PROCESS SAFETY MANAGEMENT THE IMPORTANCE OF MANAGEMENT LEADERSHIP

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PROCESS SAFETY MANAGEMENT

- Since 1990, Process safety management (PSM) is adopted by many companies in process industry to <u>reduce major accident risk</u> and <u>improved chemical industry performance</u>.

- Today, many companies continue to <u>face problems</u> of <u>inadequate</u> management system <u>performance</u>, <u>resource pressures</u>, and <u>stagnant</u> process safety <u>results</u>.

- This presentation highlights the <u>important role management leadership</u> in leading a <u>successful</u> and <u>effective</u> PSM program.

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PROCESS SAFETY MANAGEMENT

- PSM is NOT a one time program that can be forgotten when completed, it requires management's continual commitment to process safety and improvement over throughout the entire life cycle of the facilities.

- It is an on-going process that involves auditing and revaluation of the management system to continually enhance the effectiveness of the PSM system.

- PSM is a journey towards "Our process and operation are safe and we know it".

- It is a key enabler to "SUSTAINING FUTURE GROWTH".

- The journey never ENDS.

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PROCESS SAFETY MANAGEMENT ELEMENTS

- Employee Participation

- Process Safety Information (PSI)

- Process Hazards Analysis (PHA)

- Operating Procedures

- Training

- Contractors

- Pre-startup Safety Review

- Mechanical Integrity (MI)

- Hot work Permit

- Management of Change (MOC)

- Incident Investigation

- Emergency Planning and Response

- Compliance Audits

- Trade Secrets

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REASONS FOR THE DECLINE OF PROCESS SAFETY MANAGEMENT PROGRAMS

- Compliance-based approach to managing process safety ... "If isn't a regulatory requirement, I'm not going to do it!" – passive response.

- Resources are sometimes disproportionately focused on personal safety instead of process safety.

- Injury rates are steadily declining, management assumes this also indicates that the risk of low-frequency, high-consequence process safety incidents must likewise be declining.

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REASONS FOR THE DECLINE OF PROCESS SAFETY MANAGEMENT PROGRAMS

- Management systems are over-emphasized while the technical aspects of process safety are neglected.

- Organizations lack a thorough understanding of recognized and generally accepted good engineering practices and are inconsistent in interpreting and applying them.

- Complacency - absence of major accidents

  - Statistics demonstrates that worker safety in the process industries is better than all other industrial sectors.

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REASONS FOR THE DECLINE OF PROCESS SAFETY MANAGEMENT PROGRAMS

- Process safety professionals communicate poorly with senior management.

- Management does NOT receive and act on the messages.

- If such issues are left unchecked, organizations are losing their focus on process safety, resulting in

  - A serious decline in process safety performance or

  - A loss of emphasis on achieving process safety excellence.

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MAKING PROCESS SAFETY MANAGEMENT SUSTAINABLE

- Creating a strong Process Safety Management is a journey.

- The journey starts off having a reactive culture - develop and implement PSM to meet and comply with regulatory requirements.

- The journey continues to improve PSM performance towards proactive.

  - "This is the way we do business here".

- Effectiveness and performance of PSM deteriorates over time when NOT ensuring proper attention.

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MAKING PROCESS SAFETY MANAGEMENT SUSTAINABLE

- The **CAUSES** can be related to

    - Change of leadership.

    - Change of direction/new priority settings in company.

    - Poor ownership of PSM processes.

    - Lack of training.

    - Lack of review.

MAKING PROCESS SAFETY MANAGEMENT SUSTAINABLE

- A sustainability program is required to make sure that PSM is effectively embedded in leadership, people, process, structures and culture.

- Develop a mind-set where LEADERS at all levels can

  - Adopt a proactive risk based approach.

  - Are made aware of weak signals.

  - Can challenges and interventions on risk assessments and decision making.

  - Reward and recognize employee contributions.

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MAKING PROCESS SAFETY MANAGEMENT SUSTAINABLE

- The key to successful PSM is <u>LEADERSHIP</u>.

- The <u>LEADERS</u> from line organisation are expected to

  - Know the <u>main hazards</u> of the operation.

  - Involve in <u>PSM activities</u> and control the business risks <u>actively.</u>

  - Learn how the <u>PSM elements evolve</u> through <u>careful analysis</u> of <u>past mistakes</u>.

