BAGGI®

When spectrophotometry meets the technical experience of 15 years in the field. This is

SensEvolution H2S.

We are proud to present the third generation of gas and liquid analysis system completely conceived, designed and built in-house, installable in all desulphurization and treatment/control plants for detection of sulphur and ammonia compound.

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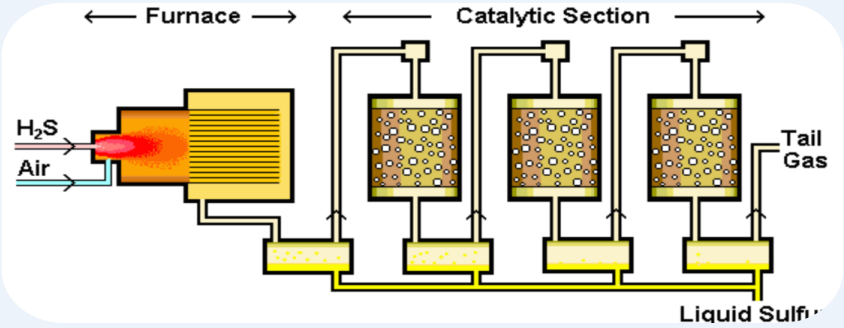
SensEvolution H2S

The SENSEVOLUTION H2S offers accurate measurements of H2S and SO2 concentration in the tail gas from a Claus process sulfur recovery plant (see drawing below). The instrument is based on a Ultra-Violet (UV) spectroscope that provides high wavelength resolution. The measurement technique relies on the Beer-Lambert law. This one is a relationship that relates the absorption of electromagnetic waves energy to the properties of the material through which the waves are travelling. The material (tail gas) is introduced in a sample cell of specific optical path length. The UV energy is transmitted to the cell via an optical fiber cable, it passes through the gas space and the residual energy is transmitted to the UV sensor by a second optical fiber. The analyzer is optimized for the following measurement ranges:

- H2S: 0 - 2 %
- SO2: 0 - 2 %
- H2S to SO2 ratio: -1 to 1

The analyzer is also able to calculate the Air Demand output signal, for driving the combustion air to the furnace. It is suitable for outdoors installation (ATEX zone 2).

Maintenance is reduced to a minimum due to:
Very long life UV Lamp.
Direct mount on the process pipe
Controlled sulphur condensation
Ruggedized components
Cell clean-up with instrument air
No moving parts
Self-monitoring
Calibration facility



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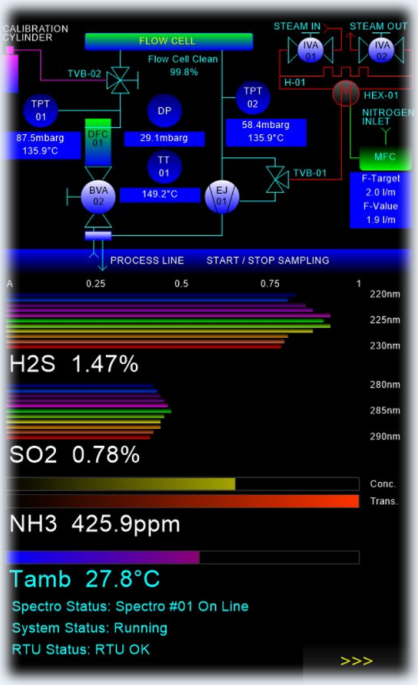
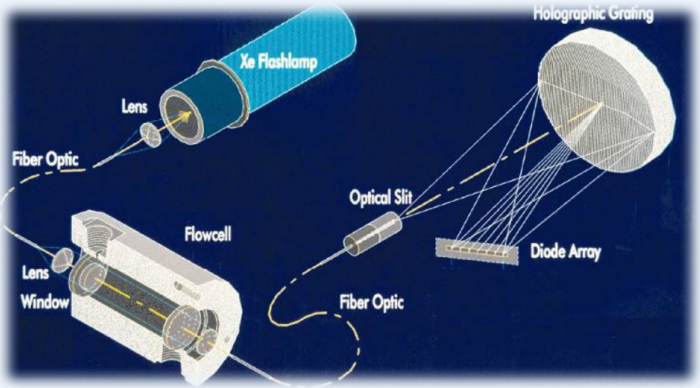
Introduction

The raw input data from the sensors (UV spectrophotometer) are processed by algorithms provided by BAGGI, running in an embedded computer that is the heart of the system. The computer, together with the sensors and the power supply, is within an enclosure provided with a protective purge system and a Vortex cooler (connected to the plant instrument air system). The following figure shows the computer's monitor with the functional keys:

