
  - **Workshop: Improving a poor step-by-step procedure**
- Addressing Operating limits and deviations
  - Defining "operating limits," "deviations," and more
  - Identifying deviations that may occur, including errors of omission and errors of commission (for step-by-step procedures)
  - Defining procedural boundaries using conditional statements, warnings, and cautions (for step-by-step procedures)

Day 2 (8:00 a.m. to 3:30 p.m.)

- Addressing Operating limits and deviations (for continuous mode of operation)
  - Listing the triggers for process parameters where action is required
  - Identifying the worst case and more likely consequences
  - Developing troubleshooting steps (diagnosis steps, steps to prevent excursions, steps to correct excursions)
  - **Workshop: Developing a troubleshooting guide for continuous operating mode**
- Deciding what procedures are needed
- Gathering information for a procedure
  - When/why the procedure will be performed
  - Main steps, sub steps, details, hazards, precautions
  - **Workshop: Creating a procedure from basic information**
- Verifying, validating, and certifying procedures
- Overview of managing changes to procedures
- Overview of risk review of procedures
- *Optional Exam*

Course 5 Pricing for Public Offerings (per student):
$1,100.00 USD in USA
$1,695.00 USD in Bahrain and Dubai [UAE]

PROCESS IMPROVEMENT INSTITUTE
Risk and Reliability Specialists

Course 6: Mechanical Integrity (2-Day)

Recommended prerequisites: Participants should have practical, technical experience in maintenance of complex systems.

This course prepares you to evaluate your existing practices versus recognized codes and standards and then to efficiently improve or develop and implement your mechanical integrity (MI) program. Topics also include how to merge your MI program with a reliability program. To enhance the value of your training investment, plan to attend Course 6's companion course on writing effective maintenance procedures (Course 5).

Typical Course Candidates:

- Designated employee responsible for designing, developing, and implementing a PSM based MI program
- Engineers – Mechanical & Plant
- Managers – Plant Manager, Maintenance, and Production
- PSM Manager or Coordinators

What You Will Learn:

- Up-to-date MI strategies and techniques for effectively building and implementing a comprehensive MI program that addresses process safety management requirements and/or reliability and other concerns as defined through company, industry, and regulatory requirements
- Through lectures and case-study-based workshops, you will learn how to develop, implement, and maintain an efficient MI program. The experienced instructor guides you through building your own MI program regardless of the age, size, or complexity of the facility
- How to expand this program to encompass reliability and quality goals
- How to define and assign roles and responsibilities
- How to integrate your new or revised MI program with existing MI activities
- Develop an inspection and testing plan using your own equipment list or generic examples
- Quality assurance methods for identifying & resolving equipment deficiencies
- How to develop maintenance procedures and training programs for maintenance personnel
- How to develop a maintenance procedures list for your plant site

Take Home:

- An easily adaptable written MI program
- A comprehensive notebook covering all course topics
- Electronic (PDF) copy of course notebook
- A Certificate of Completion
- 1.3 CEUs or 1.3 COCs

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Risk and Reliability Specialists

Day 1 (8:00 a.m. to 5:00 p.m.)

- Introduction
    - Learning objectives, goals, and motivations for mechanical integrity (MI)
        » Regulations, standards, and interpretations
        » Relationship to Reliability programs
- Designing a mechanical integrity program
    - Minimal MI only for compliance or a fully integrated reliability program?
    - Something in-between?
    - **Workshop: Deciding in detail what you need your MI program to address (this sets the basis for later workshops and discussion)**
- Developing a mechanical integrity program
    - *Equipment identification and related issues*
        » List of critical equipment
        » Types of MI activities (reactive, proactive, preventive, predictive)
        » Choosing the right task type and choosing the specific task
        » Determining the right frequency for the task (condition or time dependent)
        » **Workshop: Starting the development of an inspection, test, and preventive maintenance (ITPM) plan**
    - *Personnel focus*
        » Procedures & Training
        » **Workshop: Completing the development of an IPTM plan by identifying written procedures and training needs for your mechanical integrity program**

Day 2 (8:00 a.m. to 3:30 p.m.)

- Developing a mechanical integrity program (continued)
    - *Management systems required and related issues*
        » Quality assurance; Equipment deficiency resolution; root cause analysis; management of change
        » **Workshop: Identifying gaps in your quality assurance plan and identifying additional needs for procedures and training**
- Implementing/Maintaining a mechanical integrity program
    - Review of detailed checklist for implementing an MI/reliability system
    - Documenting and managing data/results, computer systems and other equipment files
    - **Workshop: Customizing the detailed implementation checklist to your specific needs (optional)**
- Roles and Responsibilities for MI
- **Workshop: Identifying roles and responsibilities for your MI program**
- Key performance indicators for MI and continual improvement of a mechanical integrity program
- *Optional Exam*

Course 6 Pricing for Public Offerings (per student):
$1,100.00 USD in USA
$1,695.00 USD in Bahrain and Dubai [UAE]

PROCESS IMPROVEMENT INSTITUTE
Risk and Reliability Specialists

Course 7: Management of Change & Pre-Startup Safety Review (2-Day)

Recommended prerequisites: Participants should have practical, technical experience in design, operation, or maintenance of complex systems.

MOC is the element for which all other "foundation" elements of PSM are implemented. It is the PSM element that controls introduction of new risk. Recognizing change, analyzing the risk of each change, and handling small changes efficiently are just some of the barriers that managers face with MOC implementation. This 2-day course explores proven strategies for implementing a workable MOC system and customized approaches to fit your company's culture. It also shows how to implement physical and instrumentation changes through the proper use of pre-startup safety review (PSSR) systems, sometimes called operational readiness reviews (ORRs). Written examples of programs for addressing simple and complex changes are included in the course notebook.

Typical Course Candidates:

- PSM coordinators and HSE professionals
- Engineers, Technical Managers, and Supervisors
- Quality control managers and staff
- Most other operation, maintenance, reliability, and quality staff who are involved with designing, implementing, and evaluating MOC programs

What You Will Learn:

- Requirements of a complete MOC System
- What PSSR is and how it works and how it can be combined with MOC and mechanical integrity systems
- How to realistically control both small and large changes, minimizing employees' needs to bypass the system
- Simple frameworks for identifying and analyzing risks associated with a recommended change to help ensure the minimum losses to your company (this is the heart of any MOC system)
- Training needs and requirements for all levels of your organization necessary to make managing change a functional system.
- How to integrate all company systems for managing specific functional changes into one MOC system to handle PSM, HSE, quality control, reliability, and productivity changes; and learn why this integration is so important

Take Home:

- Training tools for teaching your employees to recognize the difference between a replacement-in-kind and a change (take home copies included)
- Copies of real MOC and PSSR written programs, forms, and checklists of risk review & PSSR questions
- Electronic (PDF) copy of course notebook
- A Certificate of Completion
- 1.3 CEUs or 1.3 COCs

PROCESS IMPROVEMENT INSTITUTE
Risk and Reliability Specialists

Day 1 (8:00 a.m. to 5:00 p.m.)

- Introduction
    - Learning objectives and overview of PSM
    - Overview of PSM
    - Overview of MOC and PSSR
    - **Workshop: Identifying which MOC failures led to a catastrophe**
- Recognizing or proposing changes
    - Review of basic definitions of replacement-in-kind (RIK) and not-replacement-in-kind (NRIK)
    - **Workshop: RIK vs NRIK Quiz**
    - **Workshop: Developing RIK and NRIK examples for your company**
- Initiating the change request
    - Who does what?
    - Initiating the change request form
    - Example of change request forms
- Reviewing the proposed change
    - Technical reviews and Risk reviews
    - **Workshop: Choosing the appropriate risk review method for a minor mechanical change**
    - **Workshop: Performing a risk review of a minor mechanical change**

Day 2 (8:00 a.m. to 3:30 p.m.)

