H_2S Analysis in Sales Gas using TDL with Photo acoustics

The HLT Hilase TDL analyzer with photo acoustic detection is a proven and virtually maintenance-free online process analyzer for sales gas applications. For low ppm H_2S applications Hobré uses the concept of two measuring cells in series. One is used on process gas directly, the second on process gas coming from the scrubber. This scrubber is designed to have a lifetime of at least six months. The HLT Hilase is a big step forward in terms of technology, with a combination of features not available in any other analyzer on the market: no moving parts; full separation of the photoacoustic measuring cell from its electronics; stable calibration; a wide dynamic range; and close-to-zero maintenance. The Exd version can be supplied to meet ATEX, IECEx and CSA classifications.

Figure 1. Double cell configuration

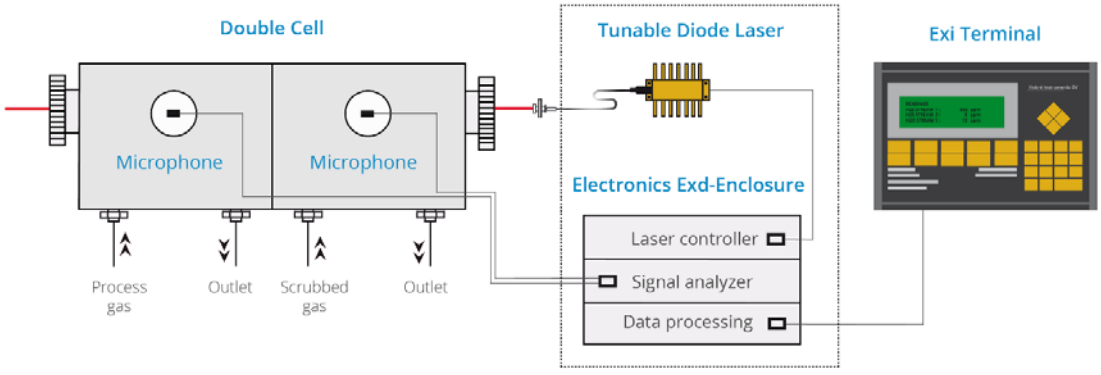

Figure 1 below shows a double cell configuration. To establish identical physical behavior through both cells, a dummy scrubber filled with glass beads is used on the process gas stream. The analyzer expresses the scrubber's saturation as a percentage.

The Exi terminal's software is designed in such a way, so it is possible to configure the unit for each application; single stream, multi stream or multi component. Control of two Hobré TDL analyzers with a single Exi terminal is also possible.

DUAL STREAM H_2S ANALYZER AT STATOIL KOLLSNES

In 2012 Statoil Kollsnes contacted Hobré about replacing two dual stream lead acetate tape analyzers, which measured H_2S in sales gas coming from the North Sea Sleipner and Draupner platforms. The desulfurized gas stream is monitored in a range of 0–5 ppm H_2S. Statoil replaced the lead acetate tape analyzers with two Hobré TDL dual stream 0–5 ppm H_2S analyzers, which have 0.3 ppm repeatability without the need for stream switching. During the design stage, Hobré took all existing locations for sample and vent lines into account to minimize the effort required for the modification. The TDL analyzers were installed halfway through 2014 and have been successfully in operation ever since.

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THE HOBRÉ TDL ANALYZER PRINCIPLE

A photoacoustic (PA) signal is generated by modulated laser light with a wavelength coinciding with that in the absorption band of the component to be measured. By absorbing light, the molecules are excited.

The temperature of the gas sample increases as a result of the absorbed light energy being converted into heat, and this in turn increases the pressure of the gas. Because the laser light is modulated, these temperature and pressure variations are periodic, which results in the formation of thermal and acoustic waves in the gas sample. Gas concentration measurement by PA spectroscopy is based on the detection of these acoustic waves, or sound signals. This sound is detected by a microphone.

The principal difference between the HLT Hilase and the optical TDL analyzers on the market is the sample cell and measuring principle. Optical TDL systems require a long path to be able to measure the light absorption accurately. An optical cell is about half a meter long and bounces the laser light onto approximately 20 critical mirrors, several times, to make sure the light absorption can be measured accurately enough. This means laser light intensity is lost, especially when the mirrors become contaminated over time.

By contrast the HLT Hilase uses a small cell, just 80 mm (approx. 3 inch) wide. The laser light passes through only once and the cell is not subject to contamination. A flow through the cell of only 150 cc/min at atmospheric pressure results in limited venting to the atmosphere and reduced environmental impact through hydrocarbon release. The only utility required is power.

Since the analyzer requires no regular maintenance, not even calibration, we initially positioned the analyzer on the market as a “black box” without an HMI like a sensor. However, multiple request from customers for an HMI helped us decide to provide the Exi Terminal as an option.

At the moment Hobré has multiple analyzers in operation in the range of 0–5 ppm H_2S in natural gas, fuel gas and recycled gas applications. This has even been extended with H_2O and CO_2 analysis.

Since CO_2 provides a strong absorption band which is very close to that of H_2S, the analyzer makes verifications such as wavelength check on the CO_2 signal. Due to the close absorption lines, CO_2 gives interference on the H_2S signal with all TDL technologies, especially when measuring gas containing low ppm H_2S. With low ppm H_2S, the HLT Hilase monitors both CO_2 and H_2S on a continuous basis.

In case the CO_2 in natural gas is too low, as is the case with Statoil Kollsnes, for the first month the analyzer is calibrated weekly, using gas containing 5% CO_2. After this, a monthly validation is sufficient, and later on even less frequent checks are enough to adjust the wavelength, assuming the analyzer is not turned off in the meantime.

Installed applications vary from monitoring the 5% to 83% CO_2 present in recycled gas at the FPSOs of SBM Offshore in the Brazilian Gulf, to measuring CO_2 levels below 1% in natural gas from Statoil in Norway.

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