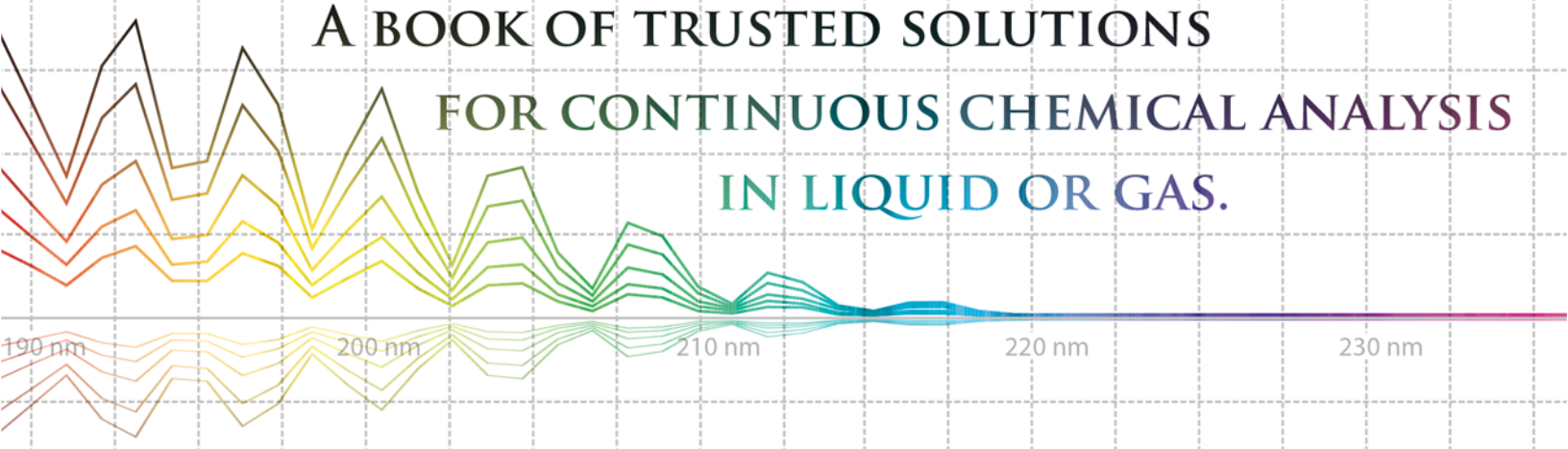
APPLIED™ ANALYTICS

A BOOK OF TRUSTED SOLUTIONS FOR CONTINUOUS CHEMICAL ANALYSIS IN LIQUID OR GAS.



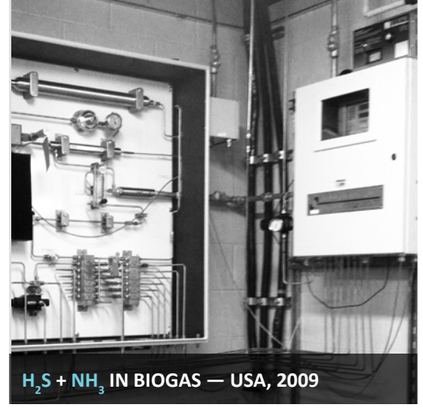
AN ABSORBANCE SPECTRUM IS A LANGUAGE WITHIN NATURE. EACH PEAK AND VALLEY SIGNIFIES THE QUANTIFIED PRESENCE OR ABSENCE OF A SPECIFIC CHEMICAL SPECIES. IF YOU CAN READ THAT LANGUAGE, YOU CAN READ THE COMPOSITION OF YOUR PROCESS STREAM AT A GLANCE — PROVIDING **A WINDOW INTO YOUR PROCESS.**


