



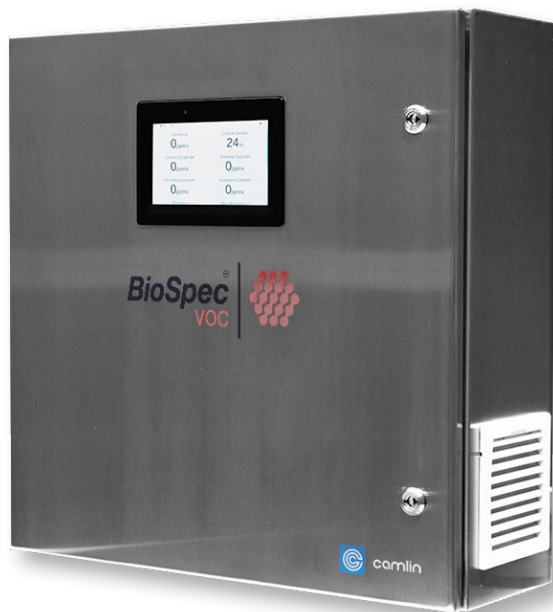
## Online VOC Analyzer for Biogas Upgrading Plants

Protect plant uptime and efficiency with  
real-time measurement of volatile organic  
compounds,  $\text{H}_2\text{S}$ ,  $\text{NH}_3$  and  
other contaminants



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» **Online monitoring of VOCs enables biogas upgrading plants to improve their operational efficiency and uptime**



### BioSpec VOC

- ✓ Protect membrane and PSA performance
- ✓ Reduces operational costs for activated carbon
- ✓ Increases overall upgrading plant uptime
- ✓ Easy and hassle-free to install and operate
- ✓ Low cost of ownership with no need for future recalibrations



## Overview

BioSpec VOC is an online sensor for volatile organic compounds, hydrogen sulphide, ammonia and other biogas contaminants, and has been designed and built specifically for biogas to biomethane (renewable natural gas) upgrading plants. Online monitoring of VOCs enables biogas upgrading plants to improve their operational efficiency by:

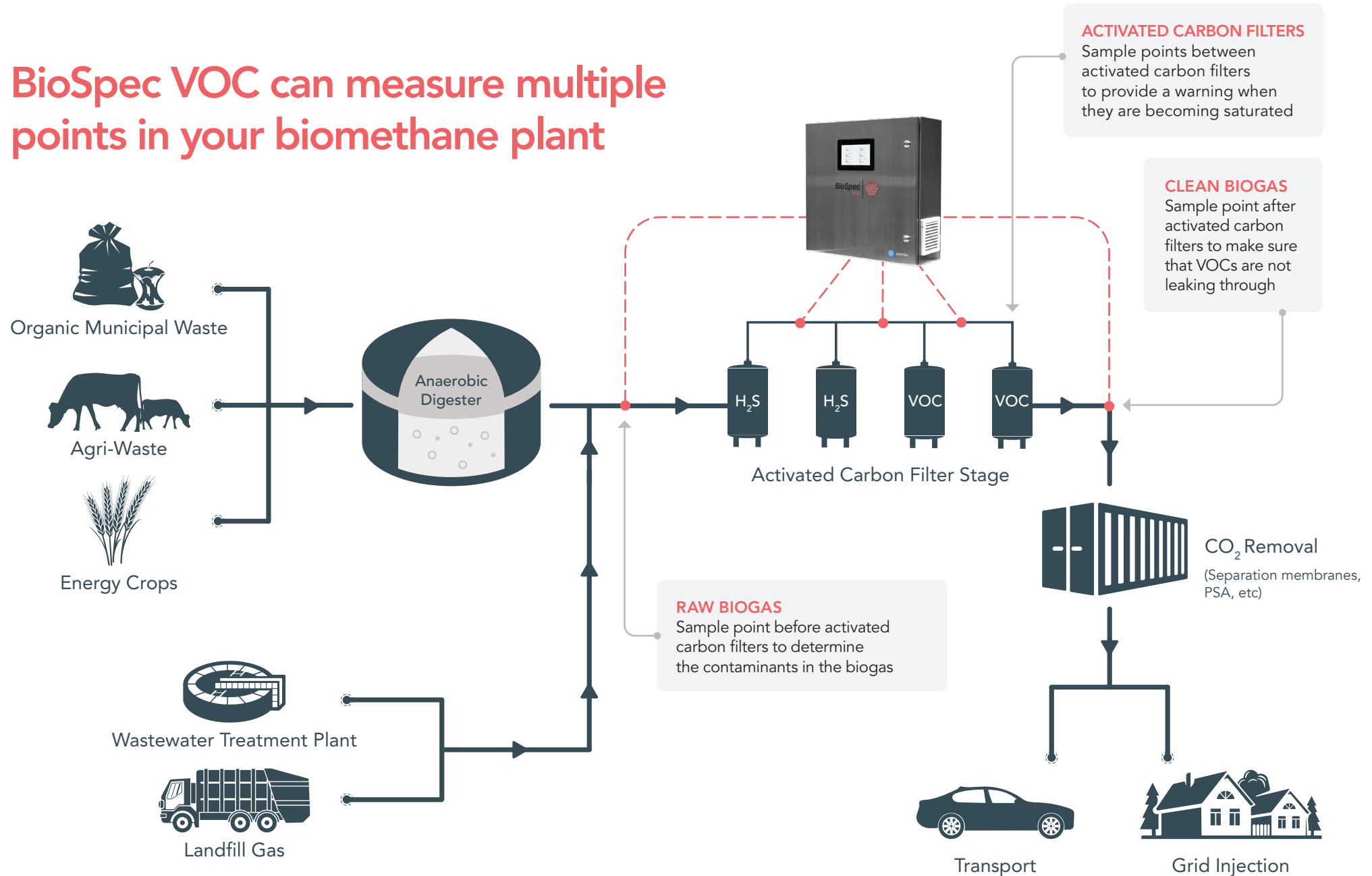
- continuously monitoring biogas quality pre and post-carbon treatment to pinpoint the precise moment when activated carbon filters begin to saturate allowing site operators to safely maximize the life-span of their carbon media
- alerting of imminent VOC breakthroughs to prevent them from reaching and harming separation membranes (CO<sub>2</sub> removal stage), thereby avoiding hidden loss of efficiency costs, membrane replacements and plant downtimes

