Part A - Process Safety Basics

ntroduction to Part A of Volume 1

Vhat is Process Safety?

1A.1.1 Definition, Purpose and Importance

1A.1.2 Key Concepts

1A.1.3 Context and Relations with other Domains

Process Safety Evolution

1A.2.1 Historical Overview

1A.2.2 Trends in Process Safety

Hazards and Consequences

1A.3.1 Hazardous Properties of Chemicals and Substances

1A.3.2 Non-chemical Hazards

1A.3.3 Natural Hazards

1A.3.4 Process Hazards Identification (HAZID)

1A.3.5 Potential Consequences

1A.3.6 Impacts: Human Health and Life

1A.3.7 Impacts: Asset damage, Environment, Reputation

1A.3.8 Probability estimates

1A.3.9 Scenario development

1A.3.10 Pre-PHA, Preliminary Hazard Analysis

Risk Assessment

1A.4.1 Risk ranking, Risk Matrices, Risk Presentation

1A.4.2 Qualitative and Semi-quantitative

1A.4.3 Quantitative

Risk Management

1A.5.1 Risk Reducing Measures

1A.5.1 Resilience Analysis

Standards and Regulations

1A.6.1 Process Safety Regulations

1A.6.2 Process Safety Standards

1A.6.3 Industry Guidance

Economics of Loss Prevention

Part B - Applying Process Safety

ndustries

Petrochem., LNG, Offshore, Pharmaceut., Food, Semicond.

Tools - Modeling, Information and Incident Databases

.earning

1B.3.1 Engineering Education

1B.3.2 Process Safety Training

1B.3.3 Practical Learning

Safety Considerations

1B.4.1 Inherently Safer Design

1B.4.2 Overpressure Protection

1B.4.3 Flares and Incinerators

1B.4.4 Process Isolation

1B.4.5 Scale-up

1B.4.6 Human Factors

1B.4.7 Facility Siting

1B.4.8 Safe work practices

Part B (cont.) - Applying Process Safety

1B.5 **Operations**

1B.5.1 Operating Procedures

1B.5.2 Operator Training

1B.5.3 Operational Readiness (PSSR)

1B.5.4 Conduct of Ops./Operational Discipline

1B.6 **Asset Integrity and Reliability**

1B.6.1 Reliability Engineering

1B.6.2 Maintenance

1B.6.3 Inspections

1B.6.4 Barrier Management

1B.7 **Process Control and Instrumentation**

1B.7.1 Mechanical Controls

1B.7.2 Digital Control Systems (DCS)

1B.7.3 Safety Instrumented Systems (SIS)

1B.8 **Emergency Response**

1B.8.1 Emergency Response System

1B.8.2 Fire Protection

1B.8.3 Evacuation

1B.8.4 Responders and Community Interactions

1B.9 **Storage**

1B.9.1 Gas, Liquids and Solids

1B.9.2 Warehousing

1B.10 **Transportation**

1B.10.1 Road, Rail, Air, Maritime

1B.10.2 Pipelines

1B.11 **Security**

1D.11.1 Physical security

1D.11.2 Cyber security

1B.12 **Processes with Special Considerations**

1B.12.1 LNG

1B.12.2 Nuclear Energy

Part C - Elements and Mgmt. Systems

1C.1 **Introduction, Elements, and Magmt. Systems**

Management Systems

1C.2 **Culture and Leadership**

1C.2.1 Leadership

1C.2.2 Process Safety Culture

1C.2.3 Assessment of Plant Culture

1C.3 **Process Safety Action Plan**

1C.3.1 Implementation Plan

1C.4 **Competence**

1.C.4.1 Achieving Employee Competence

1.C.4.2 Leadership Participation

1C.5 **Knowledge Management**

1C.5.1 Building and Managing Knowledge

1C.6 **Hazard Identification and Risk Assessment**

1.C.6.1 Managing Hazard Ident. and Risk Assess.

1C.7 **Management of Change (MOC)**

1C.7.1 MOC Requirements

Part C (cont.)-Elements and Mgmt. Syst.

1C.8 **Maintenance and Inspection**

1C.8.1 Maintenance

1C.8.2 Inspections

1C.8.3 Plant Ageing

1C.9 **Contractor Management**

1C.9.1 Facility and Contractor Requirements

1C.9.2 Risk Communication

1C.9.3 Contractor Performance Evaluation

1C.10 **Incident Investigation and Analysis**

1C.10.1 Investigation

1C.10.2 Reporting

1C.10.3 Follow-up

1C.10.4 Incident Report Maintenance

1C.11 **Emergency Management and Preparedness**

1C.11.1 Roles and Responsibilites

1C.11.2 Identification of Potential Emergencies

1C.11.3 Evacuation and Site Access

1C.11.4 Emergency Equipment and Facilities

1C.12 **Metrics**

1C.12.1 Monitoring, Metrics and Performance

1C.13 **Process Safety Audits**

1C.13.1 Auditing requirements

1C.13.2 Performing an audit

Part D - Proc. Safety in the Plant Lifecycle

1D.1 **Process plant life cycle, project mgmt., ops.**

1D.2 **Research phase process design**

1D.2.1 Characteristics and objectives

1D.2.2 Key process hazard analyses and activties

1D.2.3 Required Key input data

1D.3 **Development**

1D.3.1 Characteristics and objectives

1D.3.2 Key process hazard analyses and activties

1D.3.3 Required Key input data

1D.3.4 Milestones and Gates

1D.4 **Feasibility study phase**

1D.4.1 Characteristics of this phase

1D.4.2 Key process hazard analysis studies

1D.4.3 Required Key input data

1D.4.4 Safety studies output/milestones

1D.5 **Design**

1D.5.1 Design philosophy

1D.5.2 Conceptual design

1D.5.3 Basic design

1D.5.4 Front End Eng. Design (FEED) phase

1D.5.5 Detailed design (EPC phase)

1D.6 **Construction: process safety aspects**

1D.6.1 Construction planning and logistics

1D.6.2 Construction site conditions

1D.6.3 Management of Change

Part D (cont.) - P.S. in the P

1D.7 **Commissioning and Hand-**

1D.7.1 Precommisionin

1D.7.2 Commisioning

1D.7.3 Pre start-up safe

1D.7.4 Hand-over

1D.8 **Operations**

1D.8.1 Conduct of ops./

1D.8.2 Risk assessment

1D.8.3 Use of BowTies i

1D.8.4 Studies for norm

1D.8.5 Studies outside r

1D.9 **Modifications and upgrade**

1D.8.2 Management of

1D.10 **Decommissioning/Demolit**

1D.10.1 Mothballing

1D.10.2 Demolition

1D.10.3 Soil remediation

Part E - Emerging Tech.

1E.1 Introduction to Part E

1E.2 Process intensification

1E.3 Bio-processes

1E.4 Carbon capture and Seque

1E.5 New processes, electrificat

1E.6 Batteries & fuel cells

1E,7 Solar panels

1E.8 Hydrogen Technologies

1E.9 Recycling

1E.10 Artificial Intelligence