Process Safety Training (Shanghai)

Preventing Industrial Disasters Through Leadership

SCIENCE AT THE HEART OF SAFETY
PREVENTING INDUSTRIAL DISASTERS THROUGH LEADERSHIP, PROCESS SAFETY EDUCATION, AND EMPOWERMENT OF EMPLOYEES

One of the most important objectives of process-safety training is to educate employees to confidently recognize workplace hazards, including situations that could lead to explosion, fire, or toxic releases.

The next step requires management’s leadership to empower employees to take action to control these hazards, or to stop the process or activity creating the hazardous situation. A major purpose of these process-safety courses is to provide senior management with the understanding necessary to structure a system for training all employees on preventing disasters.

We will also discuss management’s responsibilities for attaining and maintaining a process-safety culture that control risks to people, property, the environment and corporate image.

1 BEYOND COMPLIANCE: DEVELOPMENT AND IMPLEMENTATION OF PSM IN THE WORKPLACE

2 SAFE HANDLING & PROCESSING OF COMBUSTIBLE DUSTS

3 UNDERSTANDING & CONTROLLING ELECTROSTATIC HAZARDS

4 CHEMICAL REACTIVITY HAZARD DURING PROCESS SCALE-UP

5 PRACTICAL HAZOP / PHA TEAM LEADERSHIP IN ACTION

6 LOPA: THE VALUE OF LOPA IN RISK REDUCTION

7 EVALUATION & SELECTION OF ELECTRICAL EQUIPMENT FOR USE IN HAZARDOUS AREAS
Course Design and Objectives
This course teaches attendees how to systematically develop and implement an effective and successful process safety management (PSM) program that not only meets regulatory compliance requirements, but becomes part of a company’s safety culture and everyday operations.

This course examines the specific OSHA requirements of each of the 14 PSM elements. Case histories of accidents and OSHA compliance citations will be reviewed to identify weaknesses in existing PSM programs, and specific guidance will be given on building a compliant PSM program.

The course goes beyond PSM compliance, however, and examines the role and importance of developing and maintaining an effective process safety culture in the workplace, and the role of process safety metrics in maintaining an effective PSM program. It will also introduce the concept of inherent safety.

The course includes several videos that illustrate the consequences of failure of PSM. Additionally, interactive exercises are included to promote class discussion. Each attendee will receive a notebook containing the presentation materials, including the presentation, and handouts of example forms and other information that can be immediately used by the attendees to develop their own PSM programs.

Course Outline
Process Safety Management Overview
• Accidents are Preventable: The Need for Process Safety
• OSHA PSM Approach to Managing Safety
• Additional Process Safety Regulations (state-level, EPA, others)

OSHA 14 PSM Elements (requirements, compliance and implementation is addressed for each element)
• Employee Participation
• Process Safety Information
• Process Hazards Analysis
• Operating Procedures
• Hot Work Permits
• Mechanical Integrity
• Contractors
• Training
• Management of Change
• Pre-startup Safety Review
• Incident Investigations
• Compliance Audits
• Trade Secrets

Beyond Compliance: Creating a Process Safety Culture in your Workplace
• Establishing a culture of process safety
• Development of effective process safety metrics
• Introduction to inherent safety principles

Quiz
Course Evaluation Feedback Form

You Will Learn
• Regulatory approach to process safety
• PSM requirements - Importance of the 14 PSM elements
• Weaknesses in existing PSM programs
• Elements of successful PSM programs
• Importance of a sound process safety culture in establishing an effective management of process safety

Who Should Attend
Anyone responsible for PSM program compliance and effective PSM implementation (e.g., Process Safety Managers, Engineers, EH&S Managers, Operations and Maintenance Personnel and/or other designated PSM representatives).
Course Design and Objectives
This course builds on the dust hazard recognition and management course but includes specific effective management techniques for common powder processing unit operations including: Raw material handling, Powder Charging to Vessels, Blending, Milling, Size Classification, Packaging and Dust Collection.

Many industrial processes use powdered raw materials and/or create powdered chemical intermediates that possess combustible dust hazards. The safe handling of these materials must consider the hazards associated with dust and powder combustion properties. Recent OSHA activities have brought these hazards to the forefront. This course will address the specific dust hazards associated with the most common unit operations used to receive, transfer and process combustible powders and solids and effective dust hazard control methods. It employs a systematic approach to dust explosion hazard assessment directed towards obtaining a Basis of Safety for a process.

