On the Fence about Fenceline Monitoring?

This article looks at the amendments to the Refinery MACT 1 rule.
Refineries are living with new U.S. Environmental Protection Agency (EPA) Maximum Achievable Control Technology (MACT) requirements that require passive monitoring of fugitive benzene emissions around the perimeter of their facilities. Passive monitors absorb many different air pollutants and can be deployed to detect “ambient air” concentrations (defined as the other side of the fence) at relatively low cost. Their use is likely to expand beyond refineries and beyond simple compliance monitoring as communities demand more information regarding emissions from facilities in their environment and industry values low-cost but reliable and effective methods to identify problems early and demonstrate compliance and environmental stewardship. As passive monitoring proves its utility in the refinery sector and becomes mainstream, more opportunities to utilize it for “next-generation compliance” could be forthcoming for other types of facilities.

Current Refinery Requirements
Since January 30, 2018, amendments to Refinery MACT 1 (40 CFR part 63, subpart CC) began requiring all major source petroleum refineries to monitor fugitive benzene emissions using passive samplers.¹

Major fenceline monitoring requirements include:

• determining optimum monitoring locations around the perimeter of the refinery, accounting for the size and geometry of the property and the location of “known sources” located within 50 meters of the monitoring perimeter;
• installing monitoring shelters and deploy passive sampling tubes in the shelters, changing tubes every two weeks, and sending recovered tubes for benzene analysis;
• collecting average hourly meteorological data corresponding to each sample period;
• calculating ∆C for each sample period, which is the highest value minus the lowest value from that period, and average the 26 most recent period specific ∆Cs, to develop a 12-month rolling average ∆C; and
• performing root cause analysis and initiate corrective actions if the 12-month rolling average ∆C exceeds 9 µg/m³.

EPA allows two deviations from the standard approach. A site-specific monitoring plan may be approved to exclude the influence of onsite exempt sources or offsite sources. In addition, an alternative test method may be approved in lieu of some or all of the passive samplers, as long as it meets certain validation, sensitivity, frequency, coverage, and other requirements.

Challenges to Implementation
The goal of fenceline monitoring is to ensure facility emissions are fully characterized and to trigger action if elevated levels of benzene are observed at the fenceline. Establishing a fenceline monitoring program presents the following risks and challenges to the regulated community:

1. Related areas: It can be unclear whether separate but related areas should be monitored together or separately (e.g., areas under the same operating entity but separate ownership).
2. Designing the monitoring network: EPA offers a great deal of flexibility in determining sampler placement. By carefully considering the facility configuration, the location of known sources, proximity of neighboring facilities, and seasonal weather patterns, monitoring networks can be designed to minimize the chances of exceeding the action level, while also taking other factors into consideration, such as accessibility.
3. Meteorological data: Refineries must assess whether a nearby U.S. Weather Service met station within 25 miles of the refinery provides data that are representative of conditions at the refinery, based on proximity and differences in the terrain and land use around and between the refinery and the station. Alternatively, refineries must assess whether an onsite met station meets the required siting, calibration, and standardization procedures. Quality of met data is especially important.

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when trying to determine the source of high readings.

4. **Corrective actions**: Facilities must determine based on a root cause analysis, what actions are necessary to reduce air concentrations at the monitoring perimeter to levels at or below the action level. Many different options are available and should be determined on a case-by-case basis.

5. **Public reporting**: The 12-month rolling average action level (9 µg/m³) is not a risk-based standard. It was established under the assumption that no refinery should require corrective actions if their fugitive emissions estimates developed previously are accurate.² However, results will be available to the public and refineries may need to engage with the surrounding community to help them understand what the results mean.

6. **Site-specific monitoring plans**: EPA offers limited guidance on how to determine the influence of offsite sources or onsite exempt sources. This assessment, critical to developing a site-specific monitoring plan, could include increasing sampling frequency or density or using alternative sampling methods and calculations to correct for these sources. It takes several months to develop and obtain approval for a site-specific monitoring plan so refineries should plan to assess the implications of the fenceline monitoring requirements early and allow ample time to get a site-specific plan in place, if necessary.

**The Future of Fenceline Monitoring**

Traditionally, under the U.S. Clean Air Act and amendments, air quality impacts are regulated in ambient air, starting at the facility fenceline. While tall stack emissions have been highly regulated to demonstrate National Ambient Air Quality Standards (NAAQS) compliance, fugitive emissions just outside the fenceline have rarely received significant regulatory attention. However, uptake rates for 17 Clean Air Act compounds besides benzene have already been established,³ making it possible to readily extend the breadth of fenceline monitoring to include a host of other compounds. Given new precedent in enforceable fenceline monitoring requirements at refineries, it seems plausible that similar methodology could find its way into revised or new regulations, air permits, Compliance Assurance Monitoring (CAM) Plans, other MACT Rules, and as a new regulatory enforcement tool.

