PR 1410 Working Group Meeting #3

JUNE 15, 2017

SCAQMD Headquarters, California

SCAQMD Activities Since Last Working Group Meeting

- SCAQMD staff completed its review of Torrance Refining Company (TORC's) confidential business documents
- Staff met with TORC on June 7, 2017 with the following key comments/questions
  - ❑ Assumptions for Airborne Reduction Factor (ARF) and consistency with actual operating parameters
  - ❑ Application of the ARF
  - ❑ Additional information regarding the ARF for the wt% HF in the catalyst
  - ❑ Boiling point of MHF at the wt% HF that is currently used
- TORC will provide information to SCAQMD in a couple of weeks

SCAQMD Activities Since Last Working Group Meeting *(Continued)*

- Received several letters and emails regarding the Safety Advisor's Quantitative Risk Analysis, relative maturity and use of sulfuric acid vs. HF alkylation, commercial availability of alternative technologies, and cost of technology replacement
- SCAQMD staff is still reviewing alkylation technologies in Europe
  - There is one refinery using other alkylation technology than HF or H_2SO_4*
- SCAQMD staff contacted alternative alkylation technology manufacturers for getting information on commercial availability

** IPPC, 2003. Reference Document on Best Available Techniques for Mineral Oil and Gas Refineries*

Interim Control Measures

- Interim control measures are measures that would be required when using MHF
- Since SCAQMD staff is still reviewing information on MHF, MHF will be viewed as needing the same level of control as HF
- Purpose of interim control measures is to:
  - Seek additional safety improvements in the use of MHF
  - Ensure all safety measures in place
  - Minimize off-site impacts from a potential release of MHF
- Incorporating interim control measures in PR 1410 ensures facilities adhere to requirements

Proposed Interim Control Measures for PR 1410

- Presentation at last working group meeting focused on:
  - HF Detection Systems
  - Visual Inspections
  - Active Mitigation – water, rapid acid transfer/evacuation
- Presentation today will focus on:
  - Active Mitigation – remotely operated block valves
  - Passive Mitigation
  - Inspections
  - Audits

General Approach to Identifying Interim Control Measures

- Staff looked at interim measures in:
  - Suspended Rule 1410
  - American Petroleum Institute Recommended Practices 751 (API RP 751)
  - Papers discussing scientific tests regarding mitigation measures
  - Information from Chemical Safety Board
  - Observations from site visits at Torrance and Valero refineries
  - Input received from comments made at Investigative Hearing and Working Group Meetings #1 and #2

API Recommended Practice 751 (API RP 751) - Safe Operation of Hydrofluoric Acid Alkylation Units

- API publications facilitate broad availability of proven, sound engineering and operating practices
- API RP 751 is an industry document that communicates proven industry practices to support the safe operation of an HF acid alkylation unit
- API RP 751 includes “recommended practices”– viewed as industry standard
- Includes HF acid leak prevention, detection and mitigation, operating procedures and worker protection, material inspection and maintenance, transportation and inventory control, relief and utility systems, and risk mitigation
  - For the purpose of PR 1410, focused on detection, mitigation systems, inspection, and audits

Remotely Operated Block Valves – Background Information

- Remotely-operated block valves are a mitigation measure that can quickly isolate major HF inventories, reducing the magnitude of an HF release
- Enable large HF inventories and leak sources to be safely isolated from each other, interrupts flow, and ensures no over-pressure
- Active mitigation measure – needs to be activated
- Back-up power needs to be fail safe

Remotely Operated Block Valves at Torrance and Valero Refineries*

Remotely Operated Block Valves	Torrance Refinery	Valero Refinery
Does facility have Remotely Operated Block Valves	Yes	Yes
Activation of System Location	Control room & Field	Control room & Field
How System Activated	Active (manual)	Active (manual)
Primary & Backup Power Source	Electricity & UPS (battery)	Electricity & Diesel

