Introduction to Process Safety
Overview

- Overview of Safety Systems
- Principles of Process Safety
- Application to External Industry
- Summary
Process Safety
Introduction
# Health and Safety Management

<table>
<thead>
<tr>
<th>OCCUPATIONAL HEALTH AND SAFETY</th>
<th>BEHAVIOURAL HEALTH AND SAFETY</th>
<th>PROCESS SAFETY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generally incidents have a <strong>high</strong> likelihood but generally <strong>low</strong> consequence</td>
<td>Concerned with the behaviour of individuals and teams, focused on reinforcing safe behaviour and reducing unsafe behaviour</td>
<td>Arises from processing activities and hazardous substances. Incidents have a <strong>low</strong> likelihood of occurrence but <strong>high</strong> consequences</td>
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</tbody>
</table>
‘A blend of engineering, management, and operational skills focused on preventing catastrophic accidents; particularly explosions, fires, and toxic releases associated with the use of chemical and petroleum products’

Centre for Chemical Process Safety
Flixborough 1st June 1974;
- Design modifications not controlled
- 28 fatalities
- 36 injuries on site
- 56 injuries off site
Seveso Disaster 10th June 1976;

- Overheating of chemicals due to plant shut down
- No control readings on reaction process
- Release of toxic cloud over town of Seveso
EU Law and COMAH

**European Law:**

**UK Law:**
- HASAWA (1974)
- Control of Industrial Major Accident Hazards (CIMAH) 1984 Regulations
- Control of Major Accident Hazard Regulations (COMAH) 1999 / 2015
Is Process Safety Relevant to Me?
Relevance to External Industry?
Relevance to External Industry?
Tianjin
2015
Nitrocellulose Storage
800t Ammonium Nitrate
798 injuries
173 Fatalities

https://www.youtube.com/watch?edufilter=NULL&v=993wI1Z6XFSs
Process Safety Overview
HSE Common Failings?

- Permit to work not adhered to
- Plant design layout
- Emergency procedures inadequate
- Operational procedures
- Training & competence
- Lack of, or incorrect maintenance
- Poor communication
- Management of change not carried out
Managing Process Safety

- Plant
- Process
- People
Process Safety Asset Management Lifecycle

1. Design
2. Construction
3. Commission

Underpinned by:
- Training and Competency
- Management of Change
- Audit and Inspection
- Standards and Best Practice
- Legislation and Regulation
- Learning from Incidents

4. Operate
5. Modify
6. Decommission
Layers of Protection

Aims of Layers of Protection

**Prevention**
Prevent the initiation of a sequence of events that could lead to a major accident

**Control**
Stop a hazardous event sequence progressing further

**Mitigation**
Reduce the consequences once they have occurred

Inherent Safety
Four key elements:

- Minimise
- Substitute
- Moderate
- Simplify
Layers of Protection

- Emergency Response
- Passive Protection
- Active Protection
- Safety Shutdown
- Basic Process Control
- Prevention, Control & Mitigation of Process Incidents
- Process Incident
Transferable Tools

- HAZOPS
- Management of Change
HAZOPS

- Multidisciplined team
- Process split into sections
- Hazards systematically assessed individually and as a whole
- Provides operations risk assessment base
The MoC Process

Need for Change Identified

1. Change Assessment → 2. Identify Risks → 3. Ensure mitigation controls are in place → 4. Approve

6. Implement Assessment of Change → 5. Communicate

Change Complete → 7. Closeout
HAZOP’s – Bulk Emulsion Plant
Safety Systems and Emergency Training
Smart Blasting MoC
Summary

➤ Process Safety Introduction

➤ Relevance to Other Industries

➤ Process Safety Overview

➤ Transferable Tools

➤ Application