H_2S Analysis for Sour Gas Treatment using TDL with Photo acoustics

In 2012 Vermilion Oil & Gas, the Dutch daughter company of the Canadian oil and gas producer, asked Hobré to provide a solution for measurement of H_2S in natural gas before and after the absorbers on their Weststellingwerf plant.

The application

Sour gas coming from Vermilion's De Hoeve Well contains H_2S concentrations of up to 1000 ppm. The Weststellingwerf plant has two absorbers to treat sour gas before transportation by pipeline to the Garijp Gas Treatment Center.

The desulfurized gas may not contain H_2S levels over 5 ppm. Vermilion selected the HLT Hilase TDL Analyzer, based on:

- Its wide dynamic range.
- The ability of a single analyzer to monitor both streams on a continuous basis.
- The elimination of stream switching.
- Its lack of moving parts, resulting in less maintenance.

The analyzer has been supplied with the following ranges:

- Stream 1 has a range of 0 – 1000 ppm
- Stream 2 has a range of 0 – 10 ppm

CONFIGURATION OF THE DUAL STREAM HOBRÉ HLT HILASE TDL ANALYZER

Stream 1

The 0–1000 ppm application is a straightforward solution containing a single cell with a single laser. The 80 mm (approx. 3 inches) cell is installed in a temperature-controlled GRP box. ATEX guidelines confirm the laser power entering the cell through the optical fiber is too low to be an explosion risk. Therefore, the system's sample-wetted parts are completely separated from its electronics.

A sample flow of only 150 cc/min at atmospheric pressure results in limited venting to the atmosphere and reduced environmental impact from hydrocarbon release.

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Stream 2

For the 0–10 ppm application Hobré uses the concept of having two measuring cuvettes (cells) in series. The first cell is used on process gas directly and the second on process gas coming from the scrubber. To ensure identical physical behavior through both cells, a dummy scrubber filled with glass beads is used on the process gas stream. As changes in the gas matrix are introduced simultaneously into both measuring cell and

reference cell, differential errors and long stabilizing times are avoided.

This differential measurement is performed in real time, so fast and frequent changes in the gas matrix will not disturb the measurement.

The special scrubber design of the Hobré TDL analyzer minimizes response time.

ANALYZER DESIGN AND SAMPLE HANDLING – BOTH ARE IMPORTANT

All gas-producing companies face the same issues when using analyzer sampling systems in natural gas processes:

- Excessive time lags between sample probe inlet and analyzer due to the internal volume of the probe, block and bleed valves, and other components in the sample line.
- Liquid carry-over problems.

To overcome these common problems, Hobré has developed the **Flow Impact Probe with the Close-Coupled Pressure Reduction system.** The system uses the gas velocity in the process pipeline to drive a fast loop through the probe, block valves and Pressure Reduction system inlet filter.

The proven benefits to gas producers are:

- Faster response time with 90% reduction in flaring and venting.
- No loss of heavy hydrocarbons with single-stage heated pressure reduction.
- No liquid carry-over problem and therefore less downtime.
- Reduced maintenance on the sampling systems and analyzers.
- The return pipe, in combination with the fast-loop bypass filter, protects the analyzer against entry of liquids.

CONFIGURATION OF THE VERMILION SAMPLE-HANDLING SYSTEM

For the sample take-off, Hobré supplied two Flow Impact Probes with Close-Coupled Pre-Conditioning Systems: one for the high range of H_2S and a second for the lower H_2S range.

The pre-conditioning cabinet can be directly mounted on the flange, which connects to the process stand-off. In this configuration there is no need for heat tracing of the probe nor the sample lines between probe and Pressure Reduction system. The process can be isolated by the use of two DBB valves.

From the pre-conditioning cabinet a low pressure and cleaned flow (at approximately 2 bar) can be routed via a heat-traced sample line to the analyzer cabinet.

Inside the analyzer cabinet a fast-loop filter is installed as a secondary stage of protection against liquid carry-over for the analyzer. With a final precision regulator and flow meter, the flow through the measuring cell is controlled at atmospheric pressure.

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