- Actuating the UV lamp of the spectrophotometer
- Reading the electrical signals from the CCD array (related to the intensity of the absorbed UV energy)
- Calculating the concentration of H2S and SO2
- Calculating the combustion air demand
- Actuating the digital/analog conversion for output and the calculated values over 4...20 mA signals
- Actuating the output relays for indicating possible alarms
- Displaying the measurement output data in a Graphical User
- Interface (GUI) The spectrophotomer schema is shown:





The instrument is composed of an UV lamp and a diode array. The UV beam, after passing through the measurement cell, reaches a holographic grating disk. This one diverts each wavelength composing the beam onto a specific diode of the array. The voltage emitted by the individual diodes is measured and this information is acquired by the embedded computer through a serial line. There are no moving parts. The computer knows the amount of UV energy that has been transmitted by the lamp and is able to draw the absorption spectrum. Finally it calculates the concentration of the components

Another important component of the analyzer, in addition to the embedded computer and the spectroscope, is the sample probe. The sample probe has been designed to solve the common problem of sulphur clogging. In particular, the sample is taken from a small pipe inside the probe, its temperature is decreased by a heat exchanger to let the water vapor to condensate and fall back into the process. The sample is then heated to the same temperature of the process and passes through the measurement cell. The core analyzer (computer + spectroscope) can be mounted near the sample location on a self standing skid. The connection from the core analyzer to the sample probe is made by two Stainless Steel armored fiber optics cables. The measurement cell is able to provide the following additional pneumatic inlets and outlets:

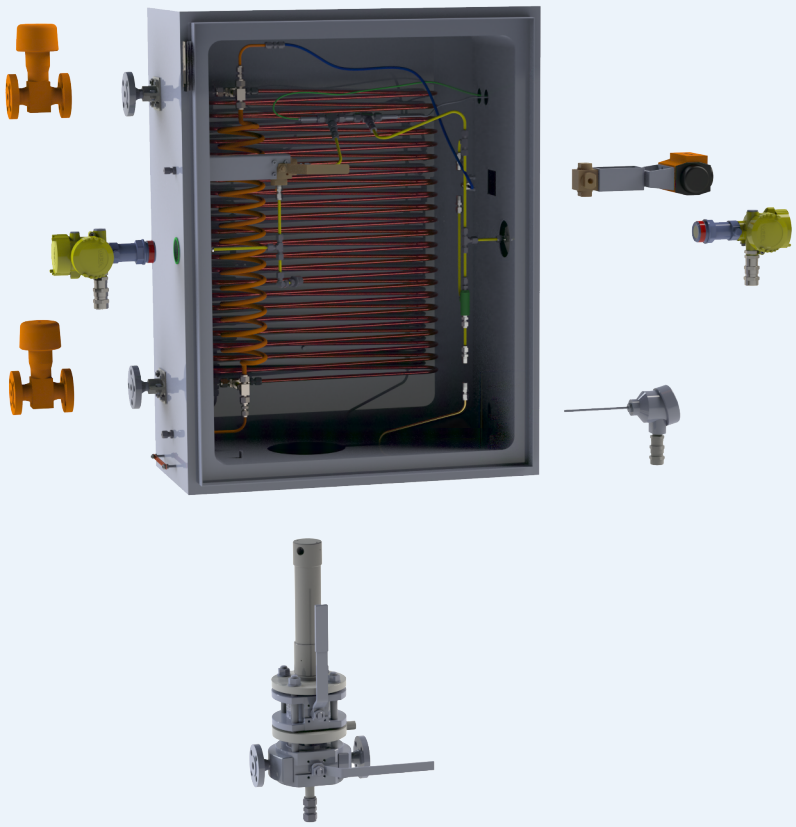
- Calibration gases from certified cylinders
- Instrument air for cleaning purposes (optional)

Key Applications

- Process Gases
- Combustion Gases
- Flare Gases

Markets

- Chemical and Petrochemical Industries
- Oil & Gas Industry
- Gas Turbines



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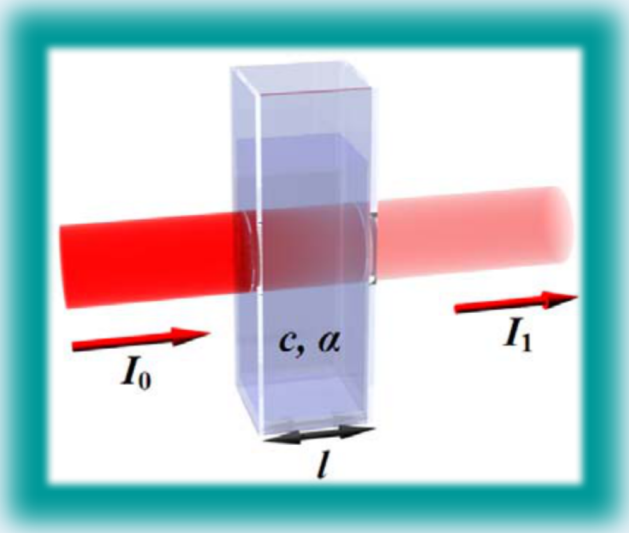
Principle of Operation

