



# U. S. Chemical Safety and Hazard Investigation Board

## RECOMMENDATIONS STATUS CHANGE

### SUMMARY

<b>Report:</b>	Tesoro Refinery Fatal Explosion and Fire
<b>Recommendation Number(s):</b>	2010-8-I-WA-R8
<b>Date Issued:</b>	May 1, 2014
<b>Recipient:</b>	Washington State Department of Labor and Industries
<b>New Status:</b>	Open – Acceptable Response or Alternate Response
<b>Date of Status Change:</b>	August 12 <sup>th</sup> , 2015

#### Recommendation Text(s):

*Perform a verification audit at all Washington petroleum refineries to ensure:*

- a. Prevention of HTHA equipment failure and safe operation of the equipment. Audit HTHA prevention and process condition monitoring techniques used at all Washington petroleum refineries. Verify that all affected equipment in use meets the requirements contained in Recommendation 2010-08-I-WA-R10;*
- b. For nonroutine work, a written hazard evaluation is performed by a multidisciplinary team and, where feasible, conducted during the job planning process prior to the day of the job execution. Verify that each facility has an effective written decision-making protocol used to determine when it is necessary to shut a process down to safely perform work or conduct repairs. Ensure the program reflects the guidance in the CCPS Risk Based Process Safety book related to hazardous nonroutine work; and*
- c. Effective programs are in place to control of the number of essential personnel present during all hazardous nonroutine work.*

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#### Board Status Change Decision:

##### A. Rationale for Recommendation

The U.S. Chemical Safety and Hazard Investigation Board (CSB) conducted an investigation of a catastrophic heat exchanger rupture at the Tesoro Anacortes refinery on April 2, 2010, in which seven workers were fatally injured. The CSB 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. For example, damage mechanism hazard reviews conducted in the 20 years preceding the incident did not identify the potential danger of HTHA in the B and E heat exchangers because they primarily relied on design operating parameters instead of measured process conditions. Although all of these design parameters indicated operation below the Nelson curve, CSB process modeling estimated that the hottest portions of the heat exchangers at times operated above the Nelson curve. In addition, the rupture occurred during hazardous, nonroutine work: the startup of a bank of heat exchangers that had been taken offline for cleaning. Though the unit's startup procedure specified the use of only one outside operator to perform the startup, a supervisor requested additional operators to assist. In past startups, additional personnel had assisted in responding to potential leaks or to assist in the NHT heat exchanger startup operations because of the difficult labor-intensive process involved. Tesoro management did not prohibit or effectively limit the use of additional personnel during these activities; therefore, exposures of additional personnel to hazards from fires and significant hydrocarbon leaks during startup had become an accepted "normal" practice. For this reason, six additional workers were present in the unit at the time of the rupture, all of whom lost their lives. Based on the findings of the

investigation, the CSB issued a recommendation to the Washington Department of Labor & Industries (WA L&I) to perform a verification audit at all Washington petroleum refineries.

B. Response to the Recommendation

WA L&I has obtained documentation from each of the five oil refineries in the state on progress made on each of the three elements of the CSB recommendation. The responses from the companies represent initial steps towards auditing the five refineries. However, to meet the full intent of the recommendation, the audit must go further in analyzing equipment design drawings, piping and instrumentation diagrams, historical data, and the various programs and policies cited to verify that these refineries are in fact doing everything they can to prevent another incident similar to the 2010 Tesoro Anacortes incident. In addition, to perform a detailed and thorough audit of these refineries, it would be beneficial to have a person with chemical process industry knowledge and expertise on the team to analyze the responsive documentation.

C. Board Analysis and Decision

As WA L&I has taken initial steps towards a complete verification audit of the five refineries in the state, the Board voted to change the status of this recommendation to: “**Open – Acceptable Response or Alternate Response.**”