MERCURY

Advanced Process Safety and Risk Management

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Introduction:

The Advanced Process Safety and Risk Management training course equips professionals in high-risk industrial environments with critical expertise in managing safety processes and mitigating operational risks. With increasing regulatory demands and operational complexities, understanding and applying advanced safety protocols is crucial for ensuring plant integrity and workforce protection.

This Advanced Process Safety and Risk Management course delivers in-depth technical knowledge alongside leadership strategies to foster a safety culture across operations. Participants will explore industry-leading practices in hazard identification, emergency preparedness, asset integrity, and safety performance. Real-world case studies from chemical and petrochemical industries will support the transfer of theory into practical action.

The Advanced Process Safety and Risk Management program emphasizes strategic integration of safety management with asset reliability, focusing on regulatory compliance and operational excellence. It meets the safety demands of packaging, processing, and petrochemical plants. Attendees will lead safety improvements in high-hazard facilities effectively and sustainably.

Targeted Groups:

This Advanced Process Safety and Risk Management training targets professionals seeking specialized knowledge and skills:

- Safety engineers work in the process and petrochemical industries.
- Plant managers oversee high-risk operations.
- HSE professionals are responsible for compliance and risk mitigation.
- Shift leaders supervise frontline operations.
- Industrial packaging engineers handle flammable materials.
- Process operations teams are involved in production cycles.
- Technical safety staff manage critical safety systems.
- Maintenance planners and asset reliability engineers.
- Section heads direct operational safety performance.
- Plant engineers oversee shutdown/start-up procedures.
- Asset managers are responsible for long-term risk planning.
- HSE managers are developing and leading safety initiatives.

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Course Objectives:

Participants will achieve the following objectives by completing the Advanced Process Safety and Risk Management course:

- Identify and assess process safety hazards using structured methodologies.
- Apply industry standards in emergency response planning and incident command.
- Design and evaluate ESD systems and safety-critical equipment.
- Analyze real-world fire and explosion incidents to learn their root causes.
- Interpret legal safety requirements and align them with operational practices.
- Develop and maintain mechanical integrity programs and inspection protocols.
- Implement Lockout/Tagout and Permit-to-Work systems effectively.
- Integrate safety metrics into asset management and decision-making frameworks.
- Conduct lifecycle risk assessments and link results to asset strategies.
- Perform SIL assessments and implement functional safety controls.
- Evaluate behavior-based safety approaches and safety leadership techniques.
- Promote proactive safety behavior across cross-functional teams.
- Establish and audit asset risk registers and criticality matrices.
- Lead the development of a sustainable safety culture across operations.
- Manage stakeholder response during crises and major incidents.

Targeted Competencies:

Participants will gain the following competencies during the Advanced Process Safety and Risk Management program:

- Hazard identification and risk assessment techniques.
- Emergency response systems design and deployment.
- Equipment reliability and asset integrity management.
- Legal and regulatory compliance for safety operations.
- Root cause analysis of critical incidents.
- Safety leadership and communication in high-risk environments.
- Integration of KPIs and safety metrics in daily workflows.
- Implementation of behavior-based safety programs.
- Practical application of PSM principles across departments.

Course Content:

Unit 1: Integrated Process Safety & Emergency Preparedness Masterclass:

- Structured hazard identification: HAZOP, LOPA, and FMEA methodologies.
- Multi-layered protection systems: theory and implementation of LOPA.
- Designing Emergency Shutdown Systems ESD and effective activation plans.
- Fire and explosion hazard management: applied case studies in chemical and packaging sectors.
- Performance standards for safety-critical instrumentation and barriers.
- Emergency response structures: development and application of ICS frameworks.
- Process safety metrics and KPI integration into asset management platforms.
- Safety culture, leadership, and strategic influence within operations.

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Unit 2: Process Safety for Packaging & Petrochemical Plants - Risk Control & Best Practices:

- Safe storage and handling of combustible packaging and bulk materials.
- Mechanical integrity strategies: preventive and predictive inspections.
- Control of hazardous energy through Lockout/Tagout and Permit-to-Work systems.
- Managing thermal and chemical reactions in packaging processes.
- Designing fire protection systems tailored to packaging facilities.
- Historical incident analysis: identifying systemic root causes.
- Adherence to OSHA, API, and Saudi ARAMCO standards and protocols.

Unit 3: Asset Integrity & Lifecycle Risk Management for Process Plants:

- Full lifecycle risk evaluation for high-value assets.
- Reliability-Centered Maintenance RCM approaches for safety optimization.
- Functional safety practices and Safety Integrity Level SIL evaluations.
- Operational procedures for safe startup and controlled shutdown.
- Monitoring performance degradation and initiating corrective actions.
- Risk-based asset management aligned with strategic priorities.
- Documentation, auditing, and compliance recordkeeping.
- Criticality analysis using structured risk registers.

Unit 4: Safety Leadership & Process Culture for High-Hazard Facilities Environments:

- Leading safety engagement through influence and cross-functional buy-in.
- Enhancing psychological safety and team communication.
- Behavior-Based Safety BBS: designing and applying interventions.
- Operationalizing Process Safety Management PSM daily.
- Stakeholder engagement during emergencies and public incidents.
- Defining and tracking safety culture indicators and goals.
- Frontline safety training for early hazard recognition and action.

Unit 5: Digital Tools & Future Trends in Process Safety and Risk Management:

- Digital twins and predictive analytics in risk assessment.
- IoT and sensor integration for real-time hazard monitoring.
- AI-driven process optimization for safety-critical environments.
- Cybersecurity in safety systems and industrial automation.
- Data-driven decision-making for performance-based safety programs.
- Emerging global trends in regulatory frameworks.
- Future-proofing safety systems for Industry 4.0.

Final Insights & Key Takeaways:

This course bridges technical process safety practices with strategic leadership in risk-intensive industries. Participants will develop practical capabilities supported by global standards and real-case analyses. It emphasizes long-term safety resilience and operational excellence. Leaders will return empowered to drive cultural transformation and embed risk control across their organizations.