

2nd Chemical Process Safety Sharing (CPSS)



Chemical
Process Safety Sharing

Process Safety Competency Development



Thodsapol Chadchavalpanichaya
Principal Consultant
PTTES



GTC



SCG
CHEMICALS

IRPC



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Introduce to PTTES

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2st Chemical Process Safety Sharing (CPSS)
27th September, 2018, Thailand





Principal Consultant



THODSAPOL CHADCHAVALPANICHAYA

Education:

1990

B.Eng. Chemical Engineering, Khon Kaen University

1994

M.Eng. Chemical Engineering, Chulalongkorn University

Experience yr:

28



Area Expertise

- | | |
|--|--|
| <ul style="list-style-type: none"> • SHE Management • Process Safety Management • Process Safety Design • Blast Pressure, Flammable Material Dispersion Model, Toxic Material Dispersion Model | <ul style="list-style-type: none"> • HAZOP leader • Supply & Planning Model • Quality Estimator • Tank and Dispatching Design • Process Control |
|--|--|

Experiences Summary

- | | |
|----------------|---|
| 1990 | Process Engineer, Thai Petrochemical Industrial Company Limited |
| 1990 - 1991 | Site Engineer in Worrachak International Company Limited |
| 1994 - 2003 | Process Control Engineer, The Aromatics Thailand Company Limited, Alliance Refining Company |
| 2003 - 2007 | Supply & Planning, Alliance Refining Company Limited |
| 2007 - 2011 | Process Engineer, PTT Aromatics and Refining Public Company Limited |
| 2011 - 2013 | Division Manager - Technical SHE, PTT Global Chemical Public Company Limited |
| 2014 – current | Principal Consultant – Process Safety, PTT Energy Solutions Company Limited |



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PTT Energy Solutions



Technical Center of Excellence
in AEC in 2020

OPERATIONAL EXCELLENCE

T

Technical Capability Enhancement



I

Reliability &
Asset Integrity Improvement



P

Performance Enhancement



P

Project Development



S

Process Safety Management



PTTES SERVICES

PS Training Courses



- **Process Safety Management (PSM)**
- **Process Safety in Design (5 days)**
- **Preliminary Design Review (2 days)**
- **Aboveground Storage Tank (3 days)**
- **Risk Management and ALARP (1 day)**
- **HAZOP for team member (3 days)**
- **HAZOP for team leader (5 days)**
- **MOC/ PSSR (2 days)**
- **Incident Investigation (1 day)**
- **etc.**

Conference 2015

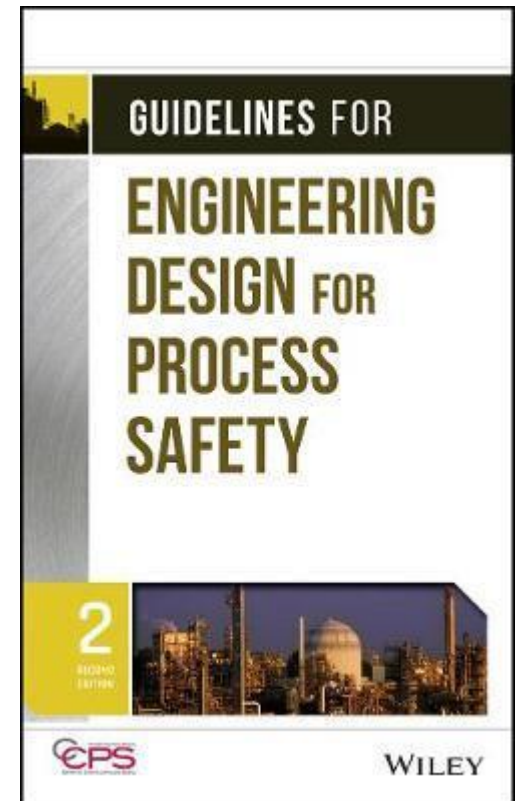
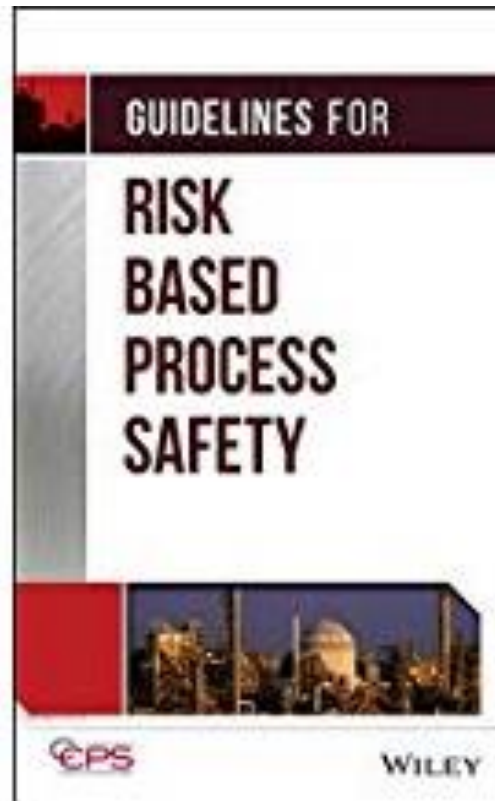
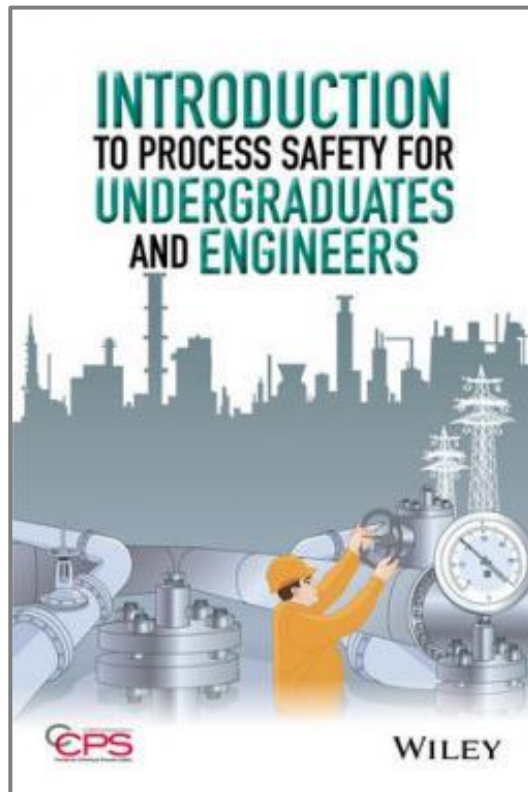


Conference 2018





PTTES is a member of CCPS.



