

**AFPM & API
ADVANCING
PROCESS SAFETY**

**ANSI API RP-754
Quarterly Webinar**

Aug 18, 2014

*Process Safety Performance
Indicators for the Refining and
Petrochemical Industries*



 **AFPM**
American
Fuel & Petrochemical
Manufacturers

energy **API.**

Purpose of RP 754 Quarterly Webinars

- To support broad adoption of RP-754 throughout the Refining and Petrochemical industries
- To ensure consistency in Tier 1 and 2 metrics reporting in order to establish credibility and validity
- To share learning's regarding the effective implementation of Tier 1-4 lagging/leading metrics

Today's Agenda

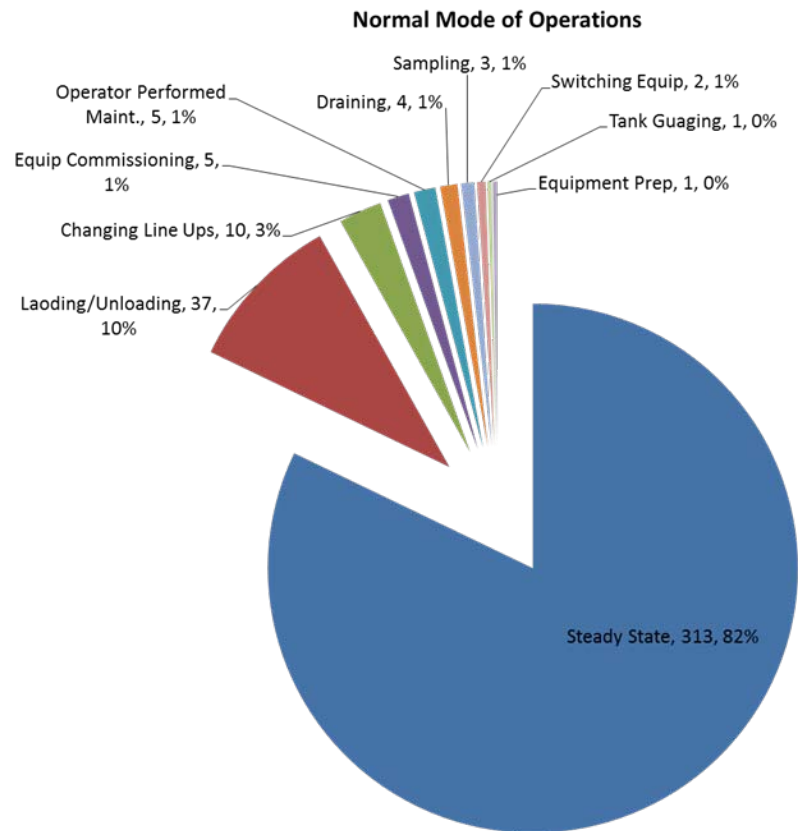
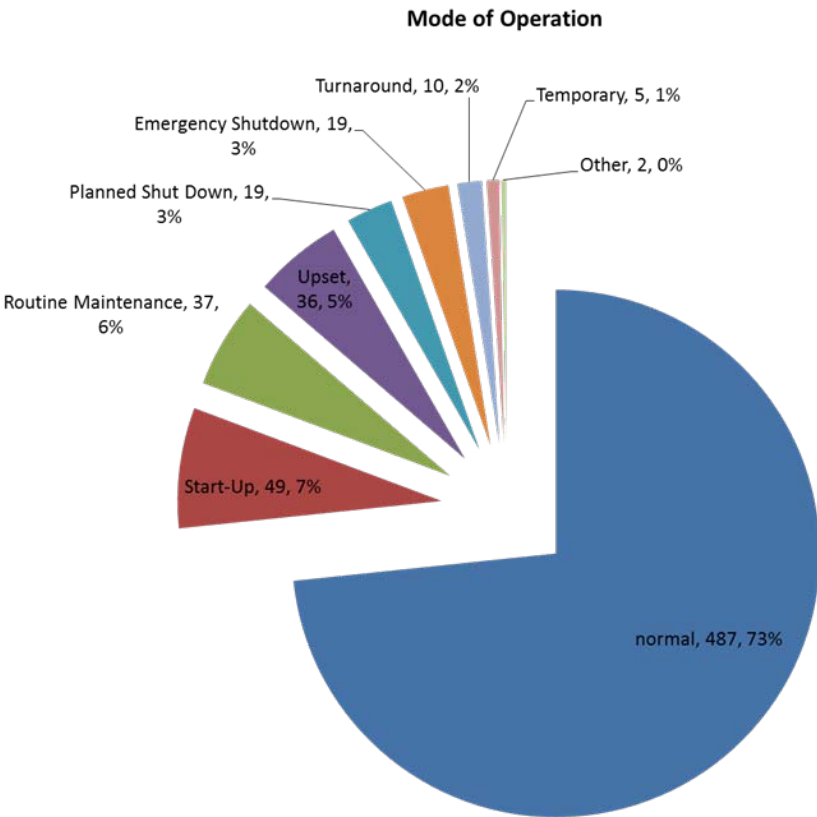
- Recap of 2013 PSE learnings
- Suggestions for effective event descriptions
- A “plug” for the Safety Portal
- Update on RP-754 revision activity
- Industry Trade Association public reporting status
- A Positive Outcome from RP-754 application

