

Fenceline Monitoring of Benzene in Refineries Using OMNI-2100

Background: According to the Environmental Protection Agency (EPA)¹, undetected leaks (aka fugitive emissions) are a significant source of pollution and can emanate from industry, refineries, energy production, and natural gas pipelines. Fixing these leaks can protect workers and nearby communities, reduce operating costs for companies, and assist regulators with implementing source emissions control and air quality standards under the Clean Air Act.

The most common method of leak detection currently employed are “Passive Sampling Tubes” (PST), which are small tubes with carbon sorbent material inside to trap benzene. PSTs are hung around the perimeter (aka fenceline) of the facility and uncapped to expose them to air. After two weeks of sample collection, the tubes are recapped and shipped to a laboratory for analysis. In a week's time, users get the results back and can “map” the time-averaged benzene levels that **were** present at the fenceline, and attempt to elucidate the elevated emissions' sources. **However, PSTs have a serious limitation: they do not provide real-time granular and actionable insight to address the leak sources in a time-sensitive manner.**

Omniscent's proprietary analyzer OMNI-2100: OMNI-2100 employs a novel Micro Electro-Mechanical System (MEMS) based analyzer to selectively separate and detect chemicals such as benzene, toluene, m-xylene, o-xylene with limits of detection (LODs) ≤ 0.5 ppb. The unique aspect of OMNI-2100 is the cloud-based **autonomous and continuous monitoring system** features that do not require any carrier gas or any human supervision for operation and data collection. OMNI-2100 can run on both Wi-Fi and LTE. OMNI-2100 can be solar-powered and battery operated depending on the customer's needs. OMNI-2100 can be configured to send alarm notifications via text and email to operators, thereby increasing industrial safety, preventing accidents and saving lives. Applications include monitoring around refineries, chemical facilities, gas stations and the impacted communities in their direct surroundings.

Proof of Concept (POC) with preliminary results: Ambient air monitoring was conducted at Torrance Refinery in Los Angeles, California. The OMNI-2100 analyzer was placed on the rooftop of a trailer close to the Torrance Refinery (Figure 1). Summary of results is shown in Table 1 and Figure 2. Benzene concentrations ranged from 0-6.82 ppb and toluene concentrations ranged from 0-3.14 ppb. EPA action limit for benzene is 2.8ppb

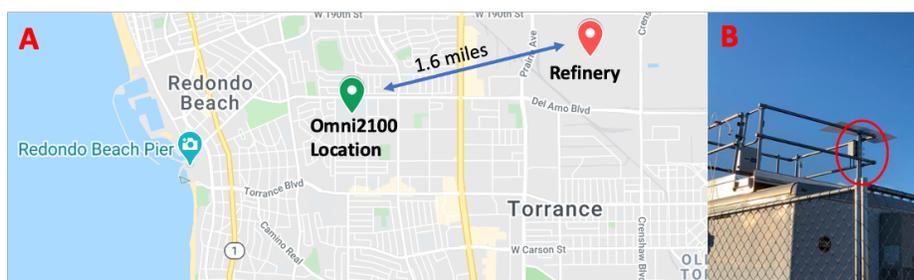


Figure 1. OMNI-2100 placed on the rooftop of a fixed site monitoring trailer in Torrance, California. Figure 1A shows the location of the sensor and the location of Torrance refinery. Figure 1B shows the rooftop of the trailer with the red circle showing OMNI-2100.

¹<https://www.epa.gov/stationary-sources-air-pollution/petroleum-refinery-sector-rule-risk-and-technology-review-and-new>.



Table 1: Summary of benzene and toluene results in the period January 29 - March 13, 2020

January 28 - March 13, 2020	Benzene Range (ppb)	Toluene Range (ppb)
OMNI-2100	0-6.82	0-3.14

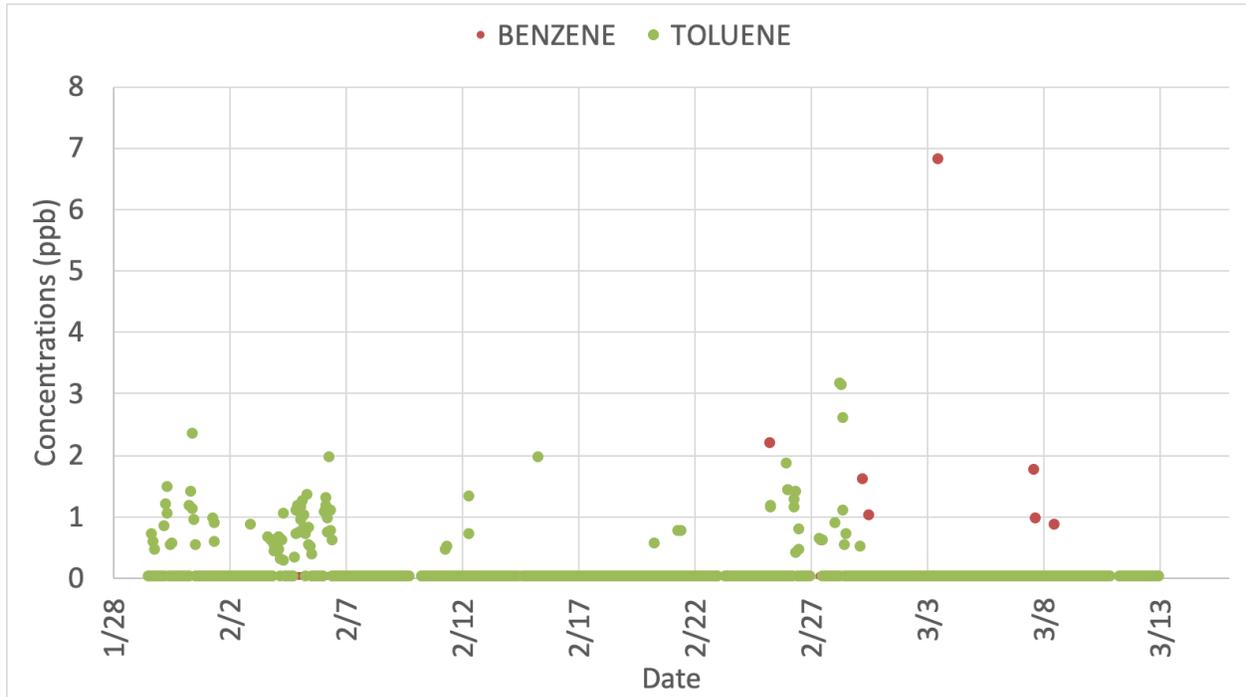


Figure 2. Time series data of benzene and toluene from 1/28/2020 – 03/13/2020 as reported by OMNI-2100.

As can be seen from Figure 2, toluene is more frequently detected in this location during the span of this study with spikes of benzene observed on a handful of days.

Conclusions from POC:

This POC demonstrates the value of OMNI-2100 as a specialized tool for real-time fence-line monitoring in refineries.

Broader applications of OMNI-2100 include community-based air monitoring, detecting leaks in gas stations and emergency response operations. Deploying a network of the OMNI-2100 analyzers to cover a wide monitoring area can yield a pollution map in real-time to benefit the environmental health and safety officers to accurately determine the fugitive emission sources and swiftly address them, thereby increasing safety while reducing labor cost.