CCPS



On March 25, 1985, AIChE formed CCPS (the Center for Chemical Process Safety) with 17 charter member companies.

- Shell Oil Company
- The Dow Chemical Company
- Union Carbide Corporation (now Dow)
- Rohm and Haas Company (now Dow)
- Monsanto Company
- American Cyanamid (now Cytec)
- Great Lakes Carbon Corp. (now SGL)
- Air Products and Chemicals
- Factory Mutual Research
- Stone and Webster Engineering
- etc.



CCPS brings together manufacturers, government agencies, consultants, academics and insurers to lead the way in improving process safety.

History



1974 Flixborough, UK
24 deaths, 36 injuries



Europe



Seveso, Italy

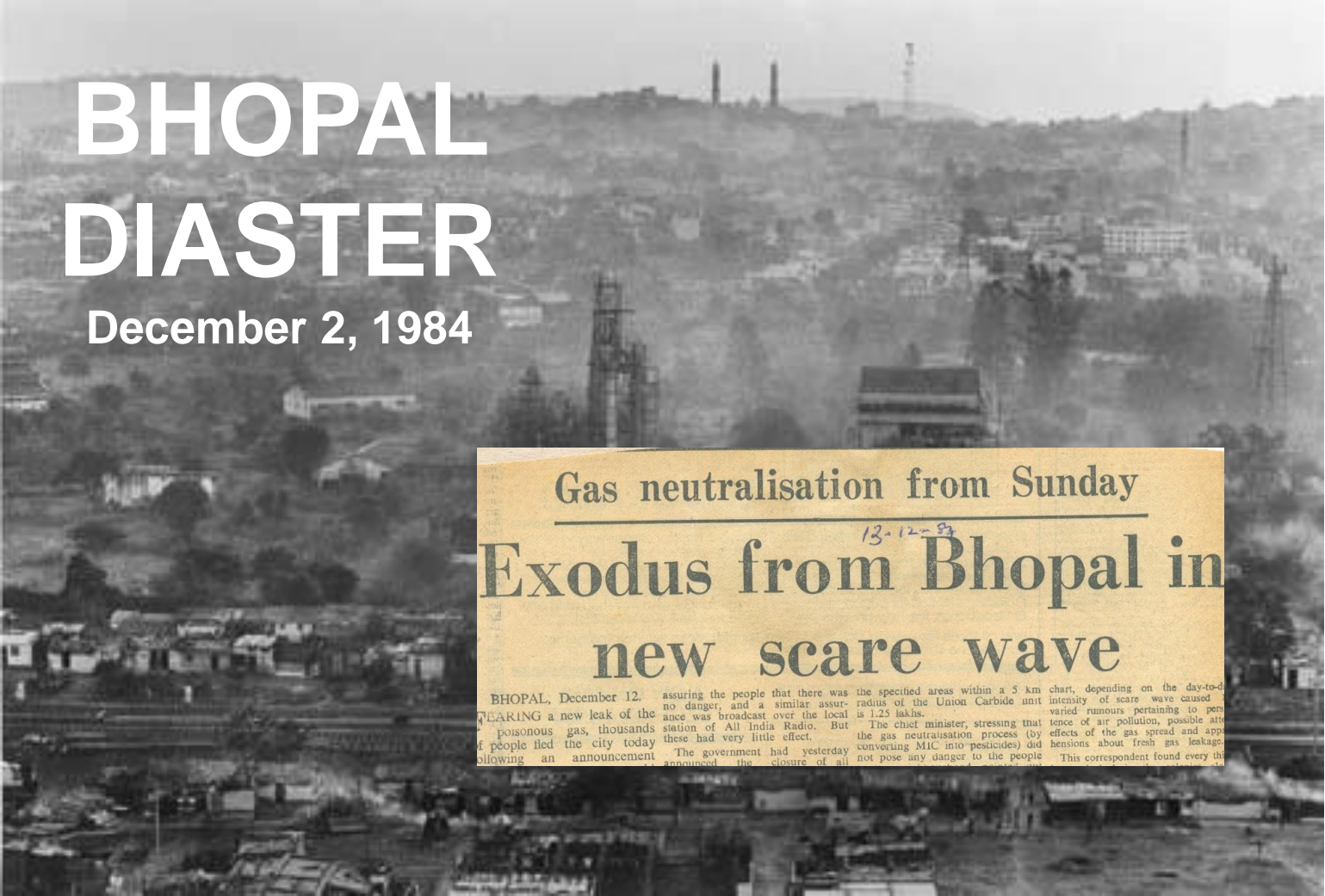
July 10, 1976





BHOPAL DIASTER

December 2, 1984



Gas neutralisation from Sunday

13-12-84

Exodus from Bhopal in new scare wave

BHOPAL, December 12. FEARING a new leak of the poisonous gas, thousands of people fled the city today following an announcement assuring the people that there was no danger, and a similar assurance was broadcast over the local station of All India Radio. But these had very little effect. The government had yesterday announced the closure of all the specified areas within a 5 km radius of the Union Carbide unit is 1.25 lakhs. The chief minister, stressing that the gas neutralisation process (by converting MIC into pesticides) did not pose any danger to the people chart, depending on the day-to-day intensity of scare wave caused varied rumours pertaining to persistence of air pollution, possible effects of the gas spread and apprehensions about fresh gas leakage. This correspondent found every th

North Sea



Piper Alpha

July 6, 1988





US



- ❑ **1989 Phillips Chemical, Texas, US (24 deaths, 132 injuries)**
- ❑ **1990 Arco Chemical, Texas, US (17 deaths)**
- ❑ **1990 BASF, Cincinnati, US (2 deaths, 41 injuries)**

US Unions



Demonstrated a great deal of interest and activity in controlling major chemical accidents.





What is Process Safety?



Process Safety = Good Design?



