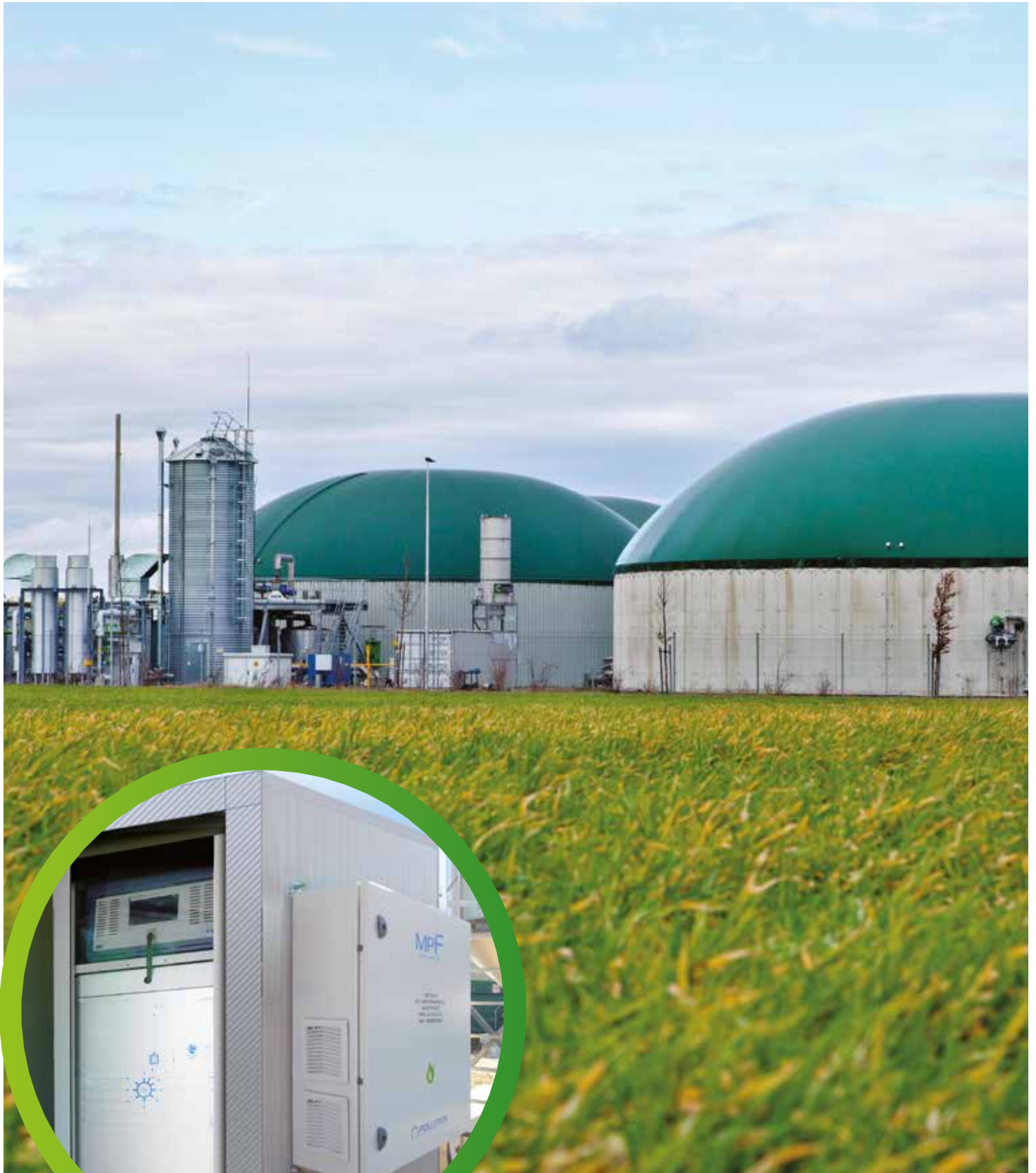# POLLUTION
ANALYTICAL EQUIPMENT

Monitoring system for Biomethane upgrading

The Pollution monitoring system is the ideal solution to measure the fundamental parameters in **upgrading plants from biogas to biomethane**, in particular, to monitor the **VOC (Volatile Organic Compounds)**, namely the biomethane odorants masking and/or interfering agents.

The solution is composed of **a micro gas chromatograph** and a **sampling system** and can be configured in three alternative solutions to meet the different needs that plants might have according to their sector (agricultural, waste treatment, water treatment).

Sampling is the most delicate part of the analysis phase, where it is easier to make mistakes: the sample must be reproducible and representative.
This is why it is necessary to install a system suited for contact with the sample gas.

Data communication is managed via **Modbus (TCP/IP)** and/or dedicated cloud software - **Pollution Guardian**.

MICRO-GC FUSION ANALYTICAL SYSTEM

The **monitoring system** of Pollution Analytical Equipment measures not only the main biogas compounds throughout the upgrading phase but also the quality of the biomethane produced. The gas chromatographic technology, similar to the technology used to measure the biomethane quality during input into the network, allows excellent accuracy and great reliability of the analysis.

In order to have control over the production process, it is crucial to properly monitor each step. A peculiar micro gas chromatograph feature is its modularity, which allows three alternative configurations: **Basic, Ideal, and Premium**. The table below shows the analytical possibilities that each setup offers.

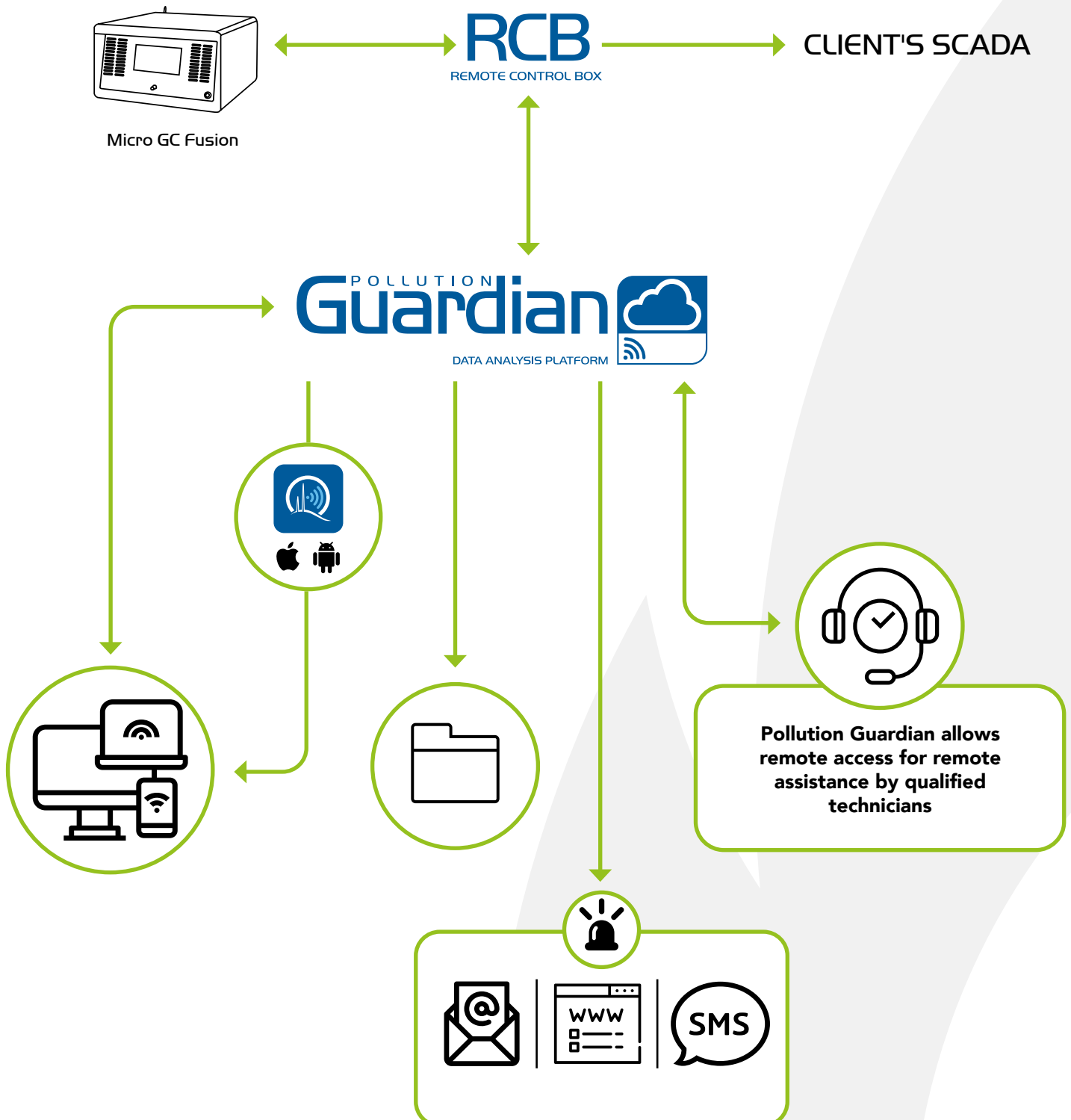| Parameter	Symbol	Measurement Unit	Sensitivity	Range	Limit Value Standard 11537	Basic	Ideal	Premium
VOC- Masking (e.g Limonene)	VOC	ppmv	≤ 1	0 – 10.000	≤ 5	•	•	•
Wobbe index	W_I	MJ/Sm³	-	-	47,31 ≤ X ≤ 52,33		•	•
Higher Heating Value	HHV	MJ/Sm³	-	-	34,95 ≤ X ≤ 45,28		•	•
Lower Heating Value	LHV	MJ/Sm³	-	-	-		•	•
Relative density	d_r	-	-	-	0,555 ≤ X ≤ 0,7		•	•
Methane	CH_4	%Mol	< 0,001	0 – 100	-		•	•
Carbon dioxide	CO_2	%Mol	< 0,001	0 – 100	≤ 2,5		•	•
Hydrogen sulfide	H_2S	mg/Sm³	≤ 2,5	0 – 10.000	≤ 5		•	•
Sulfur Content from Hydrogen Sulfide and Carbonyl Sulfide	H_2S COS	mg/Sm³	≤ 2,5	0 – 10.000	≤ 5		•	•
Oxygen	O_2	%Mol	< 0,001	0 – 100	≤ 0,6			•
Nitrogen	N_2	%Mol	< 0,001	0 – 100	-			•
Carbon Monoxide CO	CO	%Mol	< 0,001	0 -100	≤ 0,1			•
Hydrogen	H_2	% Vol	< 0,01	0 – 100	≤ 1			•

REMOTE CONTROL – POLLUTION GUARDIAN

Pollution Guardian is the Cloud solution to access remotely the analytical data acquired from the analyser.

Guardian allows you to:
- Store and display real-time data remotely
- View the data history

- Set user-defined alarms and send notifications via SMS, email, or push notifications thanks to the APP (iOS and Android)
- Control and manage the instrument remotely

RCB
REMOTE CONTROL BOX

CLIENT'S SCADA

Micro GC Fusion

POLLUTION
Guardian
DATA ANALYSIS PLATFORM

Pollution Guardian allows remote access for remote assistance by qualified technicians

WWW

SMS

# SAMPLING SYSTEM FOR VOC – MPF

VOCs are **substances present in all biogas** that come from the anaerobic fermentation of organic material. The VOCs abatement in biogas with an activated carbon system is one of the most used processes, whose efficiency should be constantly monitored with appropriate instruments **to protect the upgrading system and ensure the quality of biomethane produced**.

We use **Micro GC FUSION** combined with a heated sampling solution **(MPF Multi-Point Flammable)**.
The gas sample must be transported by an **appropriately heated sampling system**, otherwise, there will be no representative and reproducible gas sample to be analyzed, **with consequent false negative or positive**. MPF gas

sampler, therefore, maintains the gas characteristics during transport from the **6 sampling points** to the analyzer.
The analyses are carried out sequentially on the points described in the diagram below and are considered crucial for the plant's smooth operation, both in the short and the long term.
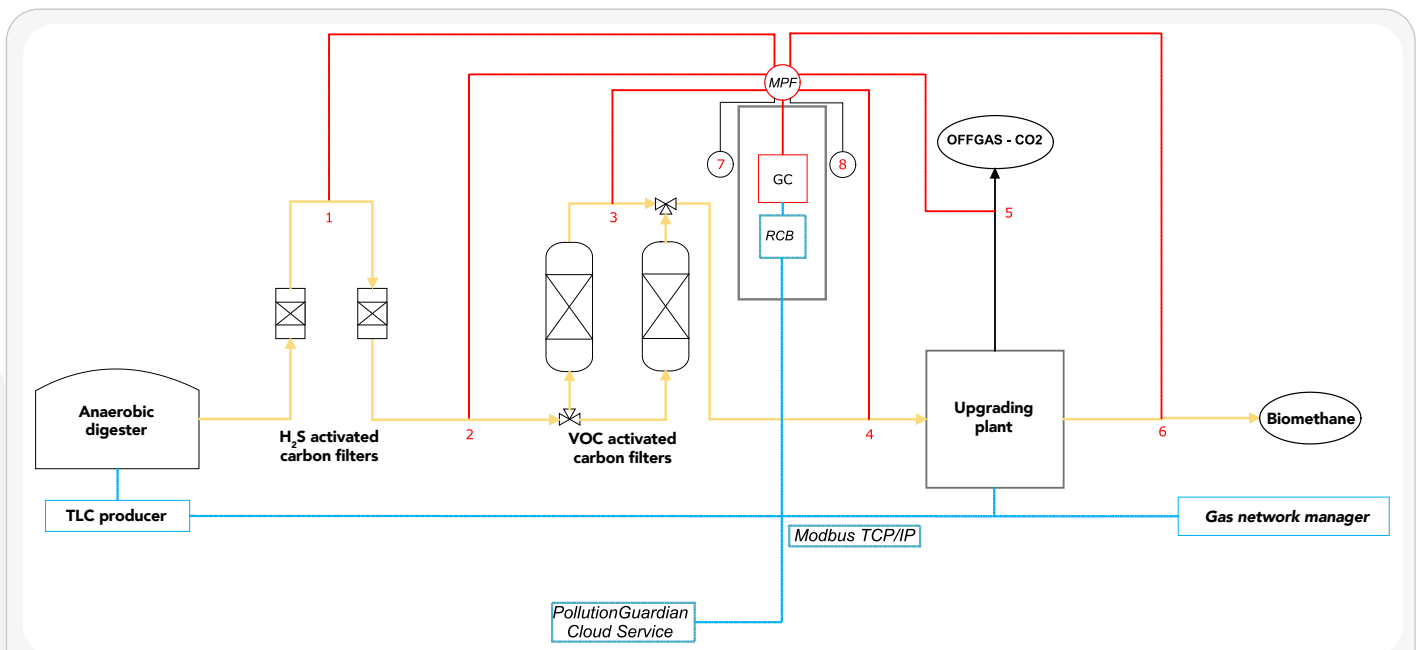
1. H₂S biogas analysis after first H₂S filter
2. VOC analysis of biogas entering activated carbon
3. VOC biogas analysis after first activated carbon analysis
4. VOC analysis of outgoing activated carbon biogas
5. CO₂ - CH₄ quality analysis in the atmosphere
6. Biomethane Quality Analysis (Pot. Cal, Wobbe, density, CO₂, H₂S, COS, O₂, H₂, etc...)

7. Standard span gas 1
8. Standard span gas 2

MPF: Multipoint Heated Sampling System for Flammable Gases

RCB: Remote data control system. The system processes, communicates data, and autonomously manages the GC.

The VOCs that have been identified are:
• Terpenes (Limonene, Cymene, Pinene, etc.)
• Ketones (Acetone, MEK, etc.)
• Alcohols (Methanol, Ethanol, etc.)
• Aromatics (Styrene, BTEX, etc.)
• Sulphur (COS, DMS, Mercaptans, etc.)

These are used as tracers **to measure the abatement system efficiency and warn the operator in real-time if necessary**, to prevent this type of substance from compromising the upgrading system or the biomethane odorisation process.

This allows the consumable of the abatement system to be replaced only when it has actually reached saturation. The trend in the VOCs concentration in the abatement system is shown below. The graph illustrates how **VOCs increase rapidly at activated carbon saturation**.

The analysis system must give a sudden alarm in case of an increase in the target substances concentrations, allowing the necessary counteractions to be carried out to safeguard the plant, otherwise exposed to high risk. This solution guarantees **lower operating costs, contributing to small and medium-sized plants' economic sustainability**.

Scheme 1
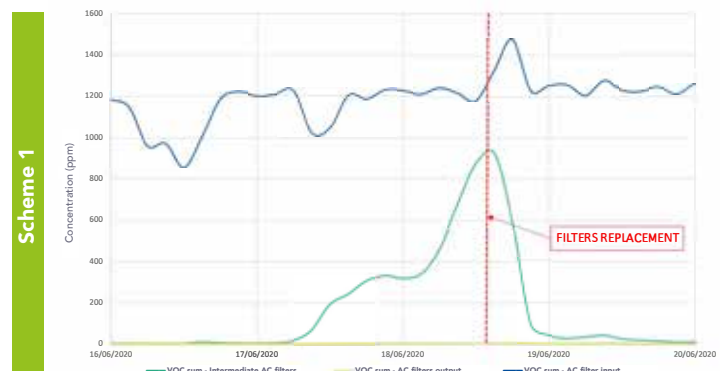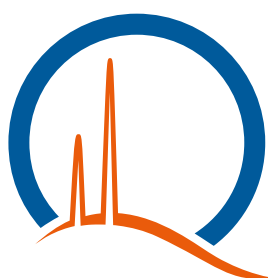
Quality & Process

THE ANSWER TO YOUR ON-SITE DETECTION CHALLENGES

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