PSM

PROCESS SAFETY MANAGEMENT

" A Tiger is Secretive,
Hard to detect – lives in the jungle.
Like a tiger, Process Safety Hazards are
hidden problems or system failures."

Take **SSHE**
to your heart,
make it part of your life

**❝ Successful Process Safety Management Implementation ❞
will ensure the way for PTTEP to achieve sustainability
of our business.**

"Process Safety incidents occur infrequently but can have catastrophic consequences on people, the environment, facilities, reputation and financial stability of a company"

"Process Safety is a multi-disciplinary management system. It is the duty of PTTEP to design, construct, operate and maintain all assets at the highest standards and to ensure that the associated Process Safety risks are understood and kept As Low As Reasonably Practicable (ALARP) at all times, throughout all phases of each assets life cycle"

"Maintaining the Process Safety of our assets is critically important to the delivery of our company mission"

Somporn Vongvuthipornchai
President and Chief Executive Officer, PTTEP

OBJECTIVE

This PTTEP Process Safety Management (PSM) booklet digests the key requirements from PTTEP PSM Standard (11038-STD-SSHE-440-007-R02) and makes them into comprehensive quick references. Importantly, it is crucial that all personnel involved in asset life cycles i.e. from design, construction, operation and maintenances have a clear understanding of PSM and that will help prevent Major Accident Event (MAE).

PROCESS SAFETY is a blend of engineering and

management skills focused on preventing catastrophic accidents and near misses, particularly structural collapse, explosions, fires and damaging releases associated with a loss of containment of energy or dangerous substances. These engineering and management skills exceed those required for managing workplace safety as it impacts people, property and the environment.

PROCESS SAFETY MANAGEMENT

is concerned with the prevention of Major Accident Events. A framework for managing Process Safety risks is used based on the 20 Elements identified by the Energy Institute for its framework, plus an additional element on Process Safety Event (PSE) Indicators.