  - Understand the current <u>status</u> of the facility.

  - Understand the <u>business benefits</u> of performance measurement.

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MAKING PROCESS SAFETY MANAGEMENT SUSTAINABLE

- Develop key performance indicators and metrics.

- Secure resources.

- Implement a performance measurement system.

- Engage employee who has direct knowledge on how systems deteriorate or become ineffective.

- Provide clear direction and focus the company's activities in that direction.

- Look out for weak signals that people are concerned with the current situation.

- Identify and focus on areas of greatest concern.

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MAKING PROCESS SAFETY MANAGEMENT SUSTAINABLE

- Have the courage to accept that past practices may have been ineffective.

- Communicate to all company levels the PSM goals.

  - Use of well designed newsletters, and bulletins to disseminate

    - Lesson learnt from past incidents and near misses

    - Safety performance achievement information

  - Management listen actively to the feedback, and take serious measures to address the points raised.

MAKING PROCESS SAFETY MANAGEMENT SUSTAINABLE

- Visible management - Managers set examples for employee to follow.

    - Present of key personnel when technical assistances are required most by operation staff during:

        - Commission new process equipment e.g., compressor, furnace

        - Startup

        - Commission a new process

        - Operation upsets

    - Walk your talk - what you say must align with what you do.

- Provide a work environment conducive to these principles.

BUSINESS BENEFITS OF A SUCCESSFUL PSM PROGRAM

- Benefits of a successful PSM program are both tangible and intangible:

    - Profitability

    - Employee morale

    - Public image

- **PROFITABILITY**

    - The initial stage of PSM implementation experience substantial costs.

    - It is the front end cost which has resulted from lack of PSM in past operation.

BUSINESS BENEFITS OF A SUCCESSFUL PSM PROGRAM

- Once PSM is successfully implemented

  - Process reliability is improved - many operability issues are uncovered during the process hazards analysis.

  - Facility's profitability is improved - minimize

    - Off-specification product.

    - Unplanned downtime (business interruption).

  - Indirect overhead expenses is reduced or maintained at minimum levels.

    - Reduce premiums paid for worker's compensation insurance.

    - Reduce size of medical bills through eliminating or reducing the incident's severity.

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BUSINESS BENEFITS OF A SUCCESSFUL PSM PROGRAM

- **EMPLOYEE MORALE**

  - Improve understanding, communication and information sharing at <u>ALL</u> levels.

  - Employees can put their <u>safety concerns</u> on the table and discuss them in an <u>open</u>, <u>informed environment</u> and <u>reduces misunderstandings</u>.

  - Employees maintain a <u>positive outlook</u> toward the company.

  - <u>Avoid</u> the <u>spread of negative rumours.</u>

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BUSINESS BENEFITS OF A SUCCESSFUL PSM PROGRAM

- **PUBLIC IMAGE**

  - Highly unlikely catastrophic event when happens will result in substantial negative media coverage that focuses on the company's practices and puts employees on the defensive.

  - The more common cause of negative public image is frequent operating upsets that result in odour complaints. These incidents raise public health concerns.

    - By reducing substance or odour releases, the company can focus on the positive aspects of its operation (jobs, useful products, etc.).

  - Result: MHI spends less time on reporting to regulators.

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KEY PERFORMANCE INDICATORS AND METRICS

- Establish KPIs/Metrics indicators to

  - Monitor the near-real-time effectiveness of the PSM.

  - Provide inputs to continuous improvement over the life of a process.

  - Overcome the decline of PSM programs.

  - Provide timely feedback on the workings of PSM management systems.

  - Provide early warning signals of ineffective process safety results.

- Periodic review and honest self-evaluation helps to

  - Sustain existing performance.

  - Drive improvement in important areas.
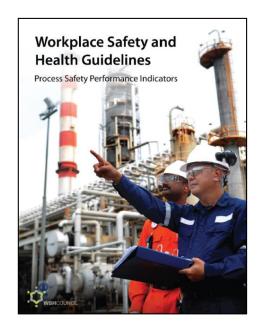
MEASUREMENT AND METRICS

- Combine both leading and lagging indicators to provide a complete picture of process safety effectiveness.

    - Leading indicators are used to

        - Monitor the effectiveness of risk control systems proactively.

        - Provide feedback on safety performance before an incident or accident happens.

        - Evaluate the present state of workplace through routine and systematic inspections actively.

