Measuring H2S and Ions in Wastewater

Applied Analytics Application Note No. AN-028

Application Summary

Analytes: **H_2S** (hydrogen sulfide), **S^{2-}** (sulfide ions), **HS^-** (bisulfide ions)

Detector: OMA-300 Process Analyzer

Process Stream: wastewater

Introduction

In the context of petrochemical refining and wastewater treatment, water containing H_2S is referred to as "sour." The sulfide loading lends an unpleasant odor and makes the water corrosive. Additionally, the presence of H_2S in certain water pipes can serve as an indicator of equipment problems, e.g. heat exchanger leaks.

Wastewater treatment costs can be reduced if pipelines are protected from corrosion due to rising sulfide loading and if the injection of chlorine (to break down H_2S) can be optimized. Since the pH of the water determines how much of the H_2S is presently dissociated to ions, additional measurement of the ions would provide a much more accurate reading of sulfide loading in the water.

The OMA system applies the power of dispersive UV-Vis absorbance spectroscopy to this analysis. Water has no absorbance in the ultraviolet range so the process background is completely transparent to this system's signal. The full-spectrum 200-800nm acquisition is critical for isolating the absorbance curves of each analyte in the water.

Applied Analytics is the industry leader in real-time analysis of multiple sulfur compounds. We utilize this expertise to measure H_2S and its ions simultaneously in the water to produce a measurement with zero dependence on pH, thus providing a proven analytical solution for water streams where other analyzers have failed.

OMA Benefits

- Continuously measures sulfur compounds' concentration in water using dispersive UV-Vis spectrophotometer
- True multi-component measurement with no pH dependence
- Totally solid state build with no moving parts — modern design for low maintenance
- Fully automated using Auto Zero to normalize spectrophotometer on zero-analyte process water

pH and the Challenge of Sour Water Analysis

The traditional difficulty of this application is that, at a pH above ~8, most of the H_2S in the water will dissociate to sulfide ions. Correlating the dissocation to a pH measurement is a highly inadequate solution because pH sensors are known to struggle with sour water: H_2S poisons the reference electrode by causing silver ion precipitates, sometimes rendering the pH sensor useless within a single day of operation.

Accurate monitoring of H_2S + sulfides therefore requires a method with no dependence on pH reading.