21 PROCESS SAFETY MANAGEMENT ELEMENTS

Process Safety Leadership

01 Leadership

02 Legal
Standard Compliance

03 Employee Competency
Assurance

04 Workforce Involvement

05 Communication with
Stakeholders

Process Risk Identification/ Assessment

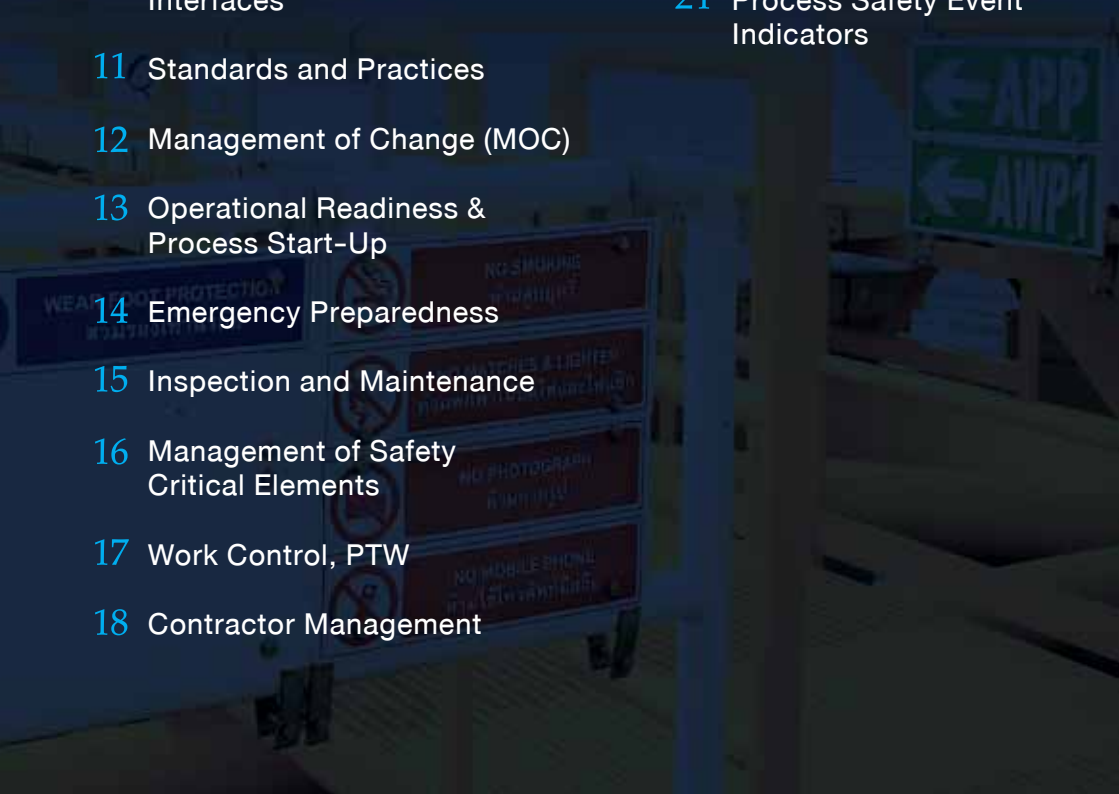06 Hazard Identification

07 Documentation,
Record & KM

Risk Management

Review and Improvement

LEADERSHIP COMMITMENT AND RESPONSIBILITY

Robust Design

"No compromise"

Disciplined Operate

Inspect & Maintain
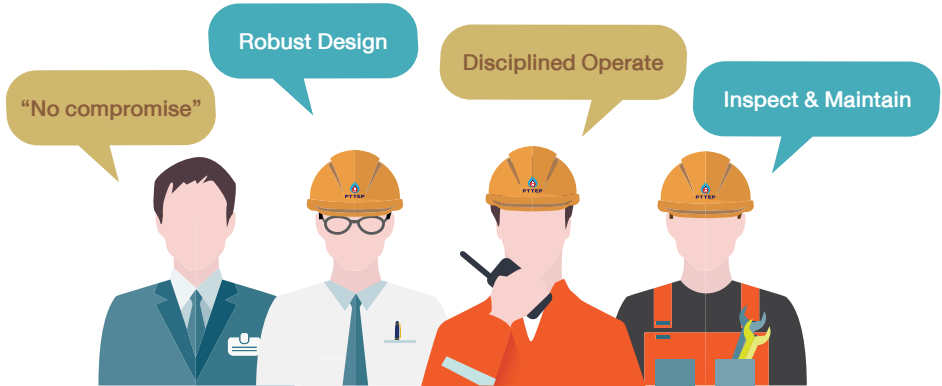
> " We are committed to preventing Major Accidents in our operations. "

- Process safety is built on strong and visible leadership.
- Set clear expectations e.g. full compliance to PREP, 100% close out of process safety audit actions.
- Allocate sufficient resources e.g. manpower, realistic schedule and timeline.
- Regularly discuss process safety and listen to subordinates suggestions.
- Lead by example, and reward positive process safety behavior.
- Encourage reporting Loss Of Primary Containment and other Process Safety events.
- Reinforce and promote a belief that all Process Safety related events are preventable.
- Maintain work environment in which everyone takes responsibility for the availability of barriers to meet the required Performance Standard.

Ref: SSHE Roles & Responsibility Standard, SSHE-106-STD-100

LEGAL AND STANDARDS COMPLIANCE

> " SSHE is license to operate our facility. "

- Comply with relevant legislation, regulations and industry standards. An effective process shall be developed to help identify, understand and communicate throughout the organization all applicable legislation, regulations and other requirements.
- Define actions required to comply with identified requirements, assign and communicate actions to responsible personnel.
- Communicate to Staff & Contractors the legislation and requirements that govern their work.

Ref: SSHE Regulatory Compliance Standard, 11003-STD-SSHE-350-004-R03

ELEMENT
03

EMPLOYEE SELECTION, PLACEMENT, COMPETENCY AND HEALTH ASSURANCE

Explorer   SSHE

Process Safety   Passion

" Our workforce are competent and fit to perform duty. "

- Identify critical positions to manage Process Safety.
- Use the Competency Management System to ensure employees are competent.
- Ensure that all employees and contractors have been trained, assessed and maintain the required level of Job and SSHE Competency adequately to perform their job safely and in compliance with related laws.
- Ensure employees are medically fit to perform their work.