* *Based on information provided by Torrance Refinery and Valero Refinery at SCAQMD site visit on 5/16/17 and 5/12/17 respectively*

API RP 751 Remotely Operated Block Valves

- Identifies remotely operated block valves as a mitigation measure to be used with other measures
- Should be located so that large HF inventories and credible potential leak sources can be isolated from each other
- Provisions for overpressure protection of equipment isolated by remotely-operated block valves should be included in the design
- Examples of locations:
  - HF unloading station
  - Fractionator overhead accumulator HF boot return lines
  - Rerun/regeneration HF feed line
  - Rerun/regeneration overhead line (gravity circulated units)
  - Reactor feed lines
  - Stripping isobutane line
  - HF cooler HF draw lines (gravity circulated units) and
  - HF circulation pump suction and discharge (pump circulated units)

Initial Concepts for Remotely Operated Block Valves

- Incorporate recommendations from API 751
- Considering more specificity for areas where remotely operated block valves are needed
- Considering automatic activation for rapid isolation – seeking comments

Passive Mitigation System – Background Information

- Physical mechanisms
  - ❑ Provide obstruction to potential release point dissipating the jet release energy and providing coalescing surface
  - ❑ Most effective in combination with water mitigation or vapor suppression additives
  - ❑ Could direct release into mitigating water, to improve contact between HF and water
  - ❑ Examples: catch-pans under or near MHF containing vessels, flange shrouds, acid circulation pump seals
- Inventory Control
  - ❑ Minimizing onsite HF/MHF inventory to levels necessary for unit operation
- Vapor Suppression Catalyst Additives
  - ❑ HF aerosol formation decreases with increasing additive fraction
  - ❑ HF additive currently used at Torrance and Valero refineries (MHF)

Passive Mitigation at Torrance and Valero Refineries*

Passive Mitigation	Torrance Refinery	Valero Refinery
Does facility have Physical Mechanisms (Types)	Yes (settler belly pans, flange shrouds, acid circulation pump seals)	Yes (acid coolers diffusers, sealless pumps, baffle in acid settler)
Inventory Control (MHF onsite storage)	Yes (max. 250,000 lbs.)	Yes (max. 550,000 lbs.)
Vapor Suppressant Catalyst Additives (wt.% in the unit)	Yes (~7%)	Yes (6%)

* *Based on information provided by Torrance Refinery and Valero Refinery at SCAQMD site visit on 5/16/17 and 5/12/17 respectively*

API RP 751 Barriers

- Can be installed near pressurized volumes of HF and on concentrated HF piping connections to capture HF and/or direct the liquids to a special containment area
  - Catch pans are an extension of barrier technology
- Barriers on piping connections should have procedures in place to ensure routine inspection for leaks and mechanical integrity
- With vapor suppressant additives, increase the amount of HF that “rains-out” from the cloud, thus reducing the airborne amount of a potential HF

Initial Concepts for Physical Mechanisms

- Use physical mechanisms such as barrier to minimize impacts from a release
- Blast walls separating HF units from other refinery equipment (e.g., ESP)
- Consider barrier distance and thickness to minimize release
- Types:
  - Flange shrouds (polymer shields surrounding flanges in portions of the alkylation unit process containing significant concentrations of MHF catalyst)
    - Ensure drains or catch areas are designed to minimize release of MHF
  - Acid settler pans (metal shields around the portions of the acid settlers containing significant concentrations of MHF catalyst),
  - Acid circulation pump barriers (complete metal barriers around the acid circulation pumps)
- Barriers, such as blast wall or other mechanisms, are needed to protect critical units such as acid settlers

API RP 751 Inventory Control

- HF storage drums
  - Minimize inventory to levels adequate for unit operation
- Process HF vessels
  - Can be segmented to minimize the amount of HF that could be released should one side of the vessel be compromised
  - Should be designed considering techniques that minimize HF volume requirements
- Existing gravity circulation unit
  - Can be retrofitted with an internal vertical baffle that can help reduce the available inventory for release in the HF-acid cooler stand pipes and reactor risers