Causes - Little Things !!!



source: <http://www.csb.gov/>

through life cycle...



Codes & Standards



"Recognized And Generally Accepted Good Engineering Practices" (RAGAGEP) - are the basis for *engineering, operation, or maintenance activities* and are themselves based on established codes, standards, published technical reports or recommended practices (RP) or similar documents.

OSHA June, 2015

What is Process Safety?



Process safety is a blend of engineering and management skills focused on preventing catastrophic accidents, particularly explosions, fires, toxic releases associated with the use of chemicals and petroleum products.

It is the application of engineering principles to design, construction, operation, and maintenance of plants and equipment, which minimize process related hazards.

CCPS, 2015

API RP 750

- Jan 1990, API RP 750 Management of Process Hazards
- A framework of procedures and practices to manage risk in oil and gas operations.

1. Process safety information
2. Process hazards analysis
3. Management of change
4. Operating procedures
5. Safe work practices
6. Training.
7. Assurance of the quality and mechanical integrity of critical equipment
8. Pre-start-up safety review
9. Emergency response and control
10. Investigation of process-related incidents
11. Audit of process hazards management systems



Public Hearing



- From November 27 through December 4, 1990 in Washington D.C.
- From February 26 through March 7, 1991 in Houston, Texas.
- Allowed hearing participants to submit post-hearing comments by May 6, 1991

OSHA received more than 175 comments in response to the notice of proposed rulemaking. In addition to these comments, the hearings resulted in almost 4000 pages of testimony and almost 60 post-hearing comments and briefs.

OSHA PSM



1992, OSHA issued the Process Safety Management of Highly Hazardous Chemicals regulation (Title 29 of CFR Section 1910.119).

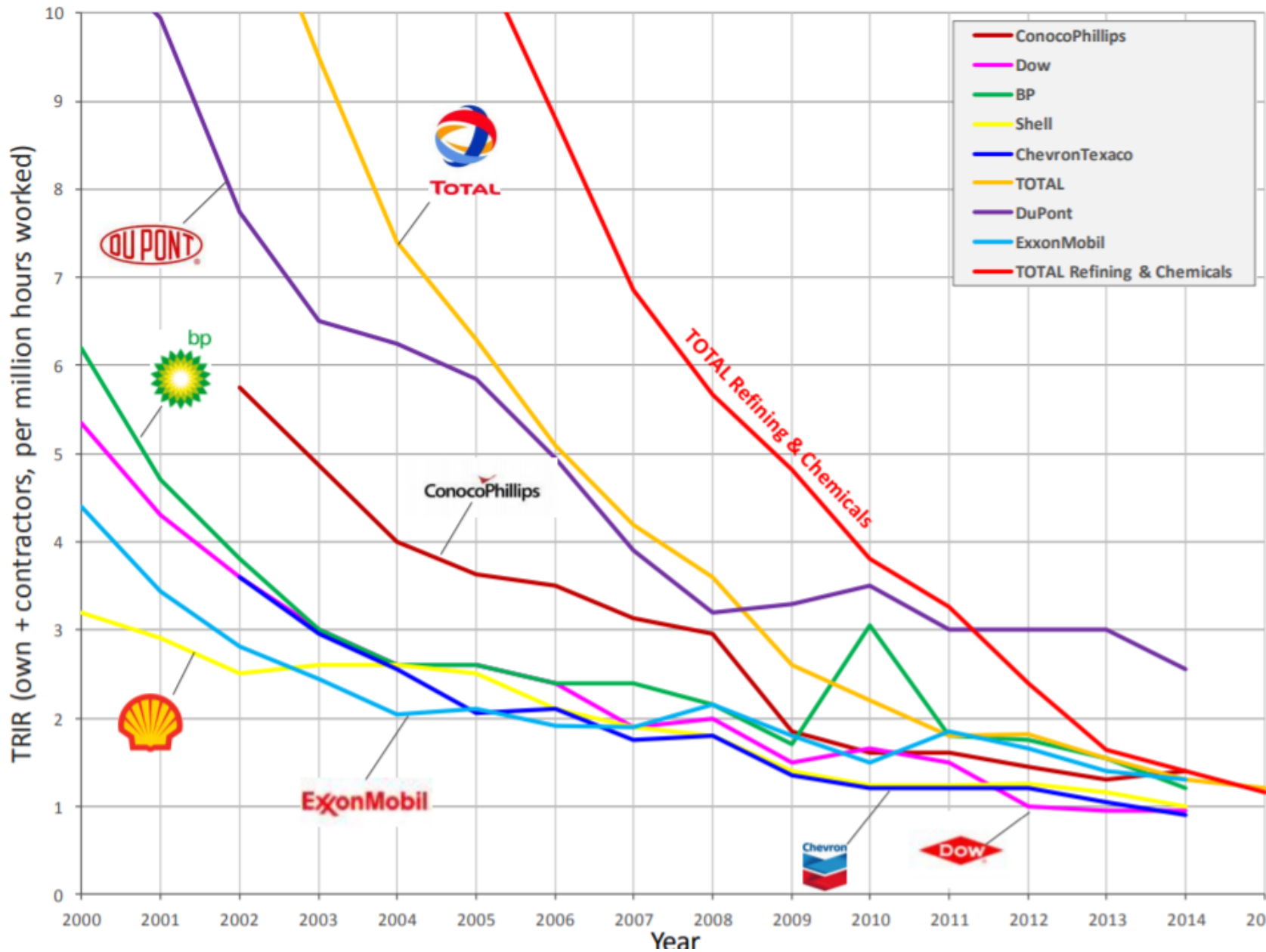
**Title 29 (Occupational Safety and Health Standards)
CFR (Code of Federal Regulations)
Part 1910 (Labor)
Section 119 (Process safety management of
highly hazardous chemicals)**

Elements of OSHA PSM



1. Employee Participation
2. Process Safety Information
3. Trade Secrets
4. Process Hazard Analysis
5. Operating Procedures
6. Training
7. Contractors
8. Mechanical Integrity
9. Hot Work
10. Management of Change
11. Pre-startup Safety Review
12. Emergency Planning and Response
13. Incident Investigation
14. Compliance Audits