$H_2S + SO_2$ IN TAIL GAS — ARUBA, 2004

$NO_x + O_2$ IN STACK GAS — USA, 2012


$NO_x + NH_3$ IN SCR — USA, 2007

H_2S IN NATURAL GAS — USA, 2012

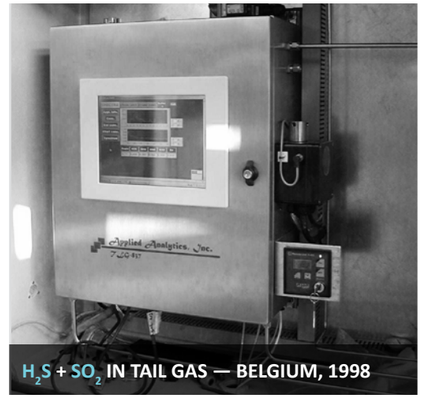

$H_2S + NH_3$ IN BIOGAS — USA, 2009

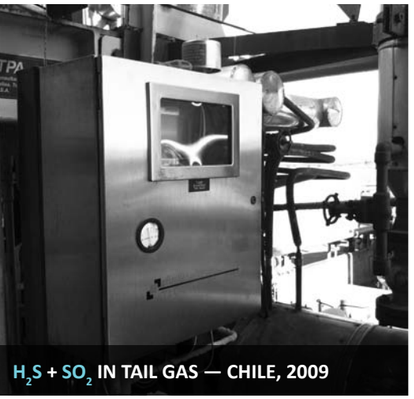

BENZENE IN NATURAL GAS — USA, 2010

$H_2S + SO_2$ IN TAIL GAS — BRAZIL, 2007

ODORANTS IN NATURAL GAS — USA, 2006

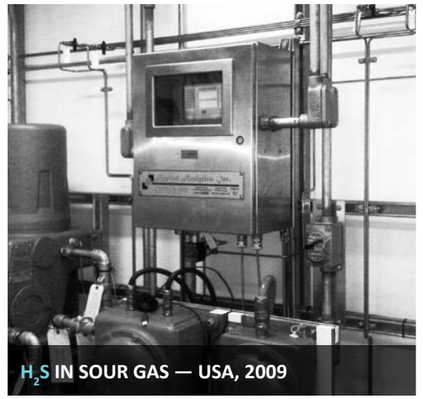

$H_2S + SO_2$ IN TAIL GAS — USA, 2009


$H_2S + SO_2$ IN TAIL GAS — BELGIUM, 1998


$H_2S + SO_2$ IN TAIL GAS — CHILE, 2009


H_2O IN LIQUID — SAUDI ARABIA, 2007


R-SH IN LPG — PERU, 2008


H_2S IN SOUR GAS — USA, 2009

H_2S IN SWEET GAS — PHILIPPINES, 2012


H_2S IN SOUR GAS — QATAR, 2005

H_2S IN CRUDE OIL — VIETNAM, 2012

Cl_2 IN TITANIUM OXIDE — CHINA, 2006


NH_3 AND UREA — USA, 2002


H_2S IN SALES GAS — NEW ZEALAND, 2005

Applied Analytics™

We are a global manufacturer of industrial process analysis equipment. Our customers depend on our systems to keep a vigilant watch over the quality of their product, illuminate hidden phenomena occurring in their process, reduce their harmful emissions into the environment, and ensure the safety of their workers in hazardous industrial environments.

We are proud to serve the industries that keep the world running — the oil refineries, the power plants, the wastewater treatment facilities, the chemical producers, the pharmaceutical innovators, the breweries, the environmental protection agencies — and meet their analysis needs with modern, automated solutions.

Applied Analytics has been operating in the greater Boston area since our incorporation in 1994. All of our products are designed and manufactured in the USA.

» OUR TEAM

AAI's specialized role as a provider of process analysis means that 100% of our focus is permanently dedicated to ensuring successful lifetime performance of every analyzer that we ship. Our project engineers have enormous experience with all types of applications and will guide you honestly towards the most practical and cost-effective analytical solution for your process.

» OUR TECHNOLOGY

We believe that, in the modern industrial plant, there is no longer a place for analyzers with moving parts, toxic consumables, or high costs of operation. All of our analyzers adhere to solid state design and use absorbance spectroscopy, the definite future of industrial process analysis.

» OUR SUPPORT

AAI maintains a comprehensive global support network. Our certified field engineers will always be available for site visits to assist with installation and commissioning, train personnel, and service the systems. Technical support by phone/email is included for the lifetime of the instrument.

OMA Process Analyzers

Continuous liquid/gas analyzers for a wide range of industrial applications.

A window into your process since 1994. Through continuous optical analysis, the OMA translates the UV-Vis / SW-NIR absorbance spectrum of a fluid to its real-time chemical composition and physical properties.

- » Dispersive high-resolution spectrophotometer
- » Solid state with no moving parts
- » Analyzes liquid or gas stream directly
- » Ultra-safe fiber optic design for handling toxic fluid
- » Scheduled Auto-Zero — no re-calibration in field
- » Measures up to 5 chemical species synchronously

Available Measurements Include:

H_2S	SO_2	COS	R-SH	NO_X	NH_3	Cl_2	NCl_3	$TiCl_4$	C_6H_6	color	BTX	• • •

What is the OMA?

The OMA is an industrial device which measures a high-resolution absorbance spectrum in a continuously drawn sample from a liquid or gas process stream. Harvesting this rich data, the OMA provides real-time analytics for the process stream, including chemical concentrations, purity, and color.

» What is Absorbance Spectroscopy?

