Comments on TCEQ Flare Task Force Report

Submitted by
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Industry Professionals for Clean Air and
Environmental Defense Fund

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We commend TCEQ for the comprehensive review of methods for minimizing emissions from flares. We urge you to be specific in your recommendations to the commissioners so that implementation will be able to proceed quickly while keeping exemptions limited to a few well-structured options. In addition we believe a more thorough coverage of the benefits to be obtained in reduced health impacts and energy recovery in the introductory material will aid in a favorable response to your recommendations from the commissioners and stakeholders. To support you in carrying this report and future rule making forward we are offering specific comments related to the following:

- Impact of flare emissions
- Monitoring and control of routine emissions
- Implementation considerations
- Flare minimization
- Particulate emissions from flares
- Research
- Other issues
- Conclusion

Impact of flare emissions

Throughout the report and the rule making process one must emphasize that the reason the under-reported emissions and incomplete combustion episodes are a concern is that even at high efficiencies the high flows to flares result in large amounts of both toxic chemicals and ozone forming precursors which affect the health of Texas residents. TCEQ has identified the association between flaring events and an increase in HRVOCs that lead to ozone formation. TCEQ has in fact already implemented a program to reduce HRVOC emissions from flares. Initial successes and data from the HRVOC program should provide valuable input in further reducing flare emissions.

Particular attention should be paid to air toxics emitted from flares. A study by Rice University, Baylor College of Medicine, Texas Southern University, University of Houston Law Center, and the University of Texas Medical Branch at Galveston looked in detail at four pollutants identified as definite risks by the City of Houston Mayor's Task Force on the Health Effects of Air Pollution. The study found:

"Mounting evidence demonstrates that the population of Southeast Texas is exposed to disproportionate levels of toxic air pollutants considered to be a health risk to this population. In Southeast Texas, benzene, 1,3-butadiene, formaldehyde and diesel particulate matter (diesel PM) have been identified as particularly pernicious pollutants requiring priority regulation. Based on the toxicological information and the concentrations seen in the Houston area for the selected four pollutants it is clear that large portions of the city have ambient concentrations posing a risk higher than one excess cancer death per 100,000 people. Observed concentrations of 1,3-butadiene and diesel PM approach a level indicating risk greater than one excess cancer death per 10,000 people." (Rice University, Baylor College of Medicine, Texas Southern University, University of Houston Law Center and the University of Texas Medical Branch at Galveston, *The Control of Air Toxics: Toxicology, Motivation and Houston Implications (Sept. 2006), p. 181)*

Emissions inventories identify flares as a significant source of these and other air toxics. Further, as TCEQ has described in the draft report, evidence indicates that these reported emissions are underestimated and that flares are actually an even larger source of these air toxics. Hence monitoring is important to better quantify the emissions; but even more urgent is to use the monitoring data to reduce overall toxic emissions. Once the emissions are identified they can be more readily controlled.

Monitoring and control of routine emissions

Routine emissions are a major component of overall flare emissions. Studies in California's SCAQMD found that between 1999 and 2003, only 4% of flaring events could be attributed to emergencies. (SCAQMD, Evaluation Report on Emissions from Flaring Operations, Sept. 3, 2004, p.2, table 1). Often these emissions are associated with startup and shutdown and off-spec incidents. From 2001 to 2003, Dow Chemical Company, in Freeport, Texas, reported a 54% reduction in emissions from such incidents using process optimization and thereby saved $2.5 million.

If routine streams are routed to the flare, monitoring is essential. For example, some stakeholders mentioned NESHAP vent streams. NESHAP streams by definition contain hazardous air pollutants and regulations require a minimum of 98% destruction efficiency. Based on the research that TCEQ has reviewed and referenced in the draft report, flares do not always meet 98% efficiency. In fact theses low flow vent streams are more likely to have lower efficiency than many large emergency vents.