- Reviewing the proposed change (continued)
    - **Workshop: Performing a risk review of a minor procedure change**
- Approving and implementing the change
    - Roles, responsibilities, and authorities
    - Tracking the change request through closure
- Pre-Startup Safety Reviews
    - Definitions and Style of PSSRs
    - Combining PSSR with other PSM or Reliability systems
    - **Workshop: PSSR Quiz**
    - **Workshop: Performing a PSSR for a minor mechanical change**
- Overall Roles and Responsibilities
- Managing the MOC/PSSR program(s)
    - MOC/PSSR scope decisions
    - Review of typical MOC Program in notebook
    - Review of typical PSSR Program in notebook
- Key Performance Indicators
- **Workshop: Implementation planning**
- *Optional Exam*

Course 7 Pricing for Public Offerings (per student):
$1,100.00 USD in USA
$1,695.00 USD in Bahrain and Dubai [UAE]

PROCESS IMPROVEMENT INSTITUTE
Risk and Reliability Specialists

Course 8: PHA Leadership Training (5-Day)

Recommended prerequisites: Course 1 or Course 2 is recommended unless student has equivalent experience. Course graduates will be capable of organizing, leading, and documenting PHAs of processes or for changes to processes (MOC risk review). Only those who will be leading and/or scribing PHAs or administering the PHA (risk review) program should attend. Courses 9, 10, and 11 are highly recommended after this course.

The risk review techniques most popular for initial PHAs of entire units or of large projects, MOC reviews, and PHA revalidations are hazard and operability (HAZOP) analysis and what-if/checklist. Both of these techniques facilitate systematic, imaginative searches for process hazards and potential operational difficulties. In this course, you will also learn how to use the failure mode and effects analysis (FMEA) method and you will learn how to use checklists of hazards to supplement your brainstorming analyses. You will learn the best situations and circumstances to use each technique. **This course is mostly workshops: You will lead and participate in several analyses to familiarize yourself with each technique.**

Typical Course Candidates:

- Process engineer or project engineer
- Operations supervisor
- PSM coordinator
- E, H, & S Managers & Engineers

What You Will Learn:

- How to perform a PHA to meet PSM requirements for initial PHAs and management of change analyses including these critical elements:
    – How to prepare for the PHA; Scope the PHA; Collect information; Select the team; Lead a meeting; Document results
- **How to analyze operating procedures for critical accident scenarios**
- How and when to apply HAZOP, FMEA, and/or what-if/checklist analyses methods to any process system in any industry

Take Home:

- A CD containing hazard evaluation software and manual (license not included; demo works for 15 days; a license can be obtained separately)
- Blank PHA analysis forms, generic PHA report, and a spreadsheet for estimating the labor and time requirements for doing a PHA
- Electronic (PDF) copy of course notebook
- A copy of the course notes and problem solutions
- A Certificate of Completion
- 3.1 CEUs and 3.1 COCs

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Risk and Reliability Specialists

Day 1 (8:00 a.m. to 5:00 p.m.)

- Introduction: Learning objectives; Overview of process safety management; Risk assessment concepts; Overview of PHA requirements
- Overview of risk review methods
    - Methods and their usefulness over the life cycle of a process; Making risk judgments; Human factors concepts and how to address human factors during hazard evaluations
- Preparing for the hazard evaluation (risk review or PHA)
    - Scoping the analysis; Choosing technique and level of detail and sections; Choosing the team members
    - Logistics and procedures for pre-meeting, meeting, and post-meeting tasks
- What-if/checklist technique
    - **Workshop: What-if/checklist review of continuous process (instructor-led)**

Day 2 (8:00 a.m. to 5:00 p.m.)

- **Workshop: What-if/checklist review of a continuous process (student-led)**
- HAZOP technique
    - **Workshop: HAZOP review of a continuous process**
- Analysis documentation, results, and follow-up
    - **Workshop: HAZOP review of a continuous process (continued)**

Day 3 (8:00 a.m. to 5:00 p.m.)

- **Workshop: HAZOP review of a continuous process (continued)**
- HAZOP/what-if techniques for analyzing procedures and batch processes
    - **Workshop: HAZOP/what-if reviews of batch processes & procedures**

Day 4 (8:00 a.m. to 5:00 p.m.)

- **Workshop: HAZOP/what-if reviews of batch processes & procedures**
- Failure Mode Effect Analysis (FMEA)
    - **Workshop: FMEA of a critical auxiliary system**

Day 5 (8:00 a.m. to 2:00 p.m.)

- Checklist analysis as supplements to brainstorming methods
    - **Workshop: Using Checklists after brainstorming methods**
- **Workshop: Estimating the schedule & labor required to perform a PHA**
- **As time allows, additional workshop: more HAZOP/what-if reviews**
- Software Training – Does NOT include a license to the software
- **Workshop: How to use software to prepare for and document hazard evaluations/risk reviews**
- *Certification exam (optional)*

Course 8 Pricing for Public Offerings (per student):
$2,500.00 USD in USA
$2,995.00 USD in Bahrain and Dubai [UAE]

PROCESS IMPROVEMENT INSTITUTE
Risk and Reliability Specialists

Course 8-O: PHA Overview Training (1 Day)

Recommended prerequisites: None

This training provides general background in how process hazard analyses (PHAs) are performed. It explains the importance of PHAs for existing plants and PHAs/hazard reviews for changes to processes. This course is for anyone who needs a general understanding of PHAs.

Typical Course Candidates:

- Operations and Maintenance Staff, process reliability, and process quality control/assurance staff who may be team members
- Managers who must ensure active participation in PHA and hazard reviews

You Will Learn:

- How to meet regulatory requirements for PHAs
- Overview of team meetings and team member responsibilities
- Overview of hazard review methods
- Overview of making risk judgments in team settings
- Overview of how to develop effective recommendations and how to effectively resolve recommendations

Take Home:

- Comprehensive course notebook
- Certificate of Completion and 0.7 CEUs & 0.7 COCs

1-Day PHA Overview, Course Outline

Day 1 (8:00 a.m. to 4:00 p.m.)

- Basics of PHAs and other related hazard reviews required over the life of a process
- Overview of team meetings and team member responsibilities
- Video: Typical team meeting
- Overview of risk review methods
- Workshop: What-if analysis of a simple system
- Overview of making risk judgments in team settings
- Overview of how to develop effective recommendations and how to effectively resolve recommendations

More Information

Schedule:
This course is only offered as a private offering at a client's site. Please contact PII for details about having our training provided at your site.

PROCESS IMPROVEMENT INSTITUTE
Risk and Reliability Specialists

Course 9: Updating and Revalidating Process Hazard Analyses (2-Day)

Recommended prerequisites: Previous training in leading PHAs, such as completion of Course 8, as well as experience in leading PHAs of entire units.

This course prepares you to execute a PHA revalidation that complies with PSM regulations and industry standards. PHAs usually must be updated and revalidated every 5 years. Several factors determine the extent of the revalidation analysis, including the quality of your previous PHAs and its documentation, process and facility changes, incidents during the past 5 years, and new interpretations of codes and standards. In some cases a complete "redo" may be required if the previous PHA quality and documentation did not meet your standards or regulatory requirements.

Typical Course Candidates:

- Anyone who wants to understand how to decide on an appropriate approach for PHA revalidations and/or lead PHA revalidations should consider attending. Though this course is primarily for PHA leaders, anyone with the following background will also find the coursed valuable:
    - Process engineer
    - PHA element coordinator/manager/owner
    - PSM coordinator and auditors
    - E, H, & S Managers & Engineers

What You Will Learn:

- Options and requirements for leading a team through a revalidation process that satisfies PSM requirements and utilizes the best approach for your company
- Resource requirements for performing a revalidation
- Preparation, execution, and documentation steps to meet company's goals, streamline future analyses and to produce a functional report useful to many
- Experience in leading and documenting PHA revalidations through workshops
- Factors to determine the appropriate revalidation approach
- How to address previous PHA deficiencies
- How to identify improvements in operating procedures, training, and preventive maintenance through the revalidation process

Take Home:

- A revalidation decision tree (flowchart) to assist you in choosing the right revalidation approach for your facility
- A copy of the course notebook
- A Certificate of Completion
- 1.3 CEUs and 1.3 COCs

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Day 1 (8:00 a.m. to 5:00 p.m.)

- Learning objectives and goals of revalidation
- Overview of PSM requirements for PHAs and Revalidations
    - Terms and definitions
    - Determining your goals (minimal compliance versus meeting the needs of procedure writers, trainers, and equipment reliability departments)
- Gathering required information
    - Previous PHA report and recommendation closure documents
    - Incident reports since previous PHA cycle
    - MOC records
    - Current P&IDs and P&IDs as existed during previous PHA cycle
    - Current SOPs and SOPs as existed during previous PHA cycle
    - **Workshop: Review of previous versus current documents to determine if MOC has worked adequately**
- Assessing the previous PHA report and other data
    - **Workshop: Compliance/Quality review of an example PHA**
- Considering "lessons learned"
- Defining the revalidation approach
- **Workshop: Choosing the revalidation approach (for an example PHA and set of gathered data)**

Day 2 (8:00 a.m. to 3:30 p.m.)

