Rosemount™ 470XA Gas Chromatograph

Carbon Purity for CCUS

Application Note

The Rosemount 470XA Gas Chromatograph is a compact and reliable solution designed for simple but precise gas analysis in fiscal and custody transfer applications. With global initiatives focused on the reduction of carbon footprints, basic GC applications are moving beyond natural gas analysis and into roles supporting the business of carbon capture, utilization, and storage.

CCUS – Carbon Capture, Utilization and Storage

As part of the effort in mitigating the impact of global climate change there is concerted focus on reducing greenhouse gas emissions. Carbon Dioxide (CO_2) gas, a product of both natural biological life on Earth and human-driven industrial processes is at the center of many efforts. Driven by both regulatory and social pressures, industry and individuals are moving to reduce their carbon footprints by reducing CO_2 emissions, capturing and reusing or storing emissions they do make, and buying or selling government-sponsored credits for CO_2 emissions made or reduced.

Historically one of the larger industrial uses for CO_2 has been in Enhanced Oil Recovery, where the CO_2 gas is pumped into oil reservoirs to help remove latent oil left after the easily recovered oil has been harvested. With the global spotlight on reducing CO_2 emissions, other applications for CO_2 in the plastics, concrete, biofuels and methanol industries are receiving more attention, while strategies to permanently sequester excess CO_2 in underground storage facilities are seeing implementation. In almost all cases the issue of getting the CO_2 from its creation to its final use must be addressed.

Transporting CO_2

Large scale transportation of CO_2 is typically done by pipeline. Due to the chemical properties of carbon dioxide, it must be transported in its supercritical state - where it exhibits the properties of a gas and a liquid simultaneously - in tightly controlled temperature and pressure ranges. One factor that greatly affects the pipeline transportability of CO_2 is its purity – how much of the gas is CO_2, how much is composed of impurities, and what type of impurities are present.

While some contaminants are specific to the technology used in capturing the CO_2, others are more common. Nitrogen, methane, and hydrogen have lower critical temperatures for example, and require increased pipe strength, while non-condensables like argon increase the amount of compression work required.

Figure 1 *Rosemount 470XA Gas Chromatograph*

Figure 2 - Phase Diagram of Carbon Dioxide (CO_2)

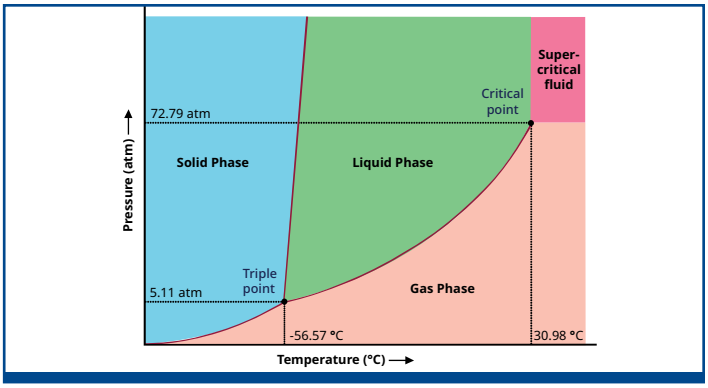

Figure 2 *Phase diagram of Carbon Dioxide, showing temperature and pressure requirements for supercritical fluid state*

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Carbon Purity with the Rosemount 470XA

A standard analysis available on the Rosemount 470XA can measure and verify the purity of CO_2 gas before transport, after transport, or at custody transfer points along the route. The CO_2 measurement is based on a full compositional analysis rather than a determination by differences, so accurate and precise measurements reduce uncertainties in custody transfer and provide key compositional measurements for flow metering. The components and ranges of CCU gas stream analysis are shown in Table 1 below, while an example chromatogram is illustrated in Figure 4. Repeatability for the CO_2 measurement is as low as ±0.1% when CO_2 concentrations are above 50 mole %. Best of all, the carbon purity analysis is easy to order – just specify the CCU application on the 470XA model configuration string.

Stream Component	Measured Range (Mole %)
C3+	0–1%
Hydrogen	0–4%
Nitrogen	0.01–7%
Argon + Carbon Monoxide	0.01–4%
Methane	0.01–4%
Carbon Dioxide	20–100%
Ethane	0–1%

Table 1 *Components and ranges measured by the CCU carbon purity application*

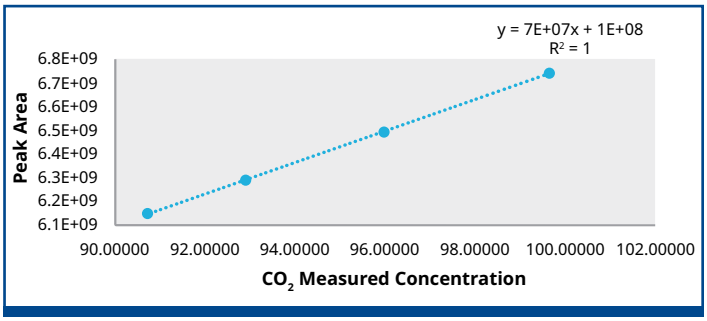

Figure 3 *Linearity plot of the CO_2 measurement*

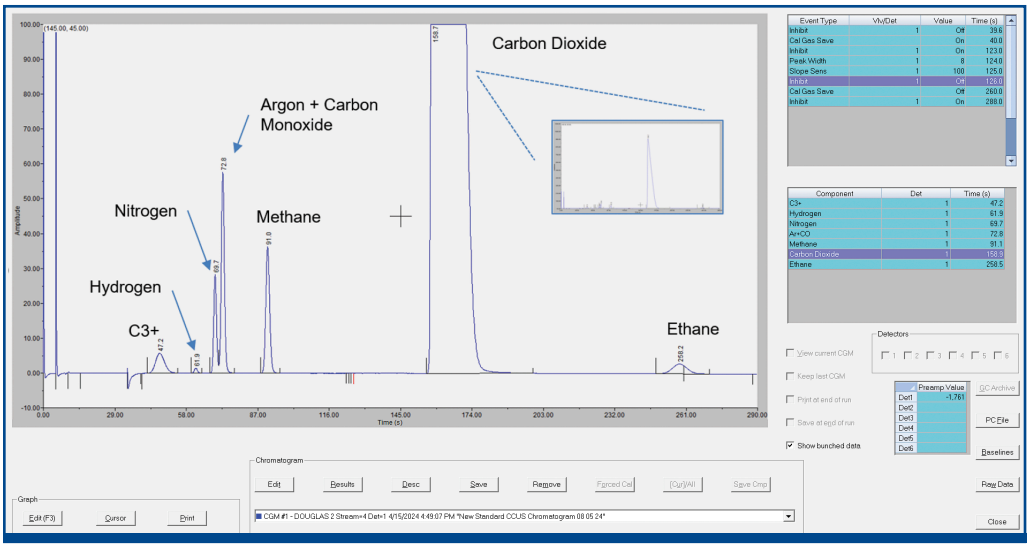

Figure 4 *The standard chromatogram produced by the CCU analysis with an insert showing the complete CO_2 peak.*

The Rosemount 470XA can measure carbon purity and support carbon capture, utilization, and storage, helping to reduce environmental emissions and your carbon footprint, making it an ideal solution for your CCUS application needs. Contact your local Emerson representative today to inquire about this product or if you have any questions.

For more information, visit
Emerson.com/Rosemount470XA

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