2013 PSE Learnings – Deep Dive analysis

- Deep Dive analysis conducted in July 2014 (2013 data)
- Used blinded AFPM RP-754 2013 data submittals (Tier 1 and 2)
- Narrowed the data to Refining events only - due to expertise of review team
- 2013 Tier 1 and 2 PSEs Refining (664 events)
 - 536 U.S., 128 International (Tier 1 and 2)
 - Tier 1 events: 171 (US: 146/ Int.:25)
 - Tier 2 events: 493 (US: 390/ Int.: 103)
 - 96% U.S. Operating capacity represented
- RP-754 currently does not require submittal of causes
- Based on the event descriptions provided and other data (e.g., process unit, point of release, etc.), the review team made engineering judgments about causal factors
- Much of the data had insufficient event descriptions to support causal factor judgments

Mode of Operation

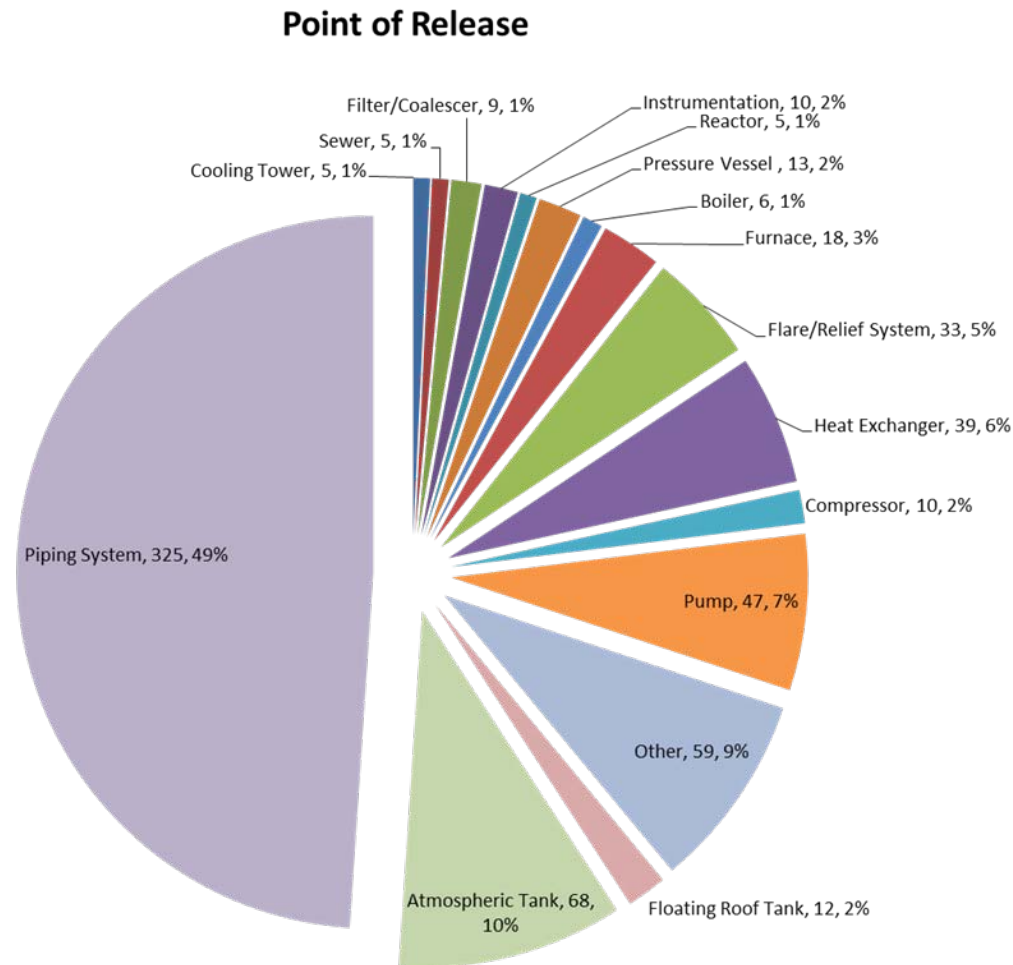
- Continue focus on preventing incidents during normal operations
 - Majority of events during “Steady State” operations
 - Future proposal to break-out “Normal” into sub-modes



