Environmental Challenges in the Petroleum Refining Industry

Barbara F Sprott
Air Advisor
ExxonMobil Refining and Supply – Baytown Refinery
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New/Revised Regulations

- The U.S. petroleum refining industry must be prepared to meet a growing number of environmental regulatory challenges
- New and proposed federal regulations will have a significant impact on future refinery operations especially in the areas of combustion sources (flares, furnaces, FCCUs, engines, etc.)
- These impacts potentially include new emission limits, equipment retrofits, new control devices, additional monitoring and reporting requirements

New/Revised Regulations

- Some new and revised regulations expected to have significant impacts include:
  - Part 98 (Greenhouse Gases)
  - NSPS Ja (Refinery Units)
  - NSPS IIII, JJJJ and MACT ZZZZ (Internal Combustion Engines)
- The following slides contain an overview of some of the requirements of these regulations. Please contact your company Environmental Department to determine the actual requirements for your facilities
- These listed regulations are by no means the only new regulations forthcoming but are meant as examples of the regulatory complexity faced by the refining industry

Part 98 -Greenhouse Gases (GHG)

- The final Mandatory GHG Reporting Rule (MRR) published October, 2009, effective January, 2010.
- Complicated regulation (219 pages long)
- Requires monitoring / reporting of CO_2, CH_4, and N_2O above certain thresholds
- Short implementation time
  - Rule proposed 4/10/2009 with Compliance date of 1/1/2010 (Begin monitoring.)
- GHGs included are CO_2, CH_4, and N_2O
- Reporting Threshold: generally >25,000 metric tons per year of CO2
- EPA will use data to set future policies/regulations (Carbon tax or Cap & Trade)

Refinery Process Requiring Reporting (Examples)

Flares	FCCUs
Process vents to atmosphere	Cokers
Combustion Sources ▪ Boilers/Process Heaters ▪ Incinerators /Thermal oxidizers ▪ Engines	Catalytic Reformers
Equipment Leaks (fugitives)	Sulfur Recovery Units
Tanks	Product Loading / Unloading

Monitoring Required
(examples)

- Flare
  - Flow rates /Composition or HHV
- Process vent to atmosphere
  - Flow rates /Composition
- Combustion Sources
  - Fuel Flow Rates / Fuel Gas Analysis/ Carbon Content
- Metering requirements
  - Meters must be accurate to +/- 2%
- More specific requirements for FCCUs, Catalytic Reformers, Cokers, etc

GHG rules - Future

- First Annual Reports to EPA due September 30, 2011 (recently revised from March 31, 2011)
- EPA still in the process of making Technical modifications to the rules
- Anticipate EPA will start using data for development of future rules (Cap & Trade or Carbon Tax) with rule proposal ~ 2013-2014

NSPS Ja

- Full Title:
  - Subpart Ja—Standards of Performance for Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After May 14, 2007
- Final Rule Date: June 24, 2008
  - Any new, "reconstructed" or "modified" facility that began construction after May 14, 2007 must meet requirements upon startup
  - Flare and Furnace NOx provisions are stayed.
- Essentially an updated version of NSPS J. Sources that have not been modified or reconstructed still potentially subject to NSPS J

NSPS Ja

- Affected sources
  - FCCUs
  - Fuel Gas Combustion Devices
  - Process Heaters
  - Flares
  - Sulfur Plants
  - Fluid Cokers
  - Delayed Cokers

Definitions

- **Modification** – Except flares
  - A physical or operational change resulting in increased flare emissions
  - Requires a minimum capital expenditure (7% for refineries) based on initial installation cost (No correction for inflation)
- **Flare Modification** – Modification Date 6/24/2008 *(STAYED)*
  - New piping from refinery unit or fuel gas system connected to flare, **OR**
  - Flare is altered to increase flow capacity
  - No emissions increase is required
    - Example Flare Modifications:
      - Tie in a new or larger SRV
      - Tie in a natural gas line to aid flare combustion
      - Clearing a new piece of equipment to the flare

Definitions

- **Reconstruction** - Replacement of components of an existing facility such that:
  - (1) new components capital cost exceeds 50% of capital cost of comparable new facility; and
  - (2) technologically/economically feasible to meet applicable standards
  - Cost includes all depreciable components replaced within any 2-year period following May 14, 2007
  - No emissions increase is required

