

Safety Case & PE (Chemical)

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SCDF
The Life Saving Force



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The Intent

- Singapore: a global petrochemical and chemicals hub
 - A need to ensure public safety as Major Hazard Installations (MHIs) may have inventories of dangerous substances with complex processes
 - Potential of catastrophic consequences if not properly managed
- MOM is planning to enact a new WSH (Major Hazard Installations) Regulations in 4Q 2016
 - MHIs in Singapore required to prepare Safety Case, demonstrating to authorities (MOM, NEA & SCDF) that they are safe to operate
 - Some elements of the Safety Case could be endorsed by a Professional Engineer

Safety Case Regime

Adopt a demonstration approach – Onus for MHIs to showcase to the **Regulator**

The Safety Case consists of **structured arguments**, supported by a **body of evidence**, that provides a compelling, comprehensive and valid case that the MHI is safe for given application in a given operating environment

Clear Links between prevention, control and mitigation and the major accident hazards

Degree of analysis proportionate to intrinsic risk

Risk reduction measures (Gaps analysed and time plans to implement the improvements)

- **Argument without Evidence is Unfounded**
- **Evidence without Argument is Unexplained**

Safety Case Regime

Descriptive
Info about MHI

MAPP & SHMS
Focus on Major accidents

Predictive
Identification of Major accidents & Risk Assessment

Process Safety

Mechanical Engineering

Electrical, Control & Instrumentation

Human Factors
Safety critical task, roles and design

Emergency Response
Incorporating domino impacts

ALARP
Gap analysis & Demonstration

Entire MHI lifecycle

- 1) Design,
- 2) Construction
- 3) Commission
- 4) Operations
- 5) Maintenance
- 6) Decommission

Roles of a PE(Chemical) from Plant Lifecycle Approach

Typical Duration		Possible Areas	Could be Certified by:	Current Legislative Requirements
0.5 ~2 yrs	Process Design	Technology Parameters	PE(Chem)	No
	Front End Engineering	1) Design Calculations / Basis 2) Quantitative Risk Analysis (QRA)	PE(Chem)	No No (Approved Coys)
0.5 ~1.5 yrs	Detailed Engineering	1) Vessel Design	PE(Mech)	Yes(if fabricated in SG)
		2) PHA e.g. HAZOP	PE(Chem)	No
		3) Process Safety Control (Interlocks Design)	PE(Chem)/ PE(Elect)	No
0.5 ~3 yrs	Procurement	4) Process Safety Critical Systems 5) Fire Safety Provision	PE(Chem) /PE(Elect)	No
	Construction	1) Oversight of procurement according to specifications.	PE(Chem) / PE(Mech)	Yes
0.5 ~3 yrs		Construction	1) Structural Designs	PE(Civil)
	2) Vessel Testing		SPE(PV)	Yes (PV only)
0.5 ~3 yrs	Construction	3) Electrical Works / Design	PE(Elect)	Yes
		4) Instrumentation	PE(Elect)	No

N.B. Although there is currently no legislation requiring certification of these possible areas, a company that employs a PE(Chem) would enhance assurance and credibility of the technical areas where endorsement was sought.

Roles of a PE(Chemical) from Plant Lifecycle Approach

Typical Duration		Possible Areas	Could be Certified by:	Current Legislative Requirements
2 ~6mths	Commissioning & Handover	Process Parameters and Commissioning Data	PE(Chem)	No
20 ~ 30 yrs & beyond	Operations & Maintenance	1) Selected Elements of Safety Case e.g. Safety Management System	PE(Chem)	No
		2) Fire Safety System Design (Process Related Portion)	PE(Chem)	No
		3) Fire Protection System Inspection	PE(Mech)	Yes
		4) Asset Integrity Programs	SPE(PV) / PE(Elect)	Yes (For PV only) For SCDF, also include storage tanks and pipings
		5) Power Supply and Instrumentation	PE(Elect)	
~2 yrs	Decommission & Demolition	1) Certify safe for removal 2) Demolition works	PE(Chem) PE(Civil)	No No

N.B. Although there is currently no legislation requiring certification of these possible areas, a company that employs a PE(Chem) would enhance assurance and credibility of the technical areas where endorsement was sought.

Core Competencies

- Areas of Chemical Engineering identified as core competencies
 - Process Safety
 - Process Design and Control
 - Fire and Explosion Protection, Prevention and Mitigation
 - Quantitative Risk Assessment (QRA)
 - Research and Development in Chemical Engineering field
 - Industrial Production and Plant Operation
 - Environment Protection and Pollution Control

The way forward

- Possible areas that PE (Chemical) could contribute in:
 - Quantitative Risk Assessment (QRA)
 - Technical aspects of Safety Case
 - Predictive
 - Process Safety
 - Human Factors
 - ALARP demonstration

The End

Thank



You