

ChemScan®

PROCESS ANALYZERS

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ChemScan® Method Summary #57 Nitrite in Water or Wastewater

Nitrite Analysis Issues

Nitrite (NO_2) is not ordinarily found in high concentration in either surface water or in groundwater, but can be present as an intermediate step in the oxidation of ammonia or in the reduction of nitrate (NO_3). Nitrite is therefore commonly present in samples from biological processes such as nitrification, denitrification or biological nutrient removal (BNR). Nitrite concentration and trend in process samples can be used as an indicator of biological process efficiency.

Unfortunately, nitrite is not commonly measured as a process control parameter because of difficulty with sample handling. Although some concentration of nitrite will be present in a process under steady state conditions, once a sample is extracted from the process, immediate analysis is required. If immediate (real time) analysis cannot be performed, oxidation or reduction processes may continue in the sample container unless continuously stored at 4°C. If analysis cannot be performed within 24 hours, acid preservation is usually recommended for biological process samples, but acidification of biological samples will convert any nitrite present into nitrate. This will not allow nitrate and nitrite to be determined in acidified samples as individual species.

Thus, if nitrite analysis is to be performed for biological process monitoring or process control applications, a real time (on-line) analysis is preferred.

Standard Nitrite Analysis

Standard methods for nitrite analysis include colorimetric and ion chromatographic methods. The colorimetric method requires addition of NED dihydrochlorite reagent to a filtered sample to produce a colored azo dye that can be measured photometrically. The method can only be used to reliably detect a few micrograms of nitrite, so extensive sample dilution may be required. Chromatography is subject to interference from high concentrations of ammonia or nitrate which are typically present in biological process samples. Neither method is well suited to on-line operation due to the need for frequent calibration and operator attention.

ChemScan Analytical Method

The ChemScan nitrite analysis method is based on the detection and analysis of the natural light absorbance signature for nitrite in the ultraviolet wavelength range. When nitrite is present in a liquid sample with nitrate and other chemicals, multiple wavelength pattern recognition techniques can be used to extract the contribution made by any single parameter to the total light absorbance signature of the solution, thus allowing nitrite to be detected as an individual parameter. This can only be accomplished if a large number (up to 30) of highly resolved individual wavelength measurements are used so that small changes in light absorbance patterns can be detected and compensation can be made for background chemistry in the sample. Visible wavelengths are also monitored to compensate for turbidity variations in the samples. ChemScan can not only detect nitrite as an individual parameter but can also use the light absorbance signature from a sample to detect nitrate and nitrite as individual parameters in the samples. This information can also be summed to produce a total oxidized nitrogen measurement for the sample.

The ChemScan nitrite analysis method does require one time on-site calibration using thirty or more site specific samples to characterize sample backgrounds and interactions with nitrite.

Monitoring System Requirements

Sample points and instrument location should be selected to minimize sample line distance. Water samples with suspended solids of 150 ppm or less and turbidity of 60 NTU or less will typically not require filtration prior to analysis. Wastewater samples extracted from points in the treatment process ahead of secondary clarification will generally exceed these specifications and will require filtration or settling prior to analysis. Wastewater samples extracted from points at or after the secondary clarifier will generally not require any filtration prior to analysis.

Multiple sample points can be monitored using one ChemScan analyzer plus a multiple sample line manifold.