Course Outline

Introduction
• Basic Theory and Definitions
  – Conditions for a Dust Explosion
  – Flash Fire or Deflagration?
• History of Dust Explosions:
  – Primary and Secondary Explosions
• Secondary Explosion Hazards

Dust Hazard Codes & Standards
• OSHA’s & EPA’s “General Duty” clauses
• OSHA Instructions on Combustible Dust
  – National Emphasis Program
• U.S. and International Fire, Mechanical & Building Codes
• NFPA and other Recommended Practices
• How Codes and Standards Apply to Your Facility and Workplace: Case Study

Combustibility Assessment Using Powder Properties
• Ignition Sensitivity
• Explosion Severity
• Thermal Instability

Process Conditions Affecting Combustibility
• Oxidant
• Temperature
• Physical Characteristics
• Moisture

Dust Explosion Hazard Control (Basis of Safety)
• Avoiding Flammable Concentrations
  – Housekeeping and the determination of hazardous deposit thicknesses
  – Safe methods for dust removal
• Avoiding Ignition Sources, Avoiding Oxidant Explosion

Protection Techniques
• Pressure Relief Venting
• Suppression
• Containment
• Isolation

Video Presentation
Q&A/Group Discussion
Quiz
Course Evaluation Feedback Form

You Will Learn
• How to incorporate combustible dust hazard management into routine powder processing
• How to analyze various conditions under which dust explosions can occur
• How to apply suitable measures for protection of people and facilities from dust explosion hazards
• Best dust explosion management practices for managing powder unit operations
• What properties of a powder create exploisible dust hazards

Who Should Attend
Personnel (e.g., management, technical, operations and maintenance) involved with process safety, EH&S, process design, operations and maintenance from the chemical & processing industries, including bulk and finished pharmaceuticals, chemicals, petrochemicals, oil and gas, food, plastic & rubber, metals, textiles, wood & paper and agrochemicals who desire a more in depth understanding of dust explosion hazards.
Course Design and Objectives
This course will discuss and demonstrate how and where electrostatic charge is generated, how to analyze static problems, and how to apply effective solutions. Practical static control techniques will be illustrated by examining case histories of explosion incidents investigated by Chilworth Technology consultants.

Course Outline
Introduction to Electrostatics
- Background Information and Definitions

Types of Electrostatic Discharges
- Four Types of Discharges
- Evaluation of discharges in terms of incendivity in Gas, Vapor, Aerosol and Dust Cloud Flammable Atmospheres
- Hands-on Demonstration of various types of discharges in the laboratory

Factors Affecting Electrostatics
- Relative Humidity
- Temperature
- Resistivity of Powders and Liquids
- Transport Mechanism (pneumatic, screw, spray, manual pouring etc)
- Immiscible Flows

Tests to Evaluate Electrostatic Characteristics of Powders and Liquids
- Volume Resistivity and Charge Relaxation Time – Powder
- Chargeability – Powder
- Conductivity – Liquid
- Chargeability – Liquid
- Hands-on Demonstration of Various types of Electrostatic Tests in Laboratory

Electrostatic Hazards Evaluation
A systematic approach to the diagnosis of electrostatic hazards associated with:
- People, Equipment and Facilities
- Powder Handling
- Liquid-Vapor Handling
- Use of Plastics
- Use of Flexible Intermediate Bulk Containers (FiBCs) (Super sacks)

Video Presentation
Case Studies Q&A/Group Discussion Quiz
Course Evaluation Feedback Form

You Will Learn
- How electrostatic charge is generated in industrial environments
- How to recognize those electrostatic hazards that can trigger industrial fires and explosions
- How to choose methods to evaluate and control electrostatic charge in order to reduce or eliminate such risks

Who Should Attend
This course is directed primarily at engineers who are involved in process-safety activities, in process operations, research and development, and safety-department oversight and auditing of the process-safety effort.

Attendance at this course also would be helpful to supervisors and managers who are responsible for ensuring appropriate protection against dust-ignition incidents that could affect employees and property.
Course Design and Objectives
This course will teach attendees how to identify the thermal and chemical reactivity hazards associated with a chemical process based on the principles of scale-up and development. Attendees will learn how to conduct risk analysis of reactive systems to ensure safety prior to process operations and how to interpret the results of preliminary screening tests through the use of chemical engineering concepts relating to safe plant operation. The course will discuss characterization of thermal runaway reaction through calorimetry methods and the latest techniques for process optimization.

