Duncan Johns, Managing Director of Ion Science discusses how the previously secret documents that have come to light in lawsuits filed against benzene manufacturers and suppliers are likely to impact the petrochemical industry. He also looks at the latest technology available for the implementation of new standards proposed by the US Environmental Protection Agency for the monitoring and control of benzene concentration levels around the perimeter of all US oil refineries.

Benzene is formed from both natural and human processes and it is a critical industrial chemical. It is a constituent of crude oil and becomes gaseous during petrochemical processing. Benzene is extremely hazardous and a recognised human carcinogen.

Aromatic compounds produced by oil refineries and petrochemical plants form the building blocks for numerous important materials, including dyes, detergents, solvents, adhesives, plastics, synthetic rubbers and pharmaceuticals. However, the aromatic compounds produced in these environments, such as benzene, are also highly toxic. Benzene is formed from both natural and human processes and it is a critical industrial chemical. It is a constituent of crude oil and becomes gaseous during petrochemical processing. Benzene is extremely hazardous and a recognised human carcinogen.

Exposure to high concentrations in the 10,000 to 20,000 parts per million (ppm) range will result in death, whilst chronic exposure to ppm levels significantly increase the likelihood of leukaemia. Exposure to high concentrations in the 10,000 to 20,000 parts per million (ppm) range will result in death, whilst chronic exposure to ppm levels significantly increase the likelihood of leukaemia.

As this exposure limit is so low, its concentration alone usually defines the toxicity of vapours in the petrochemical industry as a whole. As a result, it is essential that sub ppm benzene concentrations can be measured rapidly in the presence of the hundreds of aromatic and aliphatic compounds encountered throughout the industry.

Latest Developments

The Centre for Public Integrity (CPI), Columbia University's Mailman School of Public Health and the Graduate Centre at the City University of New York have teamed up to make some 20,000 pages of benzene documents that have surfaced during litigation open for public inspection. A new searchable database (http://www.publicintegrity.org/2014/12/04/16319/exposed-decades-denial-poisons) archives previously secret oil and chemical industry memoranda, emails, letters, presentations and meeting minutes that will grow over time.

In a recent article in The Guardian, Kristen Lombardi from the CPI said that “these suggest that major petrochemical companies, in conjunction with their trade association, the American Petroleum Institute (API), spent at least $36 million on research, which was ‘designed to protect member company interests,’ as one 2000 API summary put it, and keep further restrictions at bay”.

Kristen went on to say that “many of the documents chronicle a systematic attempt by the petrochemical industry to influence the science linking benzene to cancer and childhood leukaemia in particular”.

In May 2014, the US Environmental Protection Agency (EPA) estimated that some five million Americans, not counting those with workplace exposures, face heightened cancer risks from 68 other carcinogens released into the sky by the nation’s 149 oil refineries. This is greater than a one in one million lifetime cancer risk (Table 10 pg.277).

Making it clear that the cancer and other health risks posed by petroleum refineries on nearby communities are not being exposed to hazardous air pollution. This proposal would also set maximum achievable control technology standards for delayed coking units, which the EPA described as a “significant” unregulated source of hazardous pollutant emissions at refineries.

The EPA said it anticipates the proposal will have a “minimal” economic effect on the refining industry but could reduce emissions of hazardous air pollutants such as benzene and xylene by an estimated 5,600 tons per year.

The API and American Fuel & Petrochemical Manufacturers both released statements following the EPA’s announcement questioning whether the costs associated with the proposal are justified by the expected reductions in air emissions. The API also said these new proposals “will dramatically increase the paperwork and recordkeeping burden on refineries and cost both released statements following the EPA’s announcement questioning whether the costs associated with the proposal are justified by the expected reductions in air emissions. The API also said these new proposals “will dramatically increase the paperwork and recordkeeping burden on refineries and cost...”

Sampling options for refinery perimeter monitoring vary depending on monitoring objectives. Recommendations range from placing samplers every 15° around the plant (25 sampling periods are likely to occur) depending on monitoring objectives. Recommendations range from placing samplers every 15° around the plant (25 sampling periods are likely to occur).
The Geotech GEM5000 was designed specifically for the landfill gas extraction application. Landfill gas composition (primarily methane and carbon dioxide, although company has built a large number of Mechanical Biological Treatment, Anaerobic Digestion and leachate treatment sites and operates many landfill and landfill waste Chasapopoulos, manager of the Thessaloniki Tagarades LFG to electricity plant.

allows us to take fast, reliable measurements and to adjust the Tagarades landfill gas field to optimise operation of the power plant," comments Mr. Christos (UK) landfill gas analysers over the last 20 years, including the GA94 and GA2000. "The GEM5000 is a leading biogas analyser that Helektor has used station before reaching the engines. The electricity produced is fed to the Greek power grid from a 20kV station.

landfill gas, drawn from boreholes across the landfill site. Gas is pumped through a horizontal pipeline network and fed to a cooling, de-humidifying and cleaning

Waste Management Specialist Rates Portable Analyser for Landfill Gas Extraction Monitoring

Their four M9MW-Ducto TBO-632 V16 engines generate a total of 59MW. The site has been in operation since 2006, with power generation driven by 3000 m³/h of landfill gas, drawn from boreholes across the landfill site. Gas is pumped through a horizontal pipeline network and fed to a cooling, de-humidifying and cleaning station before reaching the engines. The electricity produced is fed to the Greek power grid from a 20kV station.

Heliktor has used Geotech’s (UK) landfill gas analysers over the last 20 years, including the GA94 and GA2000. "The GEMS5000 is a leading biogas analysers that allows us to take fast, reliable measurements and to adjust the Tagarades landfill gas field to optimise operation of the power plant," comments Mr. Christos Chasapopoulos, manager of the Thessaloniki Tagarades LFG to electricity plant.

"I particularly like the low weight and size, as well as the easy-to-read display", Mr. Chasapopoulos adds, "and would certainly recommend this analyser. "We have a fleet of Geotech’s analysers now and the GEMS5000 is a useful tool for our technical personnel to accomplish their work quickly and accurately in a demanding environment such as landfill. “ Heliktor also use the Gas Analyser Manager (GAM) software for download, analysis and evaluation of gas readings.

HELEKTOR S.A. is the Waste Management arm of the ELLAKTOR Group and a waste management specialist in South Eastern Europe, also active in Germany. The company has built a large number of Mechanical Biological Treatment, Anaerobic Digestion and leachate treatment sites and operates many landfill and landfill waste to energy sites. The Geotech GEMS5000 was designed specifically for the landfill gas extraction application. Landfill gas composition (primarily methane and carbon dioxide, although the analyser can measure up to six gases) and gas flow are measured. These are used to calculate a figure for the energy generated by the gas, shown in kW or BTU.