Source: Analysis & benchmark of 4 years of HiPo events and events with real major consequences at TOTAL RC RC/HSE/SEC, April 2016

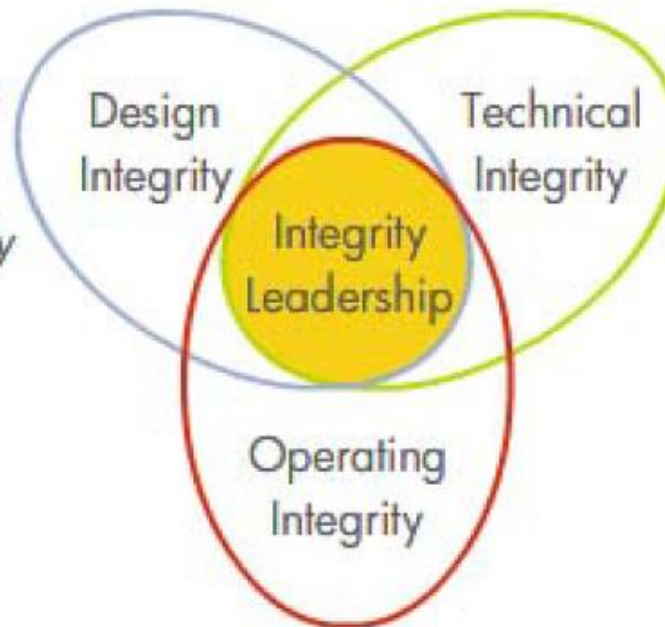


A Shell View



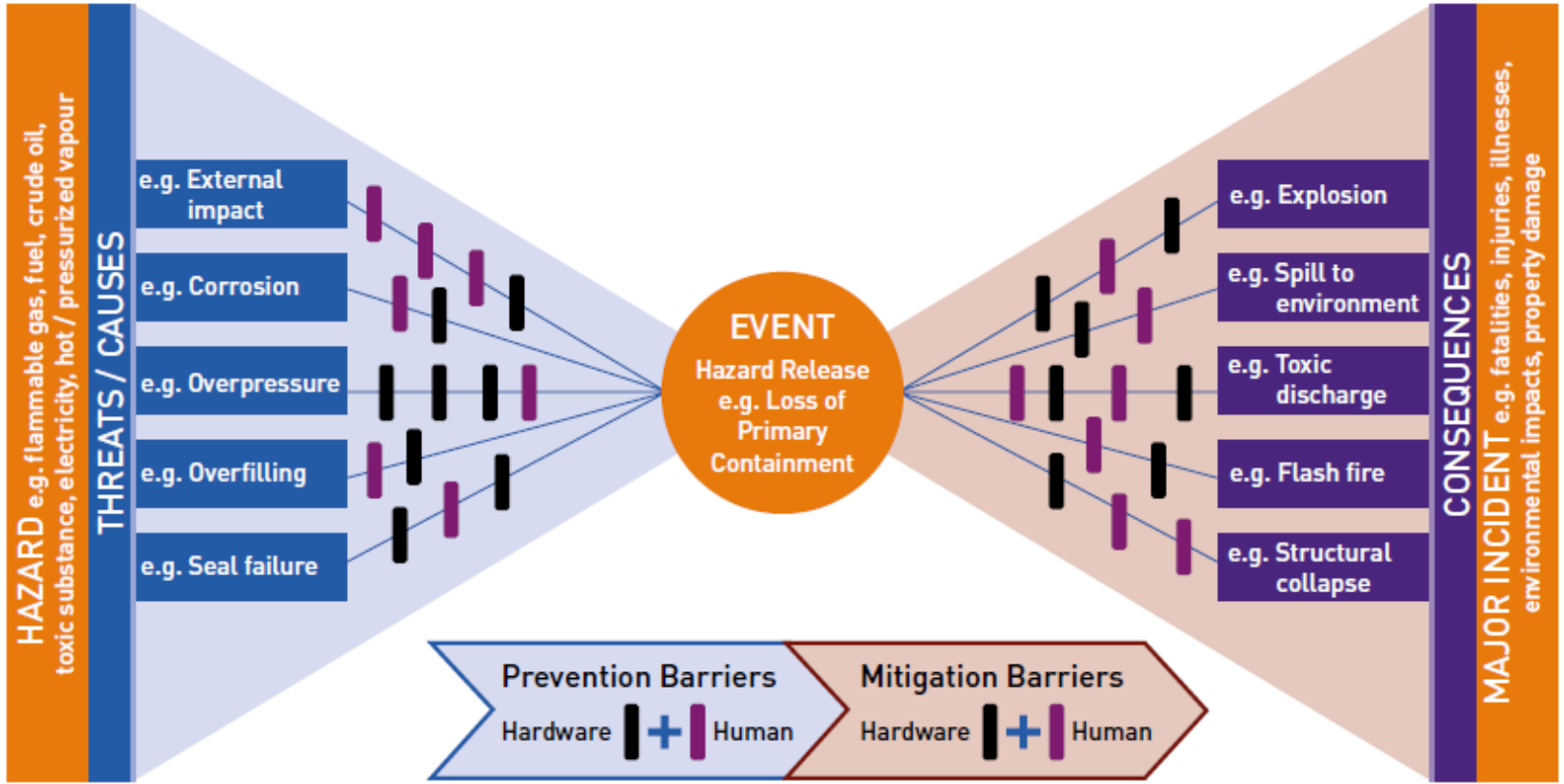
Shell Vision: "Our assets are safe, and we know it"
("and we can show it")

*We design and build
so that risks are
As Low As Reasonably
Practicable (ALARP)*



*We maintain the
hardware barriers*

*We work within the
operational barriers*



Source: IOGP



Excellence

Performance

Equipment

Procedure

People

Culture

Competency

Leadership & Commitment



Qualify?