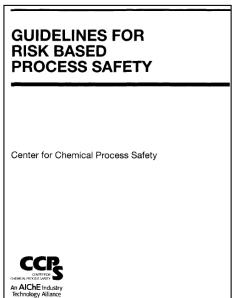   - Leading indicators require a routine systematic check that key actions or activities are undertaken as intended.

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MEASUREMENT AND METRICS

- **Lagging indicators** are outcome oriented and use to

    - Monitor the **effectiveness** of risk control systems.

    - Identify **gaps** and **weaknesses** in these systems.

    - Report on incidents or accidents to **check** that the **controls in place** are **adequate.**

- **Lagging indicators** show when a **desired** safety outcome has **failed**, or has **NOT** been achieved.

- **Measurement** helps people **recognize** their **contributions** to the **outcomes** and **creates passion** for **continuous improvement**.

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MEASUREMENT AND METRICS

- <u>Leading</u> and <u>Lagging</u> indicators for PSM Elements listed in the following references can be adopted by Companies.

  - Workplace Safety and Health Guideline Process Safety Performance Indicators
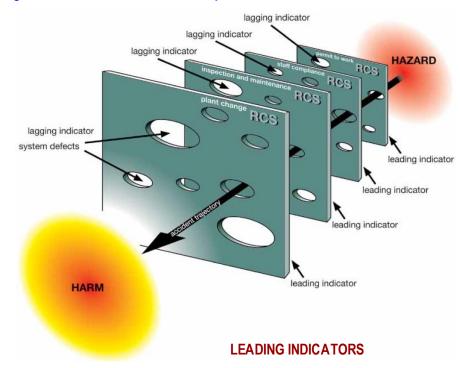
  - CCPS Risk Based Process Safety

MEASUREMENT AND METRICS

- Hazards are contained by multiple protective barriers.

- Barriers may have weaknesses or 'holes'.

- When holes align an accident occurs, resulting in the potential for harm.

- Barriers may be physical engineered containment or behavioural controls dependent on people.

- Holes can be latent/incipient, or actively opened by people.

LAGGING INDICATORS

Warning indicators - the holes have developed

LEADING INDICATORS

Preventive indicators before the holes develop

MEASUREMENT AND METRICS

- The <u>root causes</u> of serious accidents usually involve

  - <u>Degraded effectiveness</u> of management systems.

  - <u>Complete failure</u> of management system activities.

- Facilities should

  - Monitor the <u>real-time performance</u> of management system activities <u>NOT</u> to wait for

    - Accidents to happen.

    - <u>Infrequent audits</u> to identify latent management system failures.

  - Identify the <u>weaknesses</u> of the evolving management system.

  - <u>Adjust</u> PSM element work activities before they are <u>degraded</u> into a failed state.

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MEASUREMENT AND METRICS

- Such performance monitoring allows

    - Problems to be identified.

    - Corrective actions to be taken before a serious incident occurs.

- Such approach encourage company to:

    - Focus the resources on higher risk activities.

        - Manage every hazard without setting priorities is an inefficient use of scarce resources.

    - Improve management system effectiveness continuously.

    - Make process safety an integral part of an organization's business processes.

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MEASUREMENT AND METRICS

- Provide <u>assurance</u> that the <u>control measures</u> to prevent incidents/accidents are being <u>effectively implemented</u>.

- Lastly, without the <u>right safety culture,</u> even the most definitive metrics, will <u>NOT</u> produce <u>sustainable</u> process safety performance over the <u>life of process</u>.

- <u>Management's Leadership</u> plays a <u>very important role</u> in <u>creating</u>, <u>developing</u>, <u>shaping</u> and <u>maintaining</u> the <u>right safety culture</u>.

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SAFETY CULTURE

- What is <u>Safety Culture</u>?

    - What is <u>common</u> within a group.

        - Values, attitudes, perceptions, <u>competencies.</u>

        - Beliefs, rules (written and unwritten), <u>knowledge</u>, behaviours, and <u>capabilities</u> specific to safety management.

    - Like it or not, you have already created a safety culture.

- It defines the <u>manner</u> in which process safety is managed.

SAFETY CULTURE

- Emphasize people

  - Focus efforts on <u>resource</u> that can <u>prevent</u> catastrophic events - <u>people</u>.

  - Managers often rely on systems to get work done. The problem is that these systems always involve <u>people</u>.