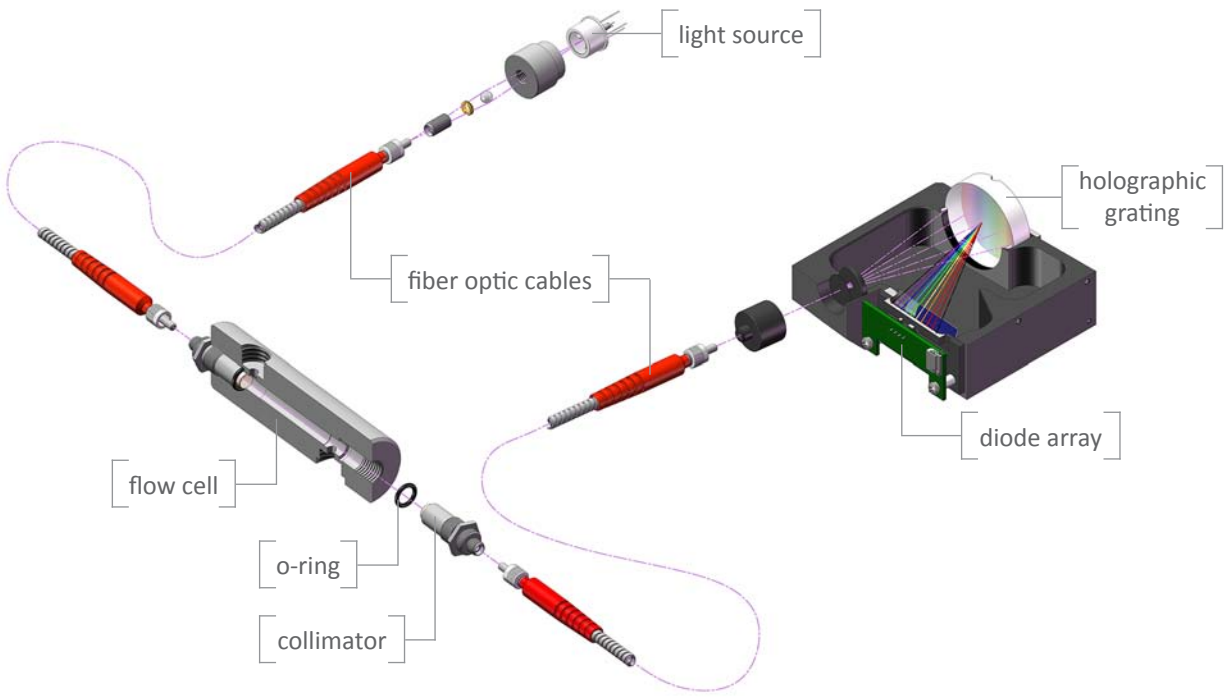
One of the ways in which light interacts with matter is absorption: a molecule absorbs specific wavelengths of radiation as a function of its unique electronic and molecular structures. The energies (wavelengths) of radiation that are absorbed match the energy quanta that are required to move that molecule between two quantum mechanical states. This is why each molecule absorbs radiation in a unique, recognizable way.

Absorption is quantified as absorbance, or the difference between intensity of the radiation entering the substance and the intensity of the radiation exiting the substance. Plotting the absorbance against wavelength creates an absorbance spectrum, which allows us to observe the shape (curve) of the absorbance. Each chemical species has a natural identifier in its absorbance curve that can be detected like a fingerprint.

According to Beer-Lambert law, the absorbance of a chemical in a mixture is directly proportional to its concentration. By measuring the height of a chemical's absorbance curve, an instrument can determine that chemical's concentration.

» OMA Principle of Operation

The optical assembly of the OMA is depicted below, illustrating the complete path of the signal.