Ref: SSHE Training & Competency Standard, SSHE-106-STD-340

ELEMENT
04

WORKFORCE INVOLVEMENT

" We aware of Process Safety and being empowered to take part in. "

- Ensure Process Safety Awareness at working level.
- Increase communication especially two-way communication.
- PTTEP staff at all levels and contractors working for or on behalf of PTTEP shall know their roles and responsibilities in contributing to PSM implementation.
- Employees and contractors whose work relates to Process Safety have the right to participate when there are any changes or issues related to Process Safety.
- Employees and contractors whose work is related to process have right to identify and report potential faults or unsafe acts and conditions.

Ref: SSHE Roles & Responsibility Standard, SSHE-106-STD-100

Process Safety
Leadership

Process Risk
Identification/
Assessment

Risk Management

Review and
Improvement

ELEMENT
05

COMMUNICATION
WITH STAKEHOLDERS

" Establishing and maintaining stakeholders
confidence with regard to Process Safety is key
to maintaining our license to operate. "

- Understand License to Operate requirements and identify who are stake holders i.e. government and regulators.
- Identify, develop and maintain good working relations with key stakeholders.
- Make information on Process Safety available to public e.g. Corporate Annual Safety Performance Report.

Ref: SSHE Communication Standard, SSHE–106–STD–320

ELEMENT
06

HAZARD IDENTIFICATION AND RISK ASSESSMENT

" All Major Accident Events are timely identified and managed to ALARP throughout our operations lifecycle. "

Example of Accident

"Toxic Release in Seveso" (Italy, 1976)

Incomplete understanding of the hazard resulted in a runaway reaction occurred that caused a large scale release of an ultratoxic material Tetra Chloro Dibenzopara Dioxin (TCDD) through a pesticide plant vent system causing widespread health and livestock damage several km within plant area. TCDD is 150,000 more toxic than Sodium Cyanide.

■ Ensure that all Major Accident Events, to which people, environment and assets are exposed, are systematically identified, risks are evaluated and measures for reducing them to levels that are As Low As is Reasonably Practicable (ALARP) are put in place, documented and maintained.

■ Conduct appropriate hazard identification and risk assessment activities in all development lifecycle.

Ref: SSHE Risk Management Standard, SSHE-106-STD-400
Safety Case Standard, SSHE-106-STD-420

Process Safety
Leadership

**Process Risk
Identification/
Assessment**

Risk Management

Review and
Improvement

ELEMENT

07

DOCUMENTATION, RECORDS, AND KNOWLEDGE MANAGEMENT

" Maintaining Process Safety Information and Knowledge Management for all staff. "

- Ensure documents are accurate and up-to-date.
- Ensure documents are available and accessible for all level staff.
- Ensure that the right Process Safety information is available, accessible, up-to-date and effectively communicated to all concerned parties.

Ref: SSHE Document Management Standard, SSHE-106-STD-330

ELEMENT

08

OPERATING MANUALS AND PROCEDURES

" Establish Safety Operating Windows and identity steps to prevent excursions outside of them. **"**

- Understand Safety Operating Windows (SOW).
- Understand steps to prevent excursion beyond the SOW, and actions taken if an excursion occurs.
- Ensure that adequate controls and recovery barriers for Safety Critical Activities and Hazardous Activities and document them in Standard Operating Procedure (SOP).
- Ensure all Operating Manuals and Procedures are available and accessible by provide them on the company web page. Employees shall be competent to fulfil their duties according to Operating Manuals and Procedures.
- Protect, promote and maintain workplace safety by reviewing & updating Operating Manuals and Procedures frequently.