***Demonstration of
skills and abilities***



Competency Assurance



- Standards set for competency
- Well-structured training
- Training validation and evaluation
- Adequate experience



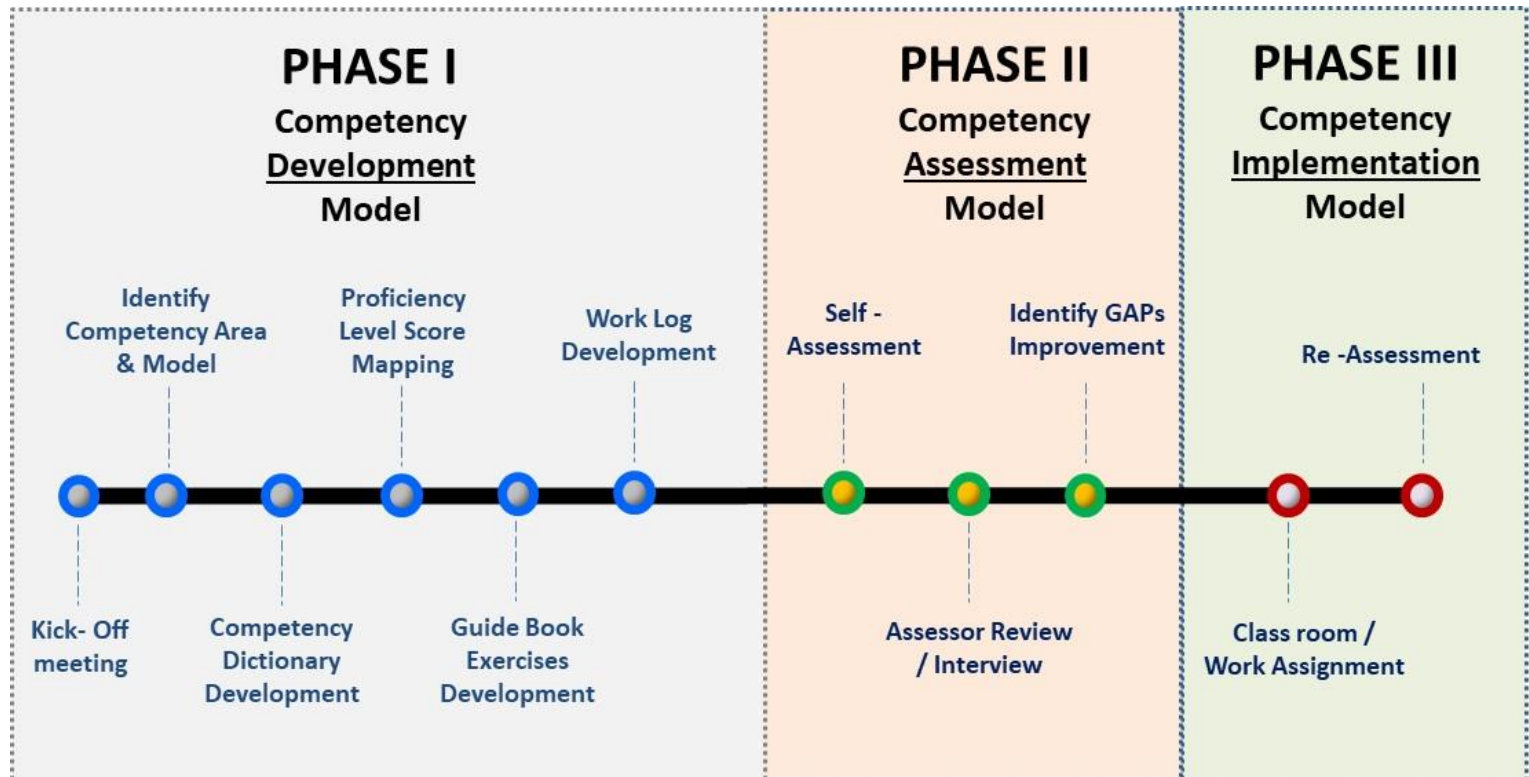
PTTES Projects



Identify Roles & Competency Needs



Project Phases



Competence Proficiency Levels



Demonstration of skills and abilities



PS Competency Matrix



Competency element	Front line			Engineering			Support functions					Management		Executives						
	Operator	Maintainer	Supervisor	Integrity	Reliability	Other tech	Project	PS advisor	PS lead	HSE site	HSE Corp	QA	HR	Manager / superintendent	GM/site manager	Leaders/ MD	General board member	Board chair	Safety committee chair	Process safety specialist board member
Process safety concepts	2	2	3	2	2	2	2	3	4	2	3	2	1	3	3	3	2	2	3	4
Hazard identification and risk assessment	2	2	2	2	2	2	2	3	4 TA	3	3	1	1	2	2	1	1	2	2	2
Hazard awareness and characterisation associated with the system being operated and product processed	2	2	2	3	3	4 TA	3	3	4 TA	1	3	1	1	3	2	2	1	2	2	3
Project management	1	1	2	3	3	4	4	3	4	1	3	1	NA	2	2	2	1	2	1	3
Management of major emergencies and emergency preparedness	2	2	3	2	2	2	2	3	4	3	4	1	1	4	3	3	1	3	3	3
Safety in design including systems	1	1	1	3	3	4 TA	3	1	2	1	2	1	NA	1	1	1	1	1	1	1
Asset integrity – inspection and maintenance	1	2	3	4	4	4 TA	2	2	2	2	1	1	NA	3T	2	1	1	1	1	4
Management of change	1	1	2	3	3	3	3	3	4	3	3	1	2	2	2	2	1	2	3	3



