Refineries can reduce leak repairs by monitoring emissions

Cutting oil refinery leak repair times by 80 percent through game-changing fixed, continuous emissions monitoring

Krishna Uppuluri
mPACT2WO

Oil refinery operators can reduce leak detection and repair (LDAR) times by up to 80% compared to traditional monitoring methods through the next-generation fixed, continuous emission monitoring solution utilising gas sensors, AI/ML-based operational analytics, automated notifications, and response workflows.

Using a real-world deployment as an example, boots-on-the-ground plant operators can leverage a systemised, operations-centric approach with real-time leak detection intelligence to improve safety and compliance with growing requirements.

Furthermore, plant operators can unlock significant potential for risk reduction, cost performance enhancement, competitive advantages, and environmental stewardship by replacing existing manual, error-prone leak detection and emission reduction methods currently deployed in refineries, petrochemicals, and other manufacturing facilities.

Existing leak detection methods rely on manual, time-based monitoring resulting in delayed leak detection and uncertainty of situational context. Missing data, error-prone documentation, high attrition, and difficult to monitor locations make manual monitoring even riskier in an era of increasing regulations and community empowerment. A patchwork of OGI cameras, portable sensors, and drones addresses some problems but leads to new gaps in emissions monitoring. These silo solutions lack the advantages of holistic, anytime-anywhere, end-to-end, continuous monitoring.

Figure 1 Gas sensors, AI/ML-based operational analytics, automated notifications, and response workflows can help reduce leaks in refineries

mPACT2WO, a Molex company, collaborated with one of the largest refining operations in the country, producing more than 700,000 barrels of oil per day to prove a fixed, continuous emissions detection mechanism as an alternative to existing manual component-by-component periodic EPA Method 21 monitoring requirements. The effectiveness of this fixed, continuous monitoring leak detection system was proven at the refinery sites and enabled an EPA approved Alternative Means of Emission Limitation (AMEL) for existing Method21,[1] the first in over 40 years. Additionally, the same leak detection system enabled a holistic expansion to emissions monitoring across fencelines, tank farms, pump stations, AVO (audio, visual, olfactory), and remote terminals.

In one application of the mPACT2WO AirCompliance solution, plant operators recorded an abnormal condition at an authorised emission source at a tank farm conservation vent. The operations team received a real-time alert that showed a Potential Source Location (PSL) on the sitemap. The control room identified the source near numerous tanks and associated piping.

The Operator dispatched technicians to the site, and within four hours of the first alert, the emission source was located and corrected. Operators avoided potential unsafe conditions and personnel exposure due to their vastly shortened response time.

In another application, the operations effectively detected a non-LDAR component emission at a hydrogen compressor and minimised a safety risk. The timely investigation helped to isolate recycled hydrogen leaking from the compressor loader and associated junction box. The site personnel were not only able to detect emissions from LDAR components but also from components that were not included in routine AVO or LDAR monitoring programs.

The AIoT (Artificial Intelligence of Things)-enabled AirCompliance solution offers three distinct advantages over the refiner's previous LDAR capabilities:

- Holistic coverage for emission monitoring across LDAR, fencelines, tank farms, terminals, pump stations, and remote unmanned sites.
- Effective estimation of emission chemical composition

Figure 2 By monitoring emissions at a refinery, operators can improve efficiencies

through advanced sensor technology, providing a more holistic view of plant-wide emissions.

- Operations-aware, intelligent analytics to isolate and fix leak sources in minutes to hours compared to days to weeks required by traditional manual methods.

Through continuous emissions monitoring with a fixed sensor network, the refinery shifted to event-based monitoring to enable more timely emissions detection and corrective actions.

Prior to that, leak detection and repair relied on a technician's hope for a chance to run into the right leak at the right time during their scheduled inspections. The shift to the new monitoring technology allowed facility operators to improve operational efficiencies, reduce emissions, and enhance safety and maintenance procedures. They can now efficiently implement safety and compliance programs with real-time alerts, timely corrections, and systemised response workflows.

Reference

1 https://www.federalregister.gov/documents/2023/02/10/2023-02811/notice-of-final-for-approval-of-alternative-means-of-emission-limitation

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