- Conducting the revalidation
- **Workshop: Revalidating a PHA (multiple examples)**
- Documenting the revalidation
- **Workshop: Revalidating a PHA (multiple examples)**
- *Certification examination (optional)*

Course 9 Pricing for Public Offerings (per student):
$1,100.00 USD in USA
$1,695.00 USD in Bahrain and Dubai [UAE]

PROCESS IMPROVEMENT INSTITUTE
Risk and Reliability Specialists

Course 10: Preventing Human Errors (2-day version; can also be condensed to 1-day)

Recommended prerequisites: None. However, this course is an excellent supplement to several other courses, particularly Course 4: Incident Investigation/RCA Leadership and Course 8: PHA Leadership and Course 7: MOC & PSSR. All the issues covered in these three courses depend heavily on understanding how and why humans make mistakes.

Human error is widely acknowledged as the major cause of quality, production, and safety risks in many industries. This course explains the underlying reasons why humans make mistakes and how you can prevent these mistakes. Although it is unlikely that human error will ever be completely prevented, there is growing recognition that many human performance problems stem from a failure within organizations to develop an effective policy for managing human reliability.

The course will provide hands-on experience of practical error reduction techniques, using real-life case studies. You will also gain an understanding of the underlying causes of human error and how to reduce its occurrence by changing the culture of the organization and changing the design of the processes. **Workshops are used throughout the course to illustrate concepts and to demonstrate human error analysis applications.**

Typical Course Candidates:

- Managers – Operations, Safety, and Executive; and Production Supervisors
- Training Managers
- Engineers – Process, Safety, and Mechanical
- PSM Coordinators and Managers
- PHA (hazard review) Leaders and Incident Investigators

What You Will Learn:

- Why human error is a factor in all accidents
- Why humans make mistakes and proven error prevention techniques
- How to analyze and identify human errors and the conditions and situations that cause them
- How weak policies and procedures in areas of human resources, training, management, communication, and workplace design cause human errors
- How to improve and optimize procedures, workplace design, process design, and more to improve human performance

Take Home:

- Comprehensive course notebook containing
    - Checklists and worksheets for several human error analysis techniques
    - Industry examples
- Certificate of Completion
- 1.3 CEUs & 1.3 COCs (2-day version) or 0.7 CEUs & 0.7 COCs (1-day version)

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Preventing Human Errors, Course Outline

(*NOTE:* Various video-based Case Studies, not shown below, *are used throughout the course to illustrate concepts and to demonstrate human error analysis applications.*)

Day 1 (8:00 a.m. to 3:00 p.m.)

Introduction to Human Error
- Learning objectives and goals of human error prevention
- What is human error and human error analysis?

Understanding Human Error:
- Errors and their relationship to loss events
- Which is most important: Management system deficiencies or personal behavior?
- Types of human error
- **Workshop: Classifying Human Errors**
- Modeling human behavior (an example of a simple model that works is used throughout the course)
- Elements associated with understanding and controlling human error
- **Workshop: Relating Human Error to Human Factor Influences**

Statistical Lower Limit of Human Error Rate and Quantitative Importance of Each Human Factors
- Error rates under various job/task design/settings
- Dependent (common cause) error rates
- Quantitative importance of each human factor
- **Workshop - Demonstrate a couple of human error probability estimates**

Common Human Error Prevention Techniques (Case Studies and Videos throughout)
- Management leadership/Culture
- Fitness for Duty
- Knowledge and Skills
- Task design versus Human Capability
- Procedures and other written reference documents (emphasis on rules for reducing human errors by content accuracy and format/presentation clarity)
- Tools and Equipment (making these fit for humans)
- Human-System Interface (introduction to error proofing)

Day 2 (8:00 a.m. to 3:00 p.m.)

Common Human Error Prevention Techniques (Case Studies and Videos throughout) - *continued*
- Task Environment
- Communication (control of errors from miscommunication; verbal and signals)
- Management systems for prediction and control
  - PHA
  - II/RCA
  - MOC
  - MoOC
- **Workshop - Split into small teams and use a human factors checklist to review various process areas and control rooms**

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Error-Proofing Methods - *NEW Course section*
- Error Recovery and Error-Proofing methods
- Application and expected values of Specific Error-Proofing methods
- Review Common Error Proofing methods (review Blue Book)

Techniques for Predicting and Analyzing Human Error
- Checklist Analysis: For situational and for management system related errors
- Guideword-based analysis (HAZOP, Job Hazard Analysis, etc.)
- Quantitative Human Reliability Analysis
- **Demonstration: Using 2 Guide-Word Analysis of procedure at IBN SINA**

Behavior/Habits
- What controls human behavior (T-H-O theory and analysis)
- Implementation strategies for controlling undesired behaviors
- **Workshops: STAR (Specific Task Action Reporting)**

Management, Leadership, and Culture
- How leadership shapes the control of human error control
- Getting Near Misses Reported
- Delegation of risk control roles

Workshop: Planning Your Path Forward

Course 10 Pricing for Public Offerings (per student):
$1,100.00 USD for 2-day version, USA
$1,695.00 USD for 2-day version, in Bahrain and Dubai [UAE]

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Risk and Reliability Specialists

Course 11: Layer of Protection Analysis (LOPA)

Recommended prerequisites: Attendees should have strong technical skills and prior training in qualitative hazard evaluation techniques; prior completion of Course 8: Process Hazards Analysis Leadership or equivalent is highly recommended.

Are proposed or existing combinations of safeguards enough to prevent an accident or mitigate the consequences? Do you perceive that doing a fully quantitative risk assessment (QRA) would be over-working the problem? Then Layer of Protection Analysis (LOPA) is the new tool you need to learn. LOPA combines both qualitative and quantitative elements of hazard evaluation and risk assessment to analyze and judge the adequacy of existing or proposed safeguards against process deviations and accident scenarios. A key to the success of LOPA is its rules for judging if protection layers are truly independent. Because of these rules, LOPA helps the analysts make consistent judgments of if the risk of scenarios are "as low as reasonably practical (ALARP)". This "How To" course is taught by one of the principal authors of the AIChE/CCPS book, *Layer of Protection Analysis (2001)*. ***Workshops are used as the primary mode of teaching each aspect of LOPA. You will perform several complete LOPA before leaving class.***

Typical Course Candidates:

This course is designed for **experienced PHA/HAZOP leaders**. Other individuals with a strong technical background (such as engineers and scientists) may attend:

Managers of Operations, Safety; Project Managers; Engineers – Process, Safety, and Mechanical; PSM Coordinators and Managers

What You Will Learn:

- When and how to use LOPA and How to systematically create risk scenarios
- How to establish risk acceptance (risk tolerance) criteria for use within your company (this is also called development of ALARP criteria)
- How to calculate "as-is" risk for a cause-consequence pair:
    - Estimate the frequency of the initiating event and estimate consequence
- What is meant by "independence" and "uniqueness" with respect to IPLs
- How to use LOPA to determine the Safety Integrity Level (SIL) necessary for an instrument IPL (to comply with the requirements of IEC 61508/61511)
- How other companies worldwide use LOPA to:
    - Decide which PHA/HAZOP recommendations to reject and which to accept
    - Focus limited resources within mechanical integrity departments and operations on what is critical to manage risk to ALARP
    - Avoid wasting resources on quantifying risk using QRA methods
    - Perform specialized risk modeling for facility siting questions

Take Home:

- Comprehensive course notebook containing: Examples of risk acceptance and judgment protocols & Industry examples and solutions to all LOPA workshops
- Certificate of Completion and 1.4 CEUs & 1.4 COCs

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Risk and Reliability Specialists

Day 1 (8:00 a.m. to 5:00 p.m.)

Introduction to LOPA
- Learning objectives and goals of using the LOPA technique
- What is LOPA? How is LOPA applied? Definitions? When is LOPA used?

