Efficient Flare System Designs in a New Regulatory Environment

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On April 17, 2012, the US EPA released final ruling for the first federal air standards for oil and natural gas production

- New Source Performance Standards (NSPS, 40 CFR Part 60, Subpart OOOO) for crude oil and natural gas production, transmission and distribution. Ruling applies to new and modified affected facilities that commenced construction after August 23, 2011 “Quad O”

- National Emission Standards and Hazardous Air Pollutants (NESHAP, 40 CFR Part 63 subpart HH & HHH) directly impacts the oil and gas production and natural gas transmission and storage facilities. Revised rule, applies to existing and new affected facilities

- www.epa.gov/airquality/oilandgas

The new ruling targets five source categories of oil and gas production:

NAICS Code

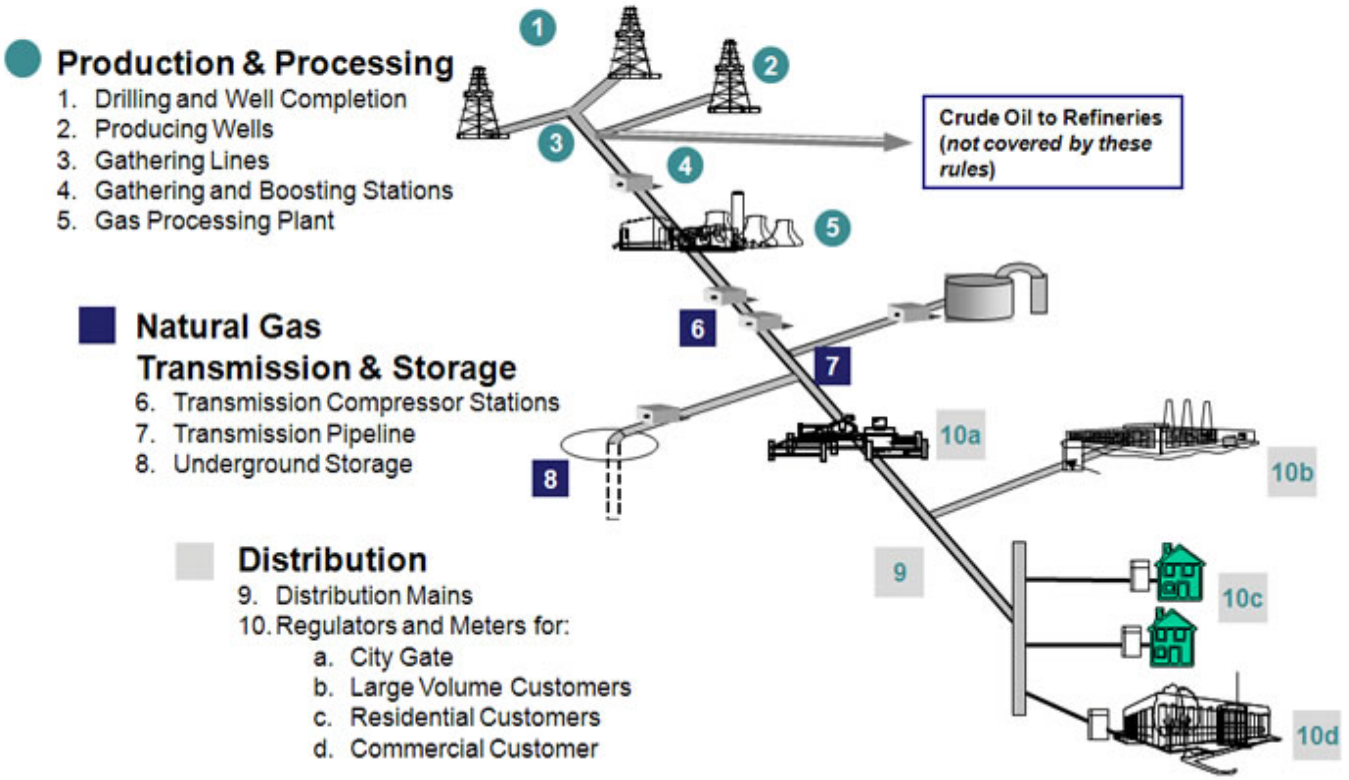
211111- Crude Petroleum and Natural Gas Extraction
211112- Natural Gas Liquid Extraction
221210- Natural Gas Distribution
486110- Pipeline Distribution of Crude Oil
486210- Pipeline Transportation of Natural Gas

• Expected to yield a 95% reduction in VOC's. VOC's in presence of sunlight creates ground level ozone (smog) which has detrimental health impact

• Expected to address methane releases from oil and gas production and processing. US is largest single methane source, and is approximately 40% of all methane released into atmosphere. Methane is also some 20x more detrimental as a greenhouse gas than CO_2

The Natural Gas Production Industry

Natural gas systems encompass wells, gas gathering and processing facilities, storage, and transmission and distribution pipelines.



