Dissolved Ammonia Monitor Enables Continuous Measurement of Ammonia in River Water

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River water quality is assessed by the Environment Agency of England and Wales through the General Quality Assessment (GQA) scheme; it is essential that potentially harmful chemicals in river water are controlled.

Continuous monitoring of ammonia in river water is important for plant operations and environmental agencies around the world.

Ammonia is an important nutrient for plants and algae that reside in river water However, when river temperatures change, ionised ammonia changes to un-ionised ammonia gas. This can be fatal to fish and other water organisms in the river, therefore it is imperative that ammonia levels are continuously monitored.

Water quality is also important for water treatment plants using river water as the water source. High ammonia levels in the inlet water cause major problems in the disinfection process. By successfully measuring the ammonia content in river water at inlets to water treatment plants, organisations are able to protect the inlet supply. In some applications, when ammonia levels hit unacceptably high levels the inlet can be closed.

Sources and Effects of Ammonia

People may be exposed to high levels of ammonia gas in air from leaks and spills at production plants and storage facilities, and from pipelines, tank trucks, railcars, ships, and barges that transport ammonia. Higher levels of ammonia in air may occur when fertiliser when ammonia or ammonium compounds are applied to farm fields. After fertiliser is applied, the concentration of ammonia in soil can be more than 3,000 ppm; however, these levels decrease rapidly over a few days.

Since ammonia, also occurs naturally in the environment, we are regularly exposed to low levels of ammonia in air, soil, and water. Ammonia exists naturally in the air at levels between 1 and 5 parts in a billion parts of air (ppb). It is commonly found in rainwater. The ammonia levels in rivers and bays are usually less than 6 parts per million (ppm; 6 ppm= 6,000 ppb). Soil typically contains about 1-5 ppm of ammonia.

Ammonia is a corrosive substance and the main toxic effects are restricted to the sites of direct contact with ammonia (i.e., skin, eyes, respiratory tract, mouth, and digestive tract). For example, if you spilled a bottle of concentrated ammonia on the floor, you would smell a strong ammonia odour; you might cough, and your eyes might water because of irritation. If you were exposed to very high levels of ammonia, you would experience more harmful effects. For example, if you walked into a dense cloud of ammonia or if your skin comes in contact with concentrated ammonia, your skin, eyes, throat, or lungs may be severely burned. These burns might be serious enough to cause permanent blindness, lung disease, or death.

Continuous Measurement of Ammonia in River Water

Current ammonia monitoring technology is expensive and complex, using ion selective electrodes and costly reagents, which are toxic and difficult to dispose of. These monitors are also non specific and require continuous calibration in order to suit different needs such as wastewater treatment, potable water treatment and measuring levels of ammonia in river water. Ion selective electrodes typically need daily zeroing and calibration using reagents.

Typical ammonia levels in river are often the parts per billion range a typical background ammonia concentration could be 50ppb and concentrations seldom rise above 5.0ppm.

Most technologies struggle to accurately measure low ammonia levels reliably and accurately.

A new technique based on chloramines measurement has been developed by specialist electrochemical sensor manufacturer Analytical Technology.

The Q45N Dissolved Ammonia Monitor achieves continuous, low level on-line monitoring of ammonia at the low levels found in rivers.

The Q45N Dissolved Ammonia Monitor avoids the shortcomings at low levels of conventional ammonia monitors through using a completely unique method. Ammonia is converted to a stable monochloramine compound, equivalent in concentration to the original ammonia level. The chloramine concentration is then measured with a polarographic membraned sensor that selectively responds linearly to chloramines. The stoichiometry of the reaction chemistry gives the monitor excellent sensitivity even at very low (ppb) ammonia levels. 1ppm of ammonia gives 5ppm of monochloramine. This means that a typical background concentration of ammonia of 50ppb of ammonia results in 0.25ppm of monochloramine, a concentration that is easily measurable.

Reagents are simple and inexpensive and their usage is low. The "by products "of the chemistry are very dilute monochloramine solutions and water. As a consequence the Q45N has a very low cost of ownership and no special requirement for reagent disposal.

The larger UK water companies and some Environment Agency of England and Wales approved laboratories are already using the Q45N monitor to effectively monitor ammonia levels in river water. This new ammonia system from Analytical Technology provides users with a monitor that is both simple to operate and economical to purchase, with low running costs and no measurement interferences.

For more information about the Analytical Technology Q45N Dissolved Ammonia Monitor for the continuous, on-line monitoring of ammonia in raw water, please call +44 (0)1457 873318, e-mail info@analyticaltechnology.com or visit www.analyticaltechnology.com

References:

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