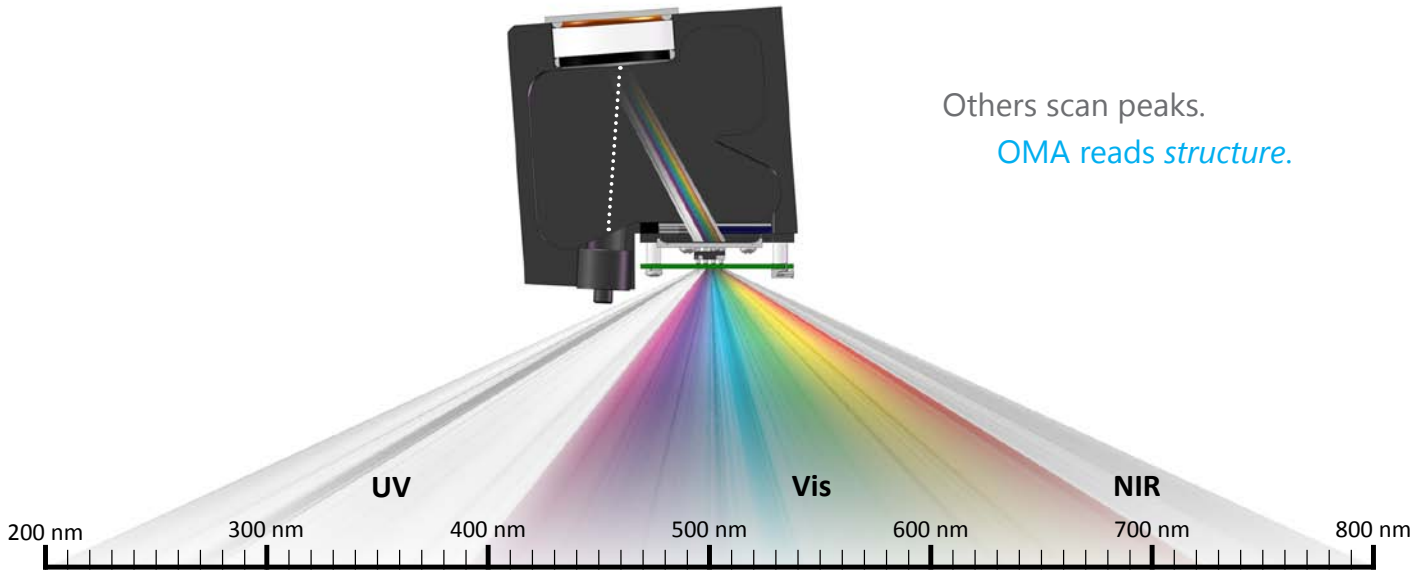


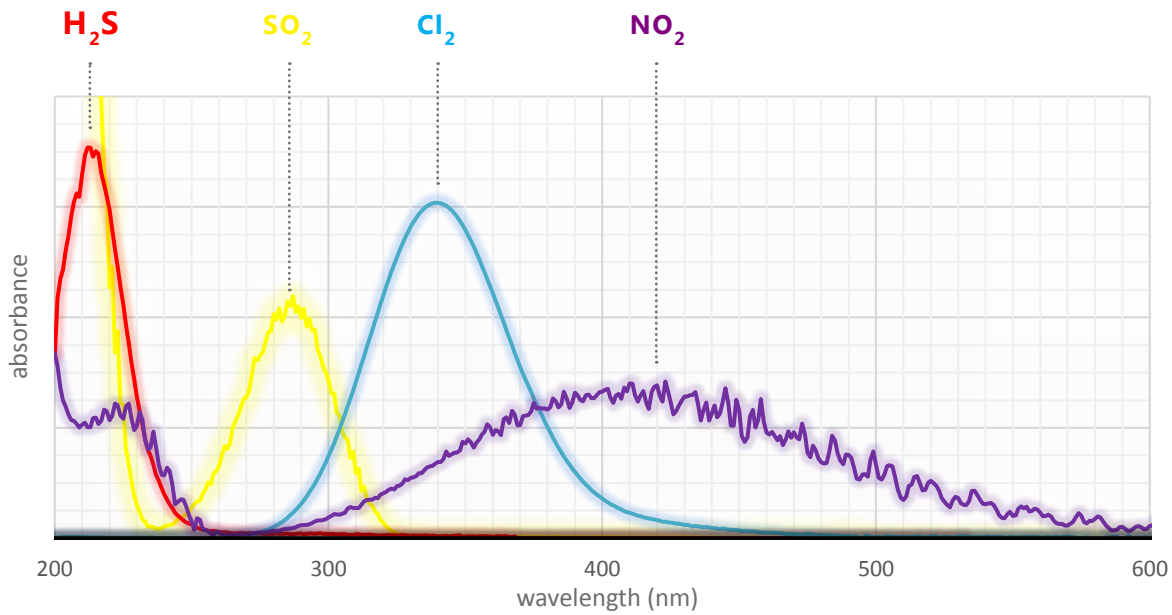
The signal originates in the light source and travels via fiber optic cable to the sample flow cell. Passing through the length of the flow cell, the signal picks up the absorbance imprint of the continuously drawn sample fluid.

While the single-wavelength photometer has only one data point and no contextual curve with which to verify the accuracy of that data point, the OMA uses statistical averaging of all the data points along the curve to immediately detect and ignore erroneous data from a single photodiode. By detecting the actual structure of the curve instead of peak absorbance, the OMA avoids false positives and provides superior accuracy.

» Full-Spectrum Analysis

A conventional 'multi-wave' photometer measures a chemical's absorbance at one pre-selected wavelength with one photodiode. This 'non-dispersive' technique uses an optical filter or line source lamp to remove all wavelengths but the pre-selected measurement wavelength. By contrast, the OMA uses a dispersive spectrophotometer to acquire a full, high-resolution spectrum. Each integer wavelength in the spectral range is individually measured by a dedicated photodiode.





