

AMSF-15 CHEMICAL PROCESS SAFETY

UNIT-1 SAFETY IN THE DESIGN OF CHEMICAL PROCESS PLANTS

- 1.1. Design principles- Process design development- types of designs, feasibility survey, preliminary design, flow diagrams, piping and instrumentation diagram,
- 1.2. Batch versus continuous operation,
- 1.3. Factors in equipment scale up and design, equipment specifications
- 1.4. Reliability and safety in designing- inherent safety- engineered safety- safety during startup and shutdown- safety checks in the design of the equipment's- reactor safety- safety in erection and commissioning of chemical plants
- 1.5. Non-destructive testing methods- pressure and leak testing
- 1.6. Emergency safety devices- scrubbers and flares-new concepts in safety design and operation- Pressure vessel testing standards
- 1.7. Inspection techniques for boilers and reaction vessels.

UNIT-2 SAFETY IN THE OPERATION OF CHEMICAL PROCESS PLANTS

- 2.1 Properties of chemicals
- 2.2 Material Safety Data Sheets
- 2.3 The various properties and formats used – methods available for property determination.
- 2.4 Operational activities and hazards- standards operating procedures- safe operation of pumps, compressors, heaters, column, reactors, pressure vessels, storage vessels, piping systems
- 2.5 Effects of pressure, temperature, flow rate and humidity on operations- corrosion and control measures- condition monitoring- control valves- safety valves- pressure reducing valves, drains, bypass valves, inert gases.
- 2.6 Chemical splashes, eye irrigation and automatic showers.

UNIT-3 SAFETY IN THE STORAGE AND HANDLING OF CHEMICALS AND GASES

- 3.1 Types of storage-general considerations for storage layouts
- 3.2 Atmospheric venting, pressure and temperature relief- relief valve sizing calculations
- 3.3 Storage and handling of hazardous chemicals and industrial gases,
- 3.4 Safe disposal methods, reaction with other chemicals, hazards during transportation- pipe line transport- safety in chemical laboratories.
- 3.5 Safety provisions like level and flow indicators- alarms, trips- protection of stills, columns and towers from lightning- color coding for pipe lines and cylinders.

UNIT-4 CHEMICAL REACTION HAZARDS

- 4.1 Hazardous inorganic and organic reactions and processes,
- 4.2 Reactivity as a process hazard, Detonations, Deflagrations, and Runaways, Assessment and Testing strategies,
- 4.3 Self- heating hazards of solids, Explosive potential of chemicals, Structural groups and instability of chemicals,
- 4.4 Thermo chemical screening, Case studies. Stability and sensitivity tests,

- 4.5 Classification of materials with explosive potential, Hazard prediction by thermodynamic calculations,
- 4.6 Prevention and control of explosions and detonations- diluting a release, purging and inserting, venting, explosion relief, flame arrestors, explosion suppression,
- 4.7 Classification of hazardous areas.

References Books:

1. Ralph King and Ron Hirst, King's Safety in the Process Industries, Arnold, London, 1998
2. Industrial Environment and its Evolution and Control: NIOSH
3. Accident Prevention Manual for Industrial Operations: Vol. I & II NSC Chicago
4. Sax N Irvin, Dangerous properties of industrial materials