Developing LOPA Scenarios
- Selecting candidate scenarios from brainstorming hazard evaluations
- Scenarios from design questions and from incidents

Estimating the Consequence of the Scenario
- Using a look-up table of consequence; Developing a consequence look-up table for your company; Alternative methods for estimating consequences
- **Workshop 1: Estimating the consequence of a scenario (part of a continuing example)**

Estimating the Likelihood of the Selected Initiating Event
- Using a look-up table of initiating event categories and frequencies
- How to develop an initiating event look-up table for your company
- Addressing enabling conditions and time-dependent initiating events
- **Workshop 1: Estimating the frequency of an initiating event of a scenario (part of a continuing example)**

Estimating the Probability of Failure of Independent Protection Layers
- Definitions, rules, and exceptions for giving credit for an independent protection layer (IPL); Using a look-up table of IPL categories and probability of failure on demand (PFOD); How to develop an IPL look-up table
- **Workshop 1: Deciding which safeguards are valid IPLs and estimating the PFOD of the valid IPLs (part of a continuing example)**

Calculating the Risk
- Using a standardized LOPA worksheet; Rules for calculating risk for an individual scenario (LOPA); Rules for summing risk of related scenarios
- **Workshop 1: Calculating the risk of a LOPA scenario (part of a continuing example)**

Day 2 (8:00 a.m. to 3:30 p.m.)

Judging the Risk
- Examples of risk tolerance criteria from the industry
- Development and implementation of a company risk tolerance criteria
- **Workshop 1: Judging the risk of a LOPA scenario (cont. example)**

Case Studies
- **Workshop 2: Performing LOPA from beginning to end for a scenario**
- **Workshop 3: Performing several LOPA, beginning with a set to HAZOP tables and deciding which scenarios need LOPA**

Special Applications of LOPA
- Using LOPA for facility siting questions; Selecting the SIL for an interlock
- **Workshop 4: Estimating the composite risk for facility siting**

Planning your path forward with LOPA

Course 11 Pricing for Public Offerings (per student):
$1,200.00 USD in USA
$1,795.00 USD in Bahrain and Dubai, [UAE]

PROCESS IMPROVEMENT INSTITUTE
Risk and Reliability Specialists

Course 12: Safety Integrity Systems (SIS & SIF & SIL)

Recommended prerequisites: Attendees should have strong technical skills and prior training in PHA/HAZOP and LOPA for determining SIL requirements; prior completion of Course 11: Layer of Protection Analysis (LOPA) or equivalent is highly recommended. Students should also have good understand of process engineering and instrumented controls.

Are you involved in determining SIL levels or designing SIS? Do you think that too many SIS (or too high of SIL ratings) are being recommended for your site? Do you just want to understand what SIS are and where they fit in to control risk and how these are specified, designed, installed, and maintained? Do you want to know how human error dominates the ACTUAL performance in the field of installed SIS? Then this is the course for you.

This course explains SIS from the ground up and explains how these have replaced the definitions of emergency shutdowns (ESDs) and how they different from basic process control systems, such as a DCS. This course differs from others in that you *will also learn the state of the art in SIL Verification (and Design) calculations, including how to account for systemic errors caused by human error*; these can dominate the failure rate for SIL 2 and SIL 3 systems.

This "How To" course is taught by one of the principal authors of the AIChE/CCPS two books, *Layer of Protection Analysis (2001)* and *Initiating Events and Independent Protection Layers (IPLs) (2011)*. The instructor is also working with the ISA TR 84.00.04 committee for developing and recommending methods for SIL Verification. The course covers all aspects of how to apply this very useful technique. *Workshops are used as the primary mode of teaching for SIF design and SIL Verification. You will perform several complete SIL Verifications before leaving class.*

Typical Course Candidates:

This course is designed for those needing to learn what SIS are, and especially those wanting to learn how to verify SIL design and install and validate SIS/SIL. The course workshops focus mostly on SIL verification and design. The coverage of SIL determination is minimal since Course 8 and Course 11 cover this topic in topic in detail. Consider taking this course in conjunction with Course 11, LOPA. Those who may benefit from this course include:
- Managers – Operations, Safety
- Project, Engineering, and Technical Managers
- Engineers – Instrumentation, Electrical, Process, Safety, and Mechanical
- Technicians/Specialist - instrumentation

PSM Coordinators and Managers

What You Will Learn:

- History of SIS
- What is a safety instrumented function (SIF) and safety integrity level (SIL)
- How to determine if a SIF is needed or not, and especially learn if the other independent protection layers are sufficient for controlling risk to as low as reasonably practical (ALARP). *NOTE: other courses will teach you methods that OVER SPECIFY the need for SIS; this course teaches you the unbiased way to determine the proper number of SIF and proper SIL for each.*

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- Minimal requirements from international SIS standards such as ANSI/ISA 84 and IEC 61511 (and the basics of 61508). But, also learn the industry best practices behind and beyond these standards.
- How to specify and design SIS to meet the required functions and SIL.
- How to verify the SIL for a design
- Requirements for installation and validation of the SIS
- Requirements for ongoing inspection, testing, and maintenance of SIS, including ongoing proving of the SIL.

Take Home:

- Comprehensive course notebook containing industry examples and solutions to all SIL Verification and Design workshops
- Certificate of Completion
- 1.4 CEUs & 1.4 COCs

Safety Integrity Systems, Course Outline

Day 1 (8:00 a.m. to 5:00 p.m.)

Introduction to SIS
- Learning objectives and goals of using SIS
- History of SIS and basic definitions
- Where does SIS fit with other ways to control process risk?
- Relationship of SIS to ESD and basic process control systems (BPCS), such as field PLCs, relays, and DCS
- What are safety integrity levels (SILs) and what are the basic requirements for SIL 1, 2, & 3
- Lifecycle of SIS
- Overview of related international standards, ANSI/ISA 84 and IEC 61511 (and 61508)
- Overview of human factors and the impact of human error on SIS. *Note: No other SIS course covers this all-important topic.*

Determining if a Safety Instrumented Function (SIF) is needed and if so, what SIL is needed.
- Evaluating all IPLs using qualitative (brainstorming) hazard evaluations methods (such as HAZOP), semi-quantitative methods (such as LOPA and Risk Graphs), and quantitative methods (such as fault tree analysis)
- Determining the risk reduction to allocate to the SIF (if any), which in turn specifies the SIL
- **Workshop 1: Determining the need for SIF and the related SIL from a HAZOP report**

Specifying the SIF and Designing the Related SIS.
- Determining the process requirements, such as how the process will be brought to safe state, in what order of steps, and with what delays, and also how the process will be restarted after a trip.
- Using the process requirements to develop the Safety Requirements Specification (SRS)

Designing the SIS to meet the required SIL
- Basic reliability terms (such as failure rates, MTTF, MTTR, and MART) and limitations of reliability data
- Basic reliability equations and converting between failure rates and probability of failures on demand (PFD)
- Options for improving SIL rating of a base design, including use of redundancy, changing test intervals, changing reliability of base components, and reducing chances for systemic errors (especially human errors)
- **Workshop 2: Basic SIL calculations**

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Day 2 (8:00 a.m. to 3:30 p.m.)

Designing the SIS to meet the required SIL (continued)
- **Workshop 3: Using redundancy to improve SIL rating**
- **Workshop 4: Using shorter test intervals to improve SIL rating**

Estimating the PFD of a SIF to Verify the SIL.
- Definitions, rules, and exceptions for determination of SIL
- Using a look-up tables of reliability data and PFDs
- Calculations using simple equations
- **Workshop 5: Extending calculations on Workshops 3 and 4 to include systemic failure probability and Human Error Probability** *Note: No other SIS course covers this all-important topic of the LARGE impact of human error probability on the actual PFD expected in the field*
- Calculations using other methods, such as Fault Tree and Markov analyses

SIS fabrication, installation, and startup
- Issues for fabrication and vendor qualifications
- Installation issues, especially related to maintainability and survivability and limit common cause failures
- Startup and initial validation test, leading to site acceptance test (SAT)

SIS maintenance and proof testing (validation) for the life of the SIS
- Maintenance planning and procedures
- Proof testing and record-keeping requirements for ongoing SIL Validation

Case Studies
- Industry example of SIS and issues with each
- Specialized SIS designs: HIPPS, Burner Management Systems (BMS)
- **Workshop 6: Pulling it all together from beginning to end**

Planning your path forward with SIS

Course 12 Pricing for Public Offerings (per student):
$1,200.00 USD in USA
$1,795.00 USD in Bahrain and Dubai [UAE]

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Course 13: Job Safety Analysis (JSA) – 4-6 hours per Session

Recommended prerequisites: None

In this course, you will learn the basics of the performing a Job Safety Analysis (JSA), which is a proven process for controlling operating hazards and costs. You will get a step-by-step overview of the process, and define your role in making it effective.

