Fence-line Monitoring: Benzene and Beyond

By: Bengt Löfstedt

Readers of recent issues of On the Beam as well as viewers of the promotional videos under “OPSIS Play” on the OPSIS website are familiar with the U.S. EPA benzene fence-line regulation and how the OPSIS monitoring systems can be applied in that context, but it doesn’t stop there.

Fence-line monitoring can be of great importance and value in the vicinity of any potentially air-polluting industry, including oil and gas refineries, chemical production facilities, and metal smelters. An OPSIS open-path system is very well suited for this application since it captures the average concentrations along the optical measurement paths, and not just concentrations in sampling points which might not catch what happens at other positions along the fence.

A fence-line system can serve at least three different purposes, all which can be fulfilled with a single monitoring system:

- To act as an alarm system in cases of accidental releases of air pollutants,
- To allow back-tracking of the pollutants to the sources of emissions for further actions, and
- To assess the air quality in general.

As in the benzene fence-line regulation case, the driving forces for monitoring can be directives from national environmental authorities, but it can also be on initiative from local governments or the industry itself. In either case, the overall purpose is usually to protect the human health.

Fence-line monitoring at Sohar Port, Oman.

The pollutants to monitor depends on the type of industry. In the refinery case, the concentrations of one or more lighter hydrocarbons can be of interest. Often, all potentially existing pollutants cannot be monitored, but it can be sufficient to select one or a few significant pollutants and allow those to reflect the general status of the air. That is the case in the U.S. EPA fence-line regulation where benzene has been selected as the gas to survey. There can be other hydrocarbons in the air too, but benzene is considered to represent them all.

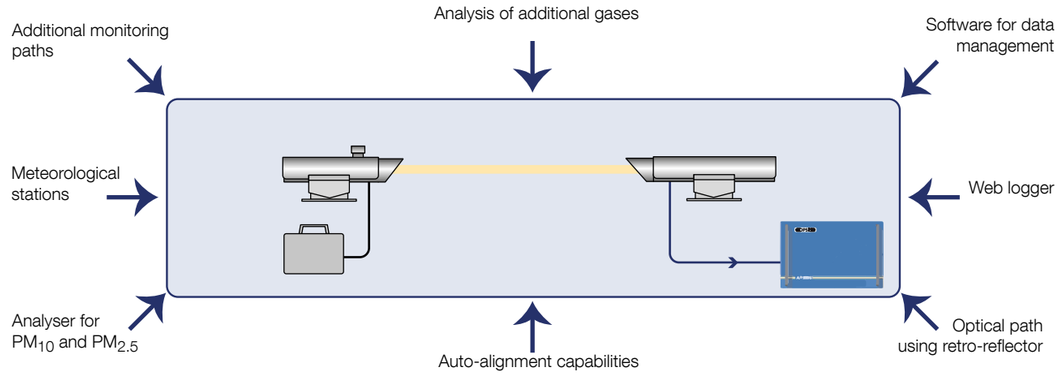
Benzene can be of interest to monitor not only around refineries, but, depending on the production process, also at chemical industries in general. However, here, the choice of monitored pollutants can also be quite different. By example, around a fertilizer production facility, it should be more relevant to monitor ammonia (NH_3) and possibly hydrogen fluoride (HF). Around metal smelters, it is most likely sulfur dioxide (SO_2) or perhaps HF that would be the prioritized parameter to keep track of.

While at it, the added cost to monitor other ambient air quality parameters too, like ozone and nitrogen dioxide, is relatively small. That’s why a fence-line station very well can double as a general air quality monitoring station. However, a practical price to pay for adding more gaseous substances to monitor is a potential lag in response time if the concentration of a specific pollutant suddenly rises. Time-critical systems aimed at issuing alarms in case of increased levels of a specific pollutant should therefore be dedicated to that pollutant only, or possibly just a few prioritized ones.

Combining the gas monitoring equipment with meteorological data including wind speed and wind direction allows in-depth studies of the sources of emissions of pollutants. It can be a matter of estimating the emission rates from known sources, but it can also be used to detect unknown leakages in pipes and valves used in the production process. The results can thereby be not only of environmental interest but also of importance to production quality and economics.

Over the years, OPSIS has successfully supplied multiple systems for fence-line monitoring, both around refineries, fertilizers, smelters, and other types of industries.

A recent large order includes fence-line monitoring of benzene, NH_3 and non-methane hydrocarbons (NMHC). It is to be installed around a large chemical production facility where a multitude of substances are produced, hence the spread of parameters. The system solution is a bit special owing to requirements on parameters, detection limits and response times. OPSIS AR500s (UV DOAS) will monitor benzene, LD500s (TDL) will monitor NH_3, and AR550s (IR-DOAS) will monitor NMHC, and each analyser has its own monitoring path. We hope to get back to you in an upcoming issue of On the Beam with a closer look at this installation.



A basic open-path ambient air quality monitoring system with a selection of available options.

OPSIS Exhibits in Gothenburg

OPSIS attended the annual Swedish exhibition ProcessTeknik (“process engineering”) in Gothenburg at Svenska Mässan (“Swedish Exhibition and Congress Centre”). The event was held October 9-11, with over 300 exhibitors. Among other things, we presented our Real Driving Emissions system RD100 and Hot Wet Extractive System for H_2S monitoring. Our presence resulted in many interesting discussions and new acquaintanceships, and the exhibition was a very successful event!

By: Ulf Gustavsson

OPSIS staff (facing the camera) from left to right: Ulf Gustavsson, Pehr-Christian Pehrson, and Ulf Stavare.