  - Consequently, <u>people</u> stand between us and catastrophe.

  - Time after time, <u>administrative</u> or <u>engineering controls</u> are relied upon to protect an organization.

  - Time after time, <u>people</u> have failed to use these systems properly.

  - <u>People</u> and <u>organization</u>s have suffered the consequences.

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SAFETY CULTURE

- Habit and culture are the efficiency and sustainability tools for excellence.

- Mental alertness is critical in safety, however, it is unrealistic and impractical to expect cognitive mental processes to control every action.

- When something becomes habitual, it is applied regardless of the environment.

- The organization's culture is your most effective sustainability mechanism.

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SAFETY CULTURE

Take a look at the word

"HABIT"

What does this word mean to you?

SAFETY CULTURE

- Remember

  - Good habits take a very long time to cultivate.

  - Bad habits can form very easily and fast.

  - Once entrenched they are very difficult to eradicate.

  - Safety culture itself is NOT enforceable.

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SAFETY CULTURE

- What does a WEAK safety culture look like?

  - Widespread, routine procedural violations.

  - Failure to comply with the company's own SMS.

  - Management decisions that appear consistently to put production before safety.

  - Natural and unconscious bias for production over safety.

  - Accepts or normalized increasingly poor safety performance.

  - Tendency to focus on the short-term.

  - Relies solely on few individuals or management to determine process safety hazards and risk management activities.

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SAFETY CULTURE

- What does a STRONG safety culture look like?

  - Integrate process safety into the core values of the organization.

  - Focus on potential failures and strive to understand the risk and control it.

  - Seek to provide resources proportional to the perceived needs.

  - Place emphasis on learning from mistakes in order to prevent future problems.

  - Employees at ALL levels

    - Identify hazard.

    - Take action to address risks.

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SAFETY CULTURE CASE STUDY

- A plant has reactors which pressure is normally operating at $40kg/cm^2G$.

- The 1st Plant Manager placed a instruction notice on DCS panel to remind the Shift Leader to kill or shut down immediately when the reactor operating pressure reaches $50kg/cm^2G$. The Shift Leader had the full authority and NOT required to seek approval from him.

- When the 2nd Plant Manager took over from the 1st plant manager, the instruction notice was removed from the DCS panel. The Shift Leader MUST seek approval from Plant Manager to kill or shutdown the reactor.

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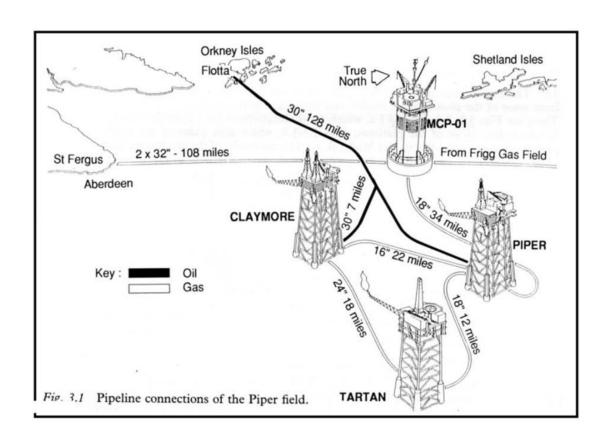
SAFETY CULTURE CASE STUDY

- Questions

  - Would the Shift Leader have <u>sufficient time</u> to shut down the reactor safety?

    - Consider the time duration between <u>when reactor at High High Pressure alarm</u> and <u>the plant manager approved</u>, the <u>time allowance</u> for board man to shut down the reactor, especially when the event happened between <u>12.00am and 6:00am</u>.

  - How would employees look at the change?

- This case illustrates that

  - Different Managers had different

    - Management styles.

    - Priority settings.

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SAFETY CULTURE CASE STUDY

- **Pipe Alpha 1988**

- Big fire on Piper Alpha platform could be seen from Claymore and Tartan platforms.

- Claymore and Tartan platforms delivered the high pressure oil and gas to the Pipe Alpha platform fueling the fire.

- Tartan and Claymore's continued production forced continuous fuel into the blaze, prevent the fire from burning out.

- Manager did NOT shut down the flow of oil and gas to Piper Alpha platform.

- Manager contacted Occidental Control Center seek approval to shutdown.

Fig. 3.1   Pipeline connections of the Piper field.