Through lecture, demonstrations, and workshops, you'll learn how to develop and manage a JSA program in your workplace. You'll also learn how to enlist participation from line employees, supervisors, and upper management. The result: Better processes make a safer workplace - and that means improved production and higher profits.

Who should attend?

- This course is for anyone involved in operations and maintenance that needs to know how to perform JSAs of new or existing tasks.
- In addition, full-time safety practitioners, safety committee members, safety coordinators, safety specialists, human resources, safety managers, loss control managers, and operations managers can benefit from this course

There is a maximum of 15 students per 4 to 6 hour session.

Take Home:

- Comprehensive course notebook containing: Checklists of JSA and JHA issues information, Example forms; blank and filled-in
- Certificate of Completion; 0.4 to 0.7 CEUs & 0.4 to 0.7 COCs

Job Safety Analysis, Course Outline

Day 1 (4 to 6 hour per session)

- Overview of JSA:
    - Understanding JSAs and when to do them
    - JSA terminology
- Understanding JSA's relation to continuous improvement in your organization
- Identify the key requirements for a successful JSA
- Recognize the hazards inherent in task performance
- Develop appropriate solutions and hazard controls
- Example management system
- **Workshop: Complete a JSA for example at your site (or using standard examples in course) to reduce personal injuries and operating costs (repeated 2 or 3 times, as time permits)**

More Information

This course is only offered as a private offering at a client's site. Please contact PII for details about having our training provided at your site.

PROCESS IMPROVEMENT INSTITUTE
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Course 14: Human Error Prevention – For Workers (1 to 3 days, depending upon needs)

Recommended Prerequisites: None

In this course, the workers (hourly workers such as operators, technicians, lab personnel, etc.) learn the basics of what causes humans (them) to be more likely to make mistakes and what they can do to prevent errors. It also briefly reviews the role that management actions play in preventing human error. The student leaves with checklists and practice in identifying error-likely situations in the workplace. This course is best in 3-day format with JSA and STAR as modules comprising 1.5 of the 3 days. For the basics on human error prevention only, 1 to 1.5 days is sufficient.

Who should attend?

- This course is for anyone involved in operations, maintenance, lab, utilities, and other support areas to a process, with direct hands-on responsibilities.
- In addition, full-time safety practitioners, safety committee members, safety coordinators, safety specialists, human resources, safety managers, loss control managers, and operations managers can benefit from this course

There is a maximum of 15 students per 1 to 3 day sessions.

Take Home:

- Comprehensive course notebook containing: Checklists of Human Error causes
- Certificate of Completion; 0.7 to 2.1 CEUs & 0.7 to 2.1 COCs

Human Error Prevention – For Workers, Course Outline

1 to 1.5 Days (unless coupled with JSA and STAR, as recommended)

- Overview of Human Error and Human Error Causes
- Categories of Human Error Causes
    - Review of each cause in each category
    - Examples from actual industry settings of good and bad designs/systems
    - Examples of how to identify and reduce the causes
- Human Error Cause Prediction and Identification Methods
- **Workshops: Many hands-on workshops and exercises in determining and addressing the causes of human error (throughout the course)**

NOTE: This course is BEST offered in a 3-day setting that combines Course 13: *JSA* **and Course 15:** *STAR* **to give the workers several tools they can use immediately to prevent human error at their worksites.**

More Information

This course is only offered as a private offering at a client's site. Please contact PII for details about having our training provided at your site.

PROCESS IMPROVEMENT INSTITUTE
Risk and Reliability Specialists

Course 15: Specific Task Action Reporting (STAR) - (1-day Worker course). *Note: A ½-day to 1-day Manager's Course is also available upon request.*

Recommended prerequisites: None

In this course, workers learn why and how to perform observations and coaching of their peers in the workplace. The method, called "Specific [sometimes Safety is substituted for Specific] Task Action Reporting (STAR)," attacks bad habits directly, which are the most stubborn forms of human error causes to eliminate. STAR is based on the principle of reinforcing good behavior frequently and positively, while encouraging changes to poor habits in a coaching setting by peers (reducing the negative aspect of correction of bad habits). This method has a 70% success rate in reducing errors caused by bad habits.

Who should attend?

- This course is for anyone involved in operations, maintenance, lab, utilities, and other support areas to a process, with direct hands-on responsibilities.
- In addition, full-time safety practitioners, safety committee members, safety coordinators, safety specialists, human resources, safety managers, loss control managers, and operations managers can benefit from this course

There is a maximum of 15 students per 1 day session.

Take Home:

- Comprehensive course notebook containing STAR forms and workshops
- Certificate of Completion; 0.7 CEUs & 0.7 COCs

Specific Task Action Reporting (STAR) – For Workers, Course Outline

1 Day (unless coupled with JSA and Human Error Prevention, as recommended)

- Overview of Human Error and Human Error Causes
- How and Why we form Bad Habits and system for changing habits (THO analysis)
- STAR Method:
  - Developing inventory of undesired habits (behaviors)
  - Technique for observation
  - Closing the distance (coaching) to reinforce good habits & change poor habits
  - Documentation and score keeping
  - Example management system
- **Workshops: Many hands-on workshops and exercises in developing and performing and managing STAR (throughout the course)**

NOTE: This course is BEST offered in a 3-day setting that combines Course 13: *JSA* and Course 14: *Human Error Prevention* to give the workers several tools they can use immediately to prevent human error at their worksites.

More Information

This course is only offered as a private offering at a client's site. Please contact PII for details about having our training provided at your site.

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Course 16: Behavior-Based Safety - (2-day Overview Course). Note: A 1- to 2-day Worker's Course is also available upon request.

Recommended prerequisites: None

This course will provide insight into current knowledge of human error and how it can be reduced. The course focuses on human errors related to undesired behaviors (habits), what causes these, and how to effectively remedy these. This topic has been taught in various forms since its inception at Georgia Tech more than 30 years ago; you will receive the most up-to-date approaches in this course. You will learn in general what leads to negative behavior and how to prevent or correct these behaviors. You will learn specific approaches/tools you can put to use in your facilities for controlling behaviors/habits on a day-to-day basis. But to keep the topic of habits/behaviors in perspective, the course also includes a brief overview of all aspects of controlling human error, not just those related to behaviors or habits. NOTE: This course "contains" *Course 15: STAR*.

Who should attend?

- This course is for anyone involved in operations, maintenance, lab, utilities, and other support areas to a process, with direct hands-on responsibilities.
- In addition, full-time safety practitioners, safety committee members, safety coordinators, safety specialists, human resources, safety managers, loss control managers, and operations managers can benefit from this course.

There is a maximum of 15 students per course.

What You Will Learn:

- Why human error is a factor in all accidents
- Why humans make mistakes and an overview of proven prevention techniques
- The basics of how others analyze and identify human errors and the conditions and situations that cause them
- How weak and deficient policies and procedures in areas of human resources, training, management, communication and workplace design can lead to human errors
- The basic so of how to improve and optimize procedures, workplace design, process design and more to improve human performance
- The most useful theories for understanding why humans develop habits
- The basics of how to improve habits and correct bad habits
- Tools/activities for improving habits/behaviors
- Management systems for improving and maintaining habits/behaviors

Take Home:

- Comprehensive course notebook containing
    - Checklists and worksheets for several human error analysis techniques
    - Industry examples
    - STAR forms and workshops
- Certificate of Completion; 1.4 CEUs & 1.4 COCs

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Behavior-Based Safety, Course Outline

Timing – 8:00 a.m. to 5:00 p.m.; for 2 days

Introduction to Human Error
- Learning objectives of course; Goals of human error prevention

Understanding Human Error:
- Errors and their relationship to loss events
- Which is most important: Management system deficiencies or personal behavior?
- Types of human error
- Modeling human behavior (an example of a simple model that works is used throughout the course)
- Elements associated with understanding and controlling human error

Behavior Science and Improving Human Behavior: (70% of the class-time will be allocated to this topic in the public course; the time can be allocated differently in a private course)
- What controls human behavior (T-H-O theory and analysis)
- Identifying an inventory of key undesirable behaviors
- Applying T-H-O to undesired behaviors to identify how to correct bad habits
- Implementation strategies for controlling undesired behaviors
- **Case Studies**
- **Workshops:** STAR (Specific Task Action Reporting)

Common Human Error Prevention Techniques
- Information Presentation Rules (procedures, trainers, communication, signs, etc.)
- Process/Operation/Workplace Design Rules
- Information Presentation Rules (procedures, trainers, communication, signs, etc.)
- Process/Operation/Workplace Design Rules
- Other General Rules
- **Selected Exercises**
- Overview of Techniques for Predicting and Analyzing Human Error

NOTE: This course is BEST offered in a 3-day setting that combines Course 12: *JSA* and Course 13: *Human Error Prevention* to give the workers several tools they can use immediately to prevent human error at their worksites.

