EnCal 3000 H$_2$S

- Dedicated H$_2$S measurement
- Combined heating value / H$_2$S measurement

Introduction

Desulfarization of natural gas is an important treatment performed on natural gas in order to make it suitable for transportation through pipeline networks. Depending on the source of the gas the sulfur content can vary from hardly any to very sour gas with high concentrations up to the 5 % level or more. High amounts of sulfur can be problematic because of the corrosive properties of for example H$_2$S in the presence of water. Besides this there is the human safety perspective; gas containing high levels of H$_2$S are unacceptable because it would be lethal when breathed in. To guarantee pipeline integrity or protection of gas turbines there are limits set to the maximum allowable concentration of sulfurs in natural gas. Sulfur can be present in several molecular forms of which H$_2$S is the most damaging form. Gasses containing high sulfur concentrations are refered to as "sour gas" and the process of desulfurisation is therefore called "sweetening" of the gas.

Technical application

The EnCal 3000 is an online gas chromatograph using the latest MEMS (Micro Electro Mechanical Systems) technology. Because of the modular concept of the EnCal 3000 it is possible to offer various applications within the same system just by swapping out analytical channels. For the measurement of H$_2$S there are several possible applications.

H$_2$S as a single component:
In case heating value measurement is not required or already present it is possible to use an EnCal 3000 with a single analytical module. The measurement will be dedicated to the measurement of H$_2$S only.

Since this application is focused on measuring H$_2$S only it has a lower limit of detection making it suitable for H$_2$S trace measurements in the low ppm range allowing measurement of H$_2$S in "sweet gas".

H$_2$S can have a demastating effect on gas turbines and gaspumps or compressors. It is extremely important to provide corrosion protection for the equipment in gas pumping stations and gas processing plants. In the presence of moisture and hydrogen sulfide, the rates of overall and chemical corrosion are several times higher; and hydrogen embrittlement and sulfide cracking of steel may occur. In centrifugal and piston compressors, when the gas comes into contact with the lube oil, conditions are created for diffusion of hydrogen sulfide into the oil, particularly favored by the high solubility of the hydrogen sulfide.

In sour gas the EnCal 3000 is able to measure the sulphur content in combination with the C6+ or C9 analysis. In these applications H2S concentrations may vary from 15 ppm to 1%. After the sweetening process the H2S concentration is so much reduced that the EnCal 3000's dedicated H2S application is required.

H$_2$S combined with heatingvalue measurement:
It is possible to measure H$_2$S in combination with the components which are required for the calculation of the heatingvalue. Combinations are possible with the standard C$_6$ analysis as well as with the extended C$_9$ analysis.

By combining heatingvalue measurement with H$_2$S measurement the EnCal 3000 offers a commercially attractive solution because costs are saved for a dedicated analyser for H$_2$S.

Upgrades of already installed analysers is possible. To do this one of the analytical channels in your EnCal 3000 must be replaced with a channel suitable for H$_2$S analysis. Besides this the calibration gas should be replaced with one containing H2S in the appropriate concentration. For more information please contact your local Elster-Instromet sales representative.

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Analyser specifications

	H$_2$S + Heating value	H$_2$S
Analytical hardware	2 parallel isothermal GC modules with narrow-bore capillary column technology in combination with MEMS based analytical components	1 isothermal GC module with narrow-bore capillary column technology in combination with MEMS based analytical components
Analysis output	Full composition of any natural gas up to C$_{6+}$ or C$_{9+}$ (option) + H$_2$S concentration Heating value, density, Wobbe index	H$_2$S concentration
Component range	N$_2$: 0 – 20 % neo-C$_5$: 0 – 0.25 % CH$_4$: 0 –100 % C$_5$: 0 – 0.25 % CO$_2$: 0 – 20 % C$_6$: 0 – 0.10 % C$_2$: 0 – 10 % C$_7$: 0 – 0.05 % C$_3$: 0 – 10 % C$_8$: 0 – 0.05 % C$_4$: 0 – 10 % C$_{9+}$: 0 – 0.05 % H$_2$S : 15 ppm – 1% Concentrations outside these ranges on request	H$_2$S : 1 ppm – 1%
Analysis cycle time	6 minutes for C$_{6+}$ analysis 10 minutes for C$_{9+}$ analysis	3 minutes
Performance H$_2$S analysis		
Detection limit	15 ppm	1 ppm
Repeatability (stdev)	1 ppm or 1% of measured value (whichever is bigger)	1 ppm – 10 ppm 0.2 ppm 10 ppm – 100 ppm 0.5 ppm 100 ppm – 500 ppm 2 ppm 500 ppm – 2500 ppm 15 ppm 2500 ppm – 1% 50 ppm
Performance heating value measurement		
Uncertainty Repeatability Min. detection limit	< 0.10 % for all calculated properties < 0.01 % for all calculated properties 1 ppm for C5	n.a. n.a. n.a.
Ambient conditions	Temperature: -20 °C to +55 °C (provided heated version is used)	
Dimensions	Base Ø 37 cm x Height 37 cm (Ø 14" x Height 14")	
Weight	< 30 kg	
Approvals	ATEX II2G E Ex d IIB T4 IP 66, vibration and shock test in accordance with IEC 60068-2-31 and 64 EMC according to EN 61000-6-2 and EN 61000-6-4 TB Metrological Certificate Reference No. PTB-3.31-4016861	
Power supply	24 VDC, 18 W nominal (50 W start-up peak) for non-heated version 24 VDC, 120 W nominal (170 W start-up peak) for heated version (ambient < 0 °C)	
Interfaces	Ethernet UTP 10 Base-T for ModBus TCP/IP and PC link Two RS 232/485 ports for ModBus RTU or ASCII 3 analogue Inputs for local sensors (4 – 20 mA or 0 – 10 VDC)	
Analyser	Complete stand-alone operation, including all calculations and generation of report formats, without need for operator intervention. Calculations in accordance with ISO 6976, GPA 2172 or GOST 22667	
PC requirements	Windows 2000 or Windows XP professional edition (Service Pack 1 or higher) 1000 MHz processor, 512 MB RAM, CD-rom player, free Ethernet port.	
Data logging	History Log: local storage of last 35 days of all analytical data (analysis, events, alarms, averages, last chromatogram, calibration data) in accordance with API Report 21.1. All data available on remote workstation in XML format	