The OMA visualizes the complete absorbance curve; this rich raw data enables far greater accuracy by eliminating noise and allowing robust multi-component analysis.

Standard
OMA-300 w/ carbon steel enclosure

Ultra Corrosion-Proof
OMA-300 w/ NEMA 4X fiberglass enclosure

Explosion-Proof (Ex p)
OMA-300 w/ NEMA 4X SS316 enclosure & purge

Explosion-Proof (Ex d)
OMA-300 w/ NEMA 4X cast-aluminum enclosure

Portable
OMA-206P w/ copolymer suitcase enclosure

Rackmount
OMA-406R w/ 19" rackmount enclosure

Freestanding Structure
OMA-300 w/ freestanding rack + sunshade

Cabinet
OMA-300 w/ total customization

OMA Series: different form factors, same trusted technology.

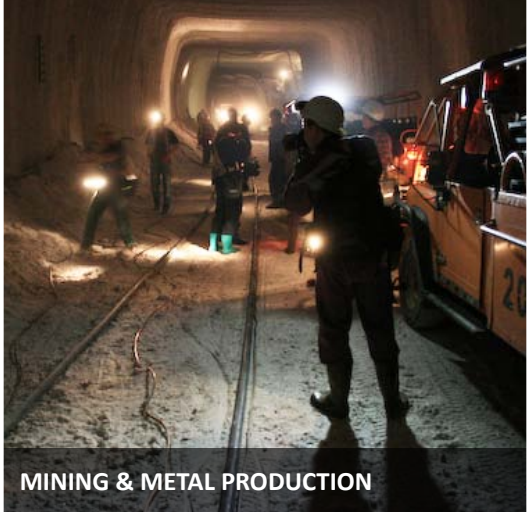
Available Certifications & Approvals

- CSA Class I Division 1
- CSA Class I Division 2
- ATEX Exp II 2(2) GD
- Gosstandart Pattern Approval
- Other certifications available — please inquire

Communication Protocols

- 1x galvanically isolated 4-20 mA analog output per analyte
- 2x digital ouputs for fault/relay control & user customizable alarms
- Alarms for high/low concentration — user customizable
- Optional: Modbus TCP/IP, RS-232, Fieldbus, Profibus, HART, and more


PIPELINES & ENERGY DISTRIBUTION


MINING & METAL PRODUCTION


FOOD & BEVERAGE INDUSTRY

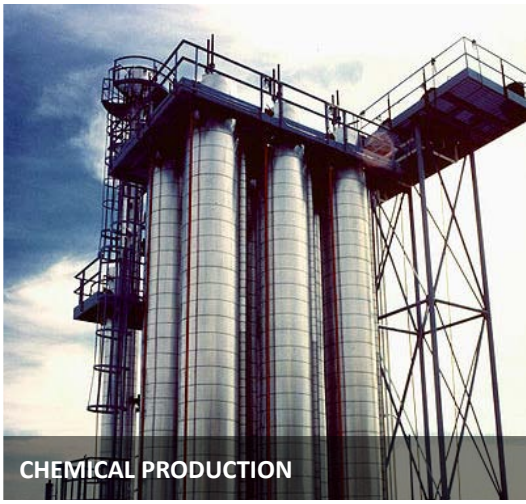

AVIATION & FUEL SAFETY


OFFSHORE OIL & GAS PRODUCTION


PETROCHEMICAL REFINING


POWER GENERATION


PHARMACEUTICAL PRODUCTION


CHEMICAL PRODUCTION

OMA Experienced Applications

Petrochemical
- crude oil
- natural gas
- sour water
- acid/sour gas
- lean/rich amine

Environmental
- emissions
- $DeNO_x$
- wastewater
- deicing fluid
- pondwater

Chemical
- TiO_2 paint production
- ethylene dichloride
- product color
- MEG
- polymerization inhibitors

Other Production
- clean-in-place
- vitamins
- metal ions
- seawater
- jet fuel

MicroSpec™ IR Analysis Module

A rugged and compact infrared photometer.

Available Measurements: | CO | CO_2 | CH_4 | C_2H_4 | H_2O |

From the MicroSpec series of modular analyzers comes the model MCP-200 continuous monitor for chemical species that absorb IR radiation. This ruggedized device pairs an NDIR photometer with a proprietary-design flow cell for excellent performance as an integrated piece or as a reliable standalone.