As anticipated, the measurement is based upon the Beer-Lambert law. This one is an empirical relationship that relates the absorption of light (or UV waves) to the properties of the material through which the light (UV) is travelling. The measurement is centered on the wave length where the investigated material has maximum energy absorption.



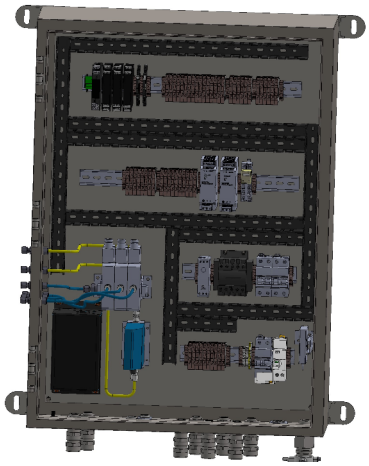
Key Applications

- **Process Gases**
- **Combustion Gases**
- **Flare Gases**

Markets ·

- **Chemical and Petrochemical Industries**
- **Oil & Gas Industry**
- **Gas Turbines**

In the figure above, $\mathbf{I_0}$ and $\mathbf{I_1}$ are the intensity of the incident signal and of the outgoing signal, respectively; **l** is the length of the path, **c** is the substance (e.g. H2S) concentration and **α** is a constant related to the substance. **α** can be written as: $\boldsymbol{\alpha = \varepsilon l}$ where **ε** is the molar absorptivity of the absorber (H2S). The following relation holds: $\mathbf{I_1/I_0 = 10^{-\varepsilon lc}}$ The transmission of the signal through the sample is expressed in terms of "absorbance", which is defined as: $\mathbf{A = -\log_{10}(I_1/I_0)}$ This implies that the absorbance is linear with the concentration: $\mathbf{A = \varepsilon lc}$ The analyzer establishes the intensity of the signal transmitted by the lamp of the spectrophotometer and measures the intensity of the signal received by a photodiode array. The signal is transmitted at wavelenghts where the absorbance of the measured substance is maximal. Then the application software calculates the concentration according to the measured values and the above formulas.

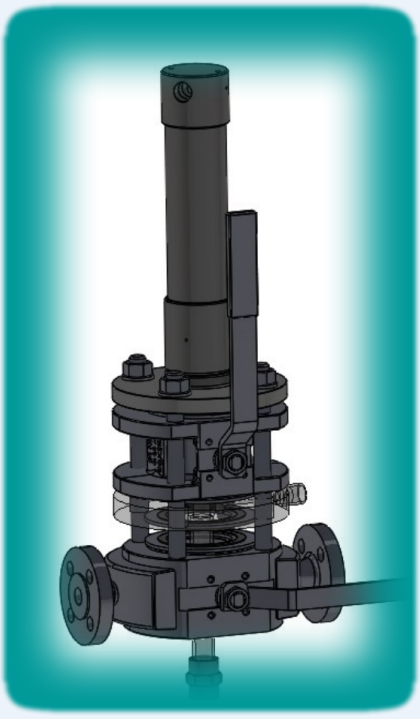


Electrical cabinet

Technical Specifications

Instrument Specification	
Power	90-264 VAC, 47-63 Hz; 6A max
Environment	0° to 40°C (32° to 104°F) - 0° to 55°C (32° to 131°F) with vortex cooler
Analogue Inputs:	- Four inputs filtered with transient protection
Analogue Outputs	4 – 20 mA
Digital Inputs	Six digital inputs
Digital Outputs	Eight isolated relay signals
Enclosure Protection	IP66
Compliances	- EN61326, EN61010-1 - ATEX (optional) II 2 G Ex px II T6 II 3 G Ex pz II T6

Tail Gas application	
Components range:	H2S 0-2% - SO2 0-2%
Accuracy	±1% F.S.
Repeatability	±0.5% F.S.
Sensitivity	±0.15% F.S.
Response time	90% of final value in 10 sec. (typical)
Services required	- Instrument Air - Steam pressure



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