Process Safety
Leadership

Process Risk
Identification/
Assessment

Risk Management

Review and
Improvement

ELEMENT

09

PROCESS AND OPERATIONAL STATUS MONITORING, AND HANDOVER

" Comprehensive process and operational status monitoring and effective handover between work groups is essential to ensure continued integrity of operations. "

- Put system in place to facilitate monitoring of operating parameters against Safety and Integrity Operating Windows.
- Establish and continuously improve Alarm Management.
- Incorporate Human Factor Engineering in control room interface.
- Ensure effective handovers between personnel that are documented with handover notes.
- Shift handovers shall cover plant status.

MANAGEMENT OF OPERATIONAL INTERFACES
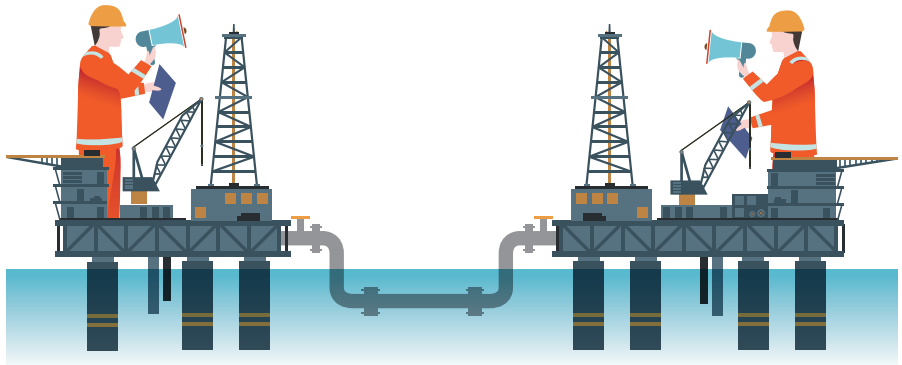
" Operational interfaces with third parties must be identified, assessed and managed. "

- Operational interfaces with third parties should be identified, assessed and managed e.g. export pipelines, onshore transportation.
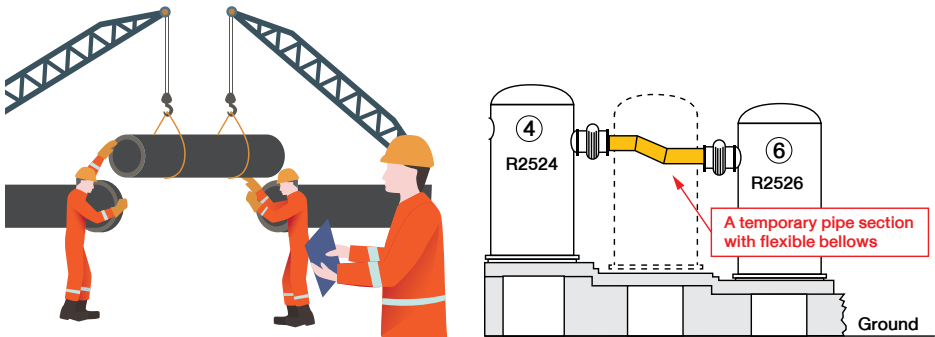
Ref: Process Safety Management Standard, 11038-STD-SSHE-440-007-R02
Operation Standard, OPE-0012-STD-201

ELEMENT

11

STANDARDS AND PRACTICES

" Process Safety is built on consistency of robust standards and practices. "

- All activities in asset's life cycle shall comply with robust standards and practices.
- Industry Design standards and safe working practices shall be consistently applied.
- Process Safety Lessons Learnt shall be incorporated into documents.
- Ensure standards and practices compliance through audits.
- PTTEP Engineering General Specifications (PEGS) provide the basis for Process Safety and shall be followed.

Ref: Process Safety Management Standard, 11038-STD-SSHE-440-007-R02
including CMS, WMS, PREP and PEGS

Process Safety
Leadership

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Review and
Improvement

ELEMENT

12

MANAGEMENT OF CHANGE AND PROJECT MANAGEMENT

④ R2524   ⑥ R2526

A temporary pipe section with flexible bellows

Ground

Example of Accident

"Flixborough Disaster" (UK,1974)

Reactor # 5 had developed a leak and was taken out of service. A temporary by-pass line with flexible bellows at each end was installed without appropriate support. A bending moment caused the by pass line bellows to fail catastrophically. 50 tons of cyclohexane were released, developing into a vapour gas cloud that ignited, causing 28 fatalities and destroying the plant.