- » Compact modular form — turnkey installation
- » Solid state with no moving parts
- » Analyzes liquid or gas stream directly
- » SS316L flow cell body for harsh environments
- » Scheduled Auto-Zero — no re-calibration in field
- » Optimized path length per analyte & range

Standalone
w/ controller and sample conditioning
(pictured: 0-500 ppm moisture in liquid solvent)

Integrated
multiple units sharing one controller
(pictured: 0-5% CO, 0-30% CO_2, 0-30% O_2)

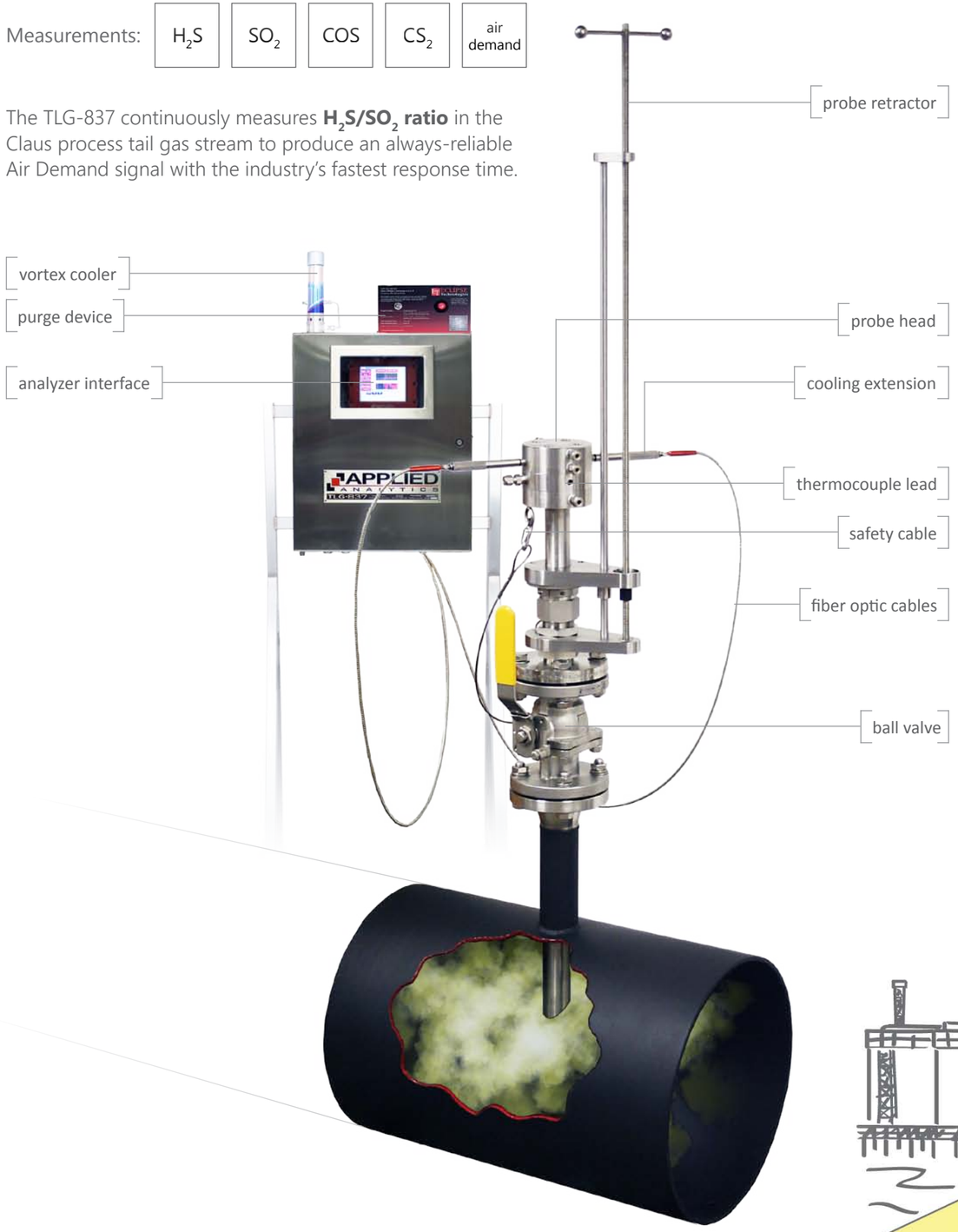
TLG-837 Tail Gas / Air Demand Analyzer

The world's **safest** tail gas analyzer for the sulfur recovery unit.

featuring the patented, sulfur-removing **DEMISTER Probe**

Measurements: H_2S | SO_2 | COS | CS_2 | air demand

The TLG-837 continuously measures **H_2S/SO_2 ratio** in the Claus process tail gas stream to produce an always-reliable Air Demand signal with the industry's fastest response time.

