



# PREVENTION FIRST 2018

## CALIFORNIA'S NEW PROCESS SAFETY MANAGEMENT REGULATION FOR REFINERIES



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# WHY DID OSHA ORIGINALLY DEVELOP PROCESS SAFETY MANAGEMENT (PSM)



- A history of severe process industry accidents in the period from 1974 to 1989 prompted legislation to improve safety, emergency planning and public risk management.
- The chemical and petroleum industry experienced catastrophic accidents including:
  - Flixborough England (1974) – Cyclohexane manufacturing
  - Seveso, Italy (1976) – Dioxin
  - Union Carbide (1984) - Bhopal
  - Mexico City, Mexico (1984) – LPG Terminal
  - Bhopal, India (1984) – Pesticide manufacturing
  - Pasadena, Texas (1989) - Polyethylene manufacturing

# ●●● WHAT IS PROCESS SAFETY MANAGEMENT?

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- **Process Safety Management** is a regulation, promulgated by the U.S. Occupational Safety and Health Administration (OSHA) in 1992, intended to prevent an incident like the ones described earlier. A process is any activity or combination of activities including any use, storage, manufacturing, handling or the on-site movement of Highly Hazardous Chemicals (HHC's – Fed/OSHA Title).
- The PSM Standard is Over 20 years Old.

# ●●●● **BACK IN THE DAY...A Need was Recognized for Performance Oriented Process Safety Management**

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- Systematic management of risk through a process of continuous improvement
- Involvement of workers in process safety
- Systemic hazard analysis
- Documentation of process design basis and safe operating limits
- Maintenance, inspection, testing
- Training
- Improved communication on risk
- Other programs acting in concert to manage process risk.

# ●●● THE STANDARD WAS PROMULGATED IN 1991 – IS IT WORKING?

- **Giant Industries Refinery near Gallup, New Mexico explosion on April 8, 2004: Six employees injured, with four being hospitalized.**



- Cause: While removing a pump, a valve was left open, resulting in release and explosion

# ●●● THE STANDARD WAS PROMULGATED IN 1991 – IS IT WORKING?

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- Kern Oil Refinery in Bakersfield, California explosion on January 19, 2005: Killed one employee and caused multiple injuries.



- Cause: During start-up, employees cleaning re-boiler pumps over-pressured the system, causing a release and explosion

# ●●● THE STANDARD WAS PROMULGATED IN 1991 – IS IT WORKING?

- BP Products Texas City - **March 2005**

- 15 Workers Killed
- 170 Injured
- Major Property Damage
- \$21 Million in Fines



- Cause: Splitter tower grossly overfilled, eventually expelling liquid hydrocarbons to atmosphere.

# ●●● THE STANDARD WAS PROMULGATED IN 1991 – IS IT WORKING?

- On August 6<sup>th</sup>, 2012 a fire erupted in the Crude Unit at the Chevron Refinery in Richmond. Chevron failed to replace aging pipe components over a 10-year period and pointed to clamps used at the refinery as a stopgap repair measure. 19 Chevron employees were engulfed by a vapor cloud during the fire and one firefighter was trapped in a fire engine 65 feet from the leaking pipe, which carried high-pressure petroleum products.





- It's Clear, Although there have been improvements...

## **PSM COMPLIANCE ISSUES & EXPOSURE TO CATASTROPHES STILL EXIST**



# ●●● Where Do We Go From Here?

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- After the August 6<sup>th</sup> Fire at the Chevron Richmond Refinery Recommendations to improve the PSM Standard were Suggested By...
  - The Chemical Safety Board
  - Legislation through Assemblywoman Skinner AND State Senator Hancock
  - The Governors Refinery Taskforce and
  - DOSH Management i.e. HQ

● ● ● ● **The Chemical Safety Board made the following recommendations to the Governor's office**

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- Revise the PSM Standard to require improvements to mechanical integrity and process hazard analysis programs for all California oil refineries. These improvements shall include engaging a diverse team of qualified personnel to perform a documented Damage Mechanism Hazard Review.
- Require the analysis and incorporation of applicable industry best practices and inherently safety systems to the greatest extent feasible into this review.

