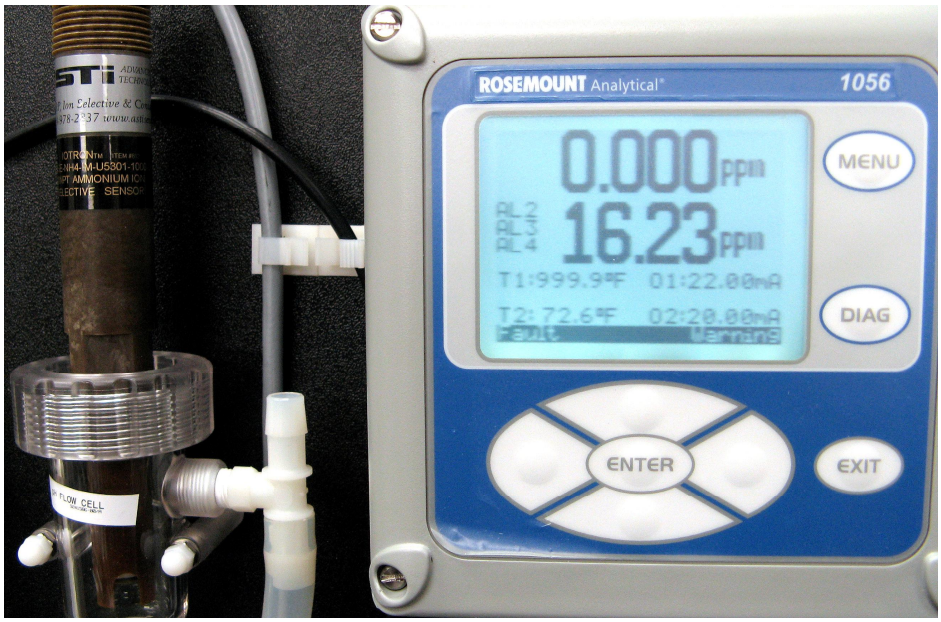
Features

- Guaranteed Longest Lasting Sensors Available with performance guarantee *
- Sensors are compatible with most existing pH/ORP Meters, Transmitters & Analyzers **
- Application Specific Engineering results in optimum Lifetime & Performance ***
- Integrated Temperature Compensation, Preamplifiers & Solution Ground Elements
- Solid State Reference System offers superior resistance to Fouling & Dehydration
- Applications such as Acid/Fluoride, Hi-Temp, Saturated Sodium and Sulfide Resistant are available as standard options
- Custom Applications are available, often at no additional charge
- Most Installation Styles are Supported Including: Immersion, Twist Lock, Valve Retractable & Sanitary
- Available in a wide range of plastics, from cost effective CPVC to thermally & chemically resilient ULTEM® and PEEK thermoplastic
- High Pressure Applications up to 100 psi for Valve Retractable & 150 psi for Inline Installations can be supported for continuous use
- Operating Temperatures from $^{-}30$ to $^{+}150$ ºC ($^{-}22$ to $^{+}302$ ºF) can be supported for continuous use

Case Study No. 17



Measurement of Ammonia and Nitrate in Municipal Wastewater for control of Nitrification and Denitrification Treatment Process

Advantages of the Advanced Sensor Technology real-time continuous online measurement systems for ammonia and nitrate

- Low Initial Procurement Cost compared to competing technologies and offerings
- No need for chemical feed and rebuilding of sensors
- Lower Cost of Ownership due to very long sensor lifetime, low maintenance & cleaning requirements for inline, immersion & submersion ion selective sensors
- Intuitive and easy to use Rosemount 1056 and 1057 analyzer programmed and configured for ammonia and nitrate ion selective analysis
- All new systems come preconfigured, precalibrated and fully qualified to install, plug-in and immediately place into service especially for compliance purposes
- Only periodic 1-point grab sample offsetting is required – this "Standardize" calibration can be performed WITHOUT removing sensor from service!

The Problem

A number of municipal wastewater plants are now using a variety of nitirification and denitrification type wastewater treatment systems to comply with various environmental and discharge limits (such as NPDES permits). The nitrification and denitrification process used can start with a number of nitrogen sources, but the simplified inorganic oxidation and reduction reaction sequence is commonly written as Ammonia (NH_3-N)> Nitrite (NO_2^-) > Nitrate (NO_3^-) > Nitrogen N_2 (off gas). Until now, the technologies to measure the two nitrogen species of greatest interest in such plants (starting ammonia and the oxidized product nitrate) have been only possible with expensive sampling analyzers that required reagents, and significant operator involvement to ensure nominal operation. The result has been the operator and time intensive method of periodic grab sampling to ensure that both the nitrification and denitrification systems are working within the appropriate limits continues to