More Information

This course is only offered as a private offering at a client's site. Please contact PII for details about having our training provided at your site.

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Course 17: Selecting the Right Manufacturing Improvement Tools (1- or 2-Day)

Recommended prerequisites: None.

At the latest count there were some one hundred tools for improving manufacturing performance. At times the selection process can be overwhelming. At other times, a tool is selected, and gains are achieved, only to disappear within a year or two. How do we know what improvement tool is best suited for our organization? How do we know when to apply it? What are some of the fundamental issues we must address, regardless of the tools selected? This seminar is designed to enable you to relate your circumstances and issues to the tools and techniques, so that you can best decide which are relevant for you. It will help you select the right tools, at the right time, for the right problem, and then sustain the improvement achieved.

Typical Course Candidates:

- Managers – Production, Maintenance and Executive
- Engineers – Reliability, Process, Safety
- Support Staff
- Anyone who leads or influences the direction and success of manufacturing plants

What You Will Learn:

- Foundational Elements for Manufacturing Excellence
- How to select the right improvement areas
- Specific guidelines for developing written programs tailored for each PSM element
- How to avoid costly defects
- The tools learned will include: Lean Manufacturing, Six Sigma, Kaizen, TPM, Supply Chain Management, RCM, Predictive Maintenance, and Root Cause Analysis
- For each tool:
  - Individual tool strengths, weaknesses, where and when they work best, when they might not work, how to align the organization for their use, and so on
  - Additional training necessary for implementation of specific tools

Take Home:

- Comprehensive course notebook containing
  - Training material on all the tools included in the course
  - Take home appendices and workshops
- Certificate of Completion
- 0.7 CEUs & 0.7 COCs

Selecting the Right Manufacturing Improvement Tools, Course Outline (1-day, 8:00 a.m. to 4:30 p.m.)

Overview of Manufacturing Business Excellence:
- Overview of manufacturing excellence; low cost producer profile
- The Reliability process for manufacturing excellence
- Leadership principles
- Change Management

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The Tools:
- Business Level FMEA – Selecting the right improvement projects and tools
- Lean Manufacturing
- Kaizen
- Total Productive Maintenance (TPM)
- Six Sigma
- Supply Chain Management
- Reliability Centered Maintenance (RCM)
- Predictive Maintenance
- Root Cause Analysis

Appendices:
- OEE as a Means of Measuring and Managing Waste
- Business Level FMEA – Case Studies
- Performance Measurement Cascade
- Maintenance Planning and Scheduling
- Quick Changeover Process
- Shutdown/Turnaround Management

Summary:
Potential Class Workshops:
- Business Level FMEA
- Case Studies – Review and Decide What You Would Do
- Personal Reflection and Action Plan

Take Home Workshops:
- Business Level FMEA – Clean, Inspect, Restore – At Your Plant
- Developing Your Action Plan for Manufacturing Excellence
- Self Audit of Management Support and Plant Culture
- Self Audit of Operating Practices
- Self Audit of Maintenance Practices
- Assuring Process Consistency during Normal Operations
- Optimization of Your PM Practices

More Information

This course is only offered as a private offering at a client's site. Please contact PII for details about having our training provided at your site.

PROCESS IMPROVEMENT INSTITUTE
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Course 18: Reliability Leadership for Manufacturing Excellence (1- or 2-Day)

Recommended prerequisites: None.

Ron will review models for achieving reliability and manufacturing excellence that are patterned after some of the world's best companies. The very best plants are able to accomplish this through the application of a reliability strategy, which supports lean manufacturing, supply chain principles, and excellence in operations and maintenance, and assures them of being the low-cost producer. This strategy ensures optimal production capability at a minimum sustainable cost. Costs are avoided by eliminating the "defects" which cause the costs being incurred in the first place, optimizing the work that adds value.

Typical Course Candidates:

- Vice Presidents & Managers – Production, Maintenance and Executive
- Engineers – Reliability, Process, Safety
- Support Staff
- Anyone who leads or influences the direction and success of manufacturing plants

What You Will Learn:

- Manufacturing Excellence and Reliability Principles
- Best practices in design, operation, maintenance practices – strengths and weakness of various approaches; and their role in manufacturing excellence
- Issues that are contributing to the losses from ideal, and more importantly, how to address the issues limiting your business performance through application of reliability principles, and without any capital investment
- How your practices compare to the best practices and benchmarks
- How to lead your company to business excellence, and manage day to day efforts
- Develop your improvement plan

Take Home:

- Comprehensive course notebook containing
  - Training material on all the tools included in the course
  - Take home appendices and workshops
- Certificate of Completion
- 0.7 CEUs & 0.7 COCs

Reliability Leadership for Manufacturing Excellence, Course Outline (1-day, 8:00 a.m. to 4:30 p.m.)

Overview of Reliability Leadership for Manufacturing Excellence:

- Introduction
- Manufacturing Business Excellence Overview – Low Cost Producer Profile
- Asset Utilization/Overall Equipment Effectiveness, Loss Accounting
- Safety and Reliability – Mutually Dependent

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- Benchmarks
- Aligning the Marketing and Manufacturing Strategies

The Reliability Process: Design, Buy, Store, Install, Operate, and Maintain for Reliability

- Designing for lowest life cycle cost vs. lowest installed cost
- Buying for supplier reliability and total cost of ownership
- Stores as a value adding asset and support function for reliability
- Installing/starting up with precision; avoiding infant mortality failures
- Operating with care, precision, consistency, and conformance

Maintaining with care and precision, and imputing reliability into the plant:

- Preventive, Predictive, and Proactive Methods

Reliability Related Methods and Tools:

- Reliability Centered Maintenance (RCM)
- Total Productive Maintenance (TPM)
- Case Studies – Combining RCM and TPM Principles – Business Level FMEA Leadership and Organizational Issues/Strategies

Strategy for Implementation

- Leadership Principles
- Alignment and Teamwork
- Change Management

Success Stories

Summary

Potential Class Workshops:

- Self-Assessments in: 1) Management support and plant culture; 2) Reliability-based design practices; 3) Reliability-based operating procedures; 4) PM maintenance practices; 5) Materials management practices; 6) Aligning the Marketing and Manufacturing Strategies
- Action Planning – Defining the Top 3 actions you're personally going to take; Integrate these into an overall strategy
- Other Available Options: Leadership and strategy development – manufacturing improvement plan, Process consistency/conformance exercise(s) – startup/shutdown & normal operation; Pump operating practices; Shift handover practices; Operator Care/PM practices; PM optimization exercises; Stores management practices; Development of capital projects and asset management strategy

More Information

This course is only offered as a private offering at a client's site. Please contact PII for details about having our training provided at your site.

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Private Training

Private training is a very popular option among our clients. In fact, we teach more of our customized, private courses than public courses. A private course offers many advantages:

1. **Savings**
   If you need to train more than 6 of your staff, then the overall training cost is substantially lower for a private course, especially when the travel cost of students is taken into account (courses are priced per day instead of per student, with recommended maximums per class). The course can be tailored to your schedule, provided at one or more of your locations, and combined with other topics. Multiple course discounts are also available.

2. **Larger Class Size**
   For company-specific courses, it is usually easier to communicate the course subject to a larger group of people at the same time. Managers and others can observe (attend) key instructional portions of a course without hindering the learning process of the students. *Many companies see this bonus training as a pivotal factor in choosing a private offering of a course.*

3. **Custom Training Plan**
   We will customize the training plan for a private course to meet your staff's needs. Typical customizations include:
   - Adding materials specific to your company's internal programs, including adding sections that you want someone in your company to present
   - Adjusting the overall course length and relative emphasis on each topic
   - Skipping sections in our standard course that you do not feel are relevant

   Because of our wide selection of pre-planned options for each standard course, there is usually no extra charge for customization. Highly customized or completely new courses can also be developed for a negotiable fee.