- Understand that introduction of change may increase risk.
- To specify minimum requirements for systematically managing permanent and temporary changes under the Management of Change (MOC) process to any work practices, facilities, operations, or organization changes to ensure that any risks or hazards arising from changes are identified, assessed, controlled and mitigated, and business activities do not get overlooked.
- Understand Like for Like replacement does not require MOC.
- Unauthorized changes are not allowed.

Ref: Management of Change Standard, SSHE-106-STD-570

ELEMENT 13

OPERATIONAL READINESS AND PROCESS START-UP
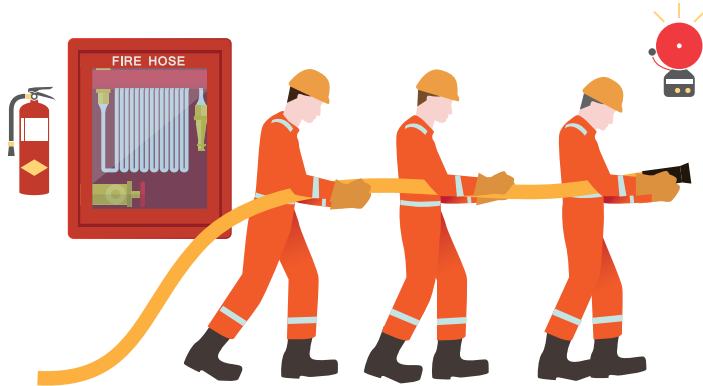
Example of Accident

"BP Texas City" (Texas, 2005)

Occurred during the start-up of the isomerization unit after a month's shut-down. Gasoline was released from a blowdown drum after a tower overfill leading to a fire & explosion. There were 15 fatalities in or near office trailers located close to the blowdown drum. 170 people were injured and financial losses of >$1.5 billion.

- Pre-Startup Safety Audit (PSSA) is done to assure that it is safe to introduce hydrocarbons.
- Confirm readiness by competent persons prior to bringing in to service.
- Assess the status of preparations of handover and commissioning.
- Establish systematic processes for checking operational readiness and systems integrity before they are brought into service. This covers both brownfield/green field projects and resumption from short/long term shutdown.

Ref: Project Commissioning and Handover Standard, CMS-0790-STD-347
Operation Readiness Review Guideline, SSHE-106-GDL-702
Pre Start Up Audit Guideline, SSHE-106-GDL-704
Readiness to Drill Guideline, 10009-WMS-GDL-5000

ELEMENT
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# EMERGENCY PREPAREDNESS

Example of Accident

"MONTARA Blowout" (PTTEP Australia, 2009)

Well H1 ST1 uncontrolled flow cause well blowout during drilling. All 69 POB on rig evacuated safely by lifeboats. No personnel injury.

- Emergency and crisis management and response plans shall be developed for guiding corporate and Asset/field personnel.
- Identify potential hazards that require emergency response plans.
- Pre Incident Planning shall be developed and advice on how to handle with a specific emergency scenario. Reference to special resources which may be used and communicated and easily accessible for all sites/fields.
- Test the plan through periodic drills and exercises which also promotes awareness.
- Make available safety equipment at all locations and ensure it is fit for service.