Competency Dictionary



Competency area	Subject matter focus	Competency	1 (Awareness)	2 (Can do)	3 (Competent)	4 (Advanced)	5 (Expert)
Safety Health and Environment	6.1 Site safety practice		Be aware of the dangers and skills required to ensure personal safety	Be trained and able to use safety equipment to ensure personal safety	Be able to supervise others to ensure safety practices are correctly followed	-Be able to review company procedures on personal safety -Be able to approve work in high risk environment	-Be the source of knowledge for company and Asia Pacific Region -Be the certified expert in Asia Pacific Region on personal safety skill -Be the custodian for personal safety skill procedures and regulations
	6.1.1 Site safety regulation		-Understand and able to follow the site safety regulations strictly -Understand and able to practice 5S program -Be able to attend and contribute to safety activities and forum	Be aware of and able to raise emergency alert and comply with safety procedure	-Be able to audit compliance to site safety regulations -Be able to lead site safety meeting and recommend improvement in the area of work -Be able to promote safety culture to the team	-Be able to regularly review the site safety regulations and recommend improvement in company across multiple sites -Be able to plan exercises and provide process/plant information to emergency response team during emergency situation	-Be able to update and approve the site safety regulations and ensure regular update in accordance with the local regulations -Be able to approve the emergency response exercises -Be able to represent company in coordination with external agencies
	6.1.2 Field risk assessment		Be aware of hazard and risk in work place	-Be able to identify hazard and evaluation risk in work place	-Be able to review and audit the field risk assessment -Be able to lead field risk assessment meeting/exercise	-Be able to regularly review the field risk assessment and recommend improvement in company across multiple sites	Be able to approve changes to the field risk assessment system
	6.1.3 Work permit system		Be aware of the work permit systems and procedures	-Be able to comply with work permit system for work in the plant -Be able to fill in work permits for low risk job classifications -Be able to conduct audit on compliance on work permit system	-Be able to ensure that the scope of work, risks and precautions are fully identified in permits -Be able to coordinate and discuss requirements with operations on all jobs	-Be able to complete permits for all jobs -Be able to establish governing criteria to meet safety requirements and standards within company (e.g. safe working height, scaffolding) -Be able to review and recommend improvement to work permit system	Be able to approve changes to the work permit system

Score Mapping





Competency area	Subject matter focus/Competency		Sub-Subject matter focus/Competency		IOC/ PTES recommended Proficiency Score for Current Job Grade
Safety, Health and Environment	6.1	Site safety practice	6.1.1	Site safety regulation	3
			6.1.2	Work permit system	3
			6.1.3	Confined space entry regulation	3
			6.1.4	Personal protection equipment usage	3
			6.1.5	Emergency preparedness and response	3
	6.2	Process safety practice	6.2.1	Process Safety in Design	3
			6.2.2	Siting evaluation and plot plan review	3

Toolkit



Guidebook



Area of focus: 1.1.4 Gas Turbines	
Basis and rationale for competency	Illustration of key concept
<ul style="list-style-type: none"> Gas turbine are critical equipment as driver for electrical power generation for the plant Gas Turbines are also widely used as main driver for major equipment like centrifugal compressor or large pumps Low performance or failures of turbines may cause a process unit to operate at lower capacity or shut down Failures of Gas Turbines may also result in a fire within the enclosure Knowledge of Gas turbines will support trouble shooting of issues and provides information for developing job scope for equipment maintenance and/or repair. It may also contribute to the correct specification and selection of Gas Turbines for new duties in new projects Awareness of gas turbines start up, control, water washing and safeguarding features are critical to safe running and shutdown. These are nearly always packaged together with the turbines supplies 	<p>Gas Turbine example</p> <ul style="list-style-type: none"> What are the key parts/components of a Gas Turbine? What is the function of each of these key parts/components? 
<p>Frequency of use</p> <ul style="list-style-type: none"> As required 	
<p>Relevant expertise/reference</p> <ul style="list-style-type: none"> Sr. rotating maintenance engineers Sr. rotating inspection engineers Maintenance supervisor Relevant API, ANSI, DEP, ISO standards Datasheet and drawings Operating manual 	

Work Log



Competency area: 6. Safety, Health and Environment

Subject matter focus: 6.1 Site safety practice

6.1.2 Field risk assessment

Reflect on following questions:

1. What is the field risk assessment?
2. What do I learn?
3. What do I find difficult? How do I deal with it?
4. What do I rely on to get information and explanations such as Books, Standards, Instruction Manuals, etc.?
5. How would I perform the field risk assessment?
6. What laws, codes and standards are required for this topic?
7. What aspects of this topic do I find inadequate and need improvement?
8. Why this topic is important?
9. How do I apply this topic in my work?
10. Who should I consult for the field risk assessment?
11. What are best practices from this topic?

Fill answers below (Number the answers according to the question covered):

Continue on another sheet or expand the text book

Complete and submit to Line Supervisor & Division Manager before Interview/Discussion date

Line Supervisor Sign off:..... Division Manager Sign off:.....

Skill Owner (if consulted) Sign off:.....

