Panametrics

Application note



# Multi-Stream Gas Analysis in Biomethane Upgrading




## Overview

Biomethane upgrading has become a basis of renewable-gas strategies worldwide. As raw biogas moves through digestion, cleaning, and purification, operators must continuously verify gas quality to meet grid-injection standards. Reliable multistream analysis ensures methane purity, controls contaminants, and maintains safe oxygen levels throughout the process.

## Panametrics Gas Analysis

Panametrics provides a complete, integrated solution for oxygen, methane and carbon dioxide and measurement using XMO2pro thermoparamagnetic analyzer and the XMTCpro thermal conductivity binary gas analyzer. Together, these instruments deliver stable, accurate, and low maintenance performance in hazardous biogas environments. With global hazardous area certifications, fast calibration, and rugged industrial design, Panametrics analyzers support safe, reliable, and efficient biomethane upgrading.

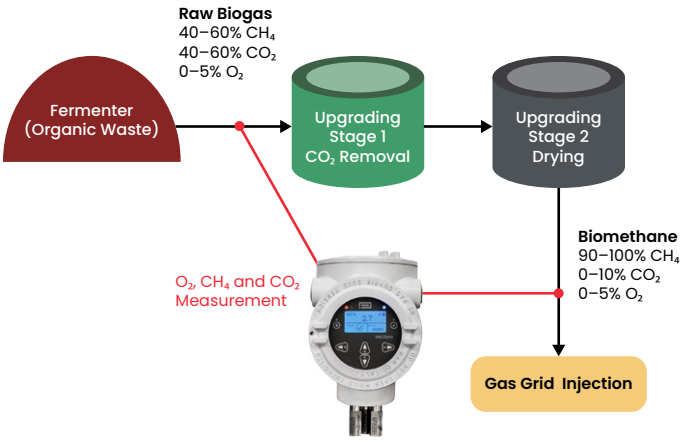
## Application Description

Biogas originates from the decomposition of organic matter in landfills, wastewater treatment plants, agricultural digesters, and industrial biodigesters.

Before entering the natural gas grid, the gas must be upgraded to meet strict specifications:

- **$O_2$ < 2%** to ensure safe compression and pipeline transport
- **$CO_2$ removal** to increase calorific value
- **$CH_4$ purity verification** before grid injection

Upgrading facilities typically include digestion, compression, dehydration, $H_2S$ removal, $CO_2$ separation, methane polishing, odorization, and final quality checks. Every stage requires reliable measurement in hazardous area environments.




## Challenges in Gas Measurement

| | |
|---|---|
| **Safety critical oxygen control** | Methane becomes flammable in air between 5–15%. Keeping oxygen below 2% is essential for compressor protection and pipeline safety. |
| **Corrosive, contaminated gas streams** | Raw biogas contains $H_2S$, $CO_2$ water vapor, siloxanes, and particulates. Instruments must withstand contamination without drift or premature failure. |
| **Multiple gas streams, each with different backgrounds** | Operators typically measure:<br>• oxygen in cleaned biogas<br>• methane purity before grid injection<br>• carbon dioxide impurities in methane<br>• methane content in carbon dioxide off gas |
| **Hazardous area installation** | All analyzers must meet global hazardous area certifications and support safe operation. |
| **Limitations of older technologies** | Traditional sensors often suffer from drift, slow response, contamination sensitivity, and limited accuracy in mixed gas backgrounds, increasing maintenance and reducing confidence in safety interlocks. |

## Panametrics Solution

### XMO2pro — Thermoparamagnetic Oxygen Analyzer

Designed for demanding biogas environments, XMO2pro provides:

- solid state, non depleting sensor
- no moving parts
- hazardous area certification
- stable measurement in methane and $CO_2$ backgrounds

### XMTCpro — Thermal Conductivity Binary Gas Analyzer

- quantifies carbon dioxide impurities in methane
- measures methane content in carbon dioxide off gas
- rugged, contamination resistant




Panametrics analyzers provide continuous measurement with reliable performance at each critical stage.

### Integrated Sample System

A multistream sample system regulates pressure, flow, filtration, and moisture removal — ensuring accurate measurement across all gas streams.



## Recommended Configuration

| |
|---|
| $O_2$: 0–2% **with XMO2pro** |
| $CO_2$: 90–100% (methane background) **with XMTCpro** |
| $CH_4$: 90–100% ($CO_2$ background) **with XMTCpro** |
| Temperature: –5 to 50 °C |
| Pressure: Regulated to 14.7 psia (101.3 kPa) |
| Installation: Hazardous area certified |
| Sample system: Multistream conditioning with pressure regulation |

## Summary

Panametrics delivers a robust, low maintenance solution for multistream gas analysis in biomethane upgrading. With XMO2pro and XMTCpro, supported by integrated sample conditioning, operators can ensure methane purity, control contaminants, maintain safe oxygen levels, and meet grid injection requirements with confidence.

Scan this code to open XMO2pro datasheet

Join the conversation and follow us on LinkedIn
linkedin.com/company/panametricscompany

Copyright 2026 by Panametrics LLC. All rights reserved.

PANA038AN (08/2026)

Panametrics

panametrics.com