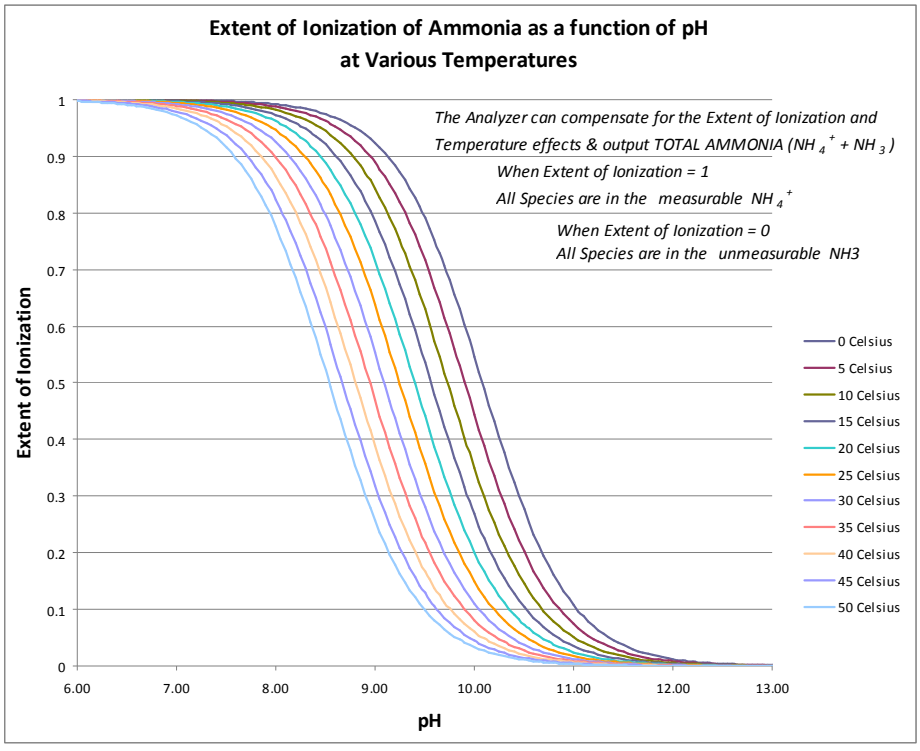
Features

- Guaranteed Longest Lasting Sensors Available with performance guarantee *
- Sensors are compatible with most existing pH/ORP Meters, Transmitters & Analyzers **
- Application Specific Engineering results in optimum Lifetime & Performance ***
- Integrated Temperature Compensation, Preamplifiers & Solution Ground Elements
- Solid State Reference System offers superior resistance to Fouling & Dehydration
- Applications such as Acid/Fluoride, Hi-Temp, Saturated Sodium and Sulfide Resistant are available as standard options
- Custom Applications are available, often at no additional charge
- Most Installation Styles are Supported Including: Immersion, Twist Lock, Valve Retractable & Sanitary
- Available in a wide range of plastics, from cost effective CPVC to thermally & chemically resilient ULTEM® and PEEK thermoplastic
- High Pressure Applications up to 100 psi for Valve Retractable & 150 psi for Inline Installations can be supported for continuous use
- Operating Temperatures from $^{-}30$ to $^{+}150$ ºC ($^{-}22$ to $^{+}302$ ºF) can be supported for continuous use

be used at most facilities. Process upsets due to the nitrogen load changing from the incoming wastewater or due to equipment malfunction can result in significant problems such as high nitrate discharges that can lead to problems with permits and other environmental issues. This issue can be particularly problematic with smaller and remote facilities that have less frequent operator presence due to personnel limitations. Often plants will have existing pH, ORP and DO measurement online to control the level of ammonia conversion to nitrate, and to define the period of anaerobic conversion of the nitrate to nitrogen off-gas. Although these processes are pH dependent, often this is not a critical control parameter due to the process pH stability (particular for larger systems). In some cases the ORP (oxidation reduction potential) can act a proxy for the ammonia/nitrate ratios in solution. Although ORP can sometimes serve as a good first order approximation for this ratio, it is highly dependent upon other components in the water and is very sensitive to pH and temperature. Lastly, since ORP is a ratio only measurement it does not provide any information about the ABSOLUTE concentration of neither ammonia nor nitrate.

The Solution

A dual or triple channel analyzer to continuously measure any of the following species of interest: ammonia a.k.a. NH_3-N or total nitrogen (in the ionized ammonium form at most wastewater pH), nitrate, pH and ORP. The dual and triple channel configuration makes the measurement very cost effective with the most common configurations being dual channel ammonium and pH and triple channel ammonium, pH and nitrate although other combinations are possible as well. The ability to measure in particular ammonia and nitrate online in real time with minimal calibration and cleaning requirements makes it possible to record and control the process between grab samples. Since the conversion of dissolved ammonia gas to the ionized ammonium form is a pH and temperature dependent process, ASTI offers the ability for this pH and temperature compensation to be performed in real-time to yield information about the total amount of free ammonia that is present (see below).