4. **Specific Workshops**
   The most common customization option in private courses is to use your processes and procedures in the workshops, examples, and exercises. To accomplish this usually takes a few extra weeks of planning and coordination, but usually is no extra cost. In several cases, we have worked with a client for a few months to develop a company-specific exercise (such as a large case study for incident investigation training); but most clients find our generic examples, exercises, and case studies to be fine for their training needs.

5. **Confidentiality**
   Since the attendees in your private course will only be from your company, they can freely discuss your company's unique problems. This results in more interaction on issues important to your company, compared to attending public courses.

6. **Follow-on Hands-on Training**
   Another good reason to have private training is to keep our instructor around for a few additional days or a couple of more weeks to coach your students through their first implementation in "real time" of what they have learned. We all know that classroom training has limitations; the on-the-job that our instructors can provide overcomes these limitations.

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Types of Private Courses

Onsite Training: If you want a course customized for your needs or if you have a number of individuals who need the same training, **let us provide a course for you at your site**. This option focuses all the discussion and example problems specifically on the issues faced by a specific facility, maximizing the benefits to your workers.

Regional Training: If you have a number of facilities in one region of the country and want to save on travel costs, **let us provide a course in a central location**. You get all of the advantages of a private course (material customized to your company) and substantial cost savings through reduced travel costs and lower course costs.

Helping You Decide if Private Courses are Right for Your Specific Need

Are you undecided? Just give us a call at 1-865-675-3458 and we will discuss all the options for meeting your training needs. The meter is not running, so feel free to call. You can also e-mail Mr. Bridges at wbridges@piii.com to have him review your needs.

Each year, PII provides 40 to 60 private courses to more than a dozen organizations world-wide. Private courses are contracted by trade associations, corporations, and individual facilities. Industry sources suggest checking references before selecting a training provider. We suggest that you check 3 or more references. PII can provide a substantial list of confidential references for specific course topics, upon request. Please call us at 1-865-675-3458 for more information.

The best way to decide if PII's training is the best option for your company is for you to send one or more "scouts" to a course open to the public (such as those described on page 2 of this catalog) offered in the USA or in Oman, Bahrain, Dubai [UAE], or elsewhere. This is a very low risk option since you can then apply one registration fee towards the purchase of a private course of the same type and duration, when it is later offered specifically for your company.

PII Instructors Have Provided Customized Courses and Services for …

AECOM	ConocoPhillips	Georgia-Pacific
Aerojet	Cook Composites and Polymers	GTI, Tampico, Mexico
Air Products	Danieli (Italy)	Gulf Petrochemicals Industry
AMCDE (Saudi Arabia)	Delek Refining	Corporation (GPIC; Bahrain)
American Electric Power (AEP),	Dixie Chemicals	HADEED (Saudi Arabia)
USA	DuPont	Heritage-WTI
Apollo Group	EarthTech	Hunt LNG (Peru)
ARAMCO	ECOLABS	Ineos
ASSE-MEC	Egypt Basic Industry Corporation	IPSL (Trinidad)
AVANTOR	Elementis	Irving Oil
BAPCO (Bahrain)	Emirates National Oil Company	J. Ray McDermott, Dubai, UAE
BANAGAS (Bahrain)	Engro Corporation Limited	Johns Manville
Boeing	(Pakistan)	Johnson & Johnson
Bostik	Enogex	Kennecott – Rio Tinto
BP USA	Equate (Kuwait)	KordSA
Bristol-Myers-Squibb	EVONIK	Kureha
BUTEMAC (Syria)	Fluor-Kayan	LANL (US DOE site)
China Light & Power, Hong Kong	General Electric	

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Marafiq (Saudi Arabia)
MOL Pakistan
Nalco
NOVA Chemical
NEXEN (Yemen)
NGC – Trinidad
NuStar
OGE
Parker USA
Pan-American Energy (Argentina)
PETRONAS
PETRORABIGH (Saudi Arabia)
Pfizer
Phoenix Park Liquefied Gas Ltd. (TT)
Pictsweet USA
Plug Power

PlusPetrol (Peru and Argentina)
Qatar Fertilizer (QAFCO)
Qatar Fuel Additives Co., Ltd (QAFAC)
ROCHE
S.W.I.F.T. USA
SABIC (nearly all affiliates; Saudi Arabia)
SAHARA (Saudi Arabia)
Saudi Ethylene & Polyethylene Co. (TASNEE)
SINOPEC-SABIC (SS-TPC; China)
SIPCHEM (Saudi Arabia)
Selmet
Shaw Group
State Lands Commission

California
SUMCO
Sun Chemical
Suncor (Canada)
Superior Wells Services
Swiss Re, Zurich, Switzerland
Titan (Malaysia)
Tennessee Valley Authority (TVA)
TORAY Plastics
US Department of Energy (DOE)
US DOE (LLNL)
US DOD
US NASA
Voescht-Alpine (Austria)
Washington Savannah River Comp (US DOE Site)

… and many others – please request our references.

Additional Comments on Selecting PII for Training Assistance

Please consider the following when evaluating the value of our public and private training services:

1. The PII-team consists of world-renowned experts in PSM consulting and related training; our courses reflect the very latest in best practices for controlling the various aspects of process safety and system reliability.

2. These course topics have been taught in various forms by the staff at PII for over 10 years (on average). Since PII was formed, all of the course topics have been newly authored using unique materials to reflect not only the best practices in the industry, but also to provide the attendees with the most comprehensive text on each topic (saving you expense related to purchasing of additional textbooks on each topic).

3. PII continually updates and improves its courses to stay current with best practices; your company will benefit from this at no extra charge.

4. PII courses are developed and taught by experts who continually help companies effectively implement PSM; we know what works in practice.

5. Our instructors teach all of these courses for many companies around the world; you will greatly benefit from this accumulated knowledge.

6. During the teaching and development of a course, we can and will comment on related management systems at your company and offer suggestions in writing for improvements. This is an enormous value-added feature of our training for organizations such as yours and could save your company many thousands of dollars in consulting fees if this service were purchased separately. We will only charge extra for such services if our instructor is not able to develop such improvements during preparation and/or delivery of a contracted training service; any extra charges will be pre-approved by you.

7. In most cases, PII can incorporate examples from your company into the courses as exercises and workshops for no extra fee, thereby minimizing development cost.

For information on having PII provide a custom course at your site(s), please call us at 1-865-675-3458.

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PII's Instructors

Process Improvement Institute's (PII's) instructors have trained more than 7000 technical and management staff in how to effectively implement PSM, safety management systems, and reliability programs. If you do not already know us, come to one of our many courses offered publicly to check us out first-hand.

William G. Bridges (Bill)

Bill is President of the Process Improvement Institute (PII). He has over 30 years of experience, including more than 20 in senior management and senior PSM advisory roles. He is considered one of the leading authorities on process safety engineering, risk management, and human error prevention. He has Bachelors and Masters degrees in Chemical Engineering from the University of Akron (USA) and he has over 14 years of hands-on chemical industry experience in process operation, process engineering, process and product development, management and safety evaluation, and operations management. He holds 10 US patents, several of which are for products and processes that are in full, profitable production today. One factor that makes Mr. Bridges such a sought-after consultant and instructor is his wealth of hands-on experience in chemical processing and in implementing PSM in the chemical industry. His last position in the chemical industry was as a chemical plant manager.
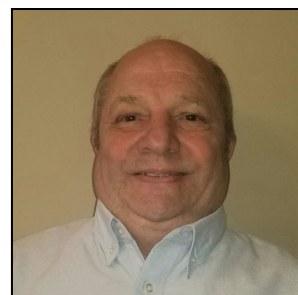
Bill has helped many companies in the petroleum, petrochemical, plastic and chemical process industries develop, implement and assess PSM and risk management programs. These programs include consideration of human factors to prevent human error. Bill has written several articles on "how to" prevent human error and how to implement PSM. He serves on the planning committee of AIChE for international conferences on process safety. Bill has taught PSM related courses, including process hazard analysis/HAZOP leadership, incident investigation/RCA, and management of change (MOC) since 1987. He is an instructor for several different courses for PII, and also lectures in American Institute of Chemical Engineers (AIChE) and he teaches through ASSE-MEC and GPCA in the Middle East. He has trained more than 5000 in PSM-related and risk analysis-related topics.