● ● ● ● **The Chemical Safety Board made the following Recommendations to the Governors office** continued...

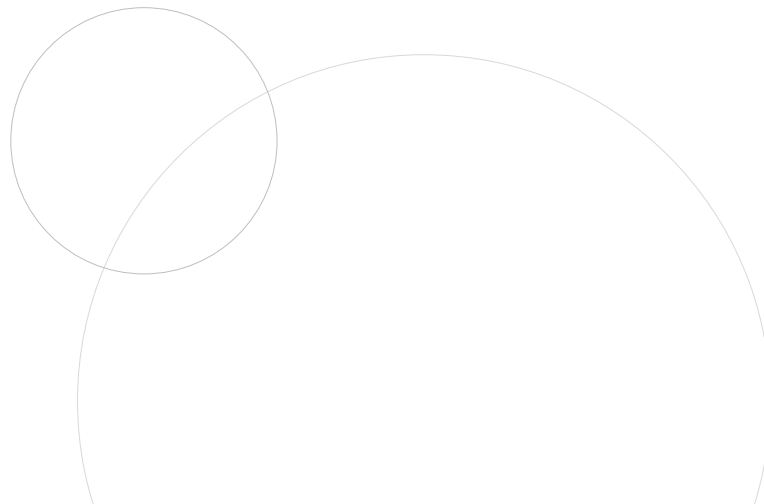
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- Establish a multi-agency process safety regulatory program for all California oil refineries to improve the public accountability, transparency, and performance of chemical accident prevention and mechanical integrity programs.
- Require that the PHA include documentation of the recognized methodologies, rationale and conclusions used to claim that safeguards intended to control hazards will be effective. This process shall use established qualitative, quantitative, and/or semi-quantitative methods such as Layers of Protection Analysis (LOPA).

- ● ● ● The Chemical Safety Board made the following Recommendations to the Governors office continued...

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Require the documented use of inherently safer systems analysis and the hierarchy of controls to the greatest extent feasible in establishing safeguards for identified process hazards.



## ●●● The Chemical Safety Board made the following Additional Recommendations

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- The safety case is a rigorous prescriptive and goal-setting regulatory regime that is highlighted by its ... continuous improvements in risk reduction for high hazard industrial facilities. The approach is used widely overseas ... The CSB is currently examining... implementation of the safety case regime... effective regulatory tool for Cal/OSHA... to ensure that California refineries are identifying and controlling hazards and driving risk to as low as reasonably practicable (ALARP). Utilizing the safety case requires effective implementation by an independent, competent, well-funded regulator. Experience and competence of the regulator in technical areas such as chemical engineering, human factors, and process safety are necessary to provide effective auditing and regulatory oversight for prevention.  
**(NOT INSTITUTED)**

# ●●● Regulatory Activity

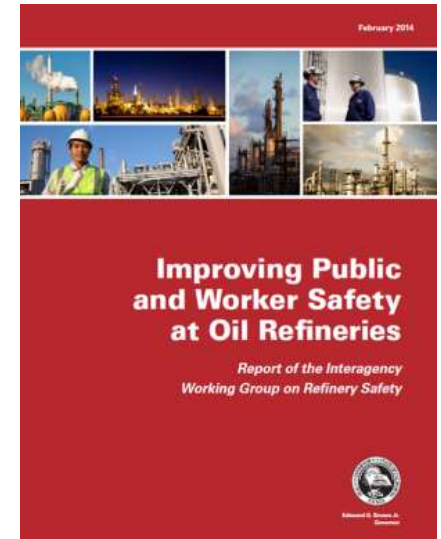
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- Assemblywoman Skinner AB1165
  - The bill would require refineries to correct serious, willful or repeated serious violations even during appeals before the state's occupational and safety appeals board.
  - Amendment to AB1165...increase PSM Unit Staffing by 15 CSHO's (2017 25 additional CSHO's) and have CSHO's conduct inspection in pre-turnaround scope.
  - Seek emergency regulation to independently fund PSM Unit via Labor Code §7870 - Notwithstanding the availability of federal funds to carry out the purposes of this part, the division may fix and collect reasonable fees for consultation, inspection, adoption of standards, and other duties conducted pursuant to this part. The expenditure of these funds shall be subject to appropriation by the Legislature in the annual Budget Act.