NSPS Ja Requirements
(examples)

Source	Requirements *(all limits dry at 0% O2)* *(Note: CEMS installations required to meet most requirements)*
FCCUs Fluid Cokers	NOx, CO, SO2, PM limits (For FCCUs, essentially codifies limits set in NSR Consent Decrees with individual companies (2000-present))
Fuel Gas Combustion Devices	H2S - 60 ppmv limit (365 day avg) 162 ppmv (3-hr rolling avg)
Process Heater > 40 mmbtu/hr (CURRENTLY STAYED)	NOx: Nat Draft - 40 ppmv (24 hr rolling avg) NOx: Forced Draft - 60 ppmv (24 hr rolling avg) (Does not account for turn-down effects)
Delayed Cokers	Depressure to 5 psig during reactor vessel depressuring and vent exhaust gases to fuel gas system for combustion

NSPS Ja Requirements – Continued

(examples)

Source	Requirements *(all limits dry at 0% O2)*
Sulfur Plants	Primary Sulfur pits considered part of Sulfur Plant Capacity > 20 long tons/day (LTD): essentially same as NSPS J Capacity < 20 LTD: SO2 - 2,500 ppmv (12 hr rolling avg)
Flares (CURRENTLY STAYED)	H2S - 162 ppmv (3-hr rolling avg) Flow meters Total Reduced Sulfur (TRS) and H2S CEMS Root Cause Failure Analysis: Flare > 500 lbs SO2 in 24 hrs based on TRS **or** > 5000 kscf flare flow in 24 hrs Note: No exemption for downtime of flare gas recovery compressor

NSPS Ja - Status

- New Flare and Process Heater NOx rules are pending
  - Expected Process Heater NOx limits at turn-down rates
  - Flare Requirements expected to change from Total Reduced Sulfur to Total Sulfur (more restrictive)
  - Potential flare flow compliance limit/flare minimization plan
- All other provisions are currently applicable
- Note: Applicability date is still May 14, 2007 even though portions of the rule are stayed

NSPS IIII, JJJJ and MACT ZZZZ
(Internal Combustion Engines)

- Effects new and existing Spark Ignition (SI) (i.e., gas or gasoline fired) and Compression Ignition (CI) (i.e., diesel fired)
- New engines are covered by NSPS IIII and JJJJ
  - Primarily standards for engine manufacturers
  - Owner/Operator maintenance and clean fuel requirements
- These rules have been amended several times in the last few years. NSPS JJJJ is currently being amended

MACT ZZZZ
(Internal Combustion Engines)

- Includes retrofit requirements for engines based on size and category
  - Emergency vs. non-emergency vs. low-usage
  - CI vs. SI
  - SI engines: lean burn vs. rich burn
- The newest category is existing CI engines > 500 hp which must comply by 5/3/2013
  - Requirements may include:
    - Formaldehyde/CO limits
    - Additional monitoring/testing based on controls installed
    - Crank case ventilation systems
    - Maintenance Requirements

Other Issues on the Horizon

- Refinery 114 requests
  - Clean Air Act Section 114 allows EPA to request data from regulated industries
  - On March 30, 2011, a 114 request was issued which requires extensive data collection from all 152 US Refiners for use in new rule development (Refinery MACT 3?)
  - 200+ pages that contains two parts: Questionnaire and Stack Testing
  - Some units affected include: FCCUs, Catalytic Reformers, Cokers, Combustion Devices, Sulfur plants, H2 plants and atmospheric vents
  - Request has short deadlines. All data including stack testing is due by 8/31/11

Summary

- The U.S. petroleum refining industry must be prepared to meet a growing number of environmental regulatory challenges.
- New and proposed federal regulations will have a significant impact on future refinery operations
- More regulation is coming which might include
  - GHG Limits
  - Loss of the Startup/Shutdown/Malfunction (SSM) Exemption
  - Regulations based on recent 114 request
  - Other?

Path Forward

- Work with your company Environmental Departments to understand the implications of these new regulations on your facilities
- Work with advocacy groups (NPRA, API, LMOGA, TXOGA, etc.) during rule proposal period to provide feedback on rule impact and feasibility
- Oh, and there's almost always a job opening in the Environmental Department. It's a growing field.

Questions?