SNG: syngas after scrubber

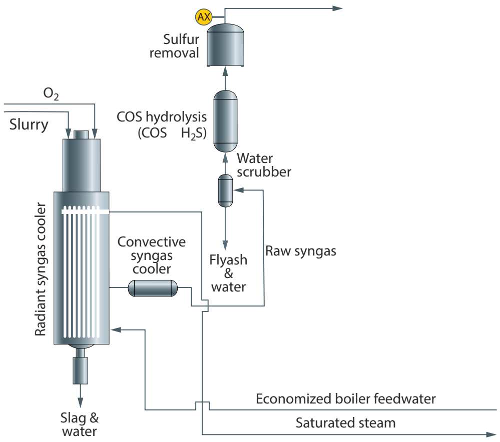

Figure 1: Typical syngas measurement point*

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
- Sample can often be returned to process, avoiding disposal to flare header
- 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

Raw syngas from a gasifier typically is saturated with steam and contains significant amounts of particulate matter. To remove these particulates often requires a combination of a candle filter, followed by a water scrubber. The water scrubber also provides additional moisture in preparation for the shift converter, in which the water shift reaction is used to convert CO in the syngas to CO_2 and H_2, each of which can be separately recovered as products. Any carbonyl sulfide (COS) in the syngas is converted to H_2S using a catalytic hydrolysis reactor, so that the sulfur can be removed in subsequent acid gas removal processes.

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 system very robust to changes in process pressure, temperature, and flow.

Reliability issues with traditional methods for syngas analysis

Syngas is often measured with process gas chromatography (GC) or mass spectrometry (MS). Both technologies often require a low pressure sample and sample transportationto the analyzer, 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 cannot be damaged by liquid carryover or fouling.

* See the general IGCC plant SNG: production analytics overview

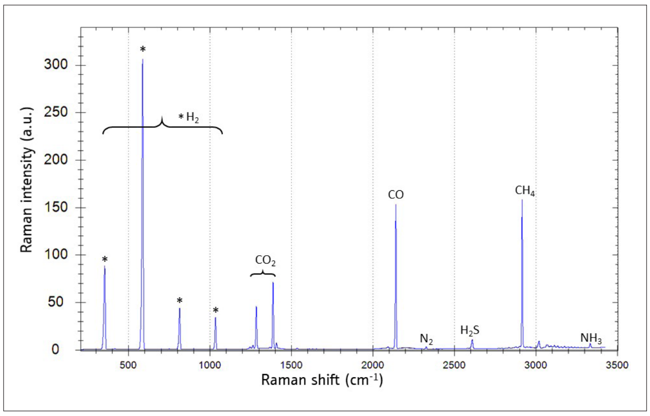

Figure 2: Typical Raman spectrum for secondary reformer syngas

Solution: Raman Rxn5 analyzer with the syngas after scrubber 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 after scrubber 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 after scrubber 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	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

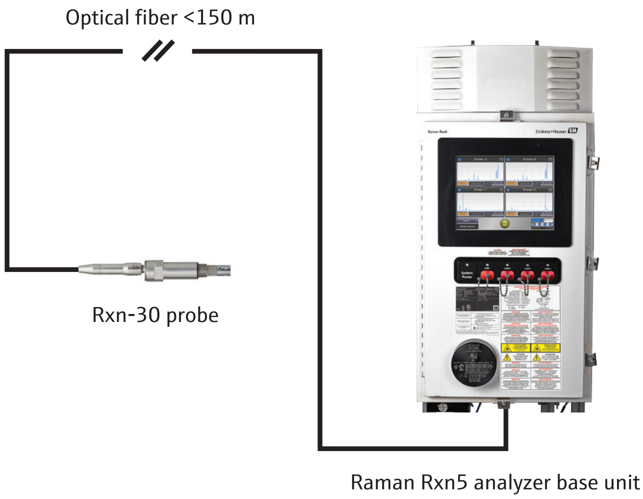

Figure 3: Recommended system configuration