REVIEW OF THE IMPLICATIONS OF THE REFINERY FLARE RULE

Prepared for Presentation at the AWMA Gulf Coast Chapter 2016 HAT Conference
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In ~ 25 minutes, summarize the refinery flare rule requirements

Discuss some of the problems that can be expected as this rule becomes applicable in other industry sectors.

The information in these slides was, in part, summarized from presentations made at the AFPM Refinery Sector Rule Conference on Feb 2 & 3.
The EPA Refinery Sector Rule was/is
- Proposed on June 30, 2014
- Signed on Sept 30, 2015
- Published in the FR on December 1, 2015
- Effective on January 30 or Feb 1, 2016 depending on the rule section.
- Is being litigated and
- Amendments have been proposed by EPA on February 9, 2016

For existing flares, the compliance date is February 1, 2019
The flare requirements in this rule are a precedent for what might occur in the future for other industry sector rules.
Current 40 CFR 63.11 and 40 CFR 60.18 flare rules are insufficient to ensure flares meet 98% control requirements.

The refinery flare rule focuses on destruction efficiency:
- Flare destruction efficiency confirmed by compliance with enhanced operational and work practice standards (§63.670).
- PFTIR monitoring to confirm 98 percent destruction efficiency technically infeasible to apply on continuous basis.

Incorrect to assume FGR cost-effective for all flares (case-by-case).

Did not finalize ban on flaring halogenated vent streams.

One set of operational standards dealing with steam assisted and air assisted flares –

+ That apply to apply to standby flares, emergency flares, non-conventional refinery flares (e.g., pressure-assisted, ground, enclosed, unassisted and hydrogen rich and other flare types), and temporary flares

+ With no consideration for large, medium and small flares or flare systems
The refinery steam assisted flare requirements are:

- Operate with a continuously lit pilot flame at all times
- Operate at velocity limits and no visible emissions below the smokeless capacity of the flare.
- Operate at a combustion zone net heating value of 270 BTU/scf on a 15 minute block average basis
- In order to deal with hydrogen, the EPA is allowing the use of a pseudo net heating value for hydrogen of 1212 BTU/scf
- Characterize the flow and composition of supplemental fuel, waste gas and assist gas (steam or air).

There are separate set of air assisted flare requirements with requirements and deviations defined at §63.670
There is an option to use grab sampling every 8 hours rather than continuous vent gas composition or heat content monitoring.

There is also an option to use limited initial sampling and process knowledge to characterize flared gas composition for flares in “dedicated” service as an alternative to collecting grab samples during each specific event.

Daily visible emission testing is required with an option to use video cameras.
The SSM exemption is no longer in the rule

The rule establishes a flare work practice, a flare monitoring system, recordkeeping system and reporting requirements

- The rule proposal required smokeless operation over the whole operating range of the flare

The implications related to the SSM exemption are covered in later slides
Establish proactive, preventative measures to prevent PRV HAP releases to atmosphere & to flares

In the event of a release, a root cause analysis/corrective action plan is required if smokeless flare capacity is exceeded

In the event of second release from the same PRD in a 3 year period with the same root cause, this is a deviation, if smokeless flare capacity is exceeded

A third release from the same PRD in the 3 year period regardless of root cause is a deviation, if smokeless flare capacity is exceeded

A system is needed to record the time and duration of a PRD release

PRD’s with low set points, low emission potential or in liquid service are not subject to the PRD monitoring requirements

These requirements apply to PRD’s to flare and to atmosphere, however, for flares – smokeless capacity must be exceeded.
For pilots, when there is least a one minute period in the 15 minute block with no pilot flame indication – this is a deviation.

- For subsequent 15 minute blocks this is a separate deviation

For smoking occurring above smokeless capacity, if there is a second release from a PRV or an event due to the same route cause within a 3 year period – this is a deviation

If there is a third smoking event/release, for any reason – this is a deviation
Is not clearly defined

Usually it’s defined by the vendor as a % of hydraulic capacity at a specified composition at a specified steam to fuel ratio

What if you lose steam and you have a smoking flare that occurs below the smokeless capacity?

Does this trigger root cause analysis and corrective action?
WHAT IS A VIOLATION OF THE EMERGENCY FLARING WORK PRACTICE?

• Any flow event for which a RCA was required and the root cause was determined to be operator error or poor maintenance.