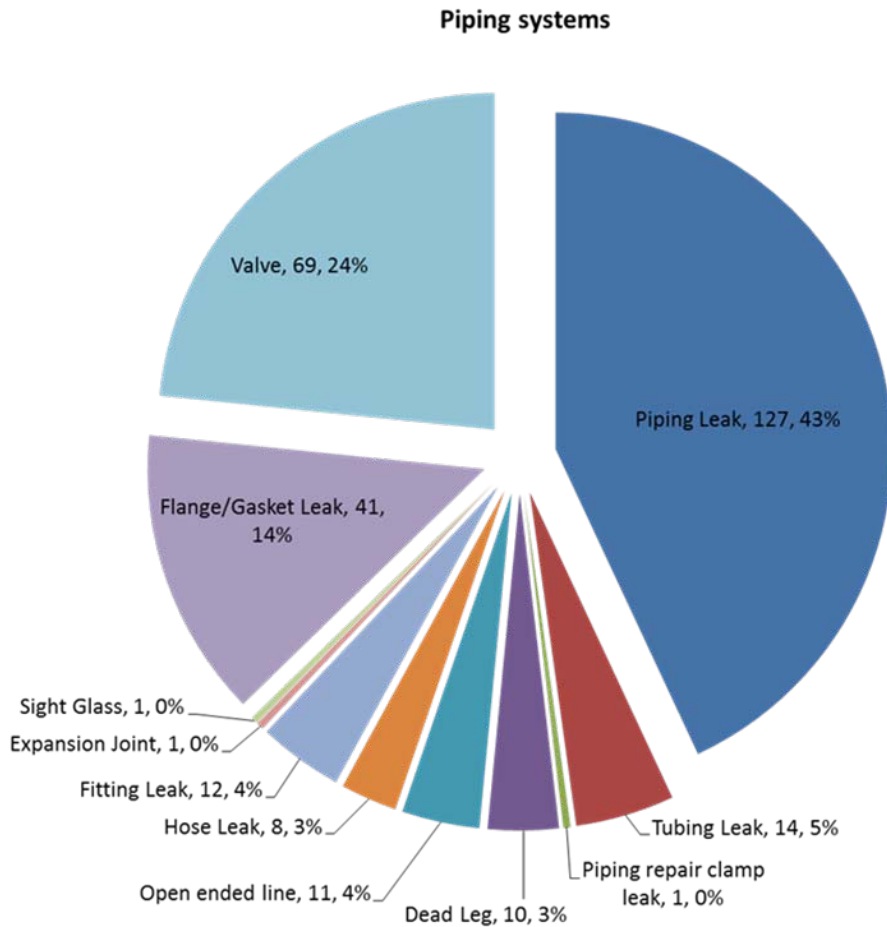
*does not include events labeled as "Insufficient Information" - 106 / 487(22%)