- monitoring VOCs before and after gas scrubber systems and carbon polishers to allow for better process optimization and can prevent expensive gas-to-grid shutdowns due to VOCs
- identifying changes in the biogas quality and composition, enabling process optimization, tailoring digester feeding, and matching the best carbon media for specific impurities

Industry leading biogas plant operators know the importance of monitoring biogas quality to optimize site performance, discover changes in feedstock, minimize risks, and avoid hidden operating costs. BioSpec VOC is a complete out-of-the-box solution that operators can rely upon to overcome these challenges.

**"BioSpec VOC clearly improved the efficiency and return on investment of our biogas upgrading plant!"**

# BioSpec VOC can measure multiple points in your biomethane plant



# Why choose BioSpec VOC?



Reduce operational costs  
for activated carbon



Safeguard performance  
and maximize service  
lifetime of upgrading  
equipment



Reduce overall biomethane  
production costs and avoid  
costly plant shutdowns



Return on investment  
typically less than one year

## BioSpec VOC Technology

- ✓ Optical spectroscopy: accurate and repeatable
- ✓ Low maintenance: No sensor drift and no recalibration required.
- ✓ No calibration or carrier gas consumables needed
- ✓ No electrochemical sensors
- ✓ Easy to use without expert knowledge
- ✓ Measures VOCs and other impurities in raw biogas and clean biomethane
- ✓ Instrument can measure at up to 7 sample points
- ✓ Full spectrum analysis