Ref: Emergency and Crisis Management Standard, SSHE-106-STD-500

ELEMENT

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INSPECTION AND MAINTENANCE
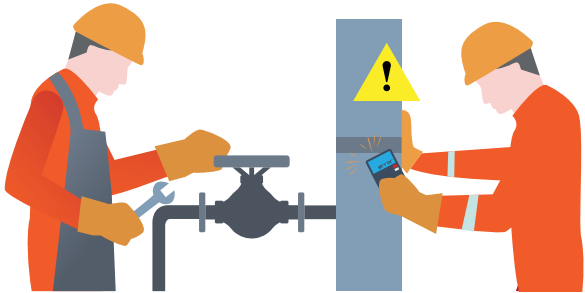
Example of Accident

"Gas release from level gauge" (PTTEP Gulf of Thailand, 2006)

There was a major gas release (50 bar) as a result of the failure of a sight glass within a level gauge with maintenance overlooked. The gas release occurred while grit blasting activity was ongoing close by. Hot work was also about to start in the same area. The release was not detected by the installed fixed gas detection system.

■ Set up and maintain properly configured Asset Register and Maintenance Management System.

■ Ensure Integrity through a Maintenance Plan by providing focused, targeted and scheduled inspection and maintenance of the Safety Critical Elements (SCE) and Systems.

■ Technical Integrity shall be demonstrated through maintenance, inspection and monitoring processes that identify anomalies or restore functions to the design intent.

■ Ensure that an effective Maintenance and Inspection Program is in place, in accordance with the Maintenance, Inspection, Corrosion Management and In- Service Inspection Standards.

Ref: Maintenance Standard, CMS-842-STD-411
     Engineering and Maintenance Integrity Standard, CMS-0790-STD-401
     Well Management System Description Standard, 10009-WMS-STD-1000

ELEMENT
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MANAGEMENT OF SAFETY CRITICAL ELEMENTS

Example of Accident

"Buncefield Explosion" (UK, 2005)

A storage tank overfilled leading to an unconfined vapor cloud explosion.
The tank level gauge stuck. No indication of level in Central Control Room. Tank Independent High Level Switch failed to alarm/shutdown because it had been installed incorrectly and there was a **lack of maintenance on Safety Critical Elements.**

■ Safety Critical Elements (SCE) management starts from project phase:
  – Identify SCEs.
  – Define Design Performance Standards and Verification Scheme.
  – Outline Operations Performance Standards and Verification Scheme.
■ Operations and Maintenance maintain and monitor their performance:
  – Finalise Operations Performance Standards and Verification Scheme.
  – Inspect, Test and Maintain the SCEs according to the Scheme via CMMS.
  – Monitor their performance.
■ Develop and maintain MAE Prevention Tool to monitor SCEs performance.

Ref: Management of Safety Critical Elements Recommended Practice, CMS–0842–RPR–431

ELEMENT

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WORK CONTROL, PERMIT TO WORK, AND TASK RISK MANAGEMENT

Example of Accident

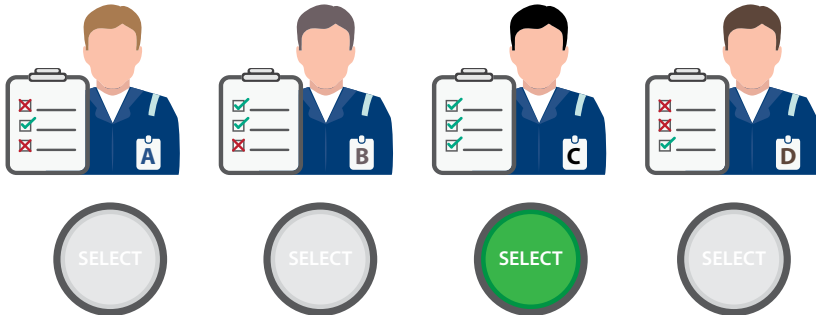*"Piper Alpha disaster" (North Sea, 1988)*

Piper Alpha is the worst ever offshore accident in terms of fatalities.
Fatalities: 167. Major root cause of the accident was **poor Permit to Work control.**

- Understand work control requirements to prevent Process Safety Events.
- Ensure effective work control and task risk management is in place to minimize hazards and communicate risks to relevant parties.
- Simultaneous operations shall be identified, subject to risk assessment, and strictly controlled.
- Work activity status must be known.
- Keep copies of Permit To Work (PTW) in the Control Room for work verification.
- Competency assessment in PTW to ensure proper level of understanding and authorization.
- PTW system shall be audited to demonstrate effectiveness and report results for management review and continuous improvement.