Initial Concepts for Inventory Control

- Incorporate recommendations from AP 751
- Increase automatic detection systems for leaks and mechanical integrity
- Maintain onsite quantity of HF/MHF to an adequate minimal level
- Increase additive concentration in MHF
- Add internal baffles in the acid settler

Initial Concepts for Other Passive Mitigation

- Use of vapor suppression catalyst additive such as MHF – working with TORC to better understand the efficacy of MHF
- Considering mechanisms to make certain active mitigation measures more passive such as automating water mitigation
- Other?

Owner/Operator Inspections – Background Information

- Supplement routine refinery inspection practices
- Include both HF and non-HF bearing process equipment
- Adjust inspection interval within the limits of the applicable standards
- Inspection requirements should be re-assessed whenever operational changes or process upsets occur that could impact the mechanical integrity of the equipment
  - Examples: excessive water content in HF unit, HF carryover, changes in feed quality and contaminants, operating temperatures outside historical/recommended ranges, changes in organic fluoride content of process streams, and temperature excursions

API RP 751 Inspections

- Develop inspection plans for commissioned HF unit equipment
- Meet requirements defined in API 510 – *Pressure Valve Inspection Code* and API 570 – *Piping Inspection Code* or other applicable standards
- Contain tasks and schedule to monitor damage mechanisms and assure mechanical integrity of the equipment
- Inspect and test pressure valves, piping, small bore piping, valves, flanged joints, pumps, fire heaters, and fireproofing
- Keep inspection records

API 751 Inspection – Pressure Vessels

- Inspect in accordance with API 510 – *Pressure Vessel Inspection Code* and API 572 – *Inspection of Pressure Vessels*
- Visual external inspection
  - Every 5 years or at the same interval of internal or on-stream inspection, whichever is less
  - Exterior insulation, its impact on under-insulation surfaces, conditions of supports, expansion, and general alignment of the vessel on its supports
- On-stream inspection
  - On-stream ultrasonic thickness measurements of equipment in main or trace acid service to establish general and localized corrosion rates in different sections of the vessel
  - Number and location of thickness measurements based on previous inspections
  - Intervals should comply with API 510 and owner/operator data or a maximum of every 5 years
  - Process surfaces of each pressure vessel in main acid service: internal visual inspection

API 751 Inspection – Pressure Vessels (*Continued*)

- Internal visual inspection
  - Process surface in main acid service – not to exceed one-half the estimated remaining life of the vessel based on corrosion rate or 5 years, whichever is less
  - Each pressure vessel in trace acid service – not to exceed one-half the estimated remaining life of the vessel based on corrosion rate or 10 years, whichever is less
  - Conduct internal visual inspection at every major turnaround in main acid service
  - Inspect pressure vessel walls for environmental cracking and blistering using wet (fluorescent) magnetic particle testing or shear wave ultrasonic

API 751 Inspection – Piping

- Inspect piping and welded pipe components at intervals established in API 570 and API 574
  - Complete external inspection on all piping circuits in main and trace acid service at least every 5 years
  - Focus on identifying process leakage from non-welded joints, as well as abnormal vibration in small bore piping components
  - Pipe wall thickness in each piping circuit in main and trace acid service at an interval not to exceed one-half the estimated remaining life based on corrosion rate or 5 years, whichever is less

API 751 Inspection – Piping (*Continued*)

- Examine and ensure the integrity of small bore piping circuits more frequently using non-destructive testing technology
- Fatigue of threaded joints should be examined every 5 years
- Inspect valves for corrosion or other forms of damage
- Test safety relief valves every 5 years and document the results
- Inspect flanged joints every 10 (main acid service) or 15 years (trace acid service) for corrosion visually or using specialized ultrasonic techniques

