SNG: raw syngas from gasifier effluent

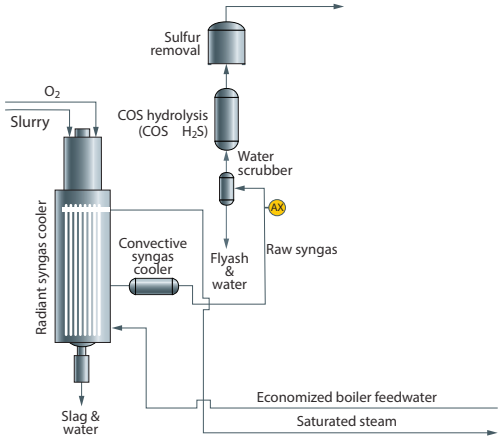

Figure 1: Typical syngas measurement point*

Benefits at a glance

- Unique spectroscopic capability to measure all syngas components, including H_2 and N_2
- Pipe-centric sampling and measurement at the sample tap
- Complete syngas speciation
- No valves, columns, or carrier gas
- Fouling cannot damage the Rxn-30 probe and cleaning is easy
- No interference from moisture vapor in the raw syngas sample when the sample is kept above its dewpoint

Gasification of coal and other low-cost feedstock is an alternative to steam methane reforming (SMR) of natural gas as a means to produce syngas. In countries where abundant coal supplies are available, major investments in gasification facilities and projects are typical. Several types of gasifiers are commercially available from GE, Shell, UHDE, KBR, and others. Controlling the steam-to-carbon or oxygen-to-carbon feed ratios, as well as monitoring CH_4 leakage and CO/H_2 ratios, provide opportunities for control and optimization of gasifier performance. The common analytical challenge for gasifier syngas production is in obtaining a reliable and representative gas sample and measuring the syngas composition of this high-temperature, particulate-laden and steam-saturated process stream.

Measurement of raw syngas composition

The Raman Rxn5 analyzer is a unique solution to the sampling and measurement of a gasifier syngas effluent stream. A typical Raman spectrum for a gasifier syngas stream is shown in Figure 2. Note the simplicity and complete speciation of H_2, CO, CO_2 and CH_4 as individual spectral peaks in the Raman spectrum. Low levels of both H_2S and NH_3 can also be measured in the same sample, when present at concentrations > 0.1%. The Raman Rxn5 analyzer is insensitive to moisture, any residual moisture leakage into the process stream after the desulfurization and dryer units does not impact the analysis.

Reliability issues with traditional methods for syngas analysis

In general, syngas is analyzed with process gas chromatography (GC) or mass spectrometry (MS). Both technologies often require a low pressure sample and sample transportation to the analyzer, adding lag time to the analysis. In the case of the gasifier raw syngas stream, the use of a dynamic reflux sampler (DRS) or alternative liquid and particulate removal system is mandatory. Protecting the analyzer from liquid carryover is the main challenge as this event can damage columns in a GC or the ionization chamber in an MS. The Rxn-30 probe used by the Raman Rxn5 cannot be damaged by liquid carryover or fouling.

* See the IGCC plant SNG: production analytics overview

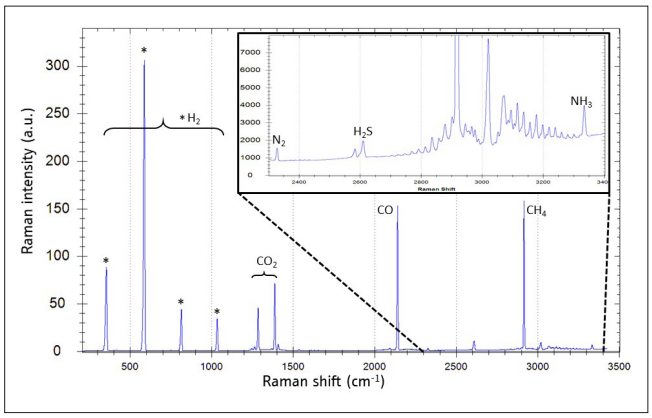

Figure 2: Typical Raman spectrum for syngas

Solution: Raman Rxn5 analyzer with the raw syngas from gasifier effluent method.

The use of a liquid removal system is mandatory for the gasifier syngas outlet stream, which is saturated with steam at high temperature (typically 300-350°C). The Rxn-30 probe can be easily integrated into sample conditioning systems to measure process streams at higher temperatures and pressures. The ability to measure at higher pressures often allows the sample to be returned to the process, eliminating waste and costly flaring. The use of fiber optic cables allows the probe to be placed at the sample tap location, eliminating the need for long heated sample transfer lines and sample lag time.

The Raman Rxn5 raw syngas from gasifier effluent contains the following per measurement point:

- Dedicated laser module
- Rxn-30 fiber optic probe
- Industrial hybrid electro-optical cable (up to 150 m long, customized to your plant requirements)
- Combined pressure and temperature sensor with cable (up to 150 m long, customized to your plant requirements)
- Dedicated syngas from gasifier effluent method

Typical process conditions	P (barg)	T (°C)
At sample tap	35	337
At Rxn-30 probe	35	55

Typical stream composition

Component	Range (Mol%)	Normal (Mol%)	Precision (Mol%) k=2	Cal gas (Mol%)	Precision (Mol%) k=2
Hydrogen	25-45	35	0.02	35	0.02
Nitrogen	0-2	0.3	0.01	1	0.01
Carbon monoxide	30-50	37.5	0.02	38	0.02
Carbon dioxide	10-30	21.8	0.03	21	0.03
Methane	0-10	4.9	0.01	5	0.01
Hydrogen sulfide	0-2	0.1	0.01	0	N/M
Ammonia	0-2	0.4	0.01	0	N/M

Table 1: Typical process conditions and stream composition

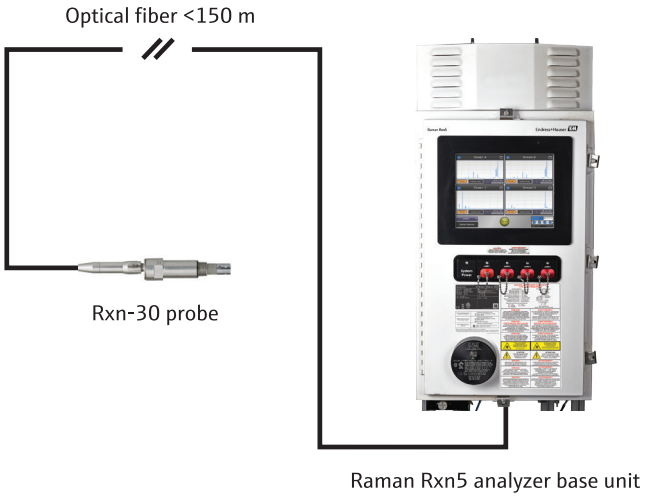

Figure 3: Recommended system configuration

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