Point of Release-Equipment

- The data supports continued focus on piping systems and tank-farms

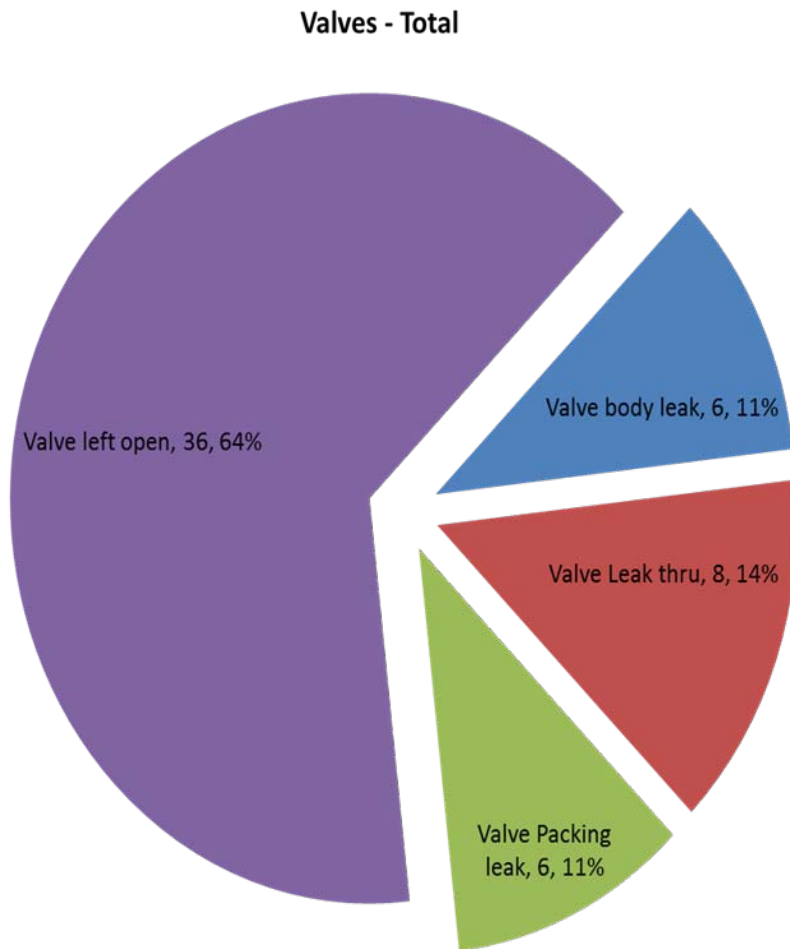


Piping Systems



- Top contributing factors to piping leaks:
 - fixed equipment inspection
 - equipment reliability
 - design
- Fixed equipment inspection issues are related to programs for mitigating metallurgical failures such as corrosion or cracking
- Of the 8 design causations, 3 were related to winterization issues
- Premature failure was the leading cause associated with equipment reliability

