Refinery Safety Regulations Summary

Two sets of regulations are proposed to improve process safety at refineries: DIR/CalOSHA's Process Safety Management standards (PSM) and the Governor's Office of Emergency Services/CalEPA amendments to regulations to implement the California Accidental Release Prevention Program (CalARP). Both regulations consist of the following nine primary elements, which are discussed in more detail below:

1) *Hierarchy of hazard control analyses (HCA)*
2) *Periodic safety culture assessments*
3) *Damage mechanism hazard reviews (DMRs)*
4) *Incident Investigations, including a root cause analysis after significant accidents or releases*
5) *Consideration of human factors*
6) *Methods to ensure effectiveness of safeguards (Safeguard Protection Analysis)*
7) *Management systems to ensure compliance with process safety requirements*
8) *Management of organizational change requirements*
9) *Measurement and reporting of performance indicators*

All elements include requirements to insure employee participation, and require corrective actions to be completed within specific time frames and communicated to employees. Deadlines for corrective actions can be extended if justified in writing.

Description of Elements

Hierarchy of Hazard Control: hazard prevention and control measures, in priority order, to eliminate or minimize a hazard. Hazard prevention and control measures ranked from most preferred to least preferred are: (1) First Order Inherent Safety (e.g., safer chemicals), (2) Second Order Inherent Safety (e.g., decreasing quantity of chemicals), and (3) passive, active and procedural protection layers.

- Regulations require an initial hierarchy of hazard control Analysis (HCA) for all processes, and a revalidation every 5 years. Refineries also must conduct an HCA when: recommendations from a Process Hazard Analysis (PHA) reveal a potential for a major incident, a major change is proposed, or a major incident occurs.
- An HCA must also be conducted 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.

Incident Investigation: Refineries must 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.

- Use a root cause analysis method to 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 of the incident and reduce the risk of future incidents.
- For major incidents, reports will be made publicly available by the CUPA.

Damage Mechanism: The mechanical, chemical, physical, or other process that results in equipment or material degradation. (Examples: corrosion, stress-cracking, thermal-related failures, wear, and mechanical loading.)

- Must be done initially for each process for which a damage mechanism exists, and revalidated at least every 5 years; also done for major changes and reviewed as part of a root cause analysis after a major incident.
- Team must include experts and employees.
- Feeds into the Process Hazard Analysis.

Safeguard Protection Analysis: A method to determine the effectiveness of the devices, systems, or actions that interrupt the chain of events following an initiating cause, or that mitigate the impacts of an incident.

- Examples:
    - Passive Safeguards. Minimizing the hazard through process and equipment design features that reduce either the frequency or consequence of the hazard without the active functioning of any device; for example, by providing a diked wall around a storage tank of flammable liquids.
    - Active Safeguards. Using controls, alarms, safety instrumented systems, and mitigation systems to detect and respond to deviations from normal process operations; for example, by using a pump that is shut off by a high-level switch in the downstream tank when the tank is 90% full.
    - Procedural Safeguards. Using policies, operating procedures, training, administrative checks, emergency response and other management approaches to prevent incidents or to minimize the effects of an incident, such as hot work procedures and permits and emergency response procedures implemented by employees.
- 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.

Human Factors: Human factors means 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.

Management of Organizational Change Assessment: 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.

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 the development, implementation, and developing and implementing recommendations.
- The refinery manager, or his or her designee, must sign off on all process safety culture assessment reports and corrective action plans.
- 3rd party Safety Culture Assessment can be contracted by the CUPA after a major incident.

Management Systems: Systems to ensure compliance with process safety requirements.

- Have a management system in place to ensure all program elements are developed, implemented, modified when needed, communicated, and roles and responsibilities are assigned.
- Review all recommendations from team reports against defined rejection criteria; generate corrective actions; and implement the corrective actions according to a specified timeline. Communicate reasons for all delays in the corrective action work process to employees and the CUPA. Document close-out of all recommendations and corrective actions.
- Have a system to allow employees to anonymously report process hazards, to refuse work based on process safety concerns, and to recommend to an operator that a process be shut down. A qualified operator has the authority to shut down a process for safety concerns. Refineries must respond in writing to written reports of process hazards, and must track hazard reports, work refusals, and shut-downs that occur for process safety reasons.
- Have written procedures for effective exchange and tracking of safety, operations, and maintenance information.
- Ensure that all findings, recommendations, and action items of the program are communicated effectively to all employees.
- Perform compliance audits every 3 years.

Performance Indicators: Annual reporting of specifically defined performance indicators.

- Under CalARP, the indicators will be reported to OES and the UPA. OES will post the indicators on its web site.
- Indicators to be reported:
    - Past due inspections for piping and pressure vessels.
    - Past due PHA recommended actions and seismic recommended actions.
    - Past due recommended actions from the investigation of certain major incidents.
    - The number of major incidents that have occurred since January 1, 2011 and the rate assigned by the American Petroleum Institute.
    - Information on leak seal repairs. (PSM only)
- Site-specific indicators: each refinery shall develop a list of site-specific activities and other events that it shall measure and report over time in order to evaluate the performance of its process safety systems.