Fenceline Monitoring

PTR-TOF real-time air quality monitoring around chemical plants

Oil & gas industry, refineries and chemical plants, have the risk of emitting pollutants into the environment. Our solutions mitigate this risk for public health concerns and ensure regulatory compliance.

Introduction and Background

Certain industries, such as refineries and chemical plants, have the risk of emitting pollutants into the environment. To mitigate this risk, "fenceline monitoring" involves strategically placing air quality sensors around the perimeter of these facilities. This method is vital for continuously assessing air quality and detecting any chemical emissions that could affect local air quality significantly. Such monitoring serves several critical functions:

1. Regulatory Compliance: Fenceline monitoring ensures that industrial facilities adhere to environmental laws and regulations by providing tangible data that confirms emissions remain within legal limits.
2. Public Health Protection: By offering real-time data on the presence and concentration of hazardous pollutants, this monitoring technique plays a crucial role in safeguarding the health of nearby communities. It facilitates

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timely health risk assessments and the deployment of emergency responses if dangerous chemical levels are detected.

3. Operational Improvements: This monitoring aids facility operators in identifying and rectifying any leaks or inefficiencies in their processes that could lead to excessive emissions.

Traditionally, fenceline monitoring systems utilize technologies like infrared spectroscopy, photoionization detectors, and gas chromatography to detect and quantify low-concentration pollutants. However, the demands for such monitoring, especially in the petrochemical industry, have intensified due to tighter global environmental regulations and more stringent enforcement of existing laws. For instance, regulatory bodies worldwide, including the U.S. Environmental Protection Agency (EPA), have imposed more detailed guidelines and requirements for emissions monitoring. The Royal Commission of the Kingdom of Saudi Arabia, for example, has recently broadened the scope of its Environmental Regulations (RCER), reflecting heightened community concerns near petrochemical facilities and a greater focus on sustainability and corporate responsibility.

These developments have increased the legal and financial stakes for companies, with non-compliance potentially leading to significant fines, legal challenges, and reputational damage. Fenceline monitoring is therefore not just a regulatory

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requirement but a crucial strategy for mitigating risks, ensuring compliance, and preemptively addressing environmental issues.

Most industrial sites use a range of toxic chemicals that necessitate stringent monitoring to mitigate risks. An ideal fenceline monitoring system is thus capable of detecting all potential emissions simultaneously, rapidly, and at concentrations low enough to prevent adverse effects. Ideally, this system is adaptable to detect not only currently recognized compounds, but also those that may be deemed hazardous in the future. This adaptability ensures ongoing compliance with evolving regulatory and environmental health standards, providing comprehensive protection against both known and emerging chemical threats.

Benefits of IONICON PTR-TOF

Proton Transfer Reaction-Time of Flight Mass Spectrometry (PTR-TOF) is an advanced analytical technique capable of detecting trace amounts of a wide range of volatile organic compounds (VOCs) simultaneously, quantitatively, and in real time. The soft nature of the efficient PTR ionization process minimizes fragmentation and combined with a TOF mass spectrometer that captures comprehensive, high-resolution spectra, PTR-TOF provides excellent separation and the ability to detect unanticipated compounds. These characteristics align perfectly with the requirements of an ideal fenceline monitoring system.

Originally, PTR-TOF systems were developed to facilitate cutting-edge scientific research in various fields of trace gas analysis, which required expert scientists to operate and to interpret the data. Over the past few years, IONICON has successfully translated these scientific instruments into easy-to-use, robust,

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automated monitoring solutions. This process has been driven primarily by the semiconductor industry's need to monitor airborne molecular contaminants (AMC) more rigorously by detecting an increasing number of compounds in real time at lower concentrations than previously possible with established technologies – a challenge akin to what is now faced in fenceline monitoring.

PTR-TOF real-time VOC analyzer (bottom), Sample Handling System (upper right) in the air conditioned shelter.

Successful implementation in KSA

IONICON has successfully implemented a fenceline monitoring solution for a large petrochemical industrial complex in the Kingdom of Saudi Arabia. As a basis, we chose tools that have a proven track record in industrial environments: our industrial PTR-TOF systems in combination with our Automated Measurement and Evaluation (AME) software.

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A key element of our approach was to design the Sample Handling System (SHS) to meet specific operational challenges. This system can switch the sample gas for analyzer between ten different sample streams, fully automated, and each stream continuously pumped at several liters per minute to ensure a consistent supply of fresh gas.

In addition, the installation included 17 kilometers of sample lines suitable for trace gas analysis, a significant factor given the potential for escalating project costs associated with lines of such length. We conducted extensive evaluations of various materials, suppliers, and pretreatment processes to find a combination that would not only provide accurate samples, but also remain cost effective.

Air conditioned shelters for each of the four PTR-TOF analyzers have been placed along the fenceline.

Illustration of a fenceline monitoring network with 4 analyzer stations, each with 6 sample points.

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A powerful partner for the industry

In recent years, IONICON's advancements in PTR-TOF technology have greatly enhanced its adaptability for industrial applications. Fenceline monitoring is one of these applications where PTR-TOF has emerged as an ideal solution.

IONICON's fenceline monitoring solution significantly enhancing the safety of workers, the community, and the environment. It not only helps industrial companies mitigate the risks associated with emissions and ensure regulatory compliance, but it also offers the flexibility to monitor additional compounds as regulatory and environmental requirements evolve. At IONICON, we are dedicated to continually refining our systems, broadening their applications, and helping industries uphold the highest standards of environmental integrity.

Visit www.ionicon.com!

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