Some problems with low flow streams include:

- Nitrogen purge gas required for safety reduces LHV for flare gas combusted and may require natural gas assist for proper combustion. Comments submitted to TCEQ by Total Petrochemicals describe the discovery, upon installing additional monitors in response to HRVOC regulations that excess nitrogen intermittently resulted in LHV below the permit specified minimum.
- For high concentration low flow streams, such as vents from product tanks, the VOCS are heavily diluted and sent to flares operating at large turndowns where combustion may not be optimal and may result in unacceptable emissions of air toxics and HRVOCs

- Thermal oxidizers have stated efficiencies of 99.99%, which may reduce emissions by a factor of 100 over flares. T.O.s are not suited to every application but where they are they can be especially beneficial in reducing toxic and HRVOC emissions. Again, the Total comments provide useful input on applicability of Thermal oxidizers as an alternative to flares.

At the Houston Stakeholder meeting in September, industry representatives were concerned about the costs of installing monitoring systems. We contend that if a facility poses a significant risk of exceeding their permit limits from undefined emissions, then they should be obligated to demonstrate how they could ensure they stay within permit guidelines with or without extensive monitoring of the flare itself. Ideally, facilities would implement flare minimization programs that divert essentially all routine streams away from the flare and to a recovery system or alternative control device. In this case monitoring with water seals or other physical seals would be used to demonstrate there are no routine flows to the flare. Routine in this instance includes most maintenance events.

Implementation considerations

If TCEQ chooses to consider any partial exemptions or delay of implementation for streams previously permitted with the flare as the required control device, we recommend the following as possible scenarios:

- Detailed flare minimization plan submitted to agency for review and approval that shows how streams will be eliminated or diverted from the flare and continuously monitored with physical seals to ensure no routine flow. In such cases extensive flare monitoring with speciation of air toxics and/or direct measurement of LHV with a calorimeter or similar device will be waived.
- In absence of formal flare minimization plan, monitoring will be required as follows: continuous flow monitoring, assist gas monitoring and continuous monitoring of the operational parameters necessary to determine the net heating value of the waste gas stream to ensure that the flare is complying with the minimum net heating value requirements in 40 CFR 60.18. For streams with a history of exceeding the reportable quantity for air toxics in APWL areas, speciation of air toxics in the monitored waste stream entering the flare should be added.

TCEQ should also carefully consider the implementation strategies employed in other jurisdictions.

In SCAQMD rule 1118(c), for example, the following apply:

Requirements
The owner or operator of a petroleum refinery, sulfur recovery plant or hydrogen production plant subject to this rule shall:

(1) Effective January 1, 2006:

(A) Maintain a pilot flame present at all times a flare is operational.

(B) Operate all flares in a smokeless manner with no visible emissions except for periods not to exceed a total of five minutes during two consecutive hours, as determined by the test method in paragraph (j)(3).

(C) Conduct an annual acoustical or temperature leak survey of all pressure relief devices connected directly to a flare and repair leaking pressure relief devices no later than the next turnaround. The survey shall be conducted no earlier than 90 days prior to the scheduled process unit turnaround.

(D) Conduct a Specific Cause Analysis for any flare event, excluding planned shutdown, planned startup and turnarounds, with emissions exceeding either:

(i) 100 pounds of VOC;

(ii) 500 pounds of sulfur dioxide;

(iii) 500,000 standard cubic feet of vent gas combusted,

(E) Conduct an analysis and determine the relative cause of any other flare events where more than 5,000 standard cubic feet of vent gas are combusted. When it is not feasible to determine relative cause, state the reason why it was not feasible to make the determination.

Rule 1118 sets specific guidelines and thresholds for performance of root cause analyses as well as requiring specific preventive maintenance checks on vents directed to the flare. In SCAQMD 1118 (c), (5), a limit is set for combustion of routine gasses above a certain H2S concentration:

(5) Effective January 1, 2009, prevent the combustion in any flare of vent gas with a hydrogen sulfide concentration in excess of 160 ppm, averaged over three hours, excluding any vent gas resulting from an emergency, shutdown, startup, process upset or relief valve leakage.

Regulations similar to these could be constructed for air toxics, such as benzene and 1,3-butadiene, in areas such as southeast Houston with high health impacts as reported by City of Houston and related studies.