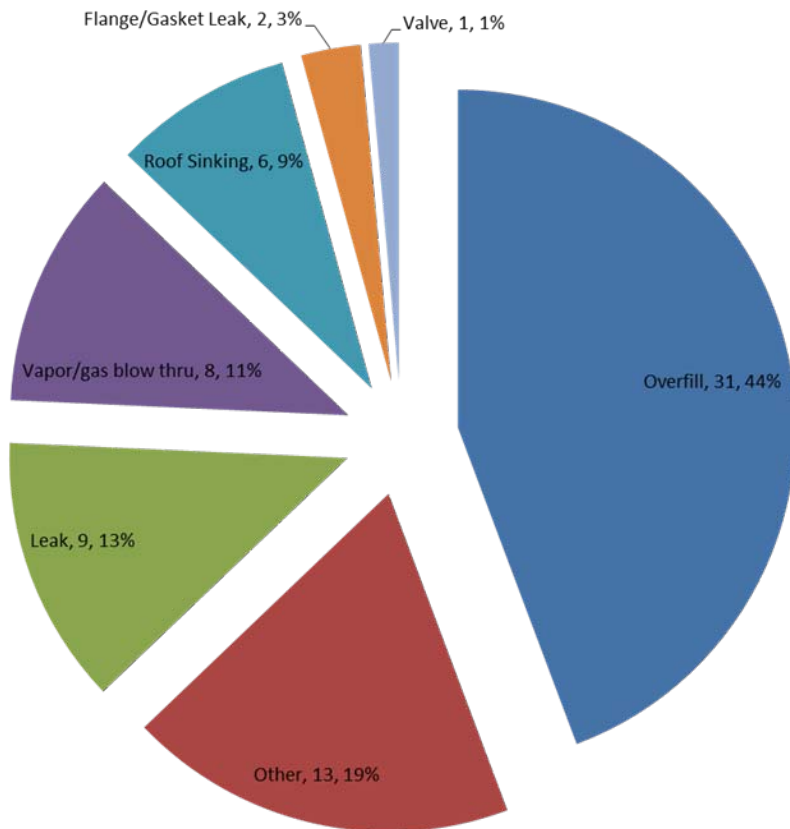
Piping Systems - Valves



- Valves left open continues to be a required area of attention
- Most occur during normal operation while loading/unloading, draining and equipment commissioning
- Safe work practices and operating procedures is an area to review and focus to reduce events related to valve leaks

Release from Atmospheric and Floating Roof Tanks

Tanks (Atmospheric and Floating Roof)



- Majority of the incidents occurred in the tank farm area followed by the sulfuric alkylation unit
- Operating Limits and Human Factors were the main causes contributing to the overfilling of atmospheric and floating roof tanks
- Human factors and equipment reliability were the top causes for tank related incidents

Event Description Improvements

- Carefully select Mode of Operation

| Description | Mode of Operation Original | Mode of Operation Corrected |
|-----------------------------------------------------------------------------------------------------------------|----------------------------|-----------------------------|
| Loss of liquid level from upstream vessel allowed blow through of C3 mixture to spent caustic tank | Normal | Upset |
| Flared hydrogen sulfide as a result of a Claus Furnace shutdown | Normal | Upset |
| Several hours following the power outage on 4/14, an explosion occurred in the Platformer Debutanizer Reboiler. | Normal | Emergency Shutdown |

- Further elaborate on Normal operating mode

| | | | |
|---------------------|--------------------------------|-------------------|--------------------------|
| Steady State | Operator Performed Maintenance | Equipment Prep | Tank Gauging |
| Draining | Sampling | Loading/unloading | Insufficient Information |
| Equip Commissioning | Switching equip | Changing lineups | |

- Carefully select Point of Release

| Description | Point of Release Original | Point of Release Corrected |
|------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|
| 1" bleeder broken on exchanger head causing an LPG release and fire | Heat Exchanger | Piping System |
| Tank roof drain left opened, sending flammable material into drain | Atmospheric Tank | Piping System |
| Fire on portable pump due to incorrect discharge line up and hose failure while draining a tank for maintenance. | Pump | Piping System |
| Hydrogen leak from compressor jacket water standpipe reservoir vent | Piping System | Compressor |
| Leak on fin fan tubing on Train 200 fin fans | Blower/Fan | Heat Exchanger |
| Tubing leak (flammable gas) on pump seal system while swinging pump into service | Pump | Piping System |
| Butylene release from broken nipple on butylene drier feed outlet sample loop | Pressure Vessel | Piping System |

Event Descriptions that are not helpful:

- Examples of event descriptions that are not helpful for data analysis (i.e., need to be expanded)

Loading Rack Spill

Pipeline Leak

Fire on E-1 Exchangers

Sump vent stack vapors

Tank 143 overfill

Piping failure on west Tk-52 pump.

Charge tank was overfilled

- Others leave you wondering if the event was even a Tier 1 or 2 event.

Power grid shut down resulting in loss of vapor recovery systems

Flared hydrogen sulfide as a result of a unit shutdown

Better, but could be improved with a little more detail

Hydrogen Sulfide was released due to a tubing fitting leak on the Hydrogen Recycle Compressor's discharge flow transmitter.

Why did the fitting leak?

LOPC on tank mixer packing due to loss of lubrication caused by continued use below the minimum level for mixer operation.

Why operated too low?

1" bleeder broken on exchanger head causing an LPG release and fire.

How was it broken?

Some were really good

A flash fire occurred in the FCC reactor when contractor employees were pulling the spectacle blind to change new gaskets on the blind. The Main Column was lined to the flare and flare gas flowed through backwards up the vapor line into the reactor catching fire. The flash fire resulted in one contractor employee receiving minor burns.

