SNG: CO_2 recovery stream

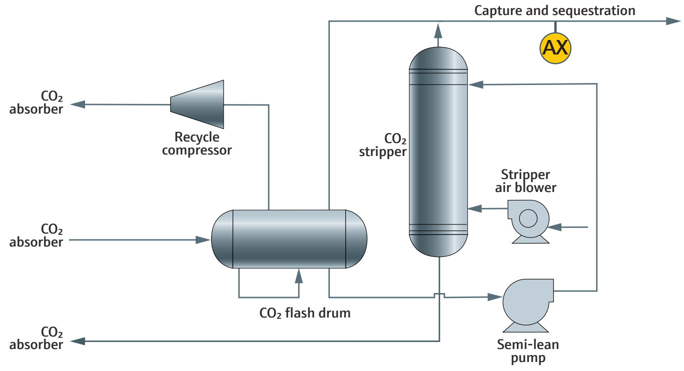

Figure 1: Typical recovered CO_2 measurement point after absorber flash drum**

Benefits at a glance

- Unique spectroscopic capability to measure all syngas components of the CO_2 absorber outlet, including N_2
- Pipe-centric sampling and measurement at the sample tap requires no sample transport to the analyzer
- 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

An important gas treatment stage in the upgrading of syngas to SNG is the removal of CO_2 after the shift converter. This is the key step of carbon capture and storage (CCS) to reduce CO_2 emissions from the plant. CO_2 is typically removed using solvent-based gas treatment absorbers and regenerators or strippers. Other types of CO_2 absorber systems include the Benfield™ and Selexol™ processes.* The captured CO_2 can be transported off-site for enhanced oil recovery (EOR), or it can be sequestered for long-term storage in depleted underground gas fields or injected into the sea floor. Other options include using captured CO_2 as a feedstock for the synthesis of other useful chemicals, such as urea and methanol.

Measurement of recovered CO_2 from the absorber flash drum

The Raman Rxn5 analyzer is a unique integrated sampling and measurement system for the CO_2 recovered from the CO_2 absorber unit. A typical Raman spectrum and stream composition for an CO_2 absorber outlet stream is shown in Figure 2. Note the simplicity, baseline separation and complete speciation of N_2, CO_2, H_2S, and CH_4 spectral peaks in the Raman spectrum. No other spectroscopic technique is capable of measuring N_2 in this stream. The measurement is based on a normalized analysis which improves the accuracy of the measurement, improves robustness against pressure and temperature changes, and significantly reduces the impact of any slow fouling that may occur.

Reliability issues with traditional methods for the recovered CO_2 measurement

Typically, the CO_2 stream composition is analyzed via process gas chromatography (GC) or mass spectrometry (MS). Both GC and MS technologies require transporting of the sample and doing sample conditioning at both the sample tap (e.g. pressure reduction) and at the sample conditioning panel close to the analyzer. As the required sample pressure for a GC or MS is relatively low, it is normally not possible to return the sample to process, so it must be disposed of via the low pressure flare header.

* Trademark of UOP

** See the general IGCC plant SNG: production analytics overview

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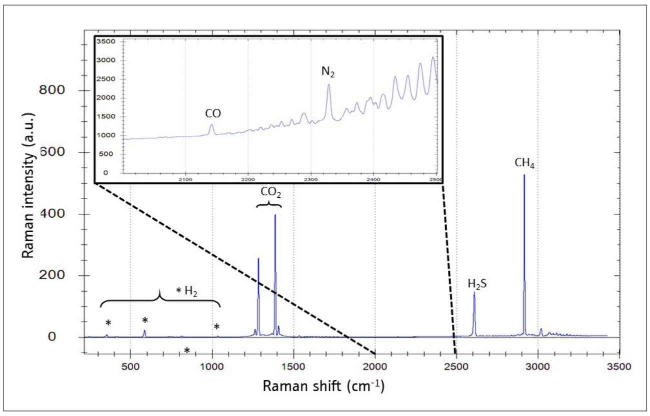

Figure 2: Raman spectrum of a typical CO_2 absorber recovery stream

Solution: Raman Rxn5 analyzer with the CO_2 recovery 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 CO_2 recovery 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 CO_2 recovery 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	0-5	1.6	0.02	2	0.02
Nitrogen	0-2	0.25	0.01	1	0.01
Carbon monoxide	0-2	0.05	0.01	1	0.01
Carbon dioxide	55-95	75.7	0.05	83	0.05
Methane	5-25	12.9	0.01	13	0.01
Hydrogen sulfide	5-15	9.5	0.01	0	N/M

Table 1: Typical process conditions and stream composition

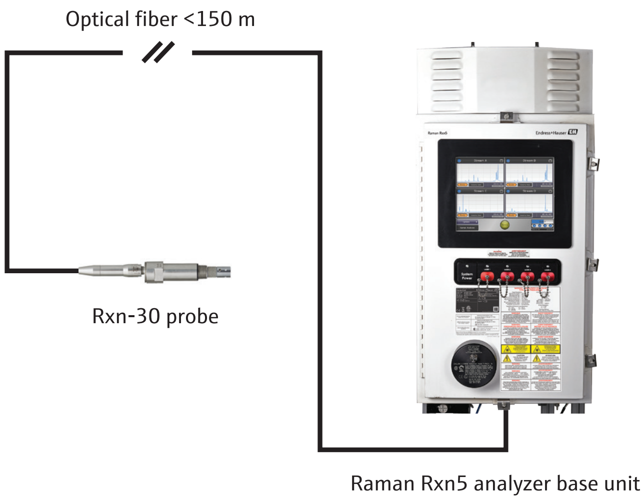

Figure 3: Recommended system configuration

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