Comments on 2010 TCEQ Flare Study Project Final Report
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The Center for Energy and Environmental Resources
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We would like to commend TCEQ and its contractors for the well-executed TCEQ 2010 Flare Study Project and provide comments on the Draft Final Report. As many others will undoubtedly comment, the study was necessarily limited in scope, particularly with respect to waste gas feed composition, wind effects, and flare tip design. Because of the complexity of flare systems, the study is unable to give precise operating parameters that can be broadly applied without being subject to multiple challenges. Nonetheless, we do not think those limitations should preclude the agency from moving forward in addressing flare emissions from both permitting and enforcement perspectives.

Taken at face value, the study data confirm many allegations of environmental groups in recent years about probable inefficiencies in flare combustion:

1. Meeting the requirements of 40 CFR 60.18 does not ensure 98% destruction and removal efficiency (DRE).
2. Vent gas streams with low flow and low lower heating value (LHV) are more likely to have lower DREs.
3. Improper use of steam and air assist can greatly reduce DRE.

In fact, for steam flare tests with propylene vent gas with nominal LHV of 350 Btu/scf and flow rates of both 937 and 2342 lbs/hr, "steam assist levels currently used by industry would be too high to achieve the desired DRE of 99%." [1]

These are not new or surprising findings, but confirmation of previous hypotheses. Continued study is important, but the current data should be strong enough to provide informed regulation and enforcement that will improve our air quality.

Routine emissions

Based on these general findings and confirmation that flares cannot be assumed to meet 98% or greater DRE, especially for low flow and low LHV conditions, the use of flares as routine emission controls warrants re-evaluation.

Several NESHAP regulations requiring 98% DRE of hazardous air pollutant (HAP) vent gas streams currently allow flares as a control option. In practice, many of these low flow emissions are continuous flows from sources such as process vents, wastewater system vents and tank vents. DREs for low flows and low heating value were shown in many of the study runs to be significantly below 98%. Alternative control options for such streams, including thermal oxidizers and flare/vent gas recovery systems, should be encouraged and even required where feasible.

Routine flows to flares provide a fairly continuous background emission source. The data in this study regarding lower DRE for low flow and low LHV streams suggest that the emissions inventories for these streams will be significantly lower than actual emissions. A lower baseline can impact emissions modeling and should be addressed by revising SIP modeling with a revised inventory.

Episodic Emissions

Emergency releases with high LHV content and flow rates were not the types of emissions tested in this study, but that does not mean the findings are not relevant to these conditions. These episodic emissions release large quantities of VOCs and HRVOCs, even under ideal combustion conditions. They also have been correlated with high ozone events in Texas. [2] However, current operating practice often includes manual adjustment of steam flow rate to eliminate smoking. Excess steam was clearly shown in this study to reduce DRE and in the study it was essentially independent of waste gas flow. At these high flow rates even small reductions in efficiency mean large increases in emissions. Education of operators with respect to best operating practices is important, but improved monitoring should also be required.

Monitoring

In the tests conducted, assist gas to vent gas ratios that achieved 98% or greater combustion were in most cases independent of waste gas flow rates. Earlier (1983) EPA studies also showed a drop off in efficiency at high steam to vent gas ratios. A parameter called Combustion Zone Net Gas Heating value (CZG NHV) is defined in the report [3] and appears to be a parameter that can be used across multiple flow conditions while taking into account the steam or air content. While there is not enough data in this study to set a universal CZG NHV that will assure 98% or greater DRE, it appears to be a good candidate for a monitoring parameter that will provide useful information on operating variability.

Calculation of CZG NHV requires data on vent and pilot gas flow rate and heating value and assist gas flow rate, parameters that are often not measured. The technology to record these measurements, however, is readily available and required in some states. For example, in California, the BAAQMD Regulation 12, Rule 11 requires continuous flow monitoring of vent gas and composition monitoring either continuously or by sampling. The manufacturer SICK is just one company that offers a variety of flow monitors:

SICK Volume Flow Monitors FLOWSIC100 Flare
https://www.mysick.com/eCat.aspx?go=FinderSearch&Cat=Row&At=Fa&Cult=English&FamilyID=339&Category=Produktfinder&Selections=35223

Optical flame monitors that monitor flare gas and link into control systems to maintain optimum steam composition are also available as shown by these examples (all sites accessed June 18, 2011):

Powertrol SLX-301 Flare Monitor
http://www.powertrol.com/flarespe.htm

Williamson Smokeless Flare Stack
http://www.williamsonir.com/content10646

Hamworthy Combustion Flarscan Automatic Steam - Control System for Smokeless Flaring
http://www.hamworthy-combustion.com/products/flares-thermal-oxidation-gas-cleaning-systems-6/flarscan-automatic-steam-control-system-for-smokeless-flaring-18.aspx

In summary, the TCEQ Flare Study Project generated some useful data that confirms that flares do not achieve over 98% DRE simply by complying with 40 CFR 60.18 when the LHV is calculated based on the vent gas alone and not the combined vent, pilot and assist gas. While continued study is important, the conclusions of this report support improved monitoring and further scrutiny of actual operating conditions of industrial flares. Flares were designed as emergency control devices and under such circumstance they can be operated most effectively. Improving operations at all times and minimizing flows of flares using flare gas recovery units, for instance, will be important steps in improving our air quality.

Additionally, the report highlights the need for improvements in monitoring and controlling emissions from facilities as a whole. Advanced monitoring technologies that give site-specific emission estimates, such as Differential Absorption Light Detection and Ranging (DIAL) or Solar Occultation Flux (SOF) are useful tools in monitoring emissions from individual facilities and should be incorporated into best management practices.

References

1. Draft TCEQ 2010 Flare Study Project Final Report, p. 89.

2. Cynthia Folsom Murphy and David T. Allen, "Event Emissions in the Houston Galveston Area" (HGA), January 14, 2004, p. A-31, http://files.harc.edu/Projects/AirQuality/Projects/H013.2003/H13AppendixA.pdf, accessed June 19 2011.

3. Draft TCEQ 2010 Flare Study Project Final Report, p. 80.

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