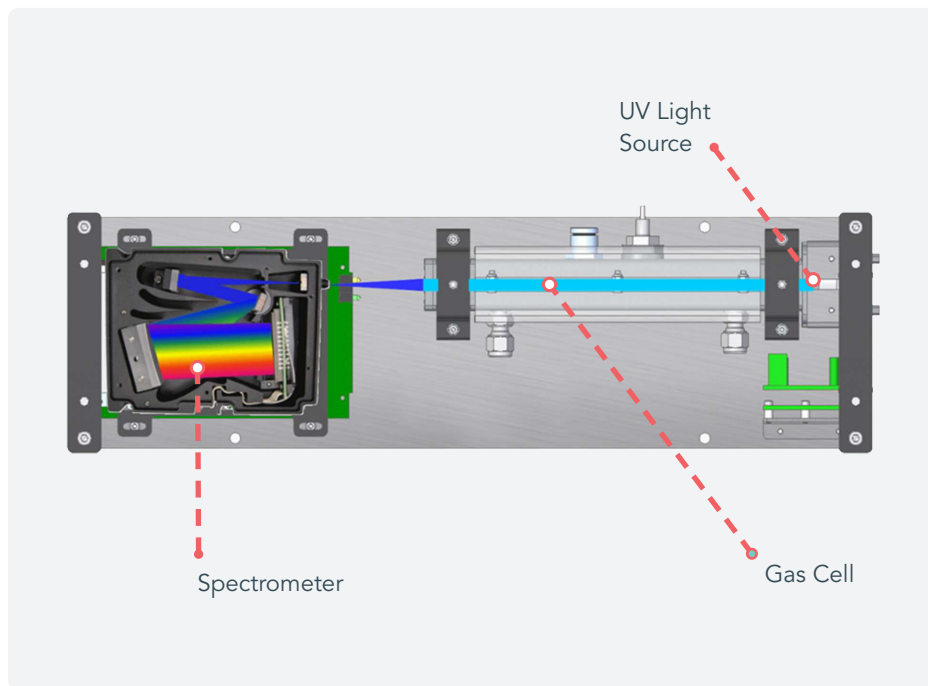
**The BioSpec VOC is used by suppliers and operators of biomethane (renewable natural gas) plants.**

## Typical Applications

- ✓ BioSpec VOC is used by OEMs, owners and operators of biomethane (renewable natural gas) plants where biogas is produced from sources such as:
  - Anaerobic Digestion of organic waste (food waste, agricultural biomass, etc.)
  - Landfill gas
  - Wastewater treatment



## Gas Measurement Technique



## Technology

### Optical Absorption Spectroscopy

BioSpec VOC uses a differential optical absorption spectroscopy technique to measure individual VOCs in gas mixtures. Every VOC component has its own unique spectral fingerprint and through optical spectroscopy we can determine the type and concentration of each VOC in the gas sample in a single measurement.

Ultraviolet (UV) light shines through a sample of gas and individual components will preferentially absorb certain wavelengths of the UV light. A spectrometer separates the transmitted light into individual wavelengths and the full UV-spectrum of the gas mixture is obtained. BioSpec VOC is the only VOC monitoring system that uses full spectrum analysis. The observed spectrum is analysed through sophisticated data analysis techniques and individual gas components and their concentrations are extracted and reported.

There is zero sensor drift with this measurement technique and no carrier gases are required for the measurement. Unlike electrochemical sensors, which require periodic recalibration and replacement, the BioSpec VOC technology does not require recalibration and the sensors don't need replaced. This significantly reduces operating costs and simplifies operation of the device.

**"BioSpec VOC is the ideal technology to solve the problem of volatile organic compounds and other contaminants in biomethane plants."**

# Impacts of not monitoring VOCs

Without monitoring VOCs and other contaminants, it is difficult to determine the optimal time to replace activated carbon filters.

Replacing the activated carbon filters too early when they have not yet reached saturation results in an unnecessary increased spend on activated carbon.