# ●●●● Governor's Report on Refinery Safety Recommendations:

## Strengthen PSM and Cal ARP Programs:

1. Implement inherently safer systems to the greatest extent feasible;
2. Perform periodic safety culture assessments;
3. Adequately incorporate damage mechanism hazard reviews into Process Hazard Analyses;
4. Complete root cause analysis after significant accidents or releases;
5. Explicitly account for human factors and organizational changes; and
6. Use structured methods such as Layer of Protection Analysis to ensure adequate safeguards.





## ●●● Refinery Taskforce

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- Development of the Governor's Interagency Refinery Taskforce (IRTF)
- Cal/OSHA PSM Unit and other agencies to work more closely during inspections.
- Develop "HIT Team" model throughout California.
- Sharing of data coordinated by Cal/EPA
- Cal/OSHA PSM Unit to Provide Regulatory Training to IRTF agencies...



# Current Process Safety Management Elements

## Title 8 §5189

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1. Scope & Application
2. Definitions
3. Process Safety Information
4. Process Hazard Analysis
5. Operating Procedures
6. Training
7. Contractors
8. Pre-Start-Up Safety Review
9. Mechanical Integrity
10. Hotwork
11. Management of Change
12. Incident Investigation
13. Emergency Planning and Response
14. Employee Participation
15. IIPP
16. Trade Secrets



# PROPOSED PSM REGULATION

- (a) Scope and Purpose
- (b) Application
- (c) Definitions
- (d) Process Safety Information (PSI)
- (e) Process Hazard Analysis (PHA)
- (f) Operating Procedures
- (g) Training
- (h) Contractors
- (i) Pre Start-Up Safety Review (PSSR)
- (j) Mechanical Integrity
- (k) Damage Mechanism Review (DMR)
- (l) Hierarchy of Hazard Controls Analysis (HCA)
- (m) Hot Work
- (n) Management of Change (MOC)
- (o) Incident Investigation—Root Cause Analysis
- (p) Emergency Planning and Response
- (q) Employee Participation
- (r) Process Safety Culture Assessment (PSCA)
- (s) Human Factors
- (t) Management of Organizational Change (MOOC)
- (u) Compliance Audits
- (v) Process Safety Management Program
- (w) Division Access to Documents and Information
- (x) Implementation


# ●●● Title 8 §5189.1 – NEW Sections of Interest

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Applicability: Petroleum Refineries  
(NAICS Code 324110)

Purpose

This Section contains requirements for petroleum refineries to prevent major incidents and minimize the process safety risks to which employees may be exposed.



# ●●● Selected General Definitions

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“Major Incident” means an event within or affecting a process that causes a fire, explosion or release of a highly hazardous material which has the potential to result in death or serious physical harm (as defined in Labor Code Section 6432(e)), or which results in a shelter-in-place, or an evacuation order.

“Feasible” means capable of being accomplished in a successful manner within a reasonable period of time, taking into account health, safety, economic, environmental, legal, social, and technological factors.

“Major change” means any of the following: (1) introduction of a new process, new process equipment, or new regulated substance; (2) any change in safe operating limits; or (3) any alteration in a process, process equipment, or process chemistry that introduces a new hazard or worsens an existing hazard.

# ●●● Additional Definitions

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- “Highly hazardous material” means a substance possessing a toxic, reactive, flammable, explosive, or other dangerous property, exposure to which could result in death or serious physical harm as defined by Labor Code 6432 (e). Highly hazardous material includes all regulated substances listed in Appendix A.
- “Process” for purposes of this Article, means petroleum refining activities involving a highly hazardous material, including use, storage, manufacturing, handling, piping, or on-site movement. Utilities and safety related devices may be considered part of the process if, in the event of an unmitigated failure or malfunction, they could potentially contribute to a major incident.



