SNG: raw syngas from other trains

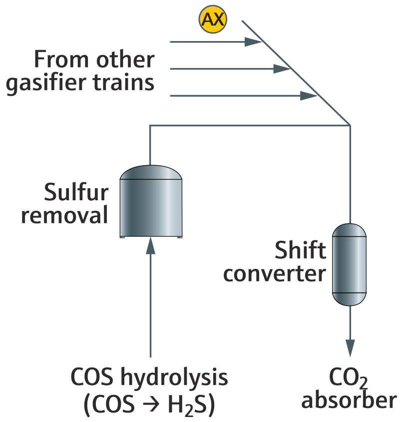

Figure 1: Typical syngas measurement point*

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
- No interference from moisture vapor in the raw syngas sample when the sample is kept above its dewpoint

Syngas can be produced from a wide variety of carbon-based feed stocks such as low grade or high sulfur coal and heavy petroleum residues. In an integrated gasification and combined cycle (IGCC) power plant, it is common to use multiple trains of gasifiers to increase the availability factor for the plant, in case one or more gasifiers is shut down for routine maintenance. The syngas of these trains is combined in a common header for subsequent processing. The performance of each gasification train can be optimized by monitoring its output independently. If different feeds are used in each gasifier, each syngas stream can be quite different. Controlled blending of the gasification trains may be possible to maintain a consistent composition after the common header, which feeds the subsequent water gas shift process.

Measurement of raw syngas composition

The Raman Rxn5 analyzer is a unique solution to the sampling and measurement of this particular process stream. A typical Raman spectrum and stream composition for a raw syngas stream after the main scrubber is shown in Figure 2. Note the simplicity and complete speciation of H_2, CO, CO_2 and CH_4 as individual 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%. As the Raman Rxn5 analyzer is insensitive to moisture, any residual moisture present in the stream does not interfere with the analysis as long as it does not condense, and the analysis represents a dry basis result. Normalized analysis is used to make the analyzer very robust to changes in process pressure, temperature, and flow.

Reliability issues with traditional methods for syngas analysis

In general, syngas is measured with process gas chromatography (GC) or mass spectrometry (MS). Both technologies require a low pressure sample and sample transportation, adding lag time to the analysis. In the case of the gasifier raw syngas streams, 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 analyzer cannot be damaged by liquid carryover or fouling, and it can be easily cleaned.

* See the general IGCC plant SNG: production analytics overview

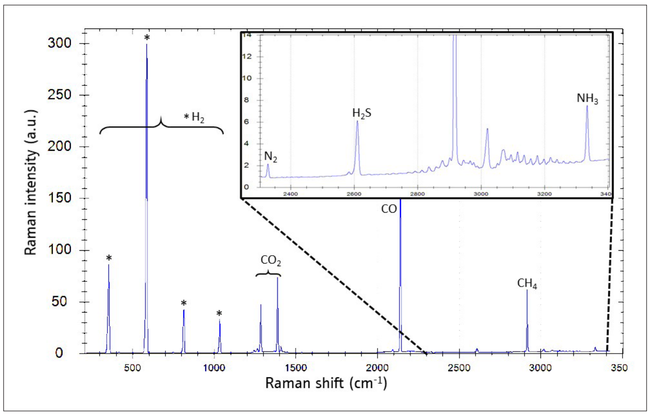

Figure 2: Typical Raman spectrum for syngas

Solution: Raman Rxn5 analyzer with the syngas from other trains method

The use of a liquid removal system is mandatory for the syngas stream after the gasifier scrubber. 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 syngas from other trains 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 other trains method

Typical process conditions	P (barg)	T (°C)
At sample tap	49	199
At Rxn-30 probe	49	55

Typical stream composition

Component	Range (Mol%)	Normal (Mol%)	Precision (Mol%) k=2	Cal gas (Mol%)	Precision (Mol%) k=2
Hydrogen	25-45	34.3	0.02	35	0.02
Nitrogen	0-2	0.4	0.01	1	0.01
Carbon monoxide	30-50	40	0.02	38	0.02
Carbon dioxide	10-30	21.7	0.03	21	0.03
Methane	0-10	2.3	0.01	5	0.01
Hydrogen sulfide	0-2	0.4	0.01	0	N/M
Ammonia	0-2	0.9	0.01	0	N/M

Table 1: Typical process conditions and stream composition

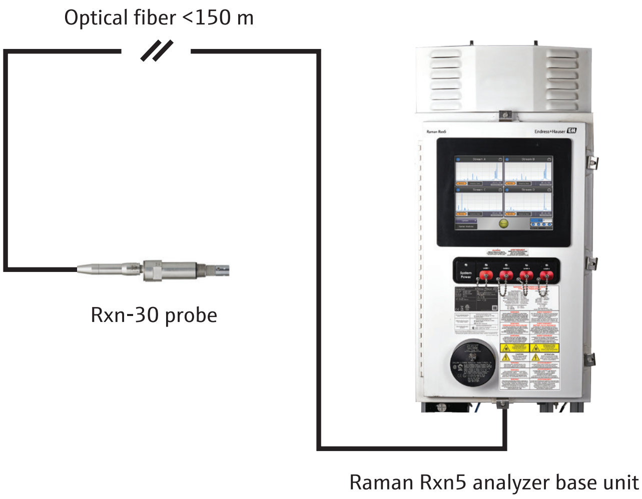

Figure 3: Recommended system configuration

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