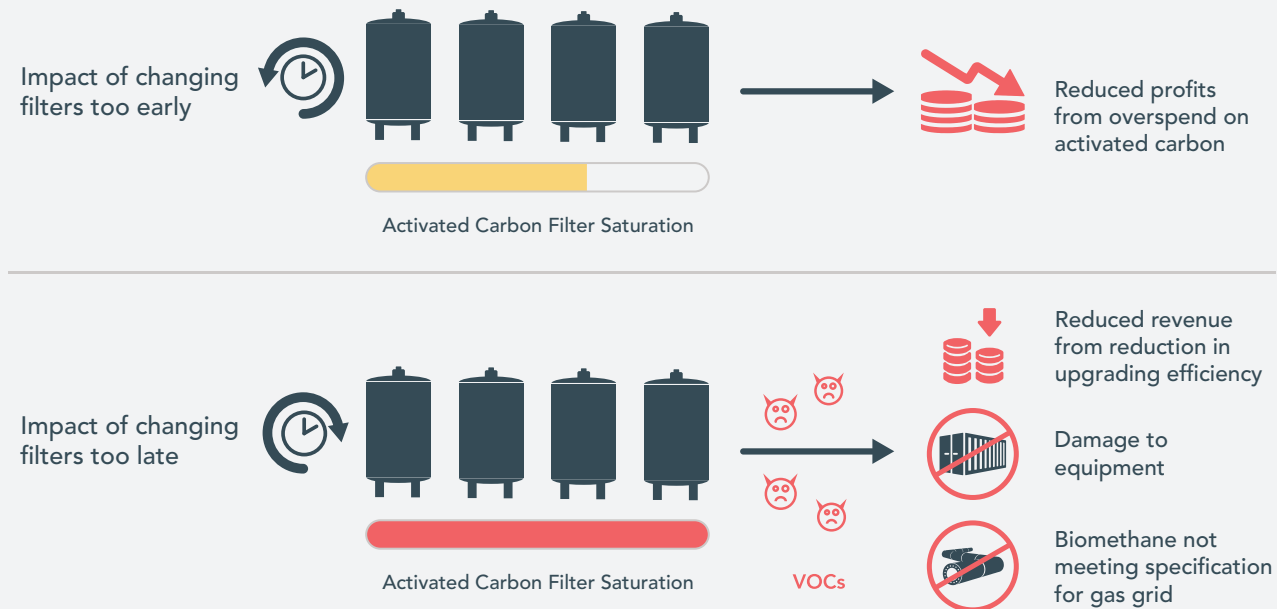
Replacing the activated carbon filters too late when the filters have become oversaturated can have a detrimental effect on the biomethane plant. Harmful VOCs can leak through the

saturated filters, reduce the efficiency of the plant, and damage expensive upgrading equipment. Furthermore, an increased amount of VOCs in the biomethane can mean that gas does not meet the required specification for grid injection.

BioSpec VOC solves these problems and allows the user to replace the activated carbon filters at the optimal time to maximize plant efficiency and operational performance, and reduce expenditure and potential plant downtime.



**Avoid unnecessary costs and mitigate against plant downtime**





## Multi-point Sampling

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A single BioSpec VOC instrument can be used to measure before and after biogas treatment and between different treatment stages in the upgrading plant. Camlin provide an optional multi-point sampling system that is directly controlled through the instrument, facilitating up to seven sampling points in a modular design. Alternatively, the instrument can easily be connected and integrated to a customer supplied sampling system.

## Online Measurement

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The measurement period is typically a few minutes per sample point and the BioSpec VOC system is commonly utilised for hourly measurement; however, sampling frequency is fully configurable.

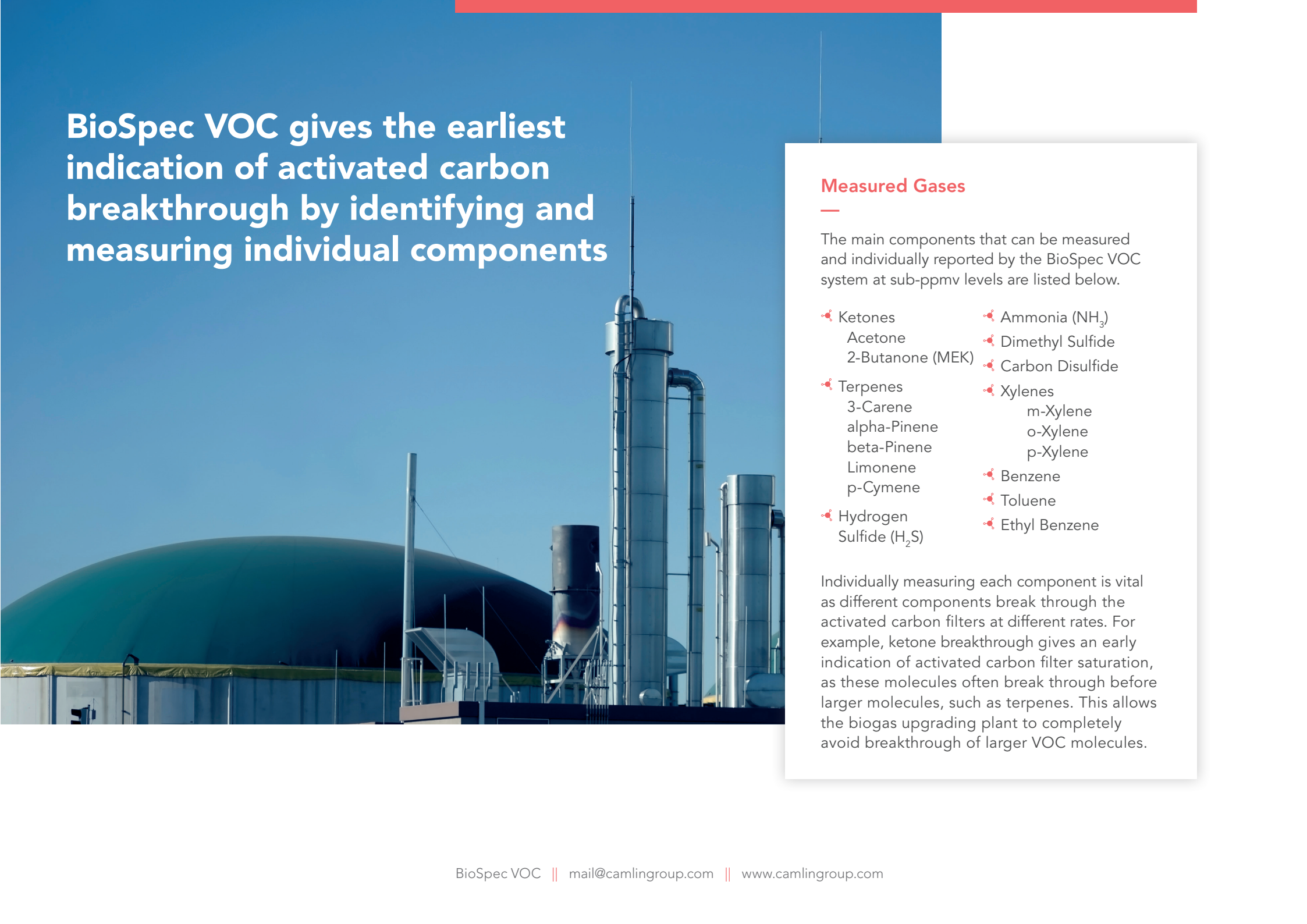
Data from the BioSpec VOC system can be easily trended and analyzed in our VOC Dashboards software, and combined with other production data, for deeper insight and better decision making.

## Customer Focus

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As well as the technical innovations, Camlin have a flexible and innovative commercial approach giving purchase and rental options with tailored service and support contracts. We partner with our customers to ensure that our technical and commercial offering is fully aligned to our customers needs.





# BioSpec VOC gives the earliest indication of activated carbon breakthrough by identifying and measuring individual components

## Measured Gases

The main components that can be measured and individually reported by the BioSpec VOC system at sub-ppmv levels are listed below.

- Ketones
  - Acetone
  - 2-Butanone (MEK)
- Terpenes
  - 3-Carene
  - alpha-Pinene
  - beta-Pinene
  - Limonene
  - p-Cymene
- Hydrogen Sulfide ( $H_2S$ )
- Ammonia ( $NH_3$ )
- Dimethyl Sulfide
- Carbon Disulfide
- Xylenes
  - m-Xylene
  - o-Xylene
  - p-Xylene
- Benzene
- Toluene
- Ethyl Benzene

Individually measuring each component is vital as different components break through the activated carbon filters at different rates. For example, ketone breakthrough gives an early indication of activated carbon filter saturation, as these molecules often break through before larger molecules, such as terpenes. This allows the biogas upgrading plant to completely avoid breakthrough of larger VOC molecules.

# Unlock the full potential of your VOC data



## VOC Dashboards

The cost of removing contaminants such as VOCs and  $H_2S$  from biogas, and the impacts of not managing these contaminants effectively, can be significant. By performing deeper analysis on data trends more insight on the impact and cost of VOCs and other contaminants to the plant can be revealed. Opportunities can then be identified to improve the cost effectiveness of managing contaminants and spend on activated carbon.

BioSpec Insights is a data visualization solution developed specifically for biogas plants. The VOC Dashboards module allows you to gain a deeper understanding of the data collected by BioSpec VOC, enabling better