# Damage Mechanism Review (DMR)

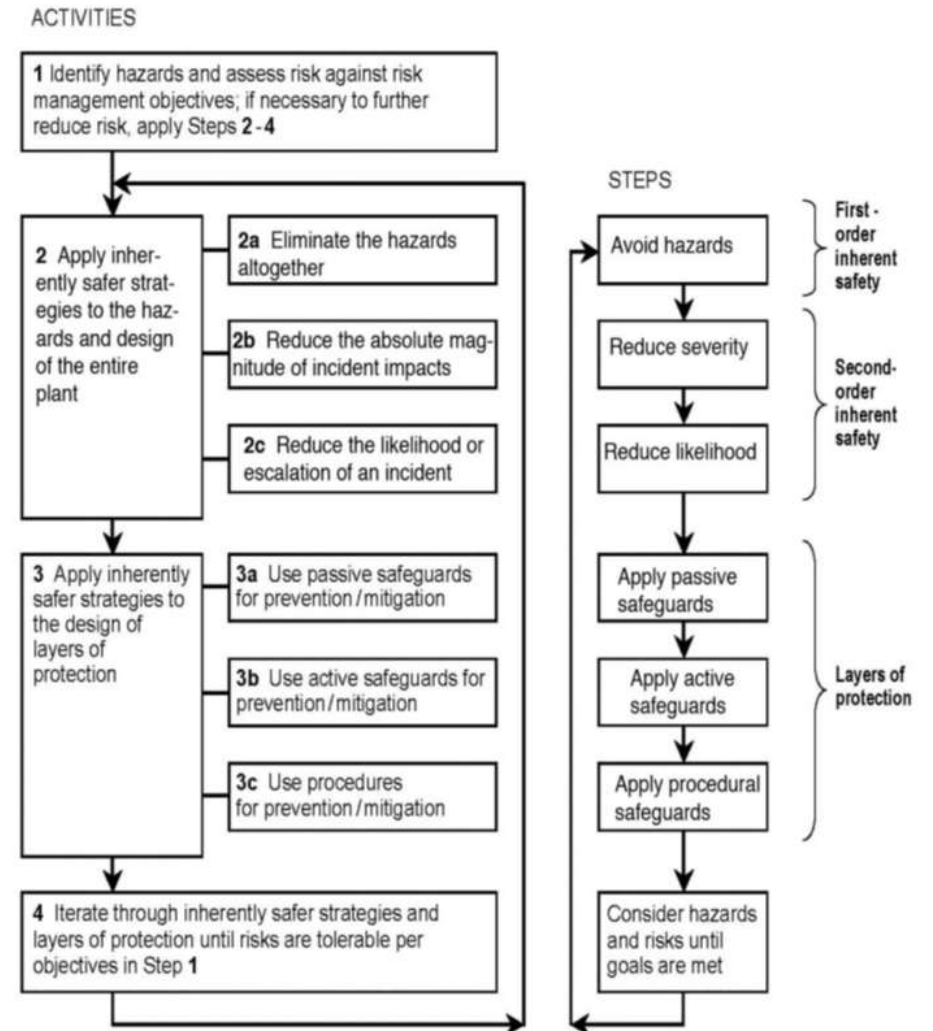
- Scope: “each process for which a damage mechanism exists”;
- Initial DMR within 5 years (50% within 3 yrs);
- Revalidated every 5 years or prior to a major change;
- Reviewed as part of an incident investigation;
- Team must include experts and employees;
- Feeds into the Process Hazard Analysis.





