

ENFORCEMENT ALERT

Violations at Petroleum Refineries and Ethylene Plants Cause Excess Benzene and Other VOC Emissions in Nearby Communities

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The U.S. Environmental Protection Agency (EPA) and state environmental agencies continue to identify common noncompliance of Clean Air Act regulations that are causing excess emissions of benzene and other volatile organic compounds (VOCs) from petroleum refineries, chemical plants, including ethylene plants, and coke byproduct recovery plants. These facilities are required to comply with longstanding requirements, including the National Emission Standard for Benzene Waste Operations at 40 C.F.R. Part 61, Subpart FF (BWON) and, in addition for refineries, New Source Performance Standards for Volatile Organic Compounds from Petroleum Wastewater Systems at 40 C.F.R. Part 60, Subpart QQQ (NSPS QQQ). The BWON regulation also applies to hazardous waste treatment, storage, and disposal facilities that treat, store, or dispose of hazardous waste generated by these three types of facilities. EPA investigations of petroleum refineries have identified BWON and NSPS QQQ requirements as areas of common noncompliance.

EPA investigations of ethylene plants are also identifying noncompliance with BWON requirements. EPA is publishing this Enforcement Alert to remind owners and operators of these facilities of the importance of compliance with these requirements. Failure to comply could result in excess emissions of benzene and other VOCs and could result in an enforcement action assessing significant penalties for noncompliance.

Public Health Concerns

Benzene is a known human carcinogen that EPA has classified as a hazardous air pollutant. Plants including refineries and ethylene plants are often located in densely populated areas and can have an impact on communities overburdened by pollution and with potential environmental justice concerns. In addition to benzene, a known human carcinogen, VOC emissions contain other hazardous air pollutants and contribute to the formation of ground level ozone and can contribute to violations of the National Ambient Air Quality Standards for ozone. Ozone is a respiratory irritant. Long-term exposure to ozone is linked to aggravation of asthma and is likely to be a cause of asthma development.

BWON Noncompliance Concerns

EPA has conducted inspections of refineries and ethylene plants across the nation and identified numerous violations related to excess benzene emissions. EPA has identified that facilities are failing to;

- 1. Perform any quarterly visual inspections and no detectable emissions (NDE) testing, or
- 2. Properly conduct quarterly visual inspections and annual NDE testing to evaluate compliance with the NDE standard at waste management and treatment units.

Additionally, EPA has identified that facilities failed to design, operate, and maintain all covers, openings, and closed vent systems in accordance with the standards for waste management units. Facilities have also failed to route all organic vapors from waste management units through closed vent systems to control devices. In addition, facilities have failed to design, install, operate, and maintain control devices associated with closed vent systems, such as inadequately combusting organic vapors in thermal oxidizers and improperly designing or operating carbon adsorption systems.

These facilities have often failed to correct noncompliance, such as waste management units with missing bolts, unlatched and poorlygasketed hatches, damaged or missing caulking, visible steam emissions, obvious cracks in sealant, holes in fixed roofs, and overflowing water; oil-water separators with gaps between the cover and separator walls, floating roofs not sealing the liquid surface of

Case Highlight: BP Products North America (BPP)

BPP owns and operates a refinery in Whiting, IN. On August 9, 2023, a court in the Northern District of Indiana entered a settlement between the United States and Indiana with BPP. The settlement requires BPP to pay a total of \$40 million in penalties, implement a \$5 million supplemental environmental project, and invest an estimated \$197 million in controls and changes to its operations. As part of the settlement, BPP will install temporary and permanent benzene strippers to reduce the benzene load to its wastewater treatment plant. Additional details about the settlement is available on the 2023 BPP CAA Benzene and VOCs Settlement Information Sheet.

the waste, and oil residue on the roof; and process drains with missing water seals, detectable emissions from above-ground sewer lines, and large gaps between process equipment drains and water-sealed drain risers.

Other Areas of BWON Noncompliance

EPA has also identified noncompliance related to determining BWON applicability stemming from miscalculation of total annual benzene quantity from aqueous waste, failure to identify all waste streams at the facility that are subject to BWON, and failure to identify the waste streams at the correct point of waste generation (for example, failing to account for benzene content in stormwater that is contaminated with oil and not captured in a segregated sewer system). These failures lead to violations of other portions of the BWON, including the inspection, testing, and reporting requirements.

Other noncompliance that EPA has observed includes the failure to create and/or maintain engineering design documentation for control equipment, which includes the covers, all openings and closed vent systems subject to NDE, as well as control devices that are installed on the waste management unit or treatment processes managing benzene waste.

In addition, EPA has observed noncompliance at inground API oil-water separators with floating roofs that frequently have detectable emissions related to venting from rain caps, hatches and seams on the connecting plates, oil floats during rain events, roof seals, and not sealing the liquid surface to minimize air emissions. These are also NSPS QQQ noncompliance issues.