Leak on a fractionator Reflux line located in the pipe rack due to corrosion. Corrosion was caused from a leak in a process water line dripping on the reflux line. The Reflux pump was shut down and the line was isolated.

Crane struck crude unit piping at the desalter while removing sump pump. There was a crude release which found an ignition source resulting in a minor fire.

LOPC from overfilling small caustic tank due to malfunctioning level indication and backflow.

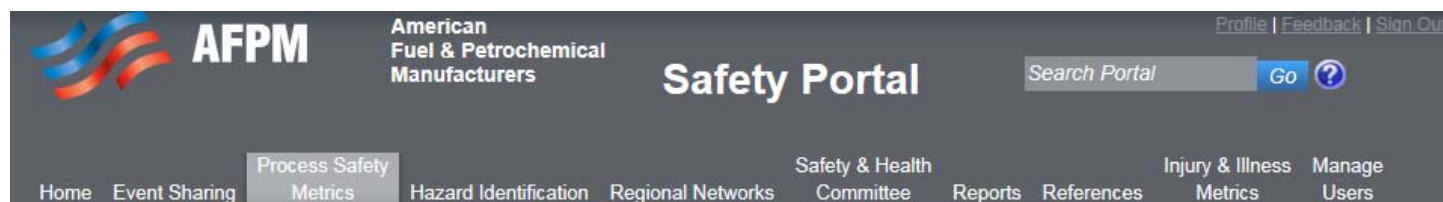
Leak on distillate line caused by corrosion/erosion.

- These offered both a consequences and a cause

Follow up

- Please reach out to the person in your organization who submits your annual RP-754 data and share this presentation!
- More detailed event descriptions will greatly help the annual industry data analysis.

The Safety Portal – “the go-to place” for RP-754 data



Process Safety Metrics & Analysis Program

AFPM and API have modified their annual safety data reporting programs to align with the new ANSI Standard - API 754 "Process Safety Performance Indicators for the Refining and Petrochemical Industries."

In the future companies will submit their annual Tier 1 and Tier 2 process safety events through this section of the Portal. In addition, companies will have the ability to develop customized benchmarking reports querying the AFPM Tier 1 and Tier 2 Process Safety Metrics database (aggregate data only).

Access to this section of the Portal is managed by each Company once a Company Database Agreement has been signed.

Through the Process Safety Metrics and Analysis program an API 754 support network is available to assist industry in the implementation and execution of the new process safety indicators standard and to drive consistency in reporting of Tier 1 and Tier 2 events in order to establish credibility and validity of the data. Support is provided in a variety of ways, through industry workshops, presentations at various forums, and quarterly implementation conference calls with the API 754 support network. Please email safetyportal@afpm.org to be added to the quarterly webinar distribution list.

For more information and instruction on participation, please view the guidance documents:

- [AFPM Guide to Reporting Process Safety Events Version 3.0](#)
- [AFPM Safety Statistics and Awards Program Guidance Document](#)
- [API Process Safety Metrics Website, FAQ and Webinar Presentations](#)

Click to view a [\(Hypothetical\) Process Safety Metrics Story](#), by Kelly Keim of ExxonMobil Chemical.

Search Process Safety Database

>Step 1: Define the Facilities to Include in Your Search

Facility Type: Refinery Petrochemical

Total man Hours: < 1.5 million 1.5-2.3 million >2.3 million

Safety Statistics Submissions And Awards

[Submit Process Safety Data](#)

Reports

- [2013 AFPM Process Safety Event Report](#)
- [2012 AFPM Process Safety Event Report](#)
- [2011 AFPM Process Safety Event Report](#)

The Safety Portal – “the go-to place” to RP-754 data

Metric:

- Counts
 Rate

Search Database

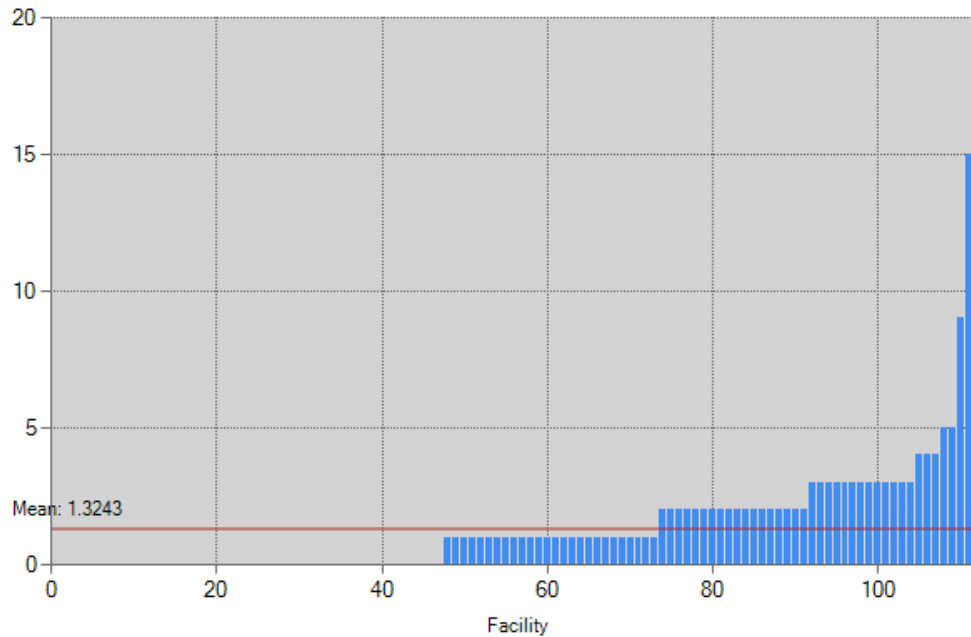
Facility Criteria:

Refinery

Event Criteria:

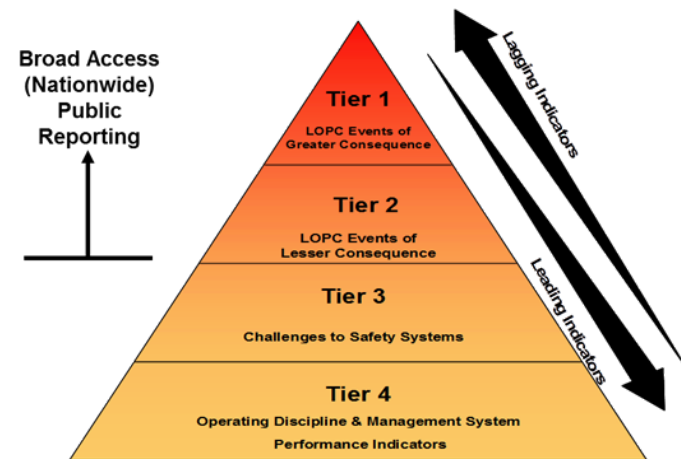
Event Yr: 2013-2013; Consequence: Tier 1

- Mask my Facilities
 Show my Facilities
- Display Counts
 Display PSE Rate



RP-754 Revision Committee - Refresher/Status

- Original recommendation from the CSB following the 2005 BP Texas City incident to API and USW
 - Create performance indicators for process safety in the refinery and petrochemical industries
 - Ensure that the standard identifies leading and lagging indicators for nationwide public reporting as well as indicators for use at individual facilities.
- RP-754 issued in April 2010; considerable outreach efforts and on-going support for implementation of the standard via webinars and conference papers
- 2011 and 2012 count of Tier 1 events published by API and AFPM
- Provision for early review after two full years of data collection (kicked off in Nov 2013)
- Current target to ballot by year-end



