Measuring H2S in Flare Gas

Applied Analytics Application Note No. AN-032

Application Summary

Analytes: **H_2S** (hydrogen sulfide)

Detection Technology: OMA-300 H_2S Analyzer

Process Stream: flare gas

Typical Range: 0-300 ppm

Introduction

Gas flare stacks are used to burn off excess flammable gas in petrochemical extraction/refining operations, with the classic example of flaring extracted gas at an oil well to relieve an overpressure condition. This open air burning is under heavy scrutiny due to the high volume of emissions. H_2S present in the gas entering the flare will largely combust to SO_2, a heavily regulated pollutant and contributor to acid rain. H_2S levels in the flare and SO_2 emissions are regulated in the US by the EPA's 40 CFR 60.104 subpart J, which forbids burning any fuel gas containing H_2S in excess of 230 mg/dscm.

In order to heed these restrictions and their counterparts in jursidictions around the world, operators require a system for continuous monitoring of H_2S loading in their flare gas.

The OMA H_2S Analyzer is a proven solution for online H_2S measurement in demanding applications. Unlike TDL-based instruments and conventional photometers, the full-spectrum diode array based OMA monitors a wide concentration range and has no susceptibility to moisture interference.

OMA Benefits

» Continuously measures H_2S concentration in flare gas stream using dispersive UV-Vis absorbance spectrophotometer

» Totally solid state build with no moving parts — modern design for low maintenance

» Easily reprogram measurement ranges at any time for future legislation requirements

» interfering chemicals can be corrected for by AAI's multi components algorithm*

*Provide sample matrix to AAI for verification

APPLIED ANALYTICS

H₂S Absorbance Curve

Any single photodiode measurement is vulnerable to noise, signal saturation, or unexpected interference. This susceptibility to error makes a lone photodiode data point an unreliable indicator of one chemical's absorbance.

As accepted in the lab community for decades, the best way to neutralize this type of error is to use collateral data in the form of 'confirmation wavelengths,' i.e. many data points at many wavelengths instead of a single wavelength:
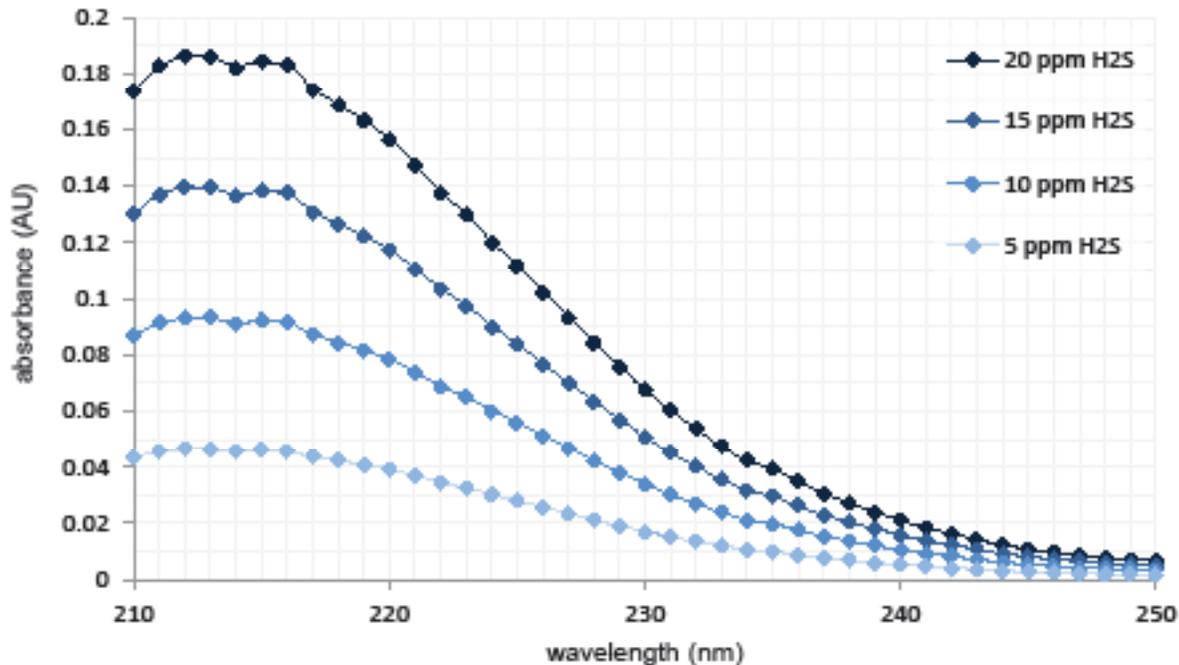
In the figures above, each diamond represents a single photodiode and data point. The Nova II registers absorbance at each integer wavelength within the 210-250 nm measurement range and produces an H₂S absorbance curve. After being calibrated on a full spectrum of pure H₂S, the OMA knows the absorbance-concentration correlation for each measurement wavelength; the system can average the modeled concentration value from each wavelength to completely eradicate the effect of noise at any single photodiode.

The OMA visualizes the H₂S absorbance curve in this manner and knows the expected relation of each data point to the others in terms of the curve's structure. This curve analysis enables the OMA to automatically detect erroneous results at specific wavelengths, such as when a single photodiode is saturated with light. The normal photometer, with a single data point, is completely incapable of internally verifying its measurement.

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

For technical details about the OMA-300 Process Analyzer, see the data sheet:
http://aai.solutions/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 (@10 bar): ±0.1 ppm 0-10 ppm (@1 bar): ±1 ppm 0-100 ppm: ±1% full scale or 1 ppm* 0-10,000 ppm: ±1% full scale 0-100%: ±1% full scale
		*Whichever is larger.

Subject to modifications. Specified product characteristics and technical data do not serve as guarantee declarations.

Further Reading

Subject	Location
OMA-300 H2S Analyzer Brochure	http://aai.solutions/documents/OMAH2S.pdf
OMA-300 Process Analyzer Data sheet	http://aai.solutions/documents/AA_DS001A_OMA300.pdf
Advantage of Collateral Data Technical Note	http://aai.solutions/documents/AA_TN-202_CollateralData.pdf

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