Stephen Bridges

Mr. Bridges has 11 years' experience in process safety consulting experience, with 5 years of hands-on process engineering experience in the pulp and paper industry. His time working in the industry was primarily spent at Georgia-Pacific (GP), where he was the production leader over Recausticizing, Lime Kiln and Utilities departments for the largest pulp mill in North America. As production leader, Mr. Bridges was responsible for daily operations and maintenance activities management. He was also heavily involved in numerous process safety initiatives while in Operations and Safety departments, which included creating the first chemical hazard and reactivity management program for the mill, participating in PSSRs, MOC reviews, JSAs and PHA meetings (Mr. Bridges was the mill PHA Leader and trainer of ABS Leader software). Mr. Bridges has led and participated in many incident investigations and process safety audits, from which he wrote and implemented several additional administrative safeguards and novel safety interlocks. He has scribed for more than 35 PHAs for PII, participated in many PHAs as operations representative, and has personally led 10 PHAs. He has taught over 300 individuals in Procedure Writing and coached over 30 individuals in PHA Leadership. Mr. Bridges has a special focus in Human Error/Human Factors, being trained in the subject extensively and capitalizes on a large volume of experience from the field and various industrial processes he has worked with professionally.

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Paul S. Casarez

Paul has over 30 years of experience in process engineering; production and maintenance management; HSE and risk-based safety management. He has facilitated, managed, developed and/or implemented policy and procedures covering every aspect of Risk Based Process Safety. Paul's process safety experience covers highly toxic, flammable, explosive and highly reactive/unstable chemicals and chemical processes. He has extensive experience in large, intermediate and small (micro) processes along with continuous, batch, and lab operations. Paul has a B.S in Chemical Engineering from Michigan Technological University.
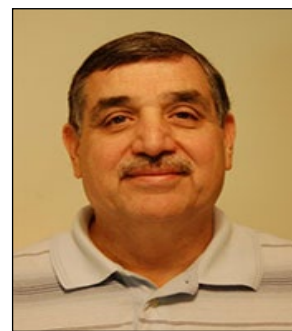
Adel Dakheel

Adel is an EHS-Process Safety Specialist with wide experience of petrochemicals EHS management, PSM (Process Safety Management) including Permit to Work and Accident Investigation, Capital Projects Safety, Environment, and Fire protection. He received his B.S. in Biological Systems Engineering from Washington State University. He has extended experience in loss prevention, safety/health/environment, fire protection, and process engineering in world-scale petrochemicals and fertilizers complexes. Adel has a quantifiable track record related to supervision of safe and secure design, construction, commissioning, start up, and operation of several world scale multi-billion petrochemicals complexes/facilities in conjunction with world renowned engineering contractors such as Fluor, Stone & Webster, Parsons, Daelim, Samsung, Snamprojetti, Chiyoda, Toyo, Linde, KBR, CTCI. He has specialized skills in risk mitigation and quantitative and qualitative risk assessment, including Consequence Analysis during design, construction and operations of process facilities. Additionally, Adel has trained personnel in the use of the HSE and PSM Elements and wrote standard operating procedures for the implementation of the Management system.

Arthur (Art) M. Dowell, III, P.E.

Art is an independent chemical process safety consultant. He has 42 years industrial experience at Rohm and Haas (now owned by the Dow Chemical Company) in technical support to operations, engineering design, plant startup, research, technology management, hazard and risk analysis, and incident investigation. He is recognized in the industry for his work in process safety management systems, incident investigation, and risk assessment and has many years conducting incident investigations. Mr. Dowell has extensive experience leading PHAs (Process Hazard Analyses), and performing consequence analysis and fault tree analysis. He is a proficient user of FMEA, what-if/checklist, event trees, and, an emerging technique, HAZROP (Hazard Reliability, and Operability Analysis). He taught multiple internal courses for Rohm and Haas PHA facilitators. He was a co-developer of the Multiple Cause, Systems Oriented Incident Investigation System at Rohm and Haas in the 1980s, and has conducted numerous training courses on incident investigation within Rohm and Haas and for the industry overall. Mr. Dowell has been using LOPA (Layer of Protection Analysis) for chemical processes for more than 20 years, spearheading its use in Rohm and Haas Company, publishing it in industry symposia, and mentoring and training engineers in its use.

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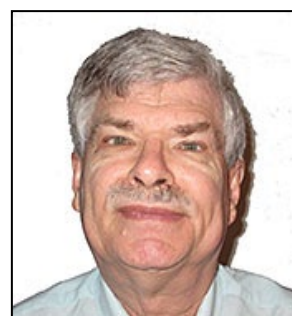
Mr. Dowell served several years on the ISA S84 Standard Committee and the US Technical Advisory Group for the IEC 61511 Standard Committee. He was one of the primary authors of technical report TR84.0.02 for analysis of the performance of Safety Instrumented Functions (SIFs). Mr. Dowell is a Fellow of AIChE and a member of ISA (the Instrumentation Systems and Automation Society). He served the South Texas Section of AIChE on the Executive Committee and as secretary and treasurer. He is a licensed Professional Engineer (Chemical Engineering) in both Pennsylvania and Texas.

Matías A. Massello

Matías is chemical and functional safety engineer from Argentina. He took his first steps related to chemical engineering as a teaching assistant in "Unit Operations" for advanced students at the University of La Plata. After receiving his degree, Matías began development of a professional career in the chemical process safety area, working for a consultancy company. In the past 7 years, Matías has gained significant hands-on experience having led, organized, participated in, and/or documented more than 80-Process Hazard Analyses (PHAs), 10-Layer of Protection Analyses (LOPAs), numerous Management of Change (MOC) risk reviews, and performed more than 10-Quantitative Risk Analysis (QRAs). He has also developed training materials for various oil, gas, and petrochemical companies specific to PHA, QRA and Safety Instrumented Systems (SIS), and has participated in the development of PSM guidelines.
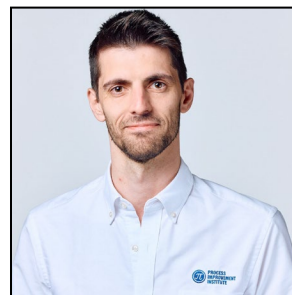
Revonda Tew

Revonda has 20+ years of experience in the chemical industry, including process development, process engineering, and process safety management and evaluation. She holds one US patent. Revonda has a B.S. in Chemical Engineering from North Carolina State University and a MBA from the University of North Carolina's Kenan-Flagler Business School. The first 8 years of her career was hands-on in the chemical industry. In the early 1990's Revonda led the PSM compliance initiative at a large chemical manufacturing facility, authoring policies and procedures to address industry, regulatory, and company standards, as well as managing their implementation. Revonda has been involved with plant emergency response teams as a responder and an incident command post team member. Revonda has PSM training from AICHE/CCPS including Process Safety Documentation and Engineering Design for Process Safety. Other training includes PHA Leader and Incident Investigation Leader training. She has significant hands-on experience having participated in, led and documented over 40 PHAs, numerous management of change (MOC) risk reviews, performed many MOC approvals, participated or led several investigations, and participated or led many PSM compliance audits and PSM assessments. She has also developed customized training materials for various topics, including MOC, PHA leadership, and PSM auditing, and she is a co-instructor for these topics and for incident investigation.

Revonda has experience with both community relations and crisis management and is currently involved in LEPC activities, her local Community Emergency Response Team (CERT), and is a "Together We Prepare" disaster preparedness volunteer and trainer with the American Red Cross. For the past 6 years of her career, she has been a consultant to the chemical industry, where she has provided PSM-related and PHA/HAZOP training and consulting.

Tim Waugh

Tim has 20+ years of experience in the petrochemical industry, including process control and instrumentation and process safety management (PSM), a B.S. in Biology from the University of New Brunswick, and is a certified instrumentation engineering technologist. The first 10-years of his career were hands-on in the petrochemical industry. In 2006, Tim began participation in the development and implementation of a formalized Risk Based Process Safety (RBPS) Management program at a large petrochemical manufacturing facility, authoring policies and procedures to address industry, regulatory, and company standards, as well as managing their implementation. He has been involved with plant emergency response teams as a responder, firefighter and an incident command-post team member.

Tim has significant hands-on experience having led, organized, participated in and documented more than 50-Process Hazard Analyses (PHAs), 40-Layer of Protection Analyses (LOPAs), numerous management of change (MOC) risk reviews, performed many MOC approvals, led over 50-incident investigations and 200-Pre-Startup Safety Review's (PSSRs), and participated in over 15-gap analyses and audits for development of a PSM program. He has also developed training materials for various topics, including PSM, PSSRs, PSI, Action Management and Safety Instrumented System (SIS) Management.