Fenceline Monitoring: Regulatory Drivers and Picarro's Solution

PICARRO

Introduction

Fenceline monitoring has become a central requirement in recent amendments to the National Emission Standards for Hazardous Air Pollutants (NESHAP), reflecting EPA's increased focus on ensuring that hazardous air pollutants (HAPs) remain controlled at facility boundaries and do not exceed EPA-defined action levels.

In response to these requirements, Picarro has developed an Alternative Test Method (ATM) for fenceline monitoring that has been validated in accordance with EPA Method 301. The ATM is based on Broadband Cavity Ring-Down Spectroscopy (CRDS) and provides near-real-time measurements, source attribution, and automated compliance workflows. Unlike traditional passive methods that rely on delayed sampling and third-party laboratory analysis, the Picarro ATM enables facilities to move from reactive to proactive compliance by identifying emission events as they occur and supporting rapid, targeted response. Problems that historically surfaced months after sampling can now be detected and addressed within days, integrating compliance into daily operations and supporting continuous, defensible emissions control.

Regulatory Landscape

Fenceline monitoring requirements currently apply across multiple NESHAP subparts, with differing pollutants, timelines, and compliance obligations depending on the source category. Key regulatory drivers are summarized below:

NESHAP Subpart	Source Category	Pollutants Requiring Fenceline Monitoring	Effective Date	Compliance Date
Subpart F-I (HON Rule)	Synthetic Organic Chemical Manufacturing Industry (SOCMI) Major Sources	Benzene 1,3-Butadiene Chloroprene Ethylene Dichloride Ethylene Oxide (EtO) Vinyl Chloride	July 15, 2024	July 15, 2026 (presidential exemption up to 2 years)
Subpart CC (Refinery Rule)	Petroleum Refineries	Benzene	January 30, 2015	January 30, 2018
Subpart VVVVVV (CMAS)	Chemical Manufacturing Area Sources	Ethylene Oxide (EtO)	Proposed January 8, 2025	2 years after the effective date of the final rule

Facilities subject to these rules must maintain annual average fenceline concentrations (ΔC) below EPA-designated action levels. Exceedances require facilities to initiate root cause analysis (RCA) and implement corrective actions to restore compliance in accordance with specified timelines. Each regulated HAP has a designated action level defined within the applicable rule.

Any alternative test method used for fenceline monitoring must demonstrate a detection limit of at least one-third of the EPA-designated action level to meet HON Rule requirements and a nominal detection limit at least an order of magnitude below the action level to satisfy Refinery Rule criteria. Picarro's Method 301 validation demonstrates that the Broadband CRDS–based ATM meets or exceeds these sensitivity requirements across all applicable HAPs, supporting defensible compliance and regulatory review.

In addition to analytical sensitivity, fenceline compliance determinations must reflect concentrations attributable to facility operations. In dense industrial corridors, fenceline monitors may detect target compounds originating from nearby sources that the facility does not own or control. Distinguishing facility-attributable emissions from external contributions is therefore critical to ensure that exceedances, RCA, and corrective actions are triggered by conditions within the facility's operational control and that reporting reflects the facility's true fenceline impact.

Together, these regulatory requirements establish not only the need for fenceline monitoring, but also specific expectations for data quality, responsiveness, documentation, source attribution, and corrective action.

Attributable Emissions and Source Contributions (On-site vs. Off-site)

Fenceline measurements may include a combination of the concentrations attributable to the facility's operations and off-site near-field sources outside the property boundary. To support defensible compliance determinations, fenceline programs should incorporate objective, documented procedures for evaluating source contributions and ensuring that rolling annual ΔC values reflect facility-attributable emissions.

Picarro's fenceline monitoring solution integrates high-frequency meteorological data (wind speed and direction) with real-time concentration measurements collected by fixed fenceline monitoring systems. Directional analysis and plume back-trajectory tools implemented through the cloud platform support source attribution by distinguishing emissions originating from facility operations from those influenced by external sources. Data collected under calm or low-wind conditions can be flagged and handled in accordance with site-specific monitoring plan procedures.
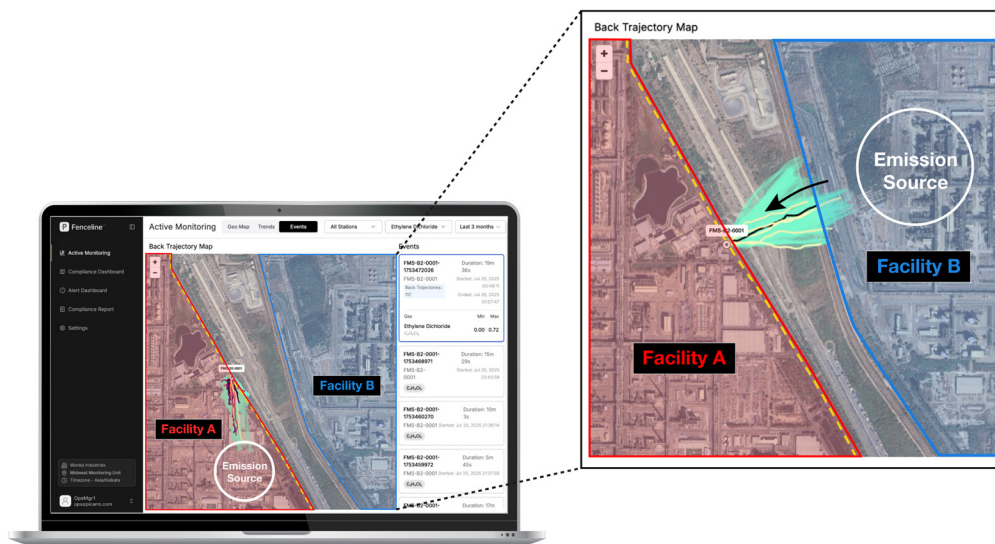

Figure 1. *Plume Back- trajectory Analysis Supporting Near-Source Attributions*

Why Choose Picarro's Alternative Fenceline Monitoring System

Traditional passive methods (EPA Methods 325 and 327) rely on multiple parties, including laboratories, consultants, and third-party data systems. This fragmented approach is costly, time-intensive, and prone to delays, with each step introducing additional vendors, workflows, and potential points of failure.