The EPA has also found that concrete waste management units are porous, prone to cracking, and if not maintained, result in uncontrolled emissions. Facilities must ensure use of proper monitoring and testing of equipment as required by BWON. For example, photo ionization detectors (PIDs) should not be used for NDE testing because PIDs do not detect all VOCs. A flame ionization detector (FID) should be used for NDE testing because the 500 ppm NDE standard applies to all VOCs. However, for carbon canister breakthrough monitoring where a nitrogen purge is used that causes a flame-out on an FID, a PID that measures total VOCs may be used to determine if there is any VOC breaking through the carbon drum.

These noncompliance issues may result in exceedance of the BWON compliance option.

NSPS QQQ Noncompliance Concerns

NSPS QQQ establishes standards to control VOC emissions from wastewater at refineries. These standards have specific requirements for individual drain systems, including sewer lines and junction boxes, oil water separators, and aggregate facilities. For example, drains must be equipped with water control seals and inspected monthly for low water levels or conditions, sewer lines must be

covered/enclosed with no visual gaps or cracks in joints, seals, or other emission interfaces, and unburied sewer lines must be inspected semiannually. Generally, EPA has identified that refineries with BWON non-compliance issues also have NSPS QQQ non-compliance issues.

EPA inspectors frequently observe NSPS QQQ noncompliance with: maintaining proper equipment (e.g., water seal controls on each drain); conducting monthly visual inspections; making necessary and timely repairs; maintaining junction boxes with a cover and vapor-tight seal; and maintaining sewer lines without visual cracks in the joints, seals, or other emissions interfaces.

Air Pollution Control Strategies

Effective air pollution control strategies include:

- Install or upgrades, or both, with benzene emission reduction technologies that treat high benzene process wastes where the waste stream exits the process unit, such as benzene stripper(s) or flash column(s);
- Upgrades to dissolved gas flotation and induced gas floatation systems;
- Upgrades to internal/external floating roof and fixed roof tanks and API separators, including modifying or replacing floating roof tanks and inground APIs separators, as needed;
- Install or upgrades to covers of aeration basins/enhanced biodegradation units (e.g., improved material selection, vapor tight sealing, and automated and remote monitoring);
- Upgrades to barscreen/grit chambers (e.g., capacity expansion, enhanced maintenance and cleaning protocols); and
- Upgrades to controls on equalization tanks and mixing bays.

Other effective strategies include: more frequent NDE testing, utilizing optical gas imaging (i.e., infrared camera that images hydrocarbon emissions) during visual inspections, and replacement of aged wastewater treatment equipment prior to repeated violations of the NDE requirement.

Benzene NESHAP and VOC NSPS

EPA also recommends conducting refinery-wide 3rd-party audits for BWON and NSPS QQQ. Routine third-party auditing ensures objectivity, a fresh look at compliance, and accuracy. The experienced third-party auditor should conduct a thorough assessment of design, operations, and documentation related to waste management, and conduct comparative NDE testing. In addition, all personnel with BWON or NSPS QQQ related responsibilities (i.e., employees and contractors) must be trained periodically to ensure necessary knowledge and skills.

Inspection of Waste Management and Treatment Components and Systems

Refineries are required to also evaluate waste management and treatment components and systems to detect anomalies (e.g., defects, flaws, cracks, corrosion) based on NDE testing and visual inspections. Following a visual inspection failure or NDE exceedance, BWON requires facilities to maintain a description of the problem, a description of the corrective action, and the date corrective action was completed. When measurements of detectable emissions occur at a single location or emission interface, facilities should conduct a rootcause analysis, take corrective actions, and update any engineering assessments for reoccurring detectable emissions, as appropriate. Since BWON became effective, advances in materials and engineering designs, sealing solutions, and low-emissions components (e.g., valves) occur regularly, are available and should be routinely explored and used to ensure the NDE emission standard is continuously achieved. Other recommendations include evaluating sewer systems and developing compliance strategies for all sewer lines, drains, junction boxes and cleanouts.

Additional Recommended Actions and Pollution Prevention Measures

Best BWON and NSPS QQQ compliance strategies to reduce potential benzene and other VOC emissions include: removing benzene from streams before the streams reach the wastewater treatment plant (by reducing benzene loading to the wastewater treatment plant, a refinery may be able to reduce or eliminate streams that must be controlled, which also reduces time and expense associated with maintaining waste management units and waste streams at the wastewater treatment plant); hard-piping individual drain systems to above-ground sewers; and conducting a sewer system evaluation to ensure proper design and preventative maintenance.

More Information

For more information, see EPA's <u>Benzene NESHAP web page</u> and for <u>VOC</u> <u>Emissions from Petroleum Refinery Wastewater System NSPS web page</u>.

DISCLAIMER: This document aims to explain the application of certain EPA regulatory provisions using plain language. Nothing in this Alert revises or replaces any regulatory provisions, any other part of the Code of Federal Regulations, the Federal Register, or the Clean Air Act. Following the recommendations discussed in this Alert does not guarantee compliance with the Clean Air Act, its implementing regulations, and associated state/local requirements. For more information, visit <u>EPA's Compliance website</u>.