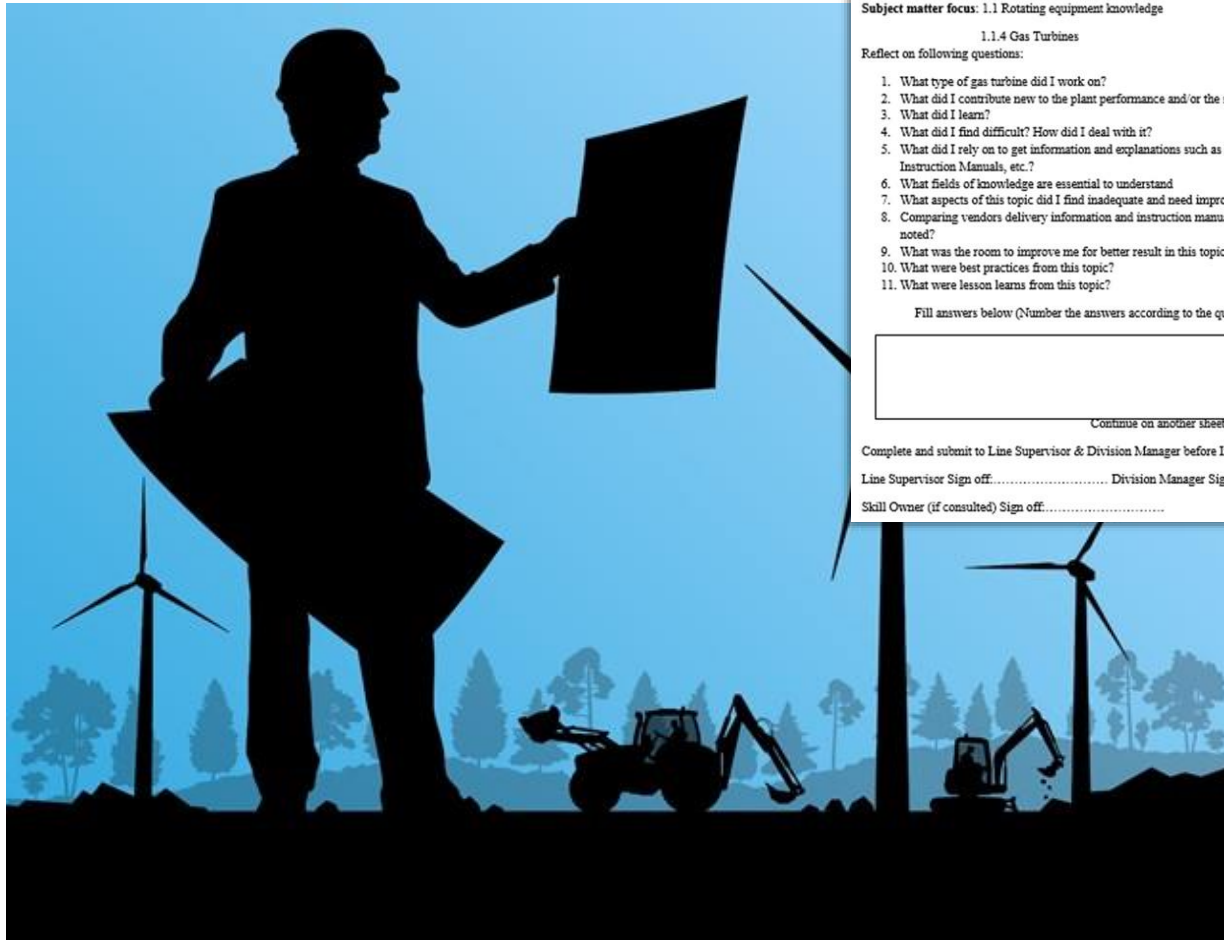


Competency Gaps



Competency area	Subject matter focus/Competency		Sub-Subject matter focus/Competency		IOC/ PTTES recommended Proficiency Score for Current Job Grade	Evidence from Assignment Record Number or Work Log No.	Finalised Proficiency Score (Assessed with Division Manager)
Safety, Health and Environment	6.2	Process safety practice	6.2.1	Process Safety in Design	3	no71-79	2
			6.2.2	Siting evaluation and plot plan review	3	no71-79	2
			6.2.3	Fire protection and firefighting systems	3	no71-79	2

Classroom/ Work Assignment



Engineer name:..... Line Supervisor.....

Date of log entry:.....

Competency area: 1. Rotating Equipment Engineering

Subject matter focus: 1.1 Rotating equipment knowledge

1.1.4 Gas Turbines

Reflect on following questions:

1. What type of gas turbine did I work on?
2. What did I contribute new to the plant performance and/or the staff performance?
3. What did I learn?
4. What did I find difficult? How did I deal with it?
5. What did I rely on to get information and explanations such as P&ID, Books, Standards, Instruction Manuals, etc.?
6. What fields of knowledge are essential to understand
7. What aspects of this topic did I find inadequate and need improvement?
8. Comparing vendors delivery information and instruction manuals, were any discrepancy noted?
9. What was the room to improve me for better result in this topic?
10. What were best practices from this topic?
11. What were lesson learns from this topic?

Fill answers below (Number the answers according to the question covered):

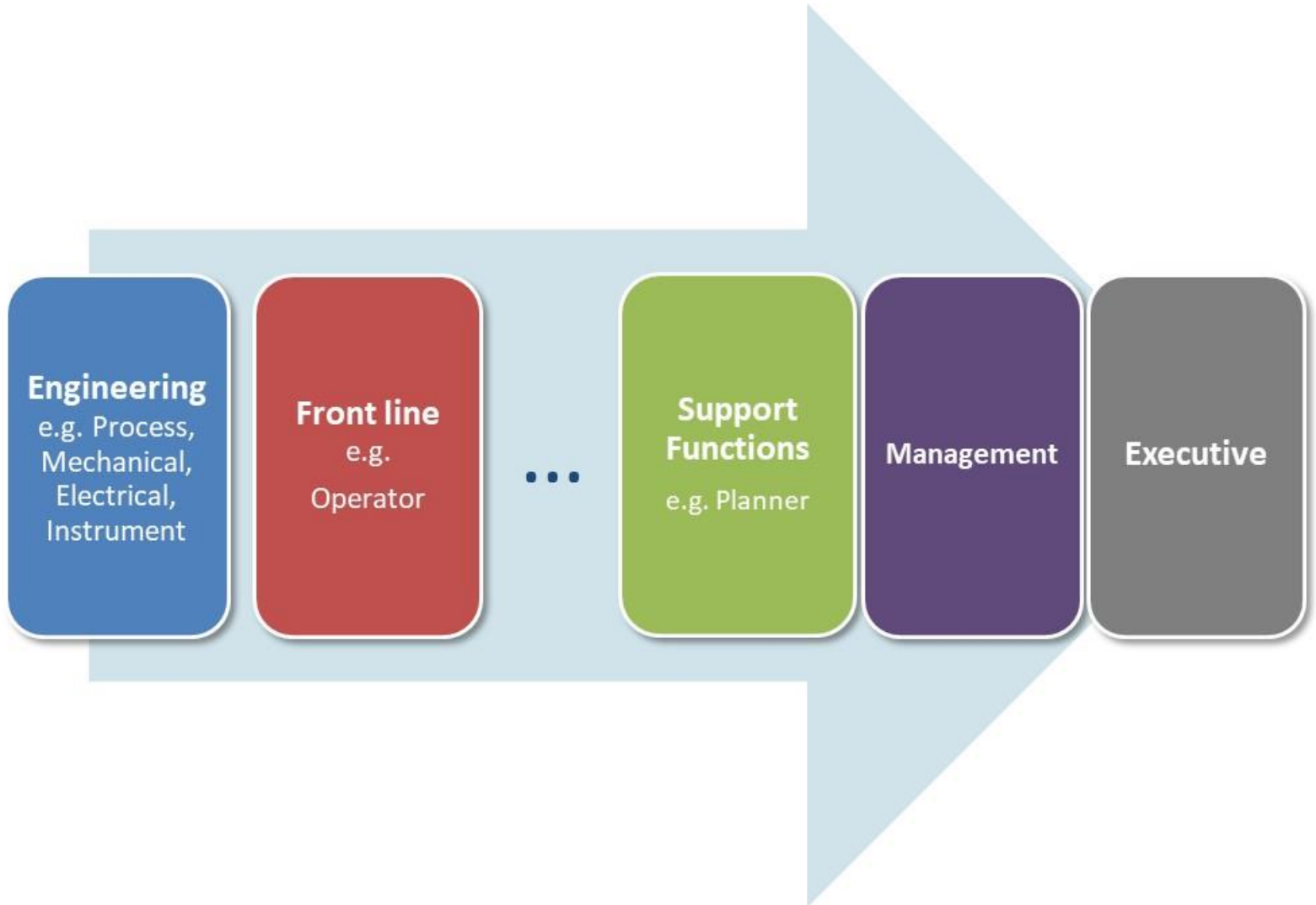
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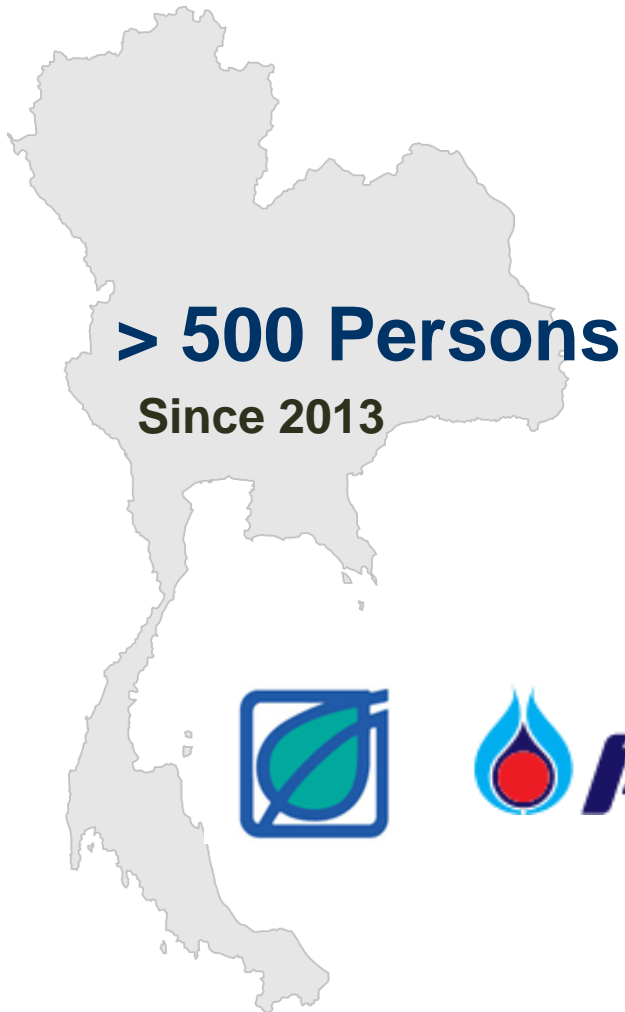
Line Supervisor Sign off:..... Division Manager Sign off:.....

