



# New Technology in Gas analysis

# Carbonic 4401 – impurities detection in pure CO<sub>2</sub>

## CO<sub>2</sub> quality Analyzer Line for CIB (Consorzio Italiano Biogas) – Ecomondo

06/11/2025

*In partnership with*



# ETG present and future

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- ETG designs and manufactures advanced and innovative gas analyzers for Industrial market, Universities and R&D Institutes
- Advanced technology and Innovative solutions (production and distribution)
- Complete project management
- Planning, start up and service

# ETG location and quality certification

ETG New location  
New Laboratories



QA International has certified  
ETG RISORSE E TECNOLOGIA  
complies to the standard  
UNI EN ISO 9001: 2015 (ISO 9001:  
2015)

## Production :

- Biogas and Syngas Analyzers (ETG 6500/MCA100/MCA100 P)
- TDL gas analyzers ETG 6900 / ETG Drone for CH<sub>4</sub> leak
- Calibrators (CAL G100)
- FTIR ETG 9500
- (Portable) Emission Analyzers (ETG 7600)
- ETG QE-PAS Ambient Gas Analyzers (ETG 8900 QEPAS)
- Special products (ETG 7500, SEMICONDUCTOR SYSTEM)
- Other projects running

# Distribution Network

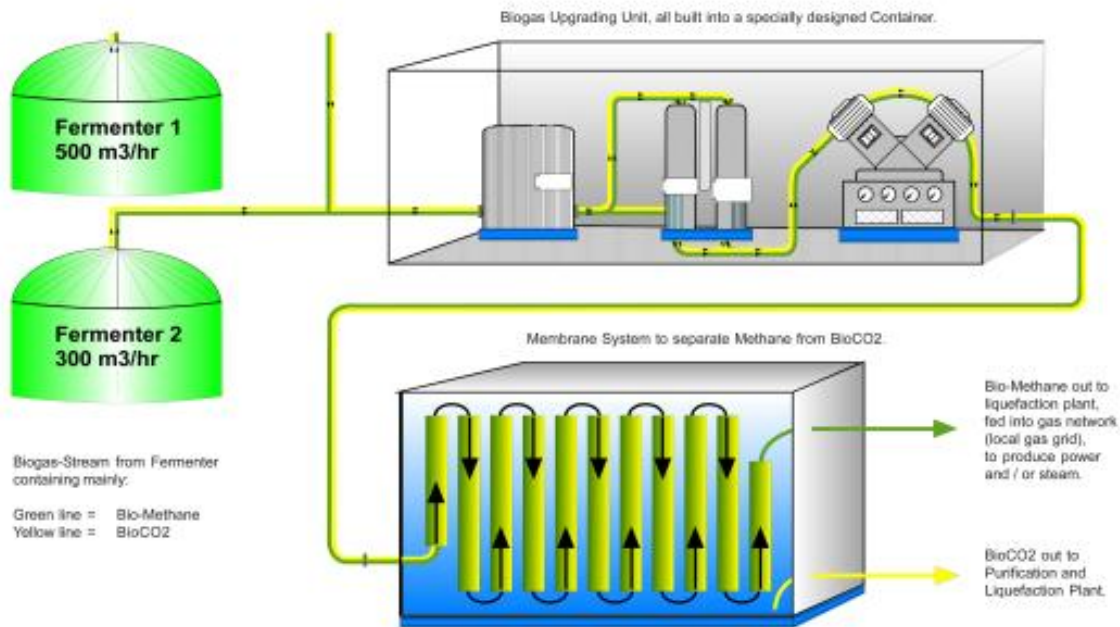


# CO<sub>2</sub> recovery application

- CO<sub>2</sub> recovery from ammonia production CO<sub>2</sub> come sottoprodotto del processo
- CO<sub>2</sub> recovery from dry ice production (ricondensazione del gas rilasciato nella produzione di ghiaccio secco)
- CO<sub>2</sub> recovery from breweries and distilleries (recupero durante la fermentazione)
- Biogas upgrading for biomethane production (rimozione del CO<sub>2</sub> per ottenere biometano)
- Enhanced Oil Recovery (EOR) e Associated Gas Recovery (recupero in processi di estrazione petrolifera e gas)
- Flue gas treatment and industrial combustion (recupero da fumi di combustione o processi industriali vari, come cementifici o acciaierie)
- Hydrogen and syngas production

# CO<sub>2</sub> quality application

## BIOGAS Plant with BIOGAS Upgrading Modules to separate Bio-Methane from BioCO<sub>2</sub>.



Continuous measurement of bioCO<sub>2</sub> quality from recovery plants and storage tanks