• Visual Emission (VE) exceedance events that were not caused by a force majeure event from a single flare in a 3 calendar year period for the same root cause for the same equipment.

• Flare tip velocity exceedance events that were not caused by a force majeure event from a single flare in a 3 calendar year period for the same root cause for the same equipment.

• 3 VE exceedance events that were not caused by a force majeure event from a single flare in a 3 calendar year period for any reason.

• 3 flare tip velocity exceedance events that were not caused by a force majeure event from a single flare in a 3 calendar year period for any reason.

Reference: Troy Boley, Sage, “Flare Monitoring System Requirements”; AFPM, Feb 2 &3, Houston
• Within 45 days after a flare flow event...

• Conduct an Root Cause Analysis (RCA) and Corrective Action Analysis (CAA) if either:
  – The vent gas flow rate exceeds the smokeless capacity of the flare and visible emissions are present from the flare for more than 5 minutes during any 2 consecutive hours during the release event.  ...OR...
  – The vent gas flow rate exceeds the smokeless capacity of the flare and the 15-minute block average flare tip velocity exceeds the maximum flare tip velocity determined using the methods in the rule

• VE events below smokeless capacity don’t seem to require RCA and CAA
  - Stay tuned for EPA “Guidance” on this issue

Reference: Troy Boley, Sage, “Flare Monitoring System Requirements”; AFPM, Feb 2 &3, Houston
One set of rules is promulgated for two flare types – air assisted flares and steam assisted flares. That apply to standby flares, emergency flares, non-conventional refinery flares (e.g., pressure-assisted, ground, enclosed, unassisted and hydrogen rich and other flare types), and temporary flares. This is a problem.
Smokeless Requirement

- Smokeless for “plant fire conditions”?

This flare complies with a regulatory permit requirement for smokeless operation under “plant fire conditions”

Reference: Scott Smith, Zeeco; “Flare Systems: Smokeless Combustion”; AFPM, Feb 2 &3, Houston
- Combustion Occurs away from the Tip providing long Tip Life
- Well Spaced Jet Nozzles
- Jet Action Entrain Air For Smokeless Combustion over the whole operating range
- Can be Combined with LP Source (HP/LP)
- Minimum 98.5% Hydrocarbon Destruction Efficiency

Reference: Scott Smith, Zeeco; “Flare Systems: Smokeless Combustion”; AFPM, Feb 2 &3, Houston
The operator of this flare was forced to replace this flare with an air assisted flare because pressure flares don’t conform to exit velocity rules.
The EPA has established an Alternative Means of Emission Limitation (AMEL) for pressure assisted ground flares.

- An elevated pressure assist array can not be tested via direct sampling
- Large releases don’t occur very often
- PFTIR studies on these flares are difficult due to the lack of ability to have “planned releases”
- There is no reason to think that an elevated pressure flare is inefficient
These flares are regulated as hydrogen flares and operate by EPA’s current rule at > 8 vol % hydrogen.
There is no demonstrated need to change the regulations for these flares.
Refiners don’t flare hydrocarbon lean, hydrogen rich gas mixtures.
ENCLOSED FLARES

- Velocity and combustion zone properties for these types of flares are different than air assisted, non assisted or steam assisted flares.
- These flares can be sampled and should be treated as control devices.
These 10 tests were from an 8” flare burning an 80/20 propylene/propane mixture inerted with nitrogen at zero steam flow.

The tests are at varying exit velocities.

The samples were taken from an elevated sample probe located above the visible flame.

These test results bracket 270 BTU/scf. This data shows no change needed to the current requirement of 200 BTU/scf for unassisted flares.

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<th>Heating Value</th>
<th>Combustion Efficiency</th>
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</table>
TCEQ Test S 3.6

CMA/EPA 1983 Test 11(a)
- Propylene/Propane flow: 612 lb/hr
- Nitrogen flow: 2489 lb/hr
- Steam flow: 0 lb/hr
- Steam/fuel ratio: 0
- BTU content: 305 BTU/scf
- Velocity: 58.7 ft/sec
- Flare Diameter: 8"

CE - 99.8% at 14.7% capacity
The rules provide for non continuous process monitoring options.

- We need to understand these options and start to develop the information and systems needed to use these options.

- The non continuous monitoring options deal with periodic sampling options and options dealing with what are called dedicated flares.