# Hierarchy of Hazard Control

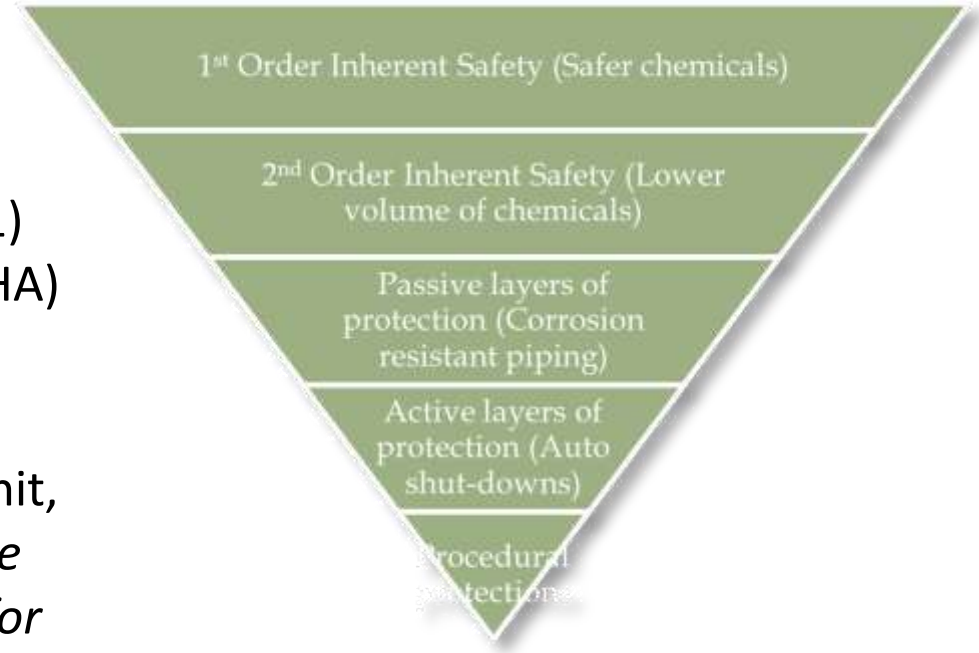
**Hierarchy of Hazard Control;** A system used to minimize or eliminate exposure to a hazard or to reduce the risk presented by a hazard. Control measures listed from most effective control measure to least effective control measure are: (1) eliminating the hazards altogether (first order inherent safety), (2) reducing severity of hazard or likelihood of release (second order inherent safety), or (3) applying layers of protection, including passive, active, or procedural safeguards (layers of protection).





# ●●●● Hierarchy of Hazard Control Analysis

- Initial HCA for all processes, & revalidation every five years. Refineries also must conduct an HCA when: (1) recommendations from a Process Hazard Analysis (PHA) show a potential for a major incident, (2) a major change is proposed, or (3) a major incident occurs.
- Also during the design of any new process, process unit, or facility. *An HCA done for this purpose must be made available to the public, with appropriate protections for trade secret information.*
- HCAs are conducted by a team with expertise in inherent safety and safeguards, with employee representation.
- Refineries must select the highest order safety measure unless it is not feasible. Any finding of infeasibility must be documented.



# ●●● Safeguard Protection Analysis (SPA)

- “Safeguard” means a device, system, or action that interrupts the chain of events following an initiating cause, or that mitigates the impacts of an incident. [Passive/Active/Procedural Safeguards]
- Conduct and update within 6 months of finalizing a Process Hazard Analysis (PHA), to ensure the effectiveness of the individual and combined safeguards for each failure scenario identified in the PHA, and to assure that the safeguards are independent of each other.
- Team with expertise in engineering and process operations, the methodology, and the safeguards being evaluated; at least one employee representative.



# ●●●● Management of Organizational Change (MOOC)

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- An analysis of impacts of any staffing changes or reorganization of operations, including reducing staffing levels, changing experience levels of employees, changing shift duration, or making changes in employee responsibilities.
- Analysis of change by a team; documentation of analysis, decision, and basis.
- Certification by the refinery manager that the proposed change(s) will not increase the likelihood of a major incident.
- Workers and their representatives must be involved in these processes.