Another component, in SCAQMD Rule 1118(d), is the requirement of a flare minimization plan if a performance target for SO2 is not met. Essentially, facilities are given the opportunity to meet a flare minimization goal without a formal plan. If the goal is not met, the facility is assessed penalties and required to submit a formal plan to the agency. Targets in Texas for a similar rule might include HRVOCs, total HAPs, individual HAPs, and total VOCs.

Research

We encourage TCEQ to pursue research to further define the issues related to flares. One area of concern is particulate emissions. Understanding that excess steam to

minimize smoking reduces combustion efficiency, we must not lessen our concern for the hazards of particulates from flares.

TCEQ and EPA should recognize that smoke from flares is a serious health hazard and another compelling reason to minimize flaring. The smoke produced by a well-operated commercial flare burning propylene was reported to be negligible in a flare study conducted by the EPA in 1983 (EPA-600/2-83-062). However, in this same study, they reported conversion values to smoke of 6-8% for badly smoking flares, where smoking was induced by reducing the feed rate below optimum in the absence of steam. The soot particles were found to contain small amounts of adsorbed chemical species known as polynuclear aromatic hydrocarbons (PAHs), which are known to be carcinogenic. In general, TCEQ has allowed operators to control smoking of flares in routine operation by "oversteaming" when necessary. Reporting of steam addition rates is not required and most flare installations do not have steam addition rate control instrumentation. Oversteaming leads to lowered combustion efficiency and the formation of PAHs in the effluent (Petroleum Environmental Research Forum Project 92-191, Aug, 1997). In non-routine (emergency) operation, the flare flame is accompanied by billowing smoke clouds.

Little work has been done on evaluating the health hazards of soot produced from flaring of hydrocarbons. However, Canadian work has shown these soot particulates to have an average size range of 100-400 nanometers (too small to be excluded from lung tissue) and to contain small amounts of PAHs (University of Alberta Flare Research Project Final Report, Nov. 1996-Sept. 2004). It is likely that soot from flares is as hazardous to human health as soot from diesel engines.

The EPA study of flaring (EPA-600/2-83-062) used propylene as flare feed. No work was done with mixed hydrocarbon waste streams more typical of flare feed. The Canadian work (above reference) suggests that EPA and TCEQ must extend their experimental work to include more typical flare feeds. The Canadian work found, for example, that smoking tendency was a function of feed composition. The difficulty of burning and tendency to smoke increased as the carbon/hydrogen ratio of the feed increased. Feeds containing butadiene, styrene, benzene or toluene, for example, will have a greater tendency to smoke than the base case of propylene feed established by the EPA in 1983. We recommend that the feed variable be investigated in the announced study of TCEQ scheduled for the first half of 2010.

Other Issues

There was a question at the September public meeting regarding the holding of flare performance data and the filing of flare minimization plans. Such data and plans, while allowing for facility personnel flexibility to construct a plan best suited to their individual facility, should be reviewed by TCEQ staff for thoroughness and rigor of control technology and methods of control. The data and plans should also be available to the public through the TCEQ's website.

There was also a question at the meeting regarding applicability of the new rule to already issued permits. We remind TCEQ that this review will only have a fraction of the impact intended should the agency not require application of the rule upon permit renewal. We think it absolutely imperative that the agency require application upon renewal of this new rule, and request clarification from TCEQ regarding its intentions concerning this issue.

Conclusion

Again, we appreciate the efforts TCEQ has undertaken in addressing the impact of flare emissions on our public health. We understand that industry stakeholders are justifiably concerned about the potential costs of implementation of some of the proposed requirements. However, we must emphasize that TCEQ as a public agency must be concerned with the costs to the citizens of Texas who breathe the air with these contaminants and bear the associated medical and health costs. These citizens do not receive the profits from these large companies; in fact those most at risk are those in areas close to the industrial facilities and who have the least resources to address their health concerns. Further flare minimization programs have been shown to reduce product loss and energy consumption, thereby benefiting the corporations as well.

The time to act is now. Implementation should proceed without delay, emphasizing controls on the largest flares and flares emitting toxics especially in APWL and nonattainment areas and including application to all permit holders upon renewal of their permits.