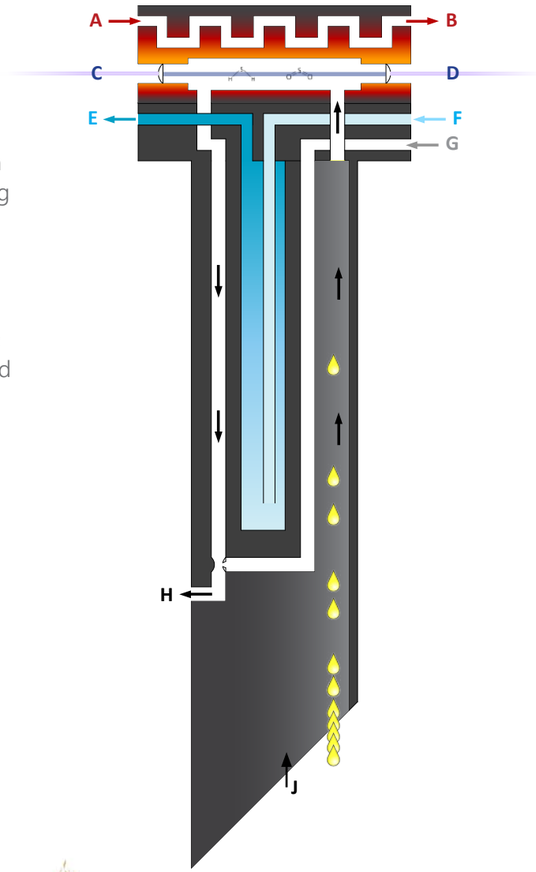


Tail gas contains elemental sulfur which is quick to condense and plug mechanical cavities or obstruct optical signals. The DEMISTER Probe removes sulfur from the rising sample as an internalized function within the probe body. Recycling the steam generated by the Claus process, the probe controls the temperature along its body at a level where all sulfur vapor in the rising sample condenses and drips back down to the process pipe.

Automatic Sulfur Vapor Removal

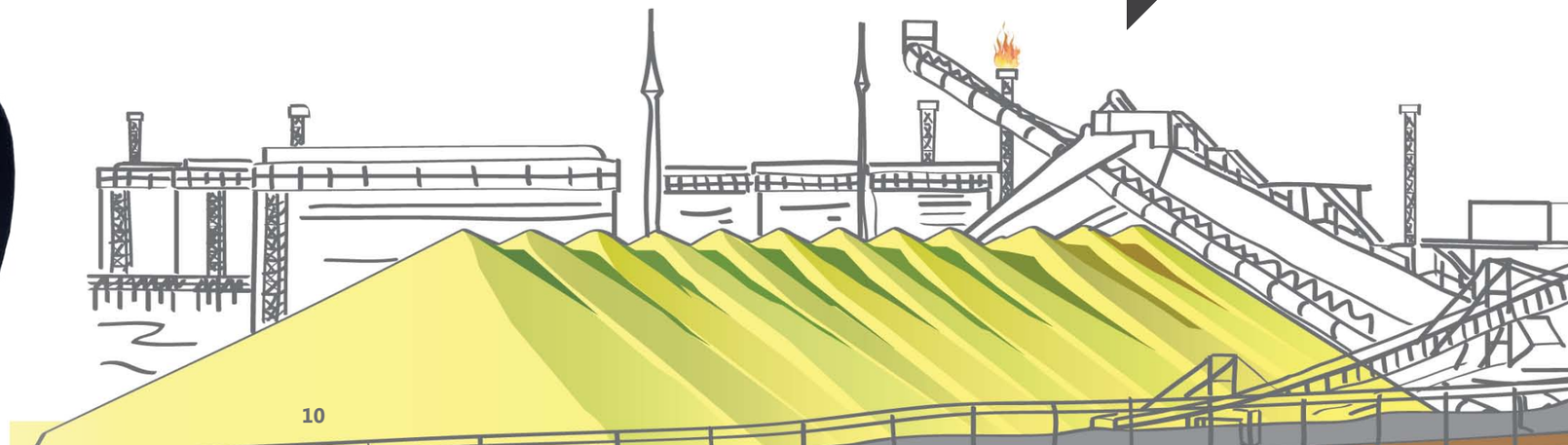
Inside the probe, an internal 'demister' chamber (concentric to the probe body) is fed with low pressure steam (see E & F). Since the LP steam is much cooler than the tail gas, this chamber has a cooling effect on the rising sample.

Elemental sulfur has the lowest condensation point of all of the components in the tail gas. Due to the internal probe temperature maintained by the LP steam, all of the elemental sulfur in the rising sample is selectively removed by condensation while a high-integrity sample continues upward for analysis in the probe head.