## Standards EIGA and ISBT

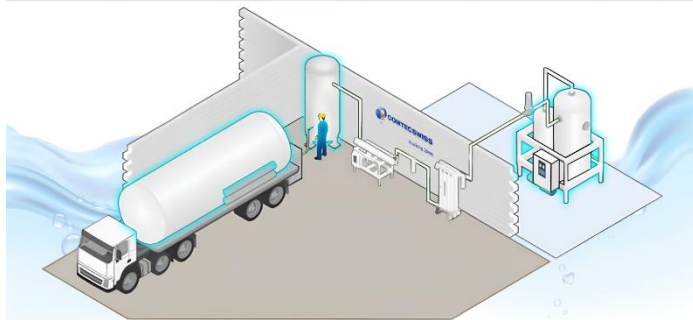
- Aldehydes < 0.2 ppm FTIR
- Ammonia < 2.5 ppm FTIR
- Carbon Monoxide < 10 ppm FTIR
- Ethanol < 0.2 ppm FTIR
- Methanol < 0.2 ppm FTIR
- Mercaptan (PFUV)
- Benzene < 0.02 ppm (GC PID)
- SO<sub>2</sub> < 1 ppm (PFUV)
- H<sub>2</sub>S < 0.1 ppm (PFUV)
- H<sub>2</sub>O < 20 ppm (FTIR)
- Xylene < 1 ppm (GC PID)
- Phosphine < 0.3 ppm FTIR
- NO < 2.5 ppm FTIR
- NO<sub>2</sub> < 2.5 ppm FTIR
- Acetone < 0.2 ppm FTIR
- HCN < 0.5 ppm FTIR
- Ethane < 20 ppm FTIR
- Propane < 20 ppm FTIR
- Pentane < 20 ppm FTIR
- Benzene < 0.02 ppm (GC PID)
- O<sub>2</sub> < 30 ppm (ECD)
- CO<sub>2</sub> 99.9% purity FTIR



## Main features

- Continuous analysis from CO<sub>2</sub> capture plants and tanks
- EIGA and ISBT compliance for Food Grade purity CO<sub>2</sub>
- Up to 6 sampling points
- Automatic cycle and manual operation
- Simple to use, with advanced Graphical User Interface

# Main Control Window and compliance certificates

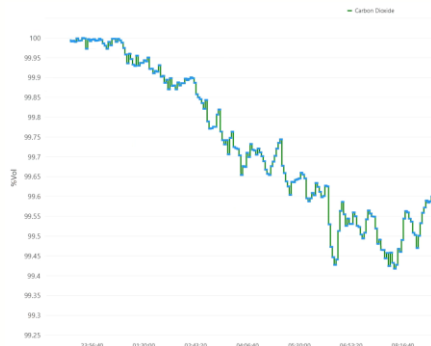


STATUS: on Testing 09:09:06



| Name    | Values | Unit   | Name          | Values   | Unit |
|---------|--------|--------|---------------|----------|------|
| O2      | 106.13 | ppm    | Toluene       | 0.00     | ppb  |
| MFC1    | 2.40   | l/min  | Ethylbenzene  | 0.00     | ppb  |
| MFC2    | 0.20   | ml/min | m-p-xylene    | 0.00     | ppb  |
| MFM     | 0.61   | l/min  | O-xylene      | 0.00     | ppb  |
| SO2     | 1.12   | ppb    | 1,3-Butadiene | 0.00     | ppb  |
| TRS     | 1.31   | ppb    | CO2           | 99.99993 | %Vol |
| Benzene | 0.00   | ppb    | H2O           | 0.00     | ppm  |

Status: FROM GUI 11:41:07



## FLWS

|        |      |                                    |
|--------|------|------------------------------------|
| MFM #1 | 2.07 | l/min                              |
| MFC #1 | 1.00 | l/min                              |
|        | 1    | <input type="button" value="SET"/> |
| MFC #2 | 0.08 | l/min                              |
|        | 0.08 | <input type="button" value="SET"/> |
| MFC #3 | 1.00 | l/min                              |
|        | 1    | <input type="button" value="SET"/> |



Realizing Ideas

**CARBONIC 4401**  
CO2-Gas Analyzer Protocol

| Certification Of CO <sub>2</sub> Purity And Quality |                  |
|-----------------------------------------------------|------------------|
| Test start time:                                    | 2025-10-17 12:00 |
| Source of CO <sub>2</sub> Tested:                   | PLANT CHECK      |
| Summary Test                                        |                  |
| Test start Date:                                    | 2025-10-17       |
| Test start Hour:                                    | 12:00            |
| Test end Date:                                      | 2025-10-17       |
| Test end Hour:                                      | 14:00            |
| Measured CO <sub>2</sub> Purity                     | 99.997 %         |
| CO <sub>2</sub> Humidity                            | 00 ppm           |
| ISBT-Specification result                           | positive         |
| BGA-Specification result                            | positive         |

