



U. S. Chemical Safety and Hazard Investigation Board

RECOMMENDATION STATUS CHANGE

SUMMARY

Report:	Tesoro Anacortes Refinery Fatal Explosion and Fire
Recommendation Number:	2010-08-I-WA-R5
Date Issued:	May 01, 2014
Recipient:	Governor and Legislature of the State of Washington
New Status:	Closed – Acceptable Alternative Action
Date of Status Change:	March 14, 2024

Recommendation Text:

Based on the findings in this report, augment your existing process safety management regulations for petroleum refineries in the state of Washington with the following more rigorous goal-setting attributes:

- a. *A comprehensive process hazard analysis written by the company that includes:*
 - i. *Systematic analysis and documentation of all major hazards and safeguards, using the hierarchy of controls to reduce those risks to as low as reasonably practicable (ALARP);*
 - ii. *Documentation of the recognized methodologies, rationale and conclusions used to claim that safeguards intended to control hazards will be effective;*
 - iii. *Documented damage mechanism hazard review conducted by a diverse team of qualified personnel. This review shall be an integral part of the Process Hazard Analysis cycle and shall be conducted by a diverse team of qualified personnel. This review shall be an integral part of the Process Hazard Analysis cycle and shall be conducted on all PSM-covered process piping circuits and process equipment. The damage mechanism hazard review shall identify potential process damage mechanisms and consequences of failure and shall ensure effective safeguards are in place to control hazards presented by those damage mechanisms. Require the analysis and incorporation of applicable industry best practices and inherently safer design to the greatest extent feasible into this review, and*
 - iv. *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 goal shall be to drive the risk of major accidents to As Low As Reasonably Practicable (ALARP). Include requirements for inherently safer systems analysis to be automatically triggered for all Management of Change and Process Hazard Analysis reviews, prior to the construction of new processes, process unit rebuilds, significant process repairs, and in the development of corrective actions from incident investigation recommendations.*

- b. *A thorough review of the comprehensive process hazard analysis by technically competent regulatory personnel;*

- c. *Required preventative audits and preventative inspections by the regulator;*
- d. *Require that all safety codes, standards, employer internal procedures and recognized and generally accepted good engineering practices (RAGAGEP) used in the implementation of the regulation contain adequate minimum requirements;*
- e. *Require an increased role for workers in management of process safety by establishing the rights and responsibilities of workers and their representatives on health and safety-related matters, and the election of safety representatives and establishment of safety committees (with equal representation between management and labor) to serve health and safety-related functions. The elected representatives should have a legally recognized role that goes beyond consultation in activities such as the development of the comprehensive process hazard analysis, management of change, incident investigation, audits, and identification and effective control of hazards. The representatives should also have the authority to stop work that is perceived to be unsafe or that presents a serious hazard until the regulator intervenes to resolve the safety concern. Work force participation practices should be documented by the company to the regulator; and*
- f. *Require reporting of information to the public to the greatest extent feasible such as a summary of the comprehensive process hazard analysis which includes a list of safeguards implemented and standards utilized to reduce risk, and process safety indicators that demonstrate the effectiveness of the safeguards and management systems.*

Board Status Change Decision:

A. Rationale for Recommendation

On April 2, 2010, a catastrophic heat exchanger rupture occurred at the Tesoro Anacortes refinery which fatally injured seven workers. The U.S. Chemical Safety and Hazard Investigation Board (CSB) investigated the incident and found that management at the refinery failed to effectively evaluate the potential for high temperature hydrogen attack (HTHA), the damage mechanism which caused the heat exchanger rupture.

The CSB concluded that the State of Washington's process safety management regulation, *Safety Standards for Process Safety Management of Highly Hazardous Chemicals*, was insufficient to prevent this incident and to promote a culture of continuous improvement in the refining industry. The CSB also found that the Washington State Department of Labor and Industries (L&I), which oversees workplace safety in the state, lacked sufficient technically experienced and qualified inspectors to verify compliance with existing PSM requirements. As a result of these findings, the CSB issued three recommendations to the Governor and Legislature of the State of Washington. This status change summary addresses CSB Recommendation No. 2010-08-I-WA-R5.

B. Response to the Recommendation

Washington’s newly adopted process safety management (PSM) regulation for petroleum refineries under WAC 296-67 Part B was adopted on December 27, 2023, and becomes effective on December 27, 2024.¹ The new regulation requires refinery employers to:

- Conduct Damage Mechanism Review for each existing and new process for which a damage mechanism exists.
- Conduct a Hierarchy of Hazard Controls Analysis to encourage refinery management to implement the most effective safety measures when considering competing demands and costs when correcting hazards;
- Implement a Human Factors Program, which requires analysis of human factors such as staffing levels, training and competency, fatigue and other effects of shift work, and the human-machine interface;
- Develop, implement, and maintain written procedures for the Management of Organizational Change to ensure that plant safety remains consistent during personnel changes;
- Utilize Root Cause Analysis when investigating any incident that results in, or could have reasonably resulted in, a major incident; and
- Perform and document a Process Hazard Analysis of the effectiveness of safeguards that apply to processes an identify, evaluate, and control hazards associated with each process.

The new regulation is intended to make Washington’s petroleum refineries safer for its workers.

C. Board Analysis and Decision

Although Washington’s newly adopted PSM regulation for petroleum refineries does not accomplish everything required in this recommendation, it is a much more robust regulation that significantly improves process safety management at these refineries, thus meeting the recommendations intent. Washington’s PSM regulation implements several new management system elements previously identified by the CSB as being necessary for improved refinery safety, including the use of hierarchy of hazard controls, performing damage mechanism reviews, conducting safeguard protection analysis. Additionally, the new regulation provides increased opportunities for employee participation in the management of process safety, including having the authority to stop work that is perceived to be unsafe.

The Board recognizes the enormity and complexity of developing such a rulemaking and applauds the success of Washington’s new and more robust process safety management regulation for petroleum refineries. As such, the Board voted to change the status of CSB Recommendation No. 2010-08-I-WA-R5 to: “Closed – Acceptable Alternative Action.”

¹ See Washington’s *Safety Standards for Process Safety Management of Highly Hazardous Chemicals* at <https://app.leg.wa.gov/wac/default.aspx?cite=296-67> (accessed February 14, 2024).