

This course can be adapted to virtual classroom mode

Introduction to Process Safety Engineering

5 days
Overview

SAFENRC-EN-A

LEVEL

Knowledge

PURPOSE

This course provides an overview of safety reviews in a project and highlights the main principles to design and maintain the prevention, mitigation and protection barriers.

LEARNING OBJECTIVES

Upon course completion, the participants are able to:

be instrumental in the safety reviews done during a project or plant modification,
improve process safety practices and reinforce the integration of the human factor from the design stage,
strengthen the integration of the human factor from the design stage.

WAYS AND MEANS

The pedagogy is active and builds on the experience of the participants and the knowledge of the site:
several exercises and applications (50% case studies or tutorial exercises), with a "rolling case" on a typical processing unit
safety impact of a simple modification,
identification of safety barriers with the impact of their maintenance on their effectiveness.
a number of visual aids: videos, learning from incidents (Texas City, Buncefield, Achinsk...).

LEARNING ASSESSMENT

Quiz.

PREREQUISITES

Provide evidence of a basic technical knowledge in process, instrumentation, static and dynamic equipment.

Agenda

RISK IDENTIFICATION

1.25 d

Risk identification and acceptability with respect to people, environment and assets - Hazard and risk - Residual risk - Risk assessment matrix.
Review of hazardous phenomena: gas dispersion, toxic release, thermal radiation, overpressure blast.
Preliminary risk quantification: evaluation of risk consequences (grass root project or revamping) based on HAZID/HAZOP reviews.

INHERENT SAFETY DESIGN & LAYOUT OPTIMIZATION

0.5 d

Layout optimization based on safety reviews: safety distances, fire zones, deluge zones.
Reducing hazardous inventories, leak control systems, disposal system (flare, diked area...) and drainage systems, equipment sealing.

TYPE OF SAFETY BARRIERS

0.25 d

Safety barriers: technical, organizational, human; prevention, mitigation, protection, active, passive. Criteria of safety barriers' efficiency.

PREVENTION BARRIERS

1.5 d

Pressure equipment and atmospheric storage tanks: selection of material of construction, corrosion, pressure resistance - Piping classes.

Overpressure and negative pressure protection: pressure safety valves, rupture discs: selection criteria, design, implementation, inspection.

Safety Instrumented Systems (SIS) and Safety Integrity Level (SIL) - Typical architecture of Safety Instrumented Systems: hierarchy, interaction with process control system and Fire & Gas system.

Flammability control: minimizing ignition sources, hazardous area classification, equipment selection and location in hazardous areas.

DETECTION, MITIGATION & PROTECTION SYSTEMS

0.75 d

Fire and gas detection system: technology of sensors, selection and location - Cause and effect matrix, voting - Relationship with mitigation systems.

Passive fire and blast protection: description of material, location, monitoring and inspection - Identification of surface/elements to be protected.

Active firefighting systems: extinguishing agents (water, foam, dry chemicals, inert/inhibition gas).

Fixed systems with water or foam: elements of the fire main system (main ring, fire water pumps, consumers, water tank, foam solution), application rate.

DAY-TO-DAY INDUSTRIAL RISK MANAGEMENT

0.75 d

Human factors: functioning of the human being - Examples of systems embedding human behavior or human error: equipment accessibility, plant ergonomics, graphic display design, alarm management...

Management Of Change (MOC): technical, organizational and human expertise (reliability of documentation, suitability/application of the procedures, corporate's specifications...).

Maintaining the efficiency of the barriers - Example of a risk management tool: the bow tie.