The Picarro fenceline monitoring solution integrates fixed monitoring systems, a cloud-based analytics platform, and supporting services into a cohesive, end-to-end compliance framework. The result is a faster, cleaner, and more defensible approach that replaces time-integrated sampling programs with real-time, actionable insight.

Key Benefits:
- **Near-continuous measurement** – Provides compliance-ready data at 15-minute intervals with underlying resolution down to 5 seconds
- **Real-time event detection** – Captures transient releases undetectable by passive methods
- **Proactive forecasting** – Automates rolling annual averages and forecasts potential exceedances up to 30 days in advance
- **Attributable emissions determination** – Differentiates facility-attributable concentrations from external contributions to support rolling annual ΔC and targeted RCA
- **Source attribution and localization** – Combines wind analysis and back-trajectory tools to identify likely source directions and support rapid field investigation
- **Integrated workflow** – Automates ΔC calculations, RCA tracking, and regulatory reporting
- **Scalability** – Supports additional compounds, evolving regulatory requirements, and mobile deployment
- **Economic efficiency** – Reduces reliance on labs, personnel, and costly dispersion modeling

Together, these capabilities redefine fenceline monitoring as a compliance, operational, and risk-management tool by aligning regulatory obligations with real-time operational insight.

Technology Overview

The Picarro fenceline monitoring solution is powered by an integrated technology stack that operates as one seamless network.

- **Measurement Technology** – Broadband CRDS analyzer with supporting hardware and software for continuous concentration measurement and QA/QC
- **Fenceline Monitoring Systems** – Weatherproof, climate-controlled fixed stations deployed at each monitoring location along the facility perimeter
- **Fenceline Network** – Multiple systems deployed around the facility perimeter, continuously streaming data to the cloud platform
- **Cloud Portal** – Web-based interface providing real-time data access, compliance dashboards, corrective action tracking, and historical analytics
- **Mobile Monitoring System (UTV)** – Vehicle-mounted real-time monitoring unit optimized for fugitive emission detection and fully integrated with the cloud platform
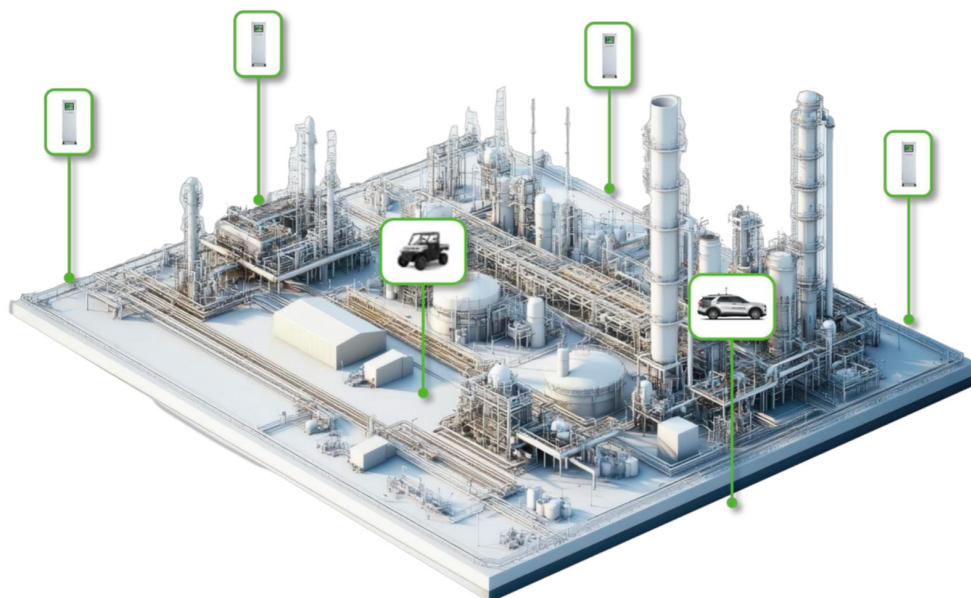
Figure 2. *Cloud-Connected, Real-Time Fenceline Monitoring Network & Advanced Mobile Leak Detection*

Performance Metrics & Support

Picarro provides quarterly KPI reporting through its cloud platform to support reliability and compliance, including:

- System uptime and availability standards
- Support response and resolution times
- Percentage of valid, quality-assured data
- QA procedure adherence and maintenance tracking
- Data completeness and calibration pass rates
- Alarm/event response times
- Reporting accuracy and timeliness

If performance metrics are not met, Picarro implements remediation measures in accordance with contractual commitments, positioning itself as a long-term compliance partner.

Conclusion

Picarro's Method 301–validated ATM enables facilities to implement continuous fenceline monitoring as an approved alternative monitoring approach through an integrated solution comprising fixed systems, a cloud platform, and supporting services. The result is a defensible, real-time compliance framework that supports facility-attributable emissions determination and timely corrective action. By integrating high-frequency measurement, source attribution, and automated compliance workflows, Picarro transforms fenceline monitoring from a reactive obligation into an active emissions management system aligned with MACT-level regulatory expectations.