The Natural Gas Production Process Diagram adapted from the American Gas Association and the EPA Natural Gas STAR Program

EPA Regulations Affecting Upstream Operations

Standards for Natural Gas Well Operations at the Well Site

•Affects newly hydraulically fractured or refractured natural gas wells drilled after August 23, 2011

• NSPS require 95% VOC reduction during flowback well completion activities

• Phase 1 requires flaring (Completion Combustion Device (CCD), or capture of gases). Phase 2 requires Reduced Emission Completion (REC), also known as Green Completion, and is not in effect until January 1, 2015 (with exceptions)

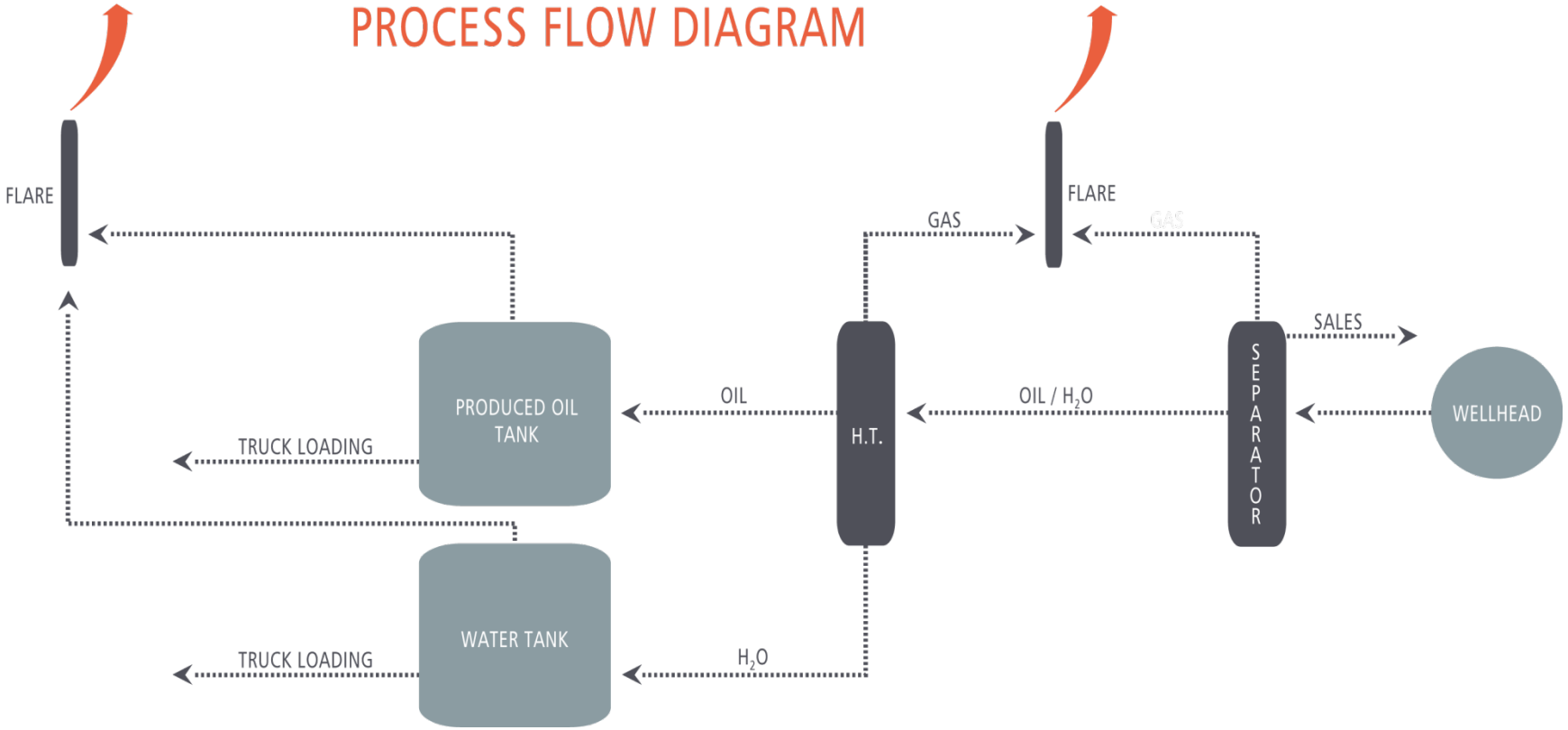
Standards for Natural Gas Well Operations at the Well Site Continued