Direct Multi-Component Analysis by OMA

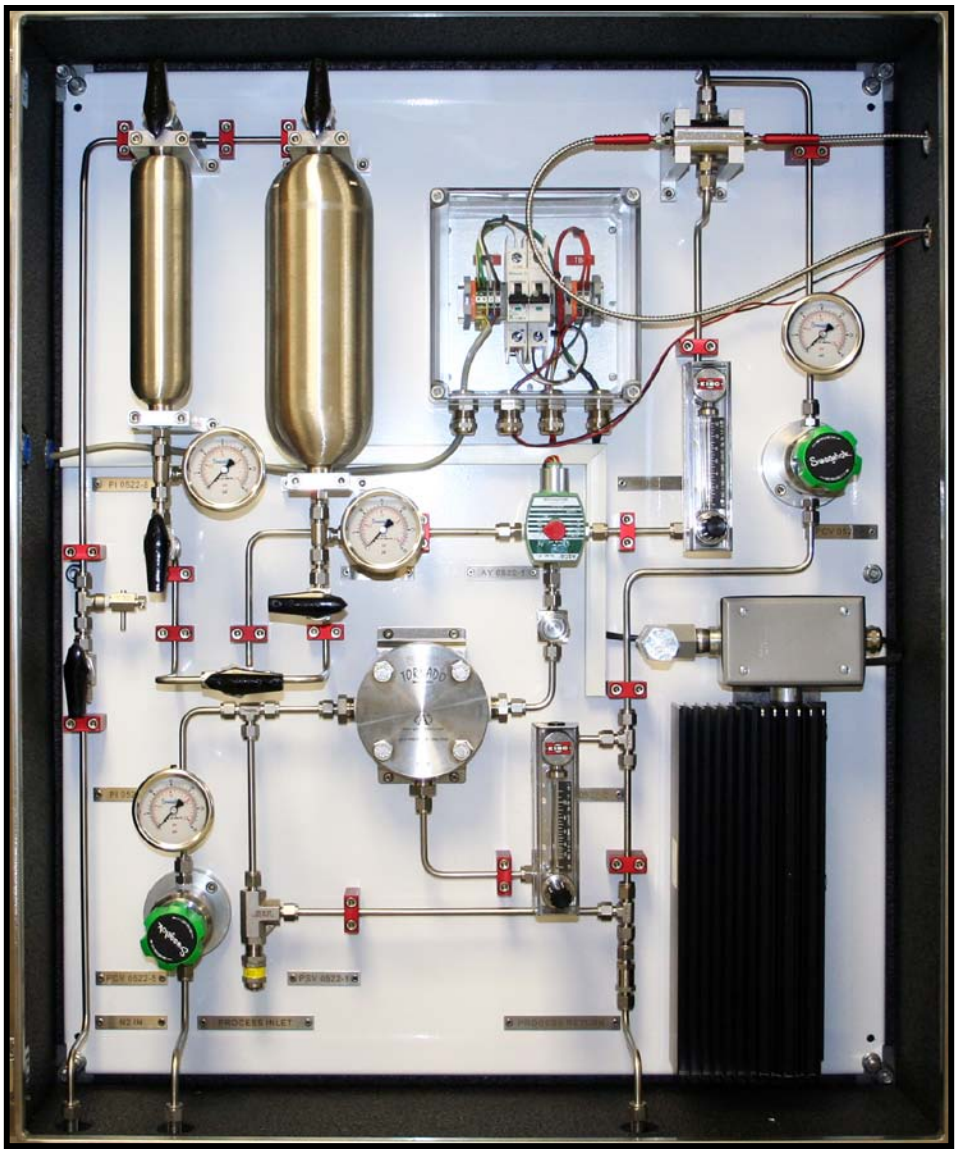
To perform analysis free from pH dependence, the OMA system directly measures the absorbance of each individual sulfur species simultaneously. Regardless of the current equilibrium between H_2S and its dissociated ions, the concentration of each species (H_2S, HS^-, S^{2-}) is reported along with a 'total sulfides' sum value.

To learn how the OMA performs multi-component analysis using high-resolution dispersive spectrophotometry, please visit:

http://www.a-a-inc.com/MultiComponentAnalysis.php

Example Sample Conditioner

The system pictured below was installed with an OMA-300 analyzer to monitor H_2S (0-5 mg/L) and sulfide ions (0-5 mg/L) in a basal water treatment process in Alberta, Canada.



The specifications below represent performance of the OMA-300 Process Analyzer in a typical wastewater application.

For technical details about the OMA-300 Process Analyzer, see the data sheet:
http://www.a-a-inc.com/documents/AA_DS001A_OMA300.pdf

All performance specifications are subject to the assumption that the sample conditioning system and unit installation are approved by Applied Analytics. For any other arrangement, please inquire directly with Sales.

Application Data		
Performance Specifications		
Accuracy	*Custom measurement ranges available; example ranges below.*	
	H_2S	0-10 ppm: ±0.5 ppm 0-100 ppm: ±1% full scale or 0.5 ppm* 0-10,000 ppm: ±1% full scale
	HS^-	0-10 ppm: ±0.5 ppm 0-100 ppm: ±1% full scale or 0.5 ppm* 0-10,000 ppm: ±1% full scale
	S^{2-}	0-10 ppm: ±0.5 ppm 0-100 ppm: ±1% full scale or 0.5 ppm* 0-10,000 ppm: ±1% full scale
		*Whichever is larger.

Further Reading

Subject	Location
OMA-300 H2S Analyzer Brochure	http://www.a-a-inc.com/documents/OMAH2S.pdf
OMA-300 Process Analyzer Data sheet	http://www.a-a-inc.com/documents/AA_DS001A_OMA300.pdf
Advantage of Collateral Data Technical Note	http://www.a-a-inc.com/documents/AA_TN-202_CollateralData.pdf
Multi-Component Analysis Technical Note	http://www.a-a-inc.com/documents/AA_TN-203_MultiComponentAnalysis.pdf

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