



U. S. Chemical Safety and Hazard Investigation Board

RECOMMENDATIONS STATUS CHANGE SUMMARY

Report:	Chevron Refinery Fire
Recommendation Number(s):	2012-3-I-CA-R30
Date Issued:	January 28, 2015
Recipient:	American Petroleum Institute (API)
New Status:	Open – Unacceptable Response/No Response Received
Date of Status Change:	March 1, 2017

Recommendation Text:

CSB Recommendation No. 2012-03-I-CA-R30

Revise API RP 574: *Inspection Practices for Piping System Components (3rd edition)* to:

- Incorporate as a normative reference API RP 939-C: *Guidelines for Avoiding Sulfidation (Sulfidic) Corrosion Failures in Oil Refineries*;
- Reference API RP 939-C: *Guidelines for Avoiding Sulfidation (Sulfidic) Corrosion Failures in Oil Refineries* when discussing that nonsilicon-killed carbon steel is susceptible to sulfidation corrosion; and
- In Section 9.3 *Investigation of Leaks*, require users to follow the leak response protocol requirements established in API RP 2001: *Fire Protection in Refineries (pursuant to 2012-03-I-CA-R31¹)*.

A. Rationale for Recommendation

On August 6, 2012, the Chevron Refinery in Richmond, California, experienced a catastrophic pipe failure in a crude unit, causing the release of flammable hydrocarbon process fluid which partially vaporized into a large cloud. Nineteen Chevron employees engulfed by the vapor cloud escaped, narrowly avoiding serious injury. The ignition and subsequent continued burning of the hydrocarbon process fluid resulted in a large plume of unknown particulates and vapor. Approximately 15,000 people from the surrounding area sought medical treatment in the weeks following the incident. The CSB's investigation found that the pipe failure was caused by sulfidation corrosion, a damage mechanism that causes piping walls to thin over time.

The CSB identified several contributing causes of the incident relating to various American Petroleum Institute (API) codes, recommended practices and guidelines, specifically with regard to piping corrosion, damage mechanisms, inspections, material verification and fire protection. API RP 574, *Inspection Practices for Piping System Components*, supplements API 570, *Piping Inspection Code*, by providing

¹ CSB Recommendation No: 2012-03-I-A-R31: Revise API RP 2001: *Fire Protection in Refineries* to require users to develop a process fluid leak response protocol specific to their own facility that must be followed when a process fluid leak is discovered. Recommend users to incorporate the following actions into their leak response protocol:

- Establish an Incident Command structure upon identification of a process fluid leak;
- Conduct a pre-response meeting with personnel with specific technical expertise (e.g., inspectors, operators, metallurgists, engineers, and management) and the Incident Commander to determine pressure, temperature, remaining inventory of process fluids, potential damage mechanisms that caused the leak, and worst-case leak scenario;
- Establish a hot zone that identifies the area of risk of exposure or injuries due to flame contact, radiant heat, or contact to hazardous materials, taking into consideration the worst-case leak scenario;
- Limit site access around leak location to essential personnel only;
- Isolate the leaking piping or vessel, or if isolation is not possible, shutdown of the unit when the leaking process fluid poses immediate danger to safety, health, or the environment—such as piping fluid that is toxic or near the autoignition temperature.

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piping inspectors with information that can improve skill and increase basic knowledge and practices. The recommended practice listed 50 reference documents, including other API standards. Several of these documents specifically discuss certain damage mechanisms. However, API RP 939-C, *Guidelines for Avoiding Sulfidation (Sulfidic) Corrosion Failures in Oil Refineries*, is not listed among the reference documents. API RP 574 does specifically inform the reader that corrosion rates can be localized in carbon steel piping; however, it does not specifically point the reader to API RP 939-C to learn more information. To align the messages presented in all piping inspection-related API guidance documents, CSB recommended that API refer the reader to the more enhanced information in API RP 939-C to increase understanding of important sulfidation corrosion characteristics and failure prevention strategies.

B. Response to the Recommendation

On November 1, 2016, API published the fourth edition of API RP 574. CSB staff compared this with the third edition, published in 2009 and part of the Chevron Refinery Fire investigation analysis.

a. Incorporate as a normative reference API RP 939-C: Guidelines for Avoiding Sulfidation (Sulfidic) Corrosion Failures in Oil Refineries;

API did not include as a normative reference, API RP 939-C.

b. Reference API RP 939-C: Guidelines for Avoiding Sulfidation (Sulfidic) Corrosion Failures in Oil Refineries when discussing that non-silicon-killed carbon steel is susceptible to sulfidation corrosion;

API did not reference API RP 939-C when discussing non-silicon-killed carbon steel's susceptibility to sulfidation corrosion.

c. In Section 9.3 Investigation of Leaks, require users to follow the leak response protocol requirements established in API RP 2001: Fire Protection in Refineries (pursuant to 2012-03-I-CA-R31).

API did add a reference to API RP 2001, stating: "Where piping may be significantly thinned rather than contain isolated defects, potential pipe rupture is more likely and should be taken into consideration when investigating leaks or during firefighting efforts. Reference API 2001 for more information on leak response protocol." While this is a good step, API 2001 has not been updated since the Chevron incident. CSB recommended in Recommendation No. 2012-03-I-CA-R31, for API RP 2001 to be updated to require users to develop a process fluid leak response protocol noting several elements that this protocol should include in the text of the recommendation.

C. Board Analysis and Decision

Overall, API did not make changes responsive to the CSB's recommendation in the fourth edition of API RP 574. While API states that they are not prescriptive in their recommended practices, the CSB requested that API reference its own standards in API RP 574. While API has referenced API RP 2001, RP 2001 has not been updated in response to the Chevron investigation findings. API did not make any references to RP 939-C where suggested. As this recommendation is still less than two years old and API may be persuaded to make further changes in a subsequent edition, the Board voted to designate **CSB Recommendation No. 2012-03-I-CA-R30** as **"Open – Unacceptable Response/No Response Received."**