Course Outline
Introduction
How and Where Hazards Arise
• Case Histories Involving Runaway Reactions and Current Legislation

Chemical Reaction Hazard (CRH) Assessment Strategy
• CRH vs. Process Life Cycle

Fundamental Principles of Scale-up and Reaction Runaway
• Vapor Pressure Effects
• Heat of Reaction
• PHI Factor
• Adiabatic Temperature Rise
• Reaction Rate
• Reaction Kinetics
• Kinetics of Heat Release/Loss
• Heat Loss Considerations
• Reactant Accumulation

Small Scale Screening Tests Identification of Highly Energetic Materials
• Strategy for Assessing Explosivity
• Oxygen Balance
• CHETAH Calculations
• Testing for Explosive Properties

Reaction Characterization Through Calorimetry
Characterization of Thermal Runaway Reaction Through Adiabatic Calorimetry
• Accelerating Rate Calorimetry
• Adiabatic Dewar Calorimetry
• Pressure Compensated Calorimetry

Inherently Safe Process
• Safe Process
• Integrating Safety Considerations into Process Design

Problem Solving Sessions Video Presentation
Q&A/Group Discussion Quiz
Course Evaluation Feedback Form
You will need to bring a scientific calculator to this course.

You Will Learn
The course will teach attendees how to assess chemical reactivity through:
• Use of Chemical Engineering principles to study the potential runaway reactions for storage and reactor risk assessments
• Small-scale studies
• Performing risk analysis of chemical processes
• Development of inherently safer processes problem solving sessions are included throughout the course, and the course incorporates case study scenarios to illustrate and extend the material.

Who Should Attend
The course will benefit attendees from a broad spectrum of backgrounds and job responsibilities including chemical engineers, process engineers/scientists, plant/process safety/risk managers, facilities managers and others who need to understand the risks and hazards that can lead to accidents, injuries, property damage and business interruptions to the plant.
Course Design and Objectives

This course provides the concepts of PHA team leadership, including how to conduct an effective PHA, role of a PHA leader, techniques for efficient and effective facilitation, creating nodes, PHA methodologies (e.g., HAZOP), optimization of PHA team performance, revalidation of PHAs and an overview of PHA software.

The course is illustrated with real industrial examples (both batch and continuous processes). Course participants will work case studies and participate in HAZOP team leader role playing exercises in the real situation of leading a HAZOP team.

The training course is delivered by one of Chilworth Technology’s highly experienced PHA practitioners.

Course Outline

Preparing for a PHA
• Purpose, Objectives, Scope Determination
• Process Safety Information Collection
• Process Noding
• Risk Ranking Methodology Determination
• PHA Team Member Selection

Facilitating PHA Sessions
• First Day Topics
• Maximizing Hazard Scenarios Identification
• Dealing with Group Dynamics
• Dealing with Missing Data

Overview of Regulatory Requirements
• 40CFR68, EPA Risk Management Program

Additional PHA Topics
• Facility Siting Review
• Human Factors Review
• Previous/Similar Incident Review

Documenting PHA
• Recording Process Safety Information
• Use of PHA software and spreadsheets
• Writing Recommendations
• Narrative Report Format

Workshops
• Practice PHA exercises
• Practice using PHA Software

Quiz

Course Evaluation Feedback Form

You Will Learn
• How to effectively prepare, lead and document PHAs and risk-rank hazard scenarios using a simplified LOPA technique
• How to maximize the identification of Hazard Scenarios, including ones with low likelihoods

Who Should Attend

Anyone responsible for PSM program compliance and effective PSM implementation (e.g., Process Safety Managers, Engineers, EH&S Managers, Operations and Maintenance Personnel and/or other designated PSM representatives).
HAZOPs and What-Ifs are common process hazards analysis (PHA) methods for identifying hazardous scenarios and for determining whether existing safeguards are sufficient for a given scenario. While these methods are often sufficient to evaluate relatively simple scenarios, they are less effective for complex scenarios. In these cases, the PHA team may have difficulty in judging the effectiveness of the safeguards, whether the hazard scenario meets company risk standards, and the effectiveness of recommendations in mitigating excessive risks. The Layer of Protection Analysis (LOPA) method has been developed to improve the evaluation of these complex scenarios. LOPA is a semi-quantitative technique to evaluate the risk of hazard scenarios and safeguard effectiveness. The LOPA method removes much of the subjectivity inherent in HAZOPs and What-Ifs, resulting in improved consistency and increased confidence in the analysis.

In this course you will learn how to conduct a LOPA review. You will learn what constitutes an initiating event, how to determine whether safeguards qualify as Independent Protection Layers (IPLs), the effect of enabling events and condition modifiers on risk, and the effectiveness of recommendations in meeting risk standards. This course includes theory and concepts behind LOPA as well as several exercises to practice the LOPA technique.