Skill Owner (if consulted) Sign off:.....

Across Organization



PS Competency Progress



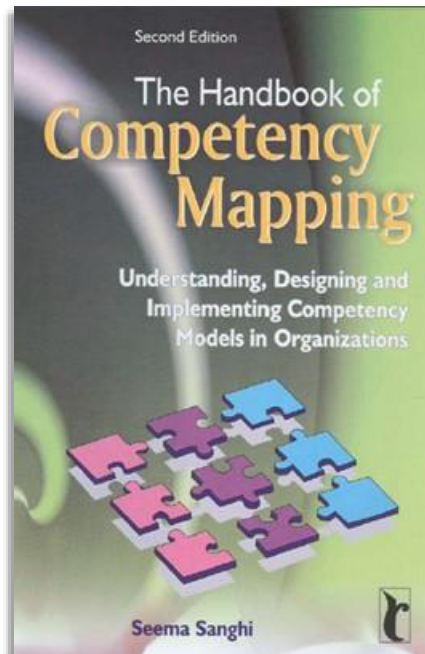
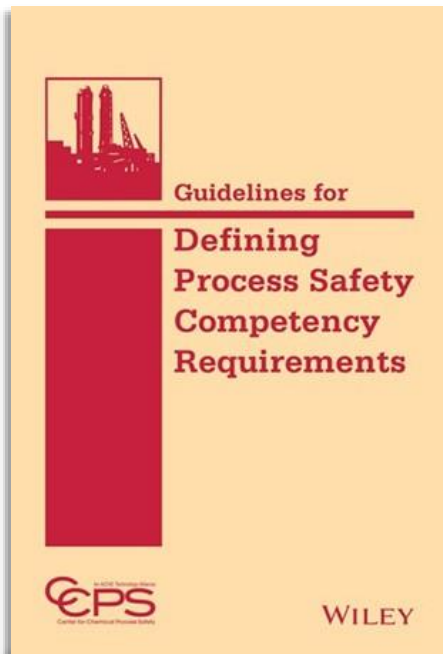
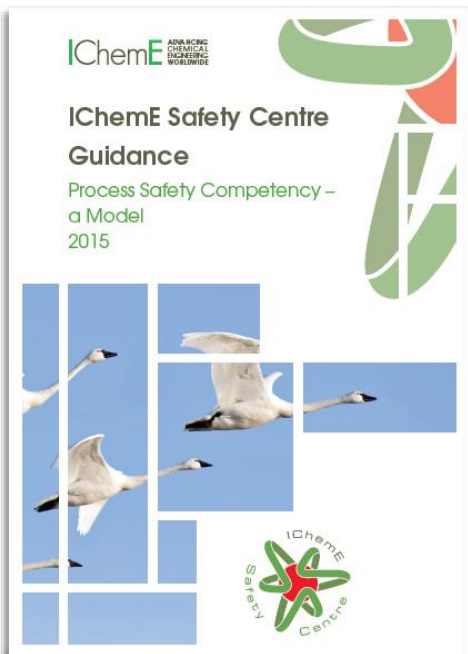
> 500 Persons

Since 2013

- Process Engineer
- Mechanical Engineer
- Electrical Engineer
- Instrument Engineer
- Maintenance
- Operator
- HSE



Reference



Q&A



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Thank you for your attention



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12th October 2018, Thailand



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