- The options deal with when engineering judgment and process knowledge that can be used instead of continuous monitoring
Elements of Good Engineering Practice

- Current regulations at 40 CFR 60.11(d), 60.18(d), 60.482-10(e), 63.6(e), 63.11(b)(1), 63.172(e) require:
  - Adhere to the flare’s design documents
  - Use Good Air Pollution Control Practices

- The flare’s design documents include a flare operating manual, usually provided by the flare vendor
  - The flare operating procedures need to be reviewed against this manual

- A Flare Management Plan is starting to be more common and is required by the Refinery Flare rule.
  - Elements of the plan are:
    - A flare map to include all connections to the flare
    - Quantification of all flows:
      - Purge gas, sweep gas, flared gas operating and RV scenarios, supplemental gas, pilot gas and steam flows
The flare management plan is required to minimize flaring during startup, shutdown or emergency releases

Need to report the “smokeless capacity” (1 numerical value)

Need to report “maximum flow rate”, the “hydraulic load capacity”, minimum and maximum steam flow rate, air assist flow rates.

Designate the pressure relief devices that are vented to the flare
  - Type, diameter, set pressure and listing of the “prevention measures” implemented by PRD
  - Can be maintained in an electronic database on-site and does not need to be submitted as part of the FMP, unless requested

The plan needs to be submitted by January 30, 2019
**Vacatur of SSM Exemption**

12/19/2008
U.S. Court of Appeals for the D.C. Circuit vacated the SSM exemption provisions: §63.6(f)(1) & §63.6(h)(1)*

10/16/2009
The Court issued a mandate finalizing the vacatur of the SSM exemptions

2/1/2016
SSM exemption eliminated as of the effective date of the Refinery Sector Rule

8/1/2017
EPA’s new proposal to delay compliance date for 18 month (Note 1)

*Provisions 63.6(f)(1) and (h)(1) state that emission limitations do not apply during periods of SSM*

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Reference: Sue Sung et. al., Trinity Consultants, “Elimination of Startup/Shutdown/Malfunction Exemptions (MACT UUU and CC)”, AFPM, Feb 2 &3, Houston
Key Changes with Vacatur of SSM Exemption

- No SSM exemption of excess emissions
- No SSMP requirement
- Some alternative limits or work practice standards during SSM for certain sources
- General duty to minimize emissions following procedures and demonstrated by records
- Permit language that includes SSM related requirements

Reference: Sue Sung et. al., Trinity Consultants, “Elimination of Startup/Shutdown/Malfunction Exemptions (MACT UUU and CC)”, AFPM, Feb 2 &3, Houston
General Duty to Minimize Emissions

- MACT CC: See § 63.642(n) for 63.6(e)(1)(i) and (ii)
- MACT UUU: See 63.1570(c) and (d) for 63.6(e)(1)(i)

- 63.642(n) & 63.1570(c) – At all times, the owner or operator must operate and maintain any affected source, including associated air pollution control equipment and monitoring equipment, in a manner consistent with safety and good air pollution control practices for minimizing emissions. The general duty to minimize emissions does not require the owner operator to make any further efforts to reduce emissions if levels required by the applicable standard have been achieved. Determination of whether a source is operating in compliance with operation and maintenance requirements will be based on information available to the Administrator which may include, but is not limited to, monitoring results, review of operation and maintenance procedures, review of operation and maintenance records, and inspection of the source.

- 63.1570(d) – During the period between the compliance date specified for your affected source and the date upon which continuous monitoring systems have been installed and validated and any applicable operating limits have been set, you must maintain a log that documents the procedures used to minimize emissions from process and emissions control equipment according to the general duty in paragraph (c) of this section.

Reference: Sue Sung et. al., Trinity Consultants, “Elimination of Startup/Shutdown/Malfunction Exemptions (MACT UUU and CC)”, AFPM, Feb 2 &3, Houston
Permit Issues

- Use of SSM exemption in permits
  - Relying on MACT SSM exemption as basis for permit compliance?
  - Permit updates required?
  - More opportunities for noncompliance?
  - Dovetails with SSM SIP call

- Need to look at your permit language carefully
  - Texas MSS permits
  - New Mexico SSM permits
  - Others

- Need to permit allowable emissions
EPA thinking for refineries re the SSM vacatur is provided in the refinery rule.

Other industry sectors need to review this and identify issues that will need to be dealt with as new state and federal rules are proposed and permits are renewed.

Does the refinery rule define general duty for other operators?

- No, but you need to minimize emissions and review procedures and recordkeeping on this issue
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