Ref: Permit-To-Work Standard, SSHE-106-STD-510
Operational Safety Management Standard, SSHE-106-STD-540

CONTRACTOR AND SUPPLIER SELECTION AND MANAGEMENT

A · SELECT
B · SELECT
C · **SELECT**
D · SELECT

Example of Accident

"Gas release from a Swagelok connection" (ZAWTIKA Onshore, 2015)

After commissioning ZAWTIKA onshore project, found many leaks from Swagelok connection fitting due to lack of competence of construction contractors.

- Ensure contractor and supplier selection complies with company's requirements.
- Contract Holders to assess contractors and suppliers whose work may impact Process Safety.
- Assess contractor competency and readiness prior to work.
- Give appropriate safety inductions to contractors before work.
- Ensure contractor compliance to our company's SSHE requirements and develop bridging documents.
- Contract sponsors and holders shall strictly follow SSHE Contractor Management Standards.

Ref: SSHE Contractor Management Standard, SSHE-106-STD-310

Process Safety
Leadership

Process Risk
Identification/
Assessment

Risk Management

**Review and
Improvement**

ELEMENT

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INCIDENT REPORTING AND INVESTIGATION

" Incident investigation is to detect root causes and prevent reoccurrence. "

- Encourage reporting of Loss of Primary Containment (LOPC), even small ones.
- Report incidents, investigate, record and learn from incidents through the PTTEP Incident Management System (IMS).
- Conduct incident investigation by competent persons to Identify root causes, provide corrective actions and prevent reoccurrence.

Ref: Incident Management Standard, SSHE–106–STD–600

ELEMENT
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AUDIT, ASSURANCE, MANAGEMENT REVIEW, AND INTERVENTION
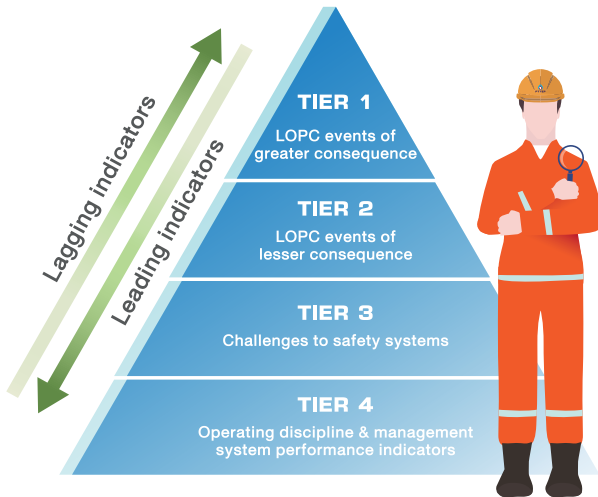

> " Effectiveness of the PSM program at site shall be verified by site management or experts. "

■ To ensure conformance as per SSHE MS requirements by providing an annual audit plan, audit organization, audit follow-up, management review and continuous improvement.

■ Monitor audit actions via Action Tracking System (ATS) that provides coverage of audit status and ensure actions are being tracked against timeframes without any overdue.

■ Periodically review and monitor Process Safety risk in operations at all levels. Various tools are available e.g. MAE Prevention Tool, Process Safety Key Risk Indicators.

Ref: Audit and Review Standard, SSHE-106-STD-700

ELEMENT
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PROCESS SAFETY EVENT INDICATORS

TIER 1
LOPC events of greater consequence

TIER 2
LOPC events of lesser consequence

TIER 3
Challenges to safety systems

TIER 4
Operating discipline & management system performance indicators

Lagging indicators

Leading indicators

" Leading indicators are warning signs to greater consequences of Process Safety Events. "

- Process Safety Event (PSE) indicators reflects the overall performance of PSM implementation.
- Periodically report PSE indicators and discuss with concerned parties about leading and lagging indicator status and action plans.
- Ensure lessons are learned and share knowledge to others.

