GAS DETECTION TO SUIT EVERY NEED

Stephen B. Harrison, from sbh4, explains the advantages of using gas detection sensors with networked communications (available from companies such as Teledyne) in the water treatment sector, where toxic gas hazards are ever-present

Part of a sewer network in Mumbai, India

Pure water is the most refreshing essence of life - essential for our health and wellbeing. On the other hand, the treatment of wastewater to produce clean water can present many hazards.

An integrated wastewater treatment facility will involve flammability and toxic gas hazards. Methane is produced by anaerobic microbes in the sewer and the early stages of the treatment process. The toxic gas hydrogen sulphide (H_2S) is also generated by bacterial action on the polluted water. At later stages in the process, oxygen enrichment and the presence of ozone may also present safety risks, if technologies using these gases are employed. Some water treatment plants rely on carbon dioxide for pH control. A build up of this gas can be toxic and may present an oxygen deficiency hazard.

When drinking water is being prepared, the use of the chemical gases: ammonia, chlorine and sulphur dioxide is common. Each of these gases is toxic and leak detection is essential to identify any emissions of these gases from storage and processing equipment.

To ensure the safety of employees and contract maintenance staff, portable gas detectors can be used as an element of their personal protective equipment. There are benefits of combining those portable detectors with fixed gas detection. Fixed systems help to achieve appropriate levels of process automation to reduce operating costs and manage risk within minimal operator intervention.

With such a broad range of gases to be detected, an integrated gas detection network is ideal for a water treatment plant. "For new-build water treatment facility projects a hard-wired gas detection and alarm network can be planned into the construction phase," said François Ampe - Product Line Manager EMEA at Teledyne Gas and Flame Detection. "On the other hand, when a site wishes to upgrade their gas detection network to comply with modern safety standards, a wireless network can be more cost-effective to retrofit. It avoids the risk, cost and change management process of digging new trenches and laying additional cable racks."

As an example of a wireless compatible gas detection network management system, Teledyne's Model X40 Integrated Alarm & Control System is designed to monitor multiple gas detection sensors as a Modbus Master. It is field programmable and offers intuitive, embedded intelligence. The control system displays real time readings and field device status on a backlit LCD screen. During normal operation the alarm status, gas type and concentration for up to eight gas detector sensors are displayed sequentially.

Water treatment plants are often unmanned sites in remote locations and maintenance can therefore be expensive. Careful product selection can minimise the lifetime ownership cost of the gas detection system.

Ampe continued: "...the air at a water treatment facility often contains traces of H_2S gas. In addition to presenting a toxic hazard to the operators and a smell nuisance to nearby residents, H_2S is corrosive to metals such as steel, copper and brass. The use of stainless-steel gas detection sensors is therefore recommended to ensure the longevity of the system and minimise maintenance costs."

Stainless steel gas detection sensor housings are slightly more expensive than alternative materials of construction on day one, but they will pay for themselves within a short period because they last longer: reducing the materials and labour costs of servicing and maintenance.

The Teledyne MX40 Controller and BM25 Area Gas Monitor (Copyright Teledyne)

The range of gases that need to be detected in a water treatment facility calls for a wide rage of gas detection sensor technologies. Electrochemical sensors are used to monitor oxygen deficiency or enrichment. They are also suitable to detect the presence of low levels of toxic gases such as H_2S and chlorine.

Semi-conductor sensors are used where higher concentrations of H_2S may be present or where the ambient temperature is high – they have a longer operating life under these harsh conditions.

Catalytic sensors are used for the detection of explosive gases such as methane, which can be produced in the sewer or in anaerobic sludge digesters. Alternatively, infrared sensors can be used for the detection of explosive gases such as methane or carbon dioxide.

Infrared (IR) sensors are recommended for corrosive atmospheres or where high levels of H_2S are present because continued exposure to a concentration of H_2S above 3 ppm risks saturation of standard catalytic sensors. On this point, Ampe said: "our IR sensor cells are not sensitive to poisons such as H_2S, so they last longer and can be guaranteed for 5 years: maintenance is reduced to only one annual test." He went on to say that: "on the other hand, the power consumption for the catalytic sensors is much less than for IR, only 150mA compared to 250mA. Where solar power is used in remote locations to power the gas detection sensor network, this low power consumption is attractive. This kind of product selection advice helps our customers to choose a gas detection system that best fits their needs."

Sewer gases can be toxic and dangerous

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