Professional Certificate in AI-driven Process Safety Management

Fundamentals of Process Safety Management

Active Failure: An event or series of events involving equipment, people, or the physical environment that, if not detected and corrected, can lead to a process safety incident. Also known as an immediate cause.

Alarm Management: The process of controlling, monitoring, and responding to alarms in a way that supports safe and efficient process operations. This includes establishing alarm system design, configuration, and performance standards, as well as implementing procedures for managing and responding to alarms.

Atmospheric Storage Tank: A tank used for the storage of liquids or gases at atmospheric pressure. These tanks can pose a significant risk if not properly designed, constructed, operated, and maintained.

Barrier Management: A systematic approach to identifying, implementing, and maintaining barriers that prevent or mitigate major accidents in a process facility. Barriers can include physical, procedural, or organizational measures that reduce risk to an acceptable level.

Cause and Effect Analysis: A structured method for identifying the causes and effects of process safety incidents. This technique can help to identify underlying systemic issues that may have contributed to an incident, and to develop recommendations for addressing these issues.

Competency Management: The process of ensuring that individuals have the necessary knowledge, skills, and abilities to perform their jobs safely and effectively. This includes the development and implementation of training programs, performance evaluations, and other measures to assess and enhance competence.

Conduct of Operations: A set of guidelines and procedures for operating and maintaining process facilities in a safe and efficient manner. This may include activities such as pre-startup safety reviews, management of change processes, and procedures for responding to abnormal situations.

Control System: The combination of hardware and software used to monitor and control process parameters. This includes sensors, actuators, controllers, and other devices used to regulate process operations.

Critical Examination: A systematic review of a process or system to identify and assess potential risks and hazards. This may include activities such as hazard and operability studies (HAZOPs), layer of protection analyses (LOPAs), and other risk assessment techniques.

Emergency Response Plan: A comprehensive plan for responding to process safety incidents, including emergencies such as fires, explosions, or chemical releases. This plan should include procedures for evacuation, emergency communication, and incident management, as well as training and exercises to ensure readiness.

Fire and Explosion Prevention: The practice of identifying and mitigating risks associated with fires and explosions in process facilities. This may include activities such as process hazard analyses, equipment design and selection, and the implementation of fire suppression systems.

Hazard Identification: The process of identifying and assessing potential risks and hazards associated with a process or system. This may include activities such as hazard and operability studies (HAZOPs), failure modes and effects analyses (FMEAs), and other risk assessment techniques.

Human Factors: The study of how human behavior and capabilities affect the design and operation of process systems. Human factors considerations include factors such as ergonomics, cognitive psychology, and organizational factors that can impact process safety.

Incident Investigation: The process of investigating and analyzing process safety incidents to identify root causes and develop recommendations for preventing future incidents. This may include activities such as gathering evidence, interviewing witnesses, and analyzing data.

Inherently Safer Design: A design approach that seeks to eliminate or reduce risks associated with process operations by minimizing the use of hazardous materials, reducing the potential for equipment failure, and simplifying process systems.

Inspection and Testing: The process of regularly inspecting and testing process equipment and systems to ensure they are operating safely and efficiently. This may include activities such as visual inspections, pressure tests, and other maintenance activities.

Layer of Protection Analysis (LOPA): A risk assessment technique used to evaluate the adequacy of safety instrumented systems and other layers of protection in a process facility. LOPA involves identifying potential scenarios that could lead to a process safety incident, and evaluating the effectiveness of safety measures in preventing or mitigating the consequences of those scenarios.

Management of Change (MOC): A process for evaluating and controlling changes to process systems or procedures. MOC procedures should include steps for identifying potential risks and hazards associated with a change, evaluating the impact of the change, and implementing appropriate controls to mitigate those risks.

Mechanical Integrity: The practice of ensuring that process equipment and systems are designed, constructed, installed, and maintained in a way that ensures their safe and reliable operation. Mechanical integrity programs may include activities such as regular inspections, testing, and maintenance.

Operational Readiness: The process of preparing a process facility for safe and efficient operation. This may include activities such as pre-startup safety reviews, training and certification of operators, and the development and implementation of operating procedures.

Performance Standard: A specific level of performance that a safety instrumented system or other layer of protection is required to achieve. Performance standards are typically established through a risk assessment process, and are used to ensure that safety measures are effective in preventing or mitigating process safety

incidents.

Process Hazard Analysis (PHA): A systematic review of a process or system to identify and assess potential risks and hazards. PHAs may be conducted using a variety of techniques, including hazard and operability studies (HAZOPs), failure modes and effects analyses (FMEAs), and other risk assessment methods.

Process Safety Culture: The shared values, beliefs, and practices that influence how process safety is managed within an organization. A strong process safety culture is characterized by a commitment to safety, a willingness to learn from incidents and near misses, and a culture of continuous improvement.

Process Safety Information: The documentation and data related to process safety, including information on process chemistry, equipment design and operation, and hazard identification and assessment. Process safety information is used to support process safety management activities, including hazard analysis, risk assessment, and incident investigation.

Process Safety Management (PSM): A systematic approach to managing process safety risks in a process facility. PSM involves the identification and assessment of process hazards, the implementation of controls and procedures to prevent or mitigate those hazards, and the ongoing monitoring and improvement of process safety performance.

Procedure: A written document that outlines the steps and activities required to perform a specific task or process. Procedures should be clear, concise, and easy to understand, and should be regularly reviewed and updated to ensure they remain effective and relevant.

Qualitative Risk Assessment: A risk assessment technique that uses subjective judgments and qualitative criteria to evaluate the likelihood and consequences of potential risks and hazards. Qualitative risk assessments may be used to identify and prioritize potential risks, and to develop recommendations for managing those risks.

Quantitative Risk Assessment: A risk assessment technique that uses quantitative data and mathematical models to evaluate the likelihood and consequences of potential risks and hazards. Quantitative risk assessments may be used to evaluate the effectiveness of safety measures, and to make decisions about the allocation of resources for risk management.

Risk: The likelihood and consequences of a potential hazard or event. Risk can be expressed in quantitative or qualitative terms, and can be used to evaluate the effectiveness of safety measures and to make decisions about risk management.

Safety Instrumented System (SIS): An automated system designed to detect and respond to process safety incidents. SISs may include sensors, controllers, and actuators, and are designed to prevent or mitigate the consequences of process safety incidents.

Safety Lifecycle Management: A systematic approach to managing the lifecycle of safety instrumented systems, from initial design and implementation through ongoing maintenance and testing. Safety lifecycle management includes activities such as hazard identification and assessment, system design and

implementation, and ongoing testing and maintenance.

Safety Management System: A comprehensive system for managing process safety risks, including the identification and assessment of hazards, the implementation of controls and procedures to prevent or mitigate those hazards, and the ongoing monitoring and improvement of process safety performance.

Safety Policy: A written statement of an organization's commitment to process safety, outlining its goals, objectives, and strategies for managing process safety risks. Safety policies should be regularly reviewed and updated to ensure they remain relevant and effective.

Safety Training: The process of providing individuals with the knowledge, skills, and abilities necessary to perform their