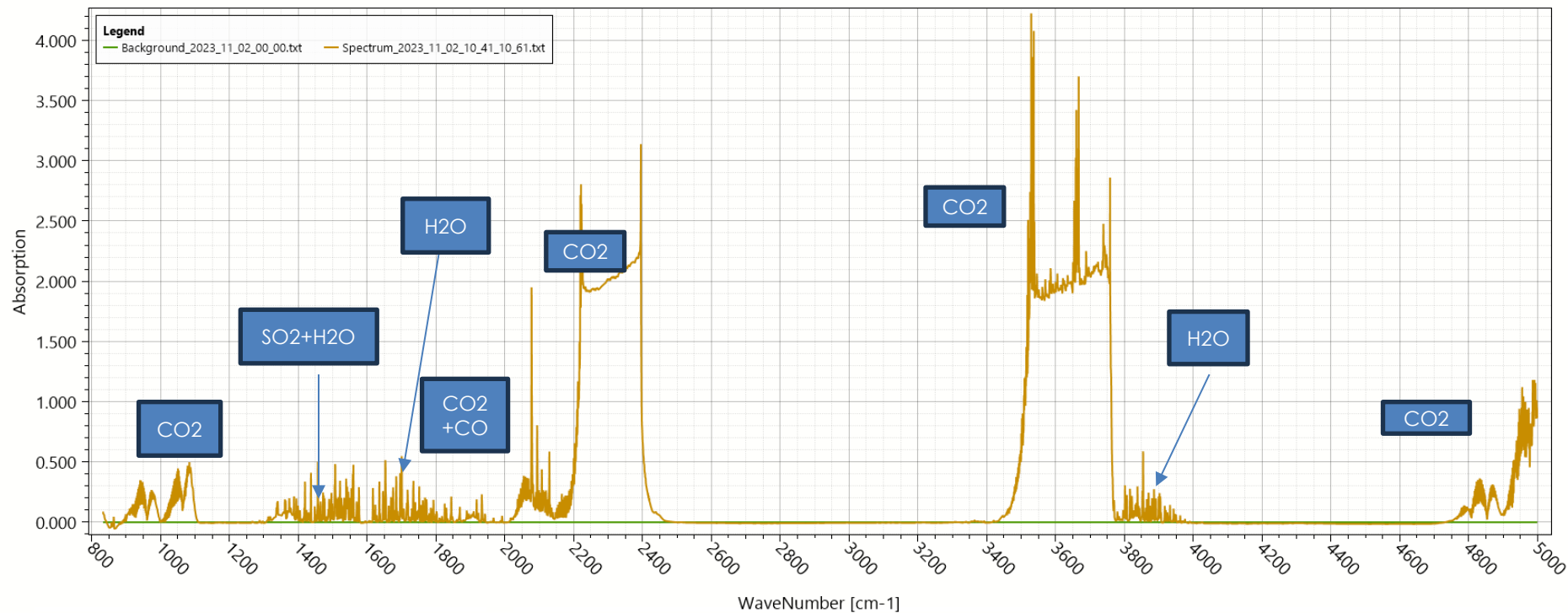


Realizing Ideas

**CARBONIC 4401**  
CO2-Gas Analyzer Protocol

| Certification Of CO <sub>2</sub> Purity And Quality                               |                               |                  |             |           |          |          |
|-----------------------------------------------------------------------------------|-------------------------------|------------------|-------------|-----------|----------|----------|
| Test start time:                                                                  |                               | 2025-10-17 12:00 |             |           |          |          |
| Source of CO <sub>2</sub> Tested:                                                 |                               | PLANT CHECK      |             |           |          |          |
| CO <sub>2</sub> Purity Per EN17 Specification of CO <sub>2</sub> for Beverage use |                               |                  |             |           | Result   | positive |
| Component                                                                         | Symbol                        | Unit             | Test Method | Value Set | Measured |          |
| CO2 Purity                                                                        | CO <sub>2</sub>               | % v/v            | FTIR        | >=99.9    | 99.997   |          |
| Moisture                                                                          | H <sub>2</sub> O              | ppm v/v          | FTIR        | <20       | 0.00     |          |
| Oxygen                                                                            | O <sub>2</sub>                | ppm v/v          | ZnO2        | <30       | 0.00     |          |
| Carbon Monoxide                                                                   | CO                            | ppm v/v          | FTIR        | <10       | 0.00     |          |
| Nitrogen Oxides                                                                   | NO <sub>x</sub>               | ppm v/v          | FTIR        | <5        | 0.00     |          |
| Nitric Monoxide                                                                   | NO                            | ppm v/v          | FTIR        | <2.5      | 0.00     |          |
| Nitrogen Dioxide                                                                  | NO <sub>2</sub>               | ppm v/v          | FTIR        | <2.5      | 0.00     |          |
| Methanol                                                                          | CH <sub>3</sub> OH            | ppm v/v          | FTIR        | <10       | 0.00     |          |
| Total Hydrocarbon THC                                                             | THC                           | ppm v/v          | FTIR        | <50       | 0.00     |          |
| Ammonia                                                                           | NH <sub>3</sub>               | ppm v/v          | FTIR        | <2.5      | 0.00     |          |
| Acetaldehyde                                                                      | CH <sub>3</sub> CHO           | ppm v/v          | FTIR        | <0.2      | 0.00     |          |
| Aromatic Hydrocarbon                                                              | C <sub>6</sub> H <sub>6</sub> | ppb v/v          | GC-PID      | <20       | 0.74     |          |
| Sulfur Dioxide                                                                    | SO <sub>2</sub>               | ppb v/v          | PFAV        | <1000     | 0.75     |          |

# CO<sub>2</sub> High concentration ~ 99% Spectrum Example



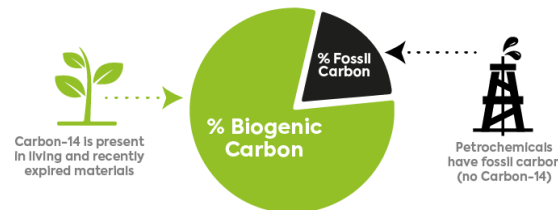
# Bio CO<sub>2</sub> – measurement and certification process for ETS

Beyond process certification, implementing a system to verify the biogenic origin of CO<sub>2</sub> is crucial.

This verification is not only important for traceability and product quality: within the ETS (Emission Trading System) framework, ensuring that CO<sub>2</sub> is genuinely biogenic can help **reduce accounted fossil emissions** and demonstrate compliance, potentially avoiding the need to purchase additional emission allowances.

One of the most reliable methods is <sup>14</sup>C isotopic analysis, which allows distinguishing fossil CO<sub>2</sub> from CO<sub>2</sub> derived from biological processes.