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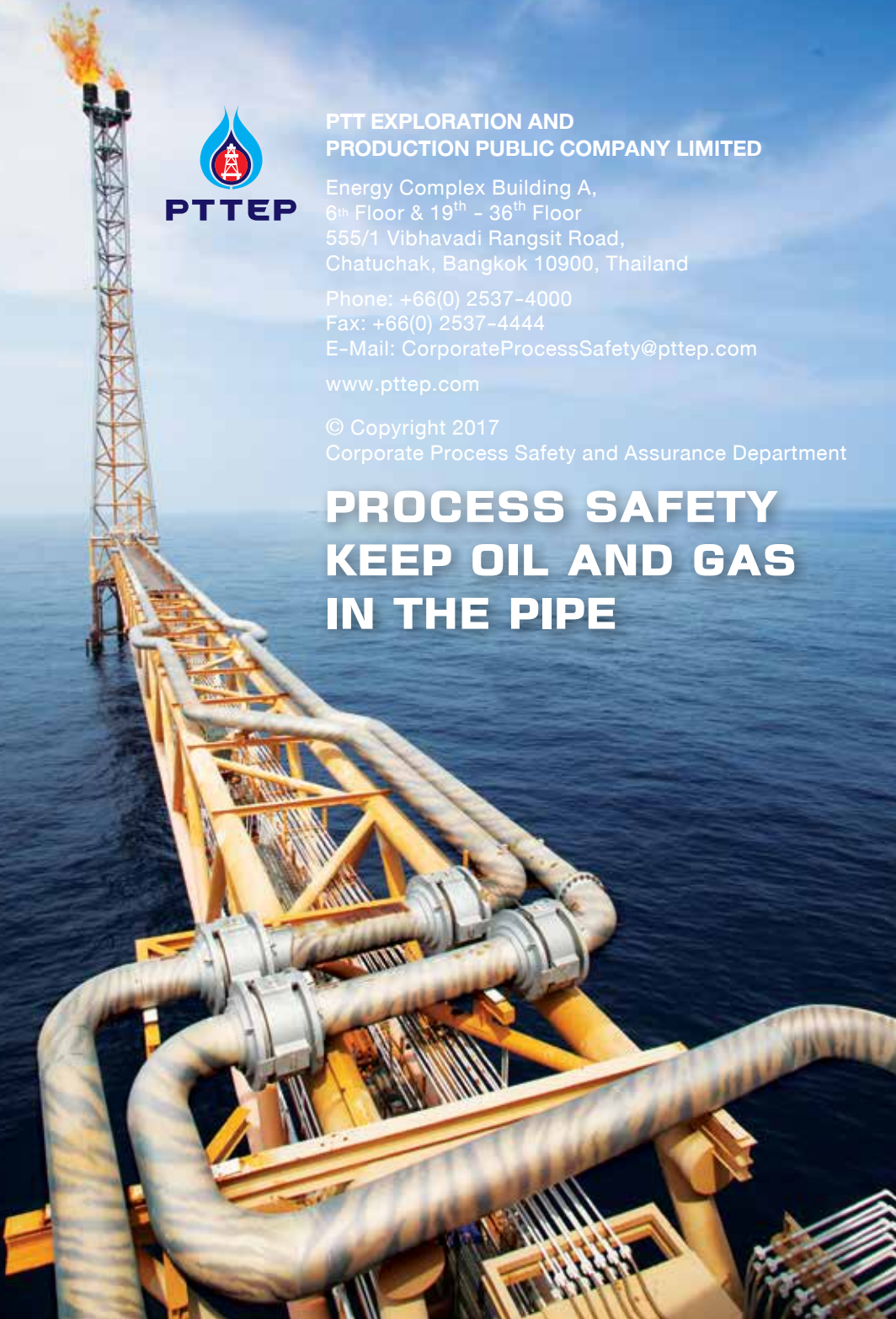
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PROCESS SAFETY KEEP OIL AND GAS IN THE PIPE

PSM
PROCESS SAFETY MANAGEMENT

NOBODY
GETS HURT
IN OUR
OPERATIONS