RP 754 – Revision Committee Membership

- Academia (1)
 - MKOPSC (M)
- Associations (7/2)
 - OGP (M)
 - UK PIA (M)
 - ACC (M)
 - Center for Operator Performance (O)
 - CEFIC (M)
 - CCPS (M)
 - AFPM (M)
 - Center for Offshore Safety (M)
 - IADC (O)
- E & C (1)
 - Operational Sustainability, LLC (M)
- Government (1/1)
 - UK HSE (M)
 - OSHA (O)
- Owner / Operator (23/5)
 - BP (M)
 - ExxonMobil (M)
 - Chevron Phillips (M)
 - Marathon Petroleum (M)
 - Dupont (M)
 - Braskem S/A (M)
 - Bayer Technology Services (M)
 - Praxair (O)
 - CHS Inc. (M)
 - Valero (M)
 - Flint Hills Resources (M)
 - Air Products (M)
 - Santos (O)
 - Abiquim (O)
 - Chevron (M)
- Owner / Operator
 - Alyeska Pipeline (M)
 - Petroleo Brasileiro (M)
 - Solvay (M)
 - REPSOL (M)
 - Dow Chemical (M)
 - Western Refining (M)
 - Phillips 66 (M)
 - Citgo (M)
 - INEOS (O)
 - Motiva (M)
 - BASF (M)
 - Scottish Power (M)
 - Petrobras (O)

Revision Guiding Principles

IT'S NOT BROKEN

- Committee members unanimously agree that RP-754 is not broken; it is doing what an indicator is intended to do.
- Evidence indicates it is working within our Companies to focus attention on process safety and to drive performance improvement.
- The revision process is focused on improvement rather than any fundamental change.
- Committee rules are written in favor of the existing document - 2/3 majority of voting members is required to change an existing provision.

Continuous Improvement Opportunities

- Incorporation of GHS classification into the threshold quantity
 - Various options being considered
 - Committee favors current threshold categories
 - Support for a standard that can be globally adopted (i.e. Europe/Asia Chemicals)
- Raising the threshold for Tier 1 fire/explosion damage
 - Rejected; an increase to \$100k would result in ~10% of events shifting from Tier 1 to Tier 2; potential criticism for raising the threshold
- Additional education / resources associated with Tier 3 and Tier 4
 - Additional details/definition of Tier 4 indicators
 - Educational material on creating / using an indicators program to drive performance improvement
- Pooling of all the data from the various trade associations for the purpose of global and industry sector benchmarking.
 - Informal poll of committee members shows overwhelming support to try and achieve this goal

Industry Trade Association Public Reporting

- Both API and AFPM started publishing annual industry data in late 2013 (2012 data)
- 2012 data – published in 2013
 - Tier 1 PSE industry aggregate counts for 2011 and 2012
 - Tier 1 two-year rolling average PSE count (2011 and 2012)
 - Link to API 2013 reporting (2012 data): <http://www.api.org/environment-health-and-safety/process-safety/advancing-process-safety-programs/api-process-safety-events-report-for-us-refining-industry>
 - Link to AFPM 2013 reporting (2012 data): <http://www.afpm.org/754-reporting/>
- 2013 data – published in 2014
 - Tier 1 industry 2013 aggregate count
 - Tier 1 three-year rolling average PSE count
 - For internal association communication only—Tier 1 blinded company 2013 CY rate and count and three-year rolling average rate and count
- 2014 data – published in 2015
 - Tier 1 industry aggregate count and rate
 - Tier 1 three-year average PSE count and rate (goal to get to 5-yr rolling avg)
 - Transparent company 2014 Tier 1 PSE count and rate, and three-year Tier 1 PSE rolling average count and rate
- Tier 2 reporting may lag Tier 1 by one year

Woods Cross City's Resolution Recognizes Value of API 754

From the API website:

In a recent resolution, the Woods Cross City Council in Utah credited the use of concepts in API Recommended Practice 754, Process Safety Performance Indicators for the Refining and Petrochemical Industry, as one factor in restoring the city's and residents' confidence and trust in Silver Eagle Refining after a refinery incident on November 4, 2009. The concepts in API 754 were used by the refinery and its consultant to develop an agreed-upon quarterly scorecard to monitor the facility's safety performance, thereby giving the city's citizens desired information on the steps that Silver Eagle is taking to improve its operations and safety.

[Woods Cross City Resolution](#)

API website

- API RP 754 Fact Sheet
- Series of four webinars presented in fall 2010 (available for viewing)
- Listing of FAQ's that help you properly classify a PSE
- API Guide to collecting PSE data
- Read-only access to API RP 754
- Contact Karen Haase at Haasek@api.org for more information

- <http://www.api.org/environment-health-and-safety/health-safety/process-safety-industry/measuring-safety-improvement.aspx>