Schematic Legend:

(A) High-Pressure Steam In
(B) Steam Out
(C) Light Signal In
(D) Light Signal Out
(E) Steam Out
(F) Low-Pressure Steam In
(G) Aspirator Air In
(H) Sample Return Point
(J) Sample Entry Point
(💧) Liquid Sulfur Droplet
(→) Sample Route



Expert **Sample Conditioning**

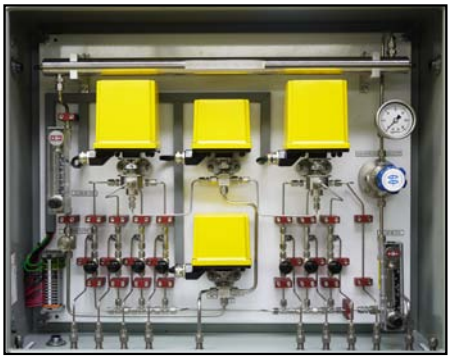
Optical measurement systems typically require that the sample undergo some conditioning to make it fit for the analyzer's method. Applied Analytics' systems are built for direct analysis without cooling/drying the sample: the OMA Series models use flow cells rated for extreme temperature and pressure, while moisture is transparent to the UV signal. This allows us to build far simpler, more elegant sample conditioning systems that retain high sample integrity and optimal response time.

In our experience, applications can be similar but rarely identical. That is why we always work from the process realities to the drawing board, building custom sample conditioning for each project.

Our core specialties include:

- Headspace sampling for analysis of opaque liquids like crude oil or dark wastewater
- Multiplexed systems for analyzing multiple sample streams with a single analyzer unit
- Close-coupled systems which mount onto a stack as a hybrid of cross-stack design and extractive design
- In situ probes for fast system response

Headspace SCS
0-100 ppm H_2S in crude oil



Multiplexed SCS
0-20 ppm H_2S in 7 streams

Ultra-Corrosive Sample SCS
0-50% Cl_2 and 0-30% NCl_3

Additional Solutions

OiW-100 Oil in Water Analyzer

Adapting the OMA design, the similar OiW-100 monitors oil (petroleum) concentration in effluent water. This system accurately correlates the 250-320 nm absorbance of aromatic hydrocarbons — a ubquitous ingredient of oil — to total oil concentration in real time.

CVA-100 Wobbe Index Analyzer

The CVA-100 analyzes calorific value in mid-process fuel gases by measuring O_2 in the sample before and after a conditioning furnace, correlating residual O_2 directly to Wobbe Index and CARI. Applications include natural gas quality assurance and flare optimization.

TSA-100 Total Sulfur Analyzer

In accordance with the ASTM method for total sulfur measurement, the TSA-100 controls pyrolysis of a liquid/gas sample to oxidize all present sulfur compounds to SO_2 for analysis. The oxidized sample enters the flow cell where it is continuously analyzed by the nova II UV-Vis Spectrophotometer.

MIX-2000 Digital Gas Mixer

The MIX-2000 Digital Gas Mixer uses thermal mass flow controllers for accurate, repatable production of complex gas mixtures. Designed for use by scientists and lab personnel, this device ships with a compact notebook PC loaded with MIX control software. The MIX-2000 enables you to mix up to 5 different gases simultaneously with no manual calculations.

ePurge X Purge Controller

The solid state ePurge X is a next-generation explosion-proofing device with fully automated purge and pressurization functions. Mounted directly on an electronics enclosure, this unit has an ultra-slim profile with less than one inch surface protrusion. A digital mass flow sensor self-regulates the purge duration.

Fiber Optic Cables

Our fiber optic cables are all manufactured in-house to ensure spectroscopic-grade quality. Production expertise includes presolarization for exceptional UV light transmission and steel cladding for durability in the field.

Applied Analytics™ is a registered trademark of Applied Analytics Group BV.

Headquarters + Manufacturing
Applied Analytics, Inc.
Burlington, MA, USA
sales@a-a-inc.com

Europe Sales
Applied Analytics Europe, SpA
Milan, Italy
sales@appliedanalytics.eu

Asia Pacific Sales
Applied Analytics Asia Pte. Ltd.
Singapore
sales@appliedanalytics.com.sg

North America Sales
Applied Analytics North America, Ltd.
Houston, TX, USA
sales@appliedanalytics.us

Middle East Sales
Applied Analytics Middle East (FZE)
Sharjah, UAE
sales@appliedanalytics.ae

Brazil Sales
Applied Analytics do Brasil
Rio de Janeiro
sales@aadbl.com.br

India Sales
Applied Analytics (India) Pte. Ltd.
Mumbai
sales@appliedanalytics.in

BUILD A WINDOW INTO YOUR PROCESS

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