## Carbon-14 Analysis Results: % Biogenic Carbon vs % Fossil Carbon



### Emissions can be:



100% biogenic



a combination  
45% fossil carbon  
55% biogenic carbon

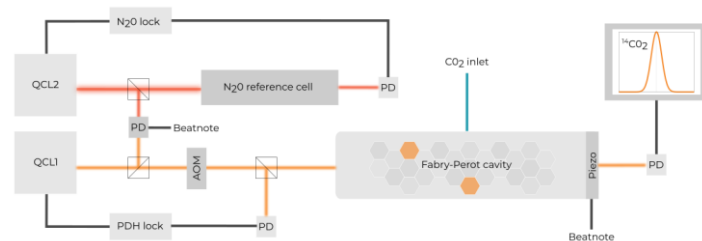


0% biogenic

# Bio CO<sub>2</sub> – next step for measurement

New technologies, such as PPQ Sense SCAR, a laser spectroscopy-based solutions, offer significant advantages: compact size, ease of use, high precision, and lower costs.

|                       | SCAR                                                                                | AMS                                                                                                                                                                                                                                                     | LSC                                                                                                                                                                                                                                                     |
|-----------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SIZE                  | ✓  | ✗    | ✓                                                                                                                                                                      |
| WEIGHT                | ✓  | ✗    | ✓                                                                                                                                                                      |
| MINIMUM SAMPLE NEEDS  | ✓  | ✓                                                                                                                                                                      | ✗    |
| PRECISION MEASUREMENT | ✓ HIGH                                                                              | ✓ HIGH                                                                                                                                                                                                                                                  | ✗ LOW                                                                                                                                                                                                                                                   |
| DYNAMIC RANGE         | ✓ HIGH                                                                              | ✗ LOW                                                                                                                                                                                                                                                   | ✓ HIGH                                                                                                                                                                                                                                                  |
| COST [€]              | ✓ <600k                                                                             | ✗ 1.5-5 M                                                                                                                                                                                                                                               | ✓ 150k                                                                                                                                                                                                                                                  |
| SAMPLE HANDLING       | ✓ AUTOMATIC                                                                         | ✓ AUTOMATIC                                                                                                                                                                                                                                             | ✗ MANUAL                                                                                                                                                                                                                                                |



Thanks for the attention

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