**Course Design and Objectives**

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**Failure Rate Analysis**

- Categorizing failure data
- Sources of failure data
- Converting failure rate to failure upon demand

**Development of LOPA scenarios**

- Identifying IPLs
- Understanding Safety Systems
- Using LOPA to evaluate risk

**Quiz**

**Course Evaluation Feedback Form**

**You Will Learn**

- Understanding numerical risk; How to develop LOPA scenarios from qualitative studies (i.e., HAZOP, What-If)
- Sources of failure rate data
- Effect of testing and demand rate on the reliability of safeguards
- What constitutes an Independent Protection Layer, IPL
- Fundamentals of Safety Systems
- How to evaluate safeguards
- How to integrate LOPA with HAZOP

**Who Should Attend**

PHA analysts, process safety personnel, project or process engineers and others that are involved with evaluating process risk. Experience with PHAs is desirable but not a requirement.
Course Design and Objectives
Incorrectly specified electrical and mechanical equipment can provide a significant source of ignition for flammable atmospheres. The hazardous area classification process is designed to identify locations within a process plant where ignitable atmospheres exist, and to determine their likely extent. Using this information, the risk of ignition from equipment and devices in these areas can be minimized by either the specification of suitable equipment/devices, or relocating them to a safe, non-hazardous area.

Course Outline
Introduction
• Overview of Regulatory Requirements
• Relevant Codes, Standards, and Guidelines: NFPA, EN, ATEX, etc.
• Introduction to Fire and Explosion Hazards
• Flammability Characteristics Relevant to Ignition Sensitivity and Hazardous Area Classification

Methodology for Hazardous Area Classification
• Identification of Hazardous (Classified) Areas or Zones, Class I, Class II and Class III
• North American and International Hazardous Area Designation
• Classifying and Determining the Extent of Areas Containing Flammable Gases, Vapors, and Dusts
• Effects of Ventilation, Temperature, and Pressure on the Extent of Zones

Assessment of Non-Electrical Equipment and Components Intended for Use in Ignitable Atmospheres
• Ignition Hazards associated with Non-Electrical Equipment and Devices
• Methodology of the Assessment

Selection of the Electrical Equipment for Hazardous Areas
• Methods of Protection and Summary of Commonly Used Protection Methods for Different Divisions & Zones
• Ingress Protection: IP Codes, NEMA and UL Types of Enclosures
• Intrinsic Safety

Workshops
Q&A/Group Discussion
Quiz

Course Evaluation Feedback Form

You Will Learn
• Ignition hazards that can be created by electrical and non-electrical equipment and devices
• The regulatory requirements of codes and standards for the classification of hazardous areas
• How to perform a hazardous area classification study
• The classification of areas where flammable atmospheres can arise from the presence of combustible dusts, flammable gases or vapors

Who should attend
Personnel (e.g., management, technical, operations and maintenance) involved with process safety, EH&S, process design, operations and maintenance from the chemical & processing industries, including bulk and finished pharmaceuticals, chemicals, petrochemicals, oil and gas, food, plastic & rubber, metals, textiles, wood & paper and agrochemicals who desire a more in depth understanding of how to evaluate and select electrical and non-electrical equipment for use in hazardous areas.
## 2016 Dekra Insight
### Process Safety Training Schedule

<table>
<thead>
<tr>
<th>Course</th>
<th>Duration</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beyond Compliance: Development and Implementation of PSM in the Workplace</td>
<td>2 Days</td>
<td>Shanghai</td>
</tr>
<tr>
<td>Safe Handling &amp; Processing of Combustible Dusts</td>
<td>1 Day</td>
<td>Shanghai</td>
</tr>
<tr>
<td>Understanding &amp; Controlling Electrostatic Hazards</td>
<td>1 Day</td>
<td>Shanghai</td>
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<tr>
<td>Chemical reactivity Hazard During Process Scale-up</td>
<td>1 Day</td>
<td>Shanghai</td>
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<tr>
<td>Practical HAZOP / PHA Team Leadership in Action</td>
<td>3 Days</td>
<td>Shanghai</td>
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<tr>
<td>LOPA: The Value of LOPA in Risk Reduction</td>
<td>1 Day</td>
<td>Shanghai</td>
</tr>
<tr>
<td>Evaluation &amp; Selection of Electrical Equipment for Use in Hazardous Areas</td>
<td>1 Day</td>
<td>Shanghai</td>
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Course Title: ____________________________________________ Date: ________________

Name*: ____________________________________________ Company: ____________________________

Address: __________________________________________________________________________

Postcode: __________________________________________________________________________

Country: __________________________________________________________________________

Tel: _______________________________________________________________________________

Email: ____________________________________________________________________________

Signature: _________________________________________________________________________ Date: ________________

To reserve your place(s) call on T + 86 21 6056 76 67 to check availability and fax or email this form to + 86 21 6056 7555.

Please submit one form per delegate. Full venue details (with a location map and local area information) will be provided prior to the event. Payments can be made by cash or company purchase order.

Chilworth a DEKRA company reserves the right to modify or cancel the course up to 5 working days prior to the course commencement date.