



# U. S. Chemical Safety and Hazard Investigation Board

## RECOMMENDATIONS STATUS CHANGE

### SUMMARY

<b>Report:</b>	Tesoro Refinery Fatal Explosion and Fire
<b>Recommendation Number:</b>	2010-08-I-WA-R12
<b>Date Issued:</b>	May 12, 2014
<b>Recipient:</b>	Tesoro Refining and Marketing Company, LLC
<b>New Status:</b>	Closed – Acceptable Action
<b>Date of Status Change:</b>	April 24, 2017

#### Recommendation Text:

*Actively participate with API in the completion of recommendation 2010-08-I-WA-R10<sup>1</sup>. Document this participation.*

#### Board Status Change Decision:

##### A. Rationale for Recommendation

On April 2, 2010, a catastrophic heat exchanger rupture at the Tesoro Anacortes refinery (Tesoro) fatally injured seven workers. The U.S. Chemical Safety Board's (CSB) investigation concluded that Tesoro failed to take actions that may have prevented the rupture, which was caused by a damage hazard mechanism known as high temperature hydrogen attack (HTHA). For example, the site relied on weak safeguards, such as equipment inspection and post-weld heat treating, to prevent HTHA, and did not consider the use of inherently safer piping materials known to be less susceptible to HTHA. Moreover, internal inspectors repeatedly, erroneously assumed that heat exchanger design conditions representative of actual process operating conditions, which contributed to the incorrect conclusion that the heat exchangers were not susceptible to damage from HTHA.

The CSB evaluated Tesoro's procedures for identifying and preventing HTHA. CSB recommended that Tesoro participate in the revision of the American Petroleum Institute's (API's) recommended practice for addressing HTHA – API RP 941 *Steels for Hydrogen Service at Elevated Temperatures and Pressures in Petroleum Refineries and Petrochemical Plants* (Recommendation No. 2010-08-I-WA-R10). This evaluation pertains to Recommendation No. 2010-08-I-WA-R12.

##### B. Response to the Recommendation

Tesoro participated in American Petroleum Institute (API) Recommended Practice (RP) 941 Task Group proceedings within the Subcommittee on Corrosion and Materials. Tesoro presented to the 941 Task Group on the Anacortes incident. Tesoro is also a member of the API Joint Industry Project (JIP) that was evaluating fitness-for-service methodologies and nondestructive examination (NDE) techniques for HTHA, and provided funding for the project. In February 2016, the 8<sup>th</sup> edition of API RP 941 was published. Tesoro confirmed that Tesoro had been represented at the 941 task group meetings between 2011 and 2015.

##### C. Board Analysis and Decision

As Tesoro participated in the revision on API RP 941, the Board voted to designate **Recommendation No. 2010-08-I-WA-R12** as “**Closed – Acceptable Action.**”

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<sup>1</sup> CSB Recommendation No. 2010-08-WA-R10 to the American Petroleum Institute: Revise American Petroleum Institute API RP 941: Steels for Hydrogen Service at Elevated Temperatures and Pressures in Petroleum Refineries and Petrochemical Plants to:

- Clearly establish the minimum necessary “shall” requirements to prevent HTHA equipment failures using a format such as that used in ANSI/AIHA Z10-2012, Occupational Health and Safety Management Systems;
- Require the use of inherently safer materials to the greatest extent feasible;
- Require verification of actual operating conditions to confirm that material of construction selection prevents HTHA equipment failure; and
- Prohibit the use of carbon steel in processes that operate above 400 °F and greater than 50 psia hydrogen partial pressure.