# Incident Investigation

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- Investigate incidents using effective methods that identify root causes to determine the underlying safety management system causes of the incident, which if corrected would prevent or significantly reduce the likelihood of the problem's recurrence.
- Investigate all incidents that resulted in, or could reasonably have resulted in, a major incident.
- Incident investigations are conducted by a team, including experts and employees.
- Investigation must begin within 48 hours; an initial report within 90 days of the incident; final report in 5 months.
- Interim and final recommendations to prevent recurrence and reduce the risk of future incidents.
- *For major incidents, reports will be made publicly available by the CUPA.*



# ●●● Human Factors

- A discipline concerned with designing machines, operations, and work environments so that they match human capabilities, limitations, and needs. Human factors can be further referred to as environmental, organizational, and job factors, and human and individual characteristics, such as fatigue, that influence behavior at work in a way that can affect health and safety.
- Human factors program shall take into account staffing levels, complexity of tasks, time needed to complete tasks, level of training and expertise, human-machine interface, fatigue, communication systems, and other factors.
- Human factors must be assessed and included in all PHAs, incident investigations, written operating and maintenance procedures, and in management of change processes for major changes and organizational changes.
- Written program must include:
  - Training, operating, and maintenance procedures.
  - Staffing, shiftwork, overtime, and fatigue.



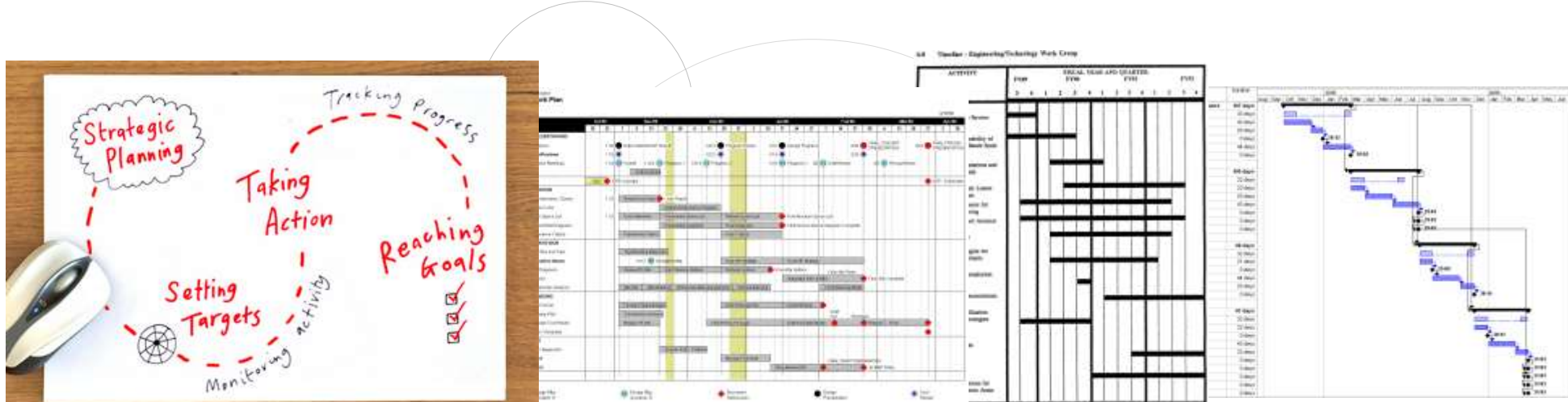
# ●●●● Process Safety Culture Assessment

- Assessment of the core values and behaviors resulting from a collective commitment by leaders and individuals to emphasize safety over competing goals in order to ensure protection of people and the environment.
- Shall be done every 5 years, with a mid-term check on progress to:
  - Ensure that reporting of safety concerns is encouraged;
  - Ensure that reward or incentive programs do not deter reporting of concerns or incidents;
  - Ensure that safety is not compromised by production pressures;
  - Promote effective process safety leadership at all levels of the organization.
- Employees and their representatives shall participate in all phases of the safety culture assessment.
- The refinery manager, or his or her designee, must sign off on all process safety culture assessment reports and corrective action plans.



# ●●● Program Management

- Written management system to ensure that all program elements are developed, implemented, modified when needed, communicated, and roles and responsibilities are assigned.
- Compliance audit every 3 years.
- Review all recommendations from team reports against defined rejection criteria; generate corrective actions; and implement corrective actions according to a specified timeline. Communicate reasons for all delays in the corrective action work process to employees. Document close-out of all recommendations and corrective actions.





# QUESTIONS?