Further, social media and heightened environmental concern are fueling ever more citizen stewardship of the environment, and when deemed appropriate, activism. Traditionally, air quality measurements have required access to a facility’s stacks and or operational data, and even if they were available, the measurement techniques and data interpretation has been expensive and highly technical. Watchdog groups have often been limited to offsite observations such as smoke (opacity), or anecdotal allegations such as watery eyes or coughing. With the advent of passive, low-cost monitoring methods, affected citizens could become an extension of state or federal air quality enforcement officers, both by policing publically available data or even by doing some monitoring on their own. For example, it is plausible that other regulated fugitive emissions released close to a facility fenceline could be passively measured by citizen groups as potentially exceeding a regulatory or air toxics ambient concentration limit.

The risk to both industry and citizen groups with the proliferation of lower cost measurement techniques is that data can be readily generated but are not always easy to accurately interpret and convert into meaningful information. EPA created two test methods (325A and 325B) to ensure quality assurance and quality control in the application of passive sorbent tubes for fenceline monitoring. Even with these detailed methods, EPA recognizes that concentrations above the action level are not violations. Rather, they trigger investigation through a root cause analysis and corrective action framework. The use of passive tubes should be compliant with Methods 325A and 325B and the limitations associated with use of the data should be recognized. Conversely, both industry and community groups should be wary of the accuracy and interpretation of data from other low-cost sensors, which do not have formal quality assurance and quality control provisions established.

Starting in 2019, all of the refinery fenceline monitoring data will be publically available on EPA’s website, but currently there is not a lot of guidance or supplementary documentation available to help citizens better understand and interpret the data. For example, a fundamental misconception is that the 9 µg/m³ annual threshold set by EPA is a health standard and any exceedance poses a health risk to surrounding communities. Rather, the threshold was set at the highest modeled value at the property boundary of any U.S. refinery—a concentration value determined to be below risk levels that would otherwise require more controls under EPA’s MACT program. However, state, federal, and global organizations have their own screening and exposure limits, which vary widely and are sometimes below the EPA threshold. It is a real risk to facilities whose monitoring data are publically available that citizens will misinterpret the data coming from the facility or that they will misapply thresholds (i.e., over the wrong time period or by interpreting a screening standard as a health limit). EPA is actively developing “Citizen Science for Environmental Protection” guidance (https://www.epa.gov/citizen-science) to further assist, educate, and empower non-regulatory potentially affected parties to participate in a variety of local air quality monitoring and enforcement activities. In the meantime, however, many refineries are seeing the value in proactively engaging with their communities to help citizens understand and interpret the monitoring data before the data are even publically released.
Other facilities in close proximity to refineries should also be aware of the impact that refinery fenceline monitoring may have on them, even if the regulations do not directly apply. Passive monitors absorb compounds from the air, regardless of their origin. While refineries have to account for these emissions, they subtract out the lowest reading each sample period, which is thought to be the ambient benzene level (i.e., the level produced by other facilities in the vicinity or that which drifts in from other areas). Site-specific monitoring plans may attribute a more significant portion of emissions to one or more specific offsite sources and will likely have evidence to support the claims. Thus, refinery monitoring may in effect be monitoring and releasing data on neighboring facilities as well.

When applied properly, passive fenceline monitoring has proven to be a low-cost, readily available, and reliable tool for assessing emissions at refineries so the reach of these types of tools is likely to expand beyond benzene monitoring at oil refineries. Therefore, many other large industrial facilities have cause to be interested in the process and lessons learned from implementing the refinery MACT amendments.

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References
1. Federal Register Vol. 80, No. 230, Tuesday, December 1, 2015. 40 CFR Parts 60 and 63 Petroleum Refinery Sector Risk and Technology Review and New Source Performance Standards; Final Rule. § 63.658
3. Method 325B: 40 Code of Federal Regulations 63.658, Appendix A of Part 63, Method 325B-Volatile Organic Compounds from Fugitive and Area Sources: Sampler Preparation and Analysis. Table 12.1. Uptake rates quantify how quickly a specific compound is absorbed by a particular media so that the mass of the compounded measured on the media can be translated to and reported as an ambient concentration.

In Next Month’s Issue…

NAAQS Update, Part 1
The September issue will provide an update on the three National Ambient Air Quality Standards (NAAQS), both primary and secondary, for sulfur dioxide, nitrogen oxides, and particulate matter. It will address implementation of the current standards and ongoing U.S. Environmental Protection Agency (EPA) efforts to review the standards. EPA has proposed to retain the 2010 nitrogen dioxide NAAQS and is working on its review of the sulfur dioxide and particulate matter NAAQS last revised in 2010 and 2012, respectively. Part 2 will appear in December 2018.