SAFETY CULTURE CASE STUDY

- The fire would have burnt out were it NOT being fed with oil and gas continuously from both the Tartan and the Claymore platforms.

- When the manager received the approval from the Control Centre, it was too late to shut down the platform.

- The reluctant attitude to shut down illustrates the paralysing effect of an industry mind-set that could NOT shut down production.

- The enormous losses entailed would surely bring career-ending consequence to the individual who took such a decision.

- Today the talk is safety first, production second, **BUT** it would need a brave person to HIT that button.

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MANANGEMENT RESPONSES TO BEFORE INCIDENTS

- What management would have said about their safety performance the day BEFORE the incident?

  - Our safety performance was excellent, safety is always our number one and over-riding priority.

  - My facility has operated for decades without incident...

    - This is a very common reaction and response.

    - Catastrophic incidents do NOT occur often, and it is usual for a facility to have incident-free operations for many years before tragedy strikes.

    - Aware the dangers of operating on a false sense of security based on an incident-free past.

    - Maintain a sense of vulnerability to ensure that process hazards are adequately controlled.

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MANANGEMENT RESPONSES TO AFTER INCIDENTS

- What management would say about their safety performance the day <u>AFTER</u> the incident?

  - ▪ Accident happened because of <u>worker negligence.</u>

  - ▪ Based on our investigation, we are convinced this accident took place because of a <u>single</u>, <u>isolated departure</u> from a <u>clearly established procedure.</u>

  - ▪ <u>74 reactors</u> around the world employ the same basic design. "These reactors have been operating for more than <u>1,300 reactor years</u> without an incident."

    - 1 in 100,000 years, 1E-5/year

MANANGEMENT RESPONSES TO AFTER INCIDENTS

- Our safety record was impeccable. We have taken every precaution we know how. We must remember this is first time in 12 years we have casualties.

  - Note: 167 fatalities in 12 years.

  - Compare with criteria 1 fatality in 1000 years, we want such event frequency less than 1E-6/year at a level broadly general accepted.

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MANANGEMENT RESPONSES TO AFTER INCIDENTS

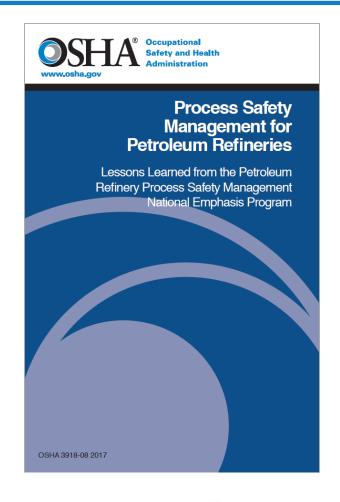- **ACCIDENTS DON'T JUST HAPPEN BY CHANCE**

  - Accidents are the <u>outcome</u> of a <u>series of safety management system failures</u>, it is <u>NOT</u> a <u>fault</u> of a <u>single person</u>.

  - <u>Management's Leadership</u> plays a very <u>important</u> role in creating, developing, shaping and maintaining the <u>right safety culture</u>.

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AREAS OF PSM STANDARDS WHERE OSHA ISSUED THE MOST CITATIONS

- This document published in 2017 highlights areas of the PSM standard where OSHA issued the most citations during the Petroleum Refinery PSM National Emphasis Program (NEP).

  - Process Safety Information (PSI)

  - Process Hazards Analysis (PHA)

  - Operating Procedures

  - Mechanical Integrity (MI)

  - Management of Change (MOC)

OSHA Occupational Safety and Health Administration
www.osha.gov

Process Safety Management for Petroleum Refineries

Lessons Learned from the Petroleum Refinery Process Safety Management National Emphasis Program

OSHA 3918-08 2017

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AREAS OF PSM STANDARDS WHERE OSHA ISSUED THE MOST CITATIONS

- The findings of the program revealed many common instances of non-compliance in the petroleum refinery industry, according to the citation issued for violations.

- Review these common instances of non-compliance to ensure that they do NOT exist in your own PSM programs.

MESSAGE TO END THIS PRESENTATION

We must recognize that the materials handle
and process are inherently hazardous

TREAT HYDROCARBON
WITH RESPECT

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PROCESS SAFETY MANAGEMENT
THE IMPORTANCE OF MANAGEMENT LEADERSHIP

THE END

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