

CHE-425: Maintenance and Process Safety

Credit Hours: 3-0

Pre-requisites: None

Course Objectives:

The objective of this course is to deliver a broad level study of risk identification and management in process plant safety/integrity management. Process integrity management (or as often referred to Process Safety Management) is important because accidents in process plants can cause significant casualties and serious financial losses with the potential impact on the community over a wide radius from the plant itself. This course focuses on high consequence and low probability events.

Course Contents

- i. Types of maintenance; preventive, predictive, and total productive maintenance
- ii. Maintenance of rotary and stationery equipment
- iii. Inspection techniques, non-destructive testing techniques
- iv. Lubrication and lubricants
- v. Basic concepts: hazard, risk, hazard rules, types of accidents their causes & effects
- vi. Risk analysis methodologies, Evaluation of risk and quantification
- vii. Hazard Identifications: HAZOP, HAZAN, safety review and safety audit
- viii. Gas, vapor and dust explosion
- ix. Fire and Explosion: The fire triangle and the factor contributing to fire and explosion
- x. Concept of Ignition, ignition energy. source of ignition, auto ignition, auto oxidation, adiabatic compression, role of fuel spray, purging of equipment, ventilation of space, control of static electricity
- xi. Safety equipment: firefighting and sprinkle system
- xii. Runaway reactions: causes, characterization, prevention, vent sizing
- xiii. Atmospheric dispersion: factors affecting dispersion and their modeling
- xiv. Safety management: process safety management, disaster control organization, OSHA guidelines
- xv. Toxicology and industrial hygiene: Typical toxins and their biological effects, toxicological parameters, release and flow of toxic gases

- xvi. Environment impact assessment: cost and benefits of EIA, EIA process, public consultation and participation in EIA process, EIA method & its techniques for impact prediction and evaluation
- xvii. Learning from major case histories
 - a. Flixborough (England)
 - b. Bhopal (India)
 - c. Seveso (Italy)
 - d. Pasadena, Texas City (Texas)
 - e. Jacksonville (Florida)
 - f. Port Wentworth (Georgia)
- xviii. Learning from case histories based on
 - a. Static electricity
 - b. Chemical reactivity
 - c. System designs
 - d. Procedural flaws
 - e. Lack of training

Recommended Books

- Crowl, D. Y., & Louvar, J. F. (1990). Chemical Process Safety Fundamentals with Applications. Prentice Hall.
- Pandya, C. L. (1991). Hazards in Chemical Units. Oxford ISH.
- Grimaldi, J. H., & Simonds, R. H. (1990). Safety Management (5th ed.). AITBS.
- Sanders, R. E. (1999). Chemical Process Safety: Learning from Case Histories. Butterworth.
- Assael, M. J., & Kakosimos, K. E. (2010). Fires, Explosions, and Toxic Gas Dispersion: Effects Calculation and Risk Analysis. CRC Press.
- Wester-Kamp, T. A. (Prentice-Hall). Maintenance Manager's Standard Manual.