



U. S. Chemical Safety and Hazard Investigation Board RECOMMENDATION STATUS CHANGE SUMMARY

Report:	Tesoro Refinery Fatal Explosion and Fire
Recommendation Number:	2010-08-I-WA-R14
Date Issued:	May 1, 2014
Recipient:	Marathon Petroleum Corporation, formerly Tesoro Refining & Marketing Company LLC
New Status:	Closed – Acceptable Action
Date of Status Change:	March 29, 2022

Recommendation Text:

Revise and improve the Process Hazard Analysis (PHA), the Integrity Operating Window (IOW), and the damage mechanism hazard review (DMHR) programs and cross-linking among these three programs such that all identified hazards are effectively managed in each program. For all Tesoro refineries require:

- a. the IOW to review damage mechanism hazards from the most recent PHA and safeguards identified to control these hazards;*
- b. the IOW review or revalidation to be conducted at least every five years;*
- c. the IOW to analyze and incorporate applicable industry best practice, the hierarchy of controls, and inherently safer design to the greatest extent reasonably practicable;*
- d. the DMHR report to be developed by the DMHR team and not just the “corrosion expert;”*
- e. the DMHR team to review the operating data to verify an accurate understanding of how the data was obtained, what it represents, and that it appropriately addresses both routine and nonroutine operations;*
- f. the DMHR and/or IOW review to identify and review gaps between current industry best practices and existing Tesoro practices with regard to material selection and process controls and make recommendations that reduce risks from damage mechanism hazards;*
- g. the DMHR and IOW review to review applicable Tesoro and industry-wide damage mechanism incidents as part of the respective DMHR or IOW review;*
- h. the DMHR to review relevant MOCs to fully evaluate the impact of the MOC on damage mechanism hazards;*
- i. the identification of minimum qualifications for the “corrosion expert” and ensure that the DMHR team has the necessary skills to meet these requirements;*
- j. for sites that have a corrosion/materials engineer, the corrosion/materials engineer shall be a required participant in the DMHR;*

- k. *the PHA to review the most recent DMHR and IOW reviews in order to contain a complete record of all identified damage mechanism hazards, evaluate existing safeguards, and propose new safeguards to control the identified hazards;*
- l. *the PHA to review the consequence of damage mechanism hazards identified in the risk-based inspection (RBI) program and IOW reviews to ensure effective safeguards are present to control the damage mechanism hazard; and*
- m. *the PHA to use the hierarchy of controls and implement opportunities for inherently safer design to the greatest extent reasonably practicable.*

Board Status Change Decision:

A. Rationale for Recommendation

On April 2, 2010, a catastrophic heat exchanger rupture at the Tesoro Anacortes refinery fatally injured seven workers. The U.S. Chemical Safety and Hazard Investigation Board's (CSB) investigation concluded that Tesoro did not 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 damage.

The CSB evaluated, among other things, current Tesoro programs for identifying and controlling damage from process hazards. These included their standards for Process Hazard Analyses (PHAs), Damage Mechanism Hazard Reviews (DMHRs), and Integrity Operating Windows (IOWs). The CSB found that these three programs were insufficiently coordinated to ensure that effective safeguards were identified and evaluated. As a result, the CSB issued a recommendation to the Tesoro Refining & Marketing Company LLC (Tesoro) to improve its PHA, IOW, and DMHR programs.

On October 1, 2018, Tesoro, which was renamed Andeavor on August 1, 2017, became an indirect wholly owned subsidiary of Marathon Petroleum Corporation.

B. Response to the Recommendation

Marathon/Tesoro informed the CSB that they addressed sub-recommendations (a) through (l) by issuing a number of updated standards – Tesoro Refining Standard (TRS) 655 – *Integrity Operating Windows*; TRS 662 – *Risk Based Inspection Corrosion Studies*; the new TRS 665 – *Fixed Equipment Material Selection Studies*; and *Process Safety Management Standard (PSM) 005 – Process Hazard Analysis*. To address sub-part (m), Tesoro informed the CSB that the company updated TSO-001 *Operational Risk Standard* in 2015 to introduce and embedded concepts of inherently safer design and hierarchy of controls. In 2016, Tesoro updated its PSM-005 *Process Hazard Analysis* standard to require the PHA teams be trained on inherently safer concepts and hierarchy of controls at the beginning of every PHA. According to Marathon/Tesoro and based upon the documentation they provided, the PHA teams are required to consider the hierarchy of controls as they make recommendations.

C. Board Analysis and Decision

As Marathon/Tesoro has provided the CSB with sufficient information to document that their actions fulfill the intent of the CSB's recommendation, the Board voted to designate CSB Recommendation No. 2010-08-I-WA-R14 as "Closed-Acceptable Action."