Features

- Guaranteed Longest Lasting Sensors Available with performance guarantee *
- Sensors are compatible with most existing pH/ORP Meters, Transmitters & Analyzers **
- Application Specific Engineering results in optimum Lifetime & Performance ***
- Integrated Temperature Compensation, Preamplifiers & Solution Ground Elements
- Solid State Reference System offers superior resistance to Fouling & Dehydration
- Applications such as Acid/Fluoride, Hi-Temp, Saturated Sodium and Sulfide Resistant are available as standard options
- Custom Applications are available, often at no additional charge
- Most Installation Styles are Supported Including: Immersion, Twist Lock, Valve Retractable & Sanitary
- Available in a wide range of plastics, from cost effective CPVC to thermally & chemically resilient ULTEM® and PEEK thermoplastic
- High Pressure Applications up to 100 psi for Valve Retractable & 150 psi for Inline Installations can be supported for continuous use
- Operating Temperatures from $^{-}30$ to $^{+}150$ ºC ($^{-}22$ to $^{+}302$ ºF) can be supported for continuous use

The Solution (Continued)

The online ion selective measurement system can be calibrated for 1-point offset without removing the sensor from service, making it ideal for low maintenance continuous use. The online ion selective measurement systems for ammonia and nitrate can readily be reference to most any grab sampling laboratory or portable method (including the popular colorimetric kits and existing sampling analyzers). Two-point calibrations need only be performed for new sensors in most cases once again minimizing the service and commissioning requirements. These ISE systems are available for a wide variety of installation styles and can be integrated into any modern PLC and DCS system. Sensors are available with a variety of options including preamplifiers for long cable lengths to 300 feet and fully submersible assemblies to interface with any process connections and configurations.

SENSORS USED FOR MEASUREMENT

Sensors for in Tank Installations with Standpipe for Immersion or Submersion (with waterproofing option) ***– 3/4”- 1” MNPT Immersion Sensor Body Configurations***

Model: AB 6410-1000-10-TL **Ammonium** Ion Selective Sensor
Description: Ammonium Ion Selective Sensor with 1000 Ohm Platinum Temperature Compensation Element; 10 feet cable to connect directly to 1056 or 1056 ISE Analyzers

Model: AB 6810-1000-10-TL **Nitrate** Ion Selective Sensor
Description: Nitrate Ion Selective Sensor with 1000 Ohm Platinum Temperature Compensation Element; 10 feet cable to connect directly to 1056 or 1056 ISE Analyzers

Model: PNZ 6052-1000-10-TL **pH** Sensor
Description: Industrial pH Sensor with 1000 Ohm Platinum Temperature Compensation Element; 10 feet cable to connect directly to 1056 or 1056 ISE Analyzers

Sensors for Inline Installations with Quick Disconnect Bayonet Style Fittings
- 1” MNPT Twist Lock Quick Disconnect Sensor Body Configurations

Model: AB 8410-1000-10-TL **Ammonium** Ion Selective Sensor
Description: Ammonium Ion Selective Sensor with 1000 Ohm Platinum Temperature Compensation Element; 10 feet cable to connect directly to 1056 or 1056 ISE Analyzers

Model: AB 8810-1000-10-TL **Nitrate** Ion Selective Sensor
Description: Nitrate Ion Selective Sensor with 1000 Ohm Platinum Temperature Compensation Element; 10 feet cable to connect directly to 1056 or 1056 ISE Analyzers

Model: PNZ 8052-1000-10-TL **pH** Sensor
Description: Industrial pH Sensor with 1000 Ohm Platinum Temperature Compensation Element; 10 feet cable to connect directly to 1056 or 1056 ISE Analyzers

ANALYZERS USED FOR MEASUREMENT

Model: 1056-XX-22ISE-32-YY (Ammonium / pH)
Description: Dual Channel Ammonium & pH Analyzer, Transmitter and Controller

Model: 1057-XX-22ISED-32-42ISED (Ammonium / Nitrate / pH)
Description: Triple Channel Ammonium, Nitrate and pH Analyzer, Transmitter and Controller

XX is the power supply option and YY is the output option (for 1057 only 4 each 4-20 mA output is available). ISE configuration must be specified at time of order. Complete ISE systems only available directly from ASTI as complete online measurement systems. Ion selective sensors are NOT available for sale without ISE analyzer as provided by ASTI. Application must be validated by ASTI factory prior to sale. References are available upon request.

Advanced Sensor Technologies, Inc.
Tel: + 1-714-978-2837
Orange, California USA
Web: www.astisensor.com