API 751 Inspection – Pumps

- Inspect pumps, pump casings, rotating parts for corrosion, porosity and cracking
  - Example: visual inspection, ultrasonic thickness testing, dye penetrant testing, wet magnetic particle testing, radiographic testing
- Inspection frequency should be based on the pump's performance history for pumps with 10 years of operating experience documented
- For new or modified pumps, pumps with less service time, or without written documentation, perform internal inspection every 5 years

AP 751 Inspection – Fire Heaters and Fireproofing

- Fired heaters
  - Inspect in accordance with ARI RP 573 – Inspection of Fired Boilers and Heaters
  - For units burning un-neutralized acid soluble oil, the flue gas surfaces of heaters and stacks should be inspected every 5 years
- Fireproofing of vessel and piping supports, critical valves, instruments, and electrical runs
  - Inspect following API Pub 2218 – Fireproofing Practices in Petroleum and Petrochemical Processing Plants
  - Spot check for corrosion under fireproofing

Initial Concepts for Operator Inspections

- Incorporate recommendations from API 751
- Considering increasing the inspection frequency for pressure vessels, piping, pumps, fire heaters and fireproofing
- Considering use of third party for some inspection activities

Safety Audit – Background Information

- Safety audit is a periodic review of a representative sample of the systems and procedures in place at an MHF alkylation unit
- Helps make existing alkylation operations much safer
- Ensures all alkylation unit process and mitigation systems are in optimal working order, regularly inspected and tested, and subjected to rigorous audits and preventative maintenance
- Valero currently conducts a safety audit of alkylation unit once every three years and has just begin a more extensive "top to bottom" auditing program
- Torrance Refinery conducts periodic safety audits
- Both facilities have historically self-conducted safety audits – currently working on a third-party audit.

API RP 751 Audits

- API RP 751 recommends facilities have a comprehensive audit plan and be audited every three years
- Audit plan covers safety, inspection, maintenance, hazard, and operability aspects of the MHF alkylation unit including safety and mitigation equipment systems
- Auditors must be from outside the facility
- All audit findings should be tracked and stewarded to resolution by the refinery owner/operator

Initial Concepts for Safety Audit

- Incorporate provisions in API 751 for safety audits
- Ensure that specific MHF alkylation operations are in good operating conditions
- Identify any potential issues
- Safety audits of the specific MHF alkylation operations (e.g., barriers, tanks, piping, pumps, flanges, evacuation system, water cannons/curtain, sensors, etc.) should be conducted every 12 months
- Considering provision that for third-party auditors to better ensure no conflict of interest
  - SCAQMD hires auditors which are paid through the District from refineries
  - Auditors should have extensive knowledge of MHF hazards, MHF alkylation units, mitigation, API 751 and other applicable standards
  - Videos and other mechanisms to verify testing
- Findings should include suggestions for corrective action and timeline to complete

Upcoming SCAQMD Activities

- Continue to research alternative alkylation technologies
- Continue working with TORC regarding review and analysis of confidential information on MHF
- Arrange meetings between alternative alkylation technology manufacturers and refineries to discuss commercial feasibility, transition time and costs
- Obtain detailed conversion cost data from refineries
- Invite alkylation technology manufacturer to address working group?
- Next working group meeting on July 19, 2017
- Prepare project description and preliminary draft rule requirements

Schedule

Activity	Current Target Date
PR 1410 Working Group Meeting #3 (SCAQMD)	June 15, 2017
Update to SCAQMD Refinery Committee	July 2017
PR 1410 Working Group Meeting #4 (SCAQMD)	July 19, 2017
Release of CEQA Notice of Preparation/Initial Study	July/August 2017
Public Workshops/CEQA Scoping Meeting	August 2017
Release of CEQA Draft EIR	September 2017
SCAQMD Refinery Committee Meeting	October/November 2017
Governing Board consideration of PR 1410	December 2017

NOTE: Additional Working Group meetings as needed

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