SNG: to pipeline

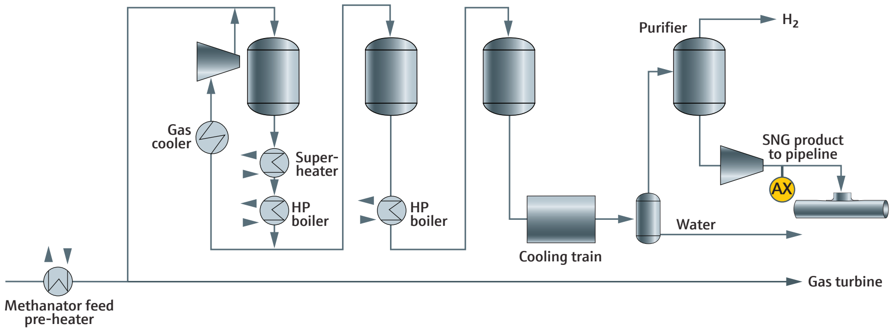

Figure 1: Typical SNG pipeline input measurement point*

Benefits at a glance

- Unique spectroscopic capability to measure all SG components, including H_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
- No interference from moisture vapor in the raw syngas sample when the sample is kept above its dewpoint

The methane-rich SNG from the methanator is typically not pipeline quality. Depending on the methanation process and conditions used, the SNG may contain excess amounts of moisture, CO_2, CO, H_2, or other gases. SNG upgrading to grid specifications involves removing any residual gases and water, and compressing the stream to between 40 and 70 barg, depending on the distribution grid pressure, before it can be injected into the natural gas grid.

Measurement of pipeline quality SNG

The Raman Rxn5 analyzer is a unique integrated sampling and measurement solution for the pipeline SNG stream. A typical Raman spectrum and stream composition for an SNG stream is shown in Figure 2. Note the key impurities in the SNG stream can be measured while retaining a simple spectrum with complete speciation of the individual components. As the Raman Rxn5 is essentially transparent to moisture, any residual moisture leakage from any upstream driers does not interfere with the analysis as long as the moisture does not condense. Regardless of moisture content, the analysis results are provided on a dry basis. It is also a normalized analysis which makes it very robust against pressure and temperature changes as well as any slow fouling that may occur.

Reliability issues with traditional methods for SNG analysis

In general, the grid quality SNG stream composition is measured with process gas chromatography (GC) or mass spectrometry (MS). Both technologies require transporting and conditioning the sample at both the sample tap and at the sample conditioning panel close to the analyzer. As the required sample pressure at the GC or MS analyzer is relatively low, it typically is not possible to return the sample to process, so it must be sent to flare. Protecting the GC or MS analyzers from even small amounts of liquid carryover after the absorber dryer becomes the main sampling system challenge, as this event can damage columns in a GC or the ionization chamber in an MS. The Rxn-30 probe cannot be damaged by liquid carryover or fouling, and cleaning is simple and straightforward.

* See the general IGCC plant SNG: production analytics overview

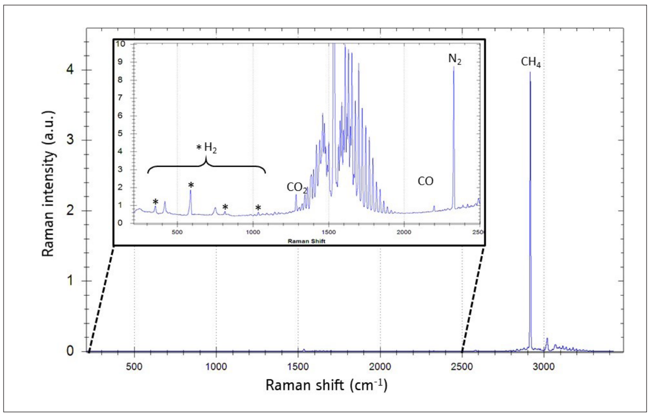

Figure 2. Raman spectrum of a typical SNG to pipeline stream

Solution: Raman Rxn5 analyzer with the SNG to pipeline method

In the case of relatively clean and dry streams like a natural gas feed, the Raman Rxn5 analyzer with an Rxn-30 probe allows for a wide range of sample pressure (70-800 psia typical) and sample temperature (-40 to 150°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 at a lower pressure sampling point - flaring of the returned sample is avoided. Sampling lag time is essentially zero, as no sample transport is required, increasing the speed of analysis.

The Raman Rxn5 analyzer for SNG to pipeline 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 SNG to pipeline method

Typical process conditions	P (barg)	T (°C)
At sample tap	39	40
At Rxn-30 probe	39	45

Typical stream composition

Component	Range (Mol%)	Normal (Mol%)	Precision (Mol%) k=2	Cal gas (Mol%)	Precision (Mol%) k=2
Hydrogen	0-1	0.1	0.01	1	0.01
Nitrogen	0-5	2.1	0.01	3	0.01
Carbon dioxide	0-2	0.3	0.01	1	0.01
Methane	75-100	97.5	0.02	95	0.02

Table 1: Typical process conditions and stream composition

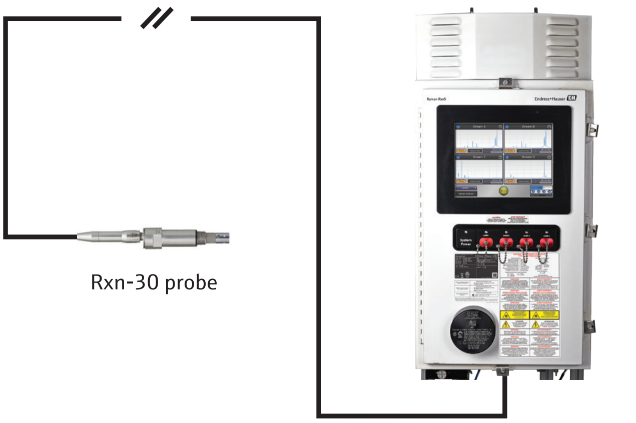

Figure 3: Recommended system configuration

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