- A Completion Combustion Device (CCD), otherwise known as a flare, requires reliable pilot and ignition source over the duration of the flowback period (typically 3-10 days) and must meet 95% VOC reduction

- Properly designed and engineered flare systems can achieve greater than 98% VOC reduction

- Portable flare system designs, either open or enclosed flames, can increase flexibility to address multiple well sites without any foundation requirement and allow for management of multiple well sites

PROCESS FLOW DIAGRAM



Standards for Storage Tanks

- Includes storage tanks located at well site, gathering & boosting stations, NG processing facilities and compressor stations
- Targets sites with VOC emissions level of six tons per year or more
- Have until October 15, 2013, to install necessary controls
- NSPS requires 95% VOC reduction
- Properly designed, engineered flare will achieve 98% VOC reduction

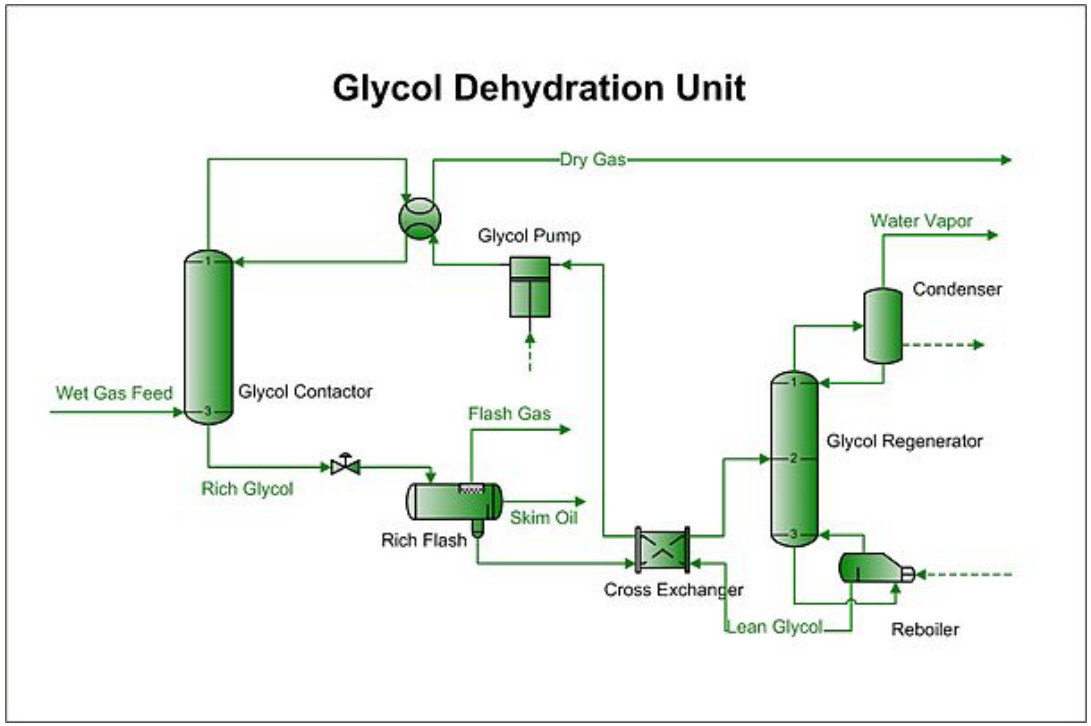
Well site flare options – Open flame

- Engineered flare system design
- High pressure vents off separator
- Low pressure vents off the tanks
- Combination flare for both streams

Well site flare options – Enclosed flame

- High pressure vents off separator
- Low pressure vents off the tanks
- Combination flare for both streams
- Properly designed, engineered enclosed flare will provide for greater than 98% VOC reduction

Standards for Glycol Dehydrators



• Includes units located at well site, gathering & boosting stations, NG processing facilities and compressor stations

• Subject to NESHAP, large units must meet same existing standards (less than 1 tpy benzene compliance option, as opposed to 95% reduction control)

Standards for Glycol Dehydrators Continued

- New standards apply for small units at major sources (10 tpy single HAP or 25 tpy combination of HAPs). Required to meet unit specific BTEX limit via formula set forth in final ruling, 40 CFR 63.765 (b)(1)(iii)

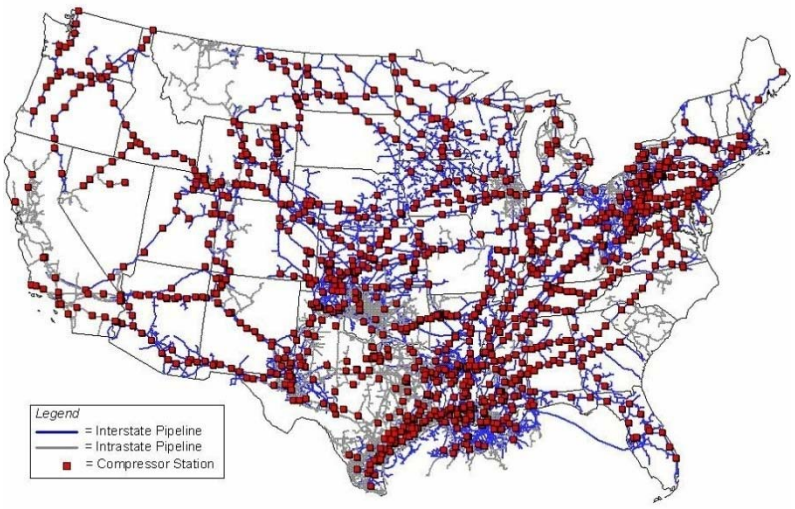
- Compliance for new units is required upon startup. Units constructed after August 23, 2011, will have 3 years

Glycol Dehydrator Vent Flare

- A 95% reduction in VOC is now required by NSPS

- This emissions reduction can be easily achieved through the use of a properly designed and engineered flare system to achieve minimum 98% reduction

Standards for Centrifugal Compressors



- Includes units located at gathering & boosting stations, NG processing facilities

- NSPS for new or modified compressors with wet seal systems require 95% VOC reduction

- Compliance is required at initial startup or 60 days after ruling is published in Federal Register, whichever is later

- Properly designed, engineered flare will achieve 98% VOC reduction

Compressor Station Flares

- Limits storage tanks at compressor station facilities to a VOC emissions level of six tons per year

- Storage tanks have one year or until October 15, 2013, to install necessary controls

- Glycol dehydration vent flares may be required in addition to storage tank flares

Gas Processing Plant Facilities

- Forthcoming EPA regulations will likely require additional controls if assist media is being utilized for smokeless operation, typically steam or low pressure air blowers, to reduce excessive VOC emissions (CZNHV)

- http://www.tceq.texas.gov/airquality/stationary-rules/stakeholder/flare_stakeholder.html

- Affected facility operators need to remain aware of both the newly published and likely forthcoming regulations and consider a potential engineered flare system design that would meet requirements for new facilities

Engineered Flare System Design

•Critical to get it right the first time, no field development, proven field design

•Durable Materials of Construction (MOC), refinery-grade robust design, suitable for unmanned field applications

•Environmentally compliant design, knowledge of regulations present and forthcoming

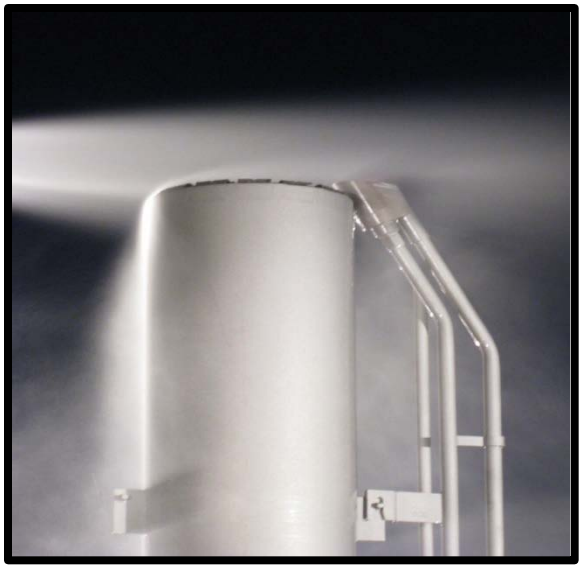
Engineered Flare System Design Continued

- Key flare components utilize investment casting MOC for safe, stable, long life in the critical heat affected zones

- Designed for installation in remote operations and monitoring, as required to meet standards

- Combination HP / LP design to optimize performance and cost

Engineered Flare System Design Continued



- Pilot designed per API 537- tested to industry standards to ensure flare will meet environmental performance requirements
- Stable flame in minimum wind speeds of 150 mph with 10 inches of rain / hour
- Ability to reignite automatically without operator interface or electric power
- Ability to monitor for the presence of a flame and record for environmental records verification

Engineered Flare System Design Continued

- Local service and support capabilities for installation, start up, and operator training
- Resources to manage multiple temporary flare applications
- Engineering support for optimizing flare system design for the affected facility

Using Engineered Flares to Meet New Regulations

- Well site flare systems
- Gathering and Booster Stations flare systems
- Natural Gas Processing plant flare systems
- Compressor Station flare systems

- Properly designed, engineered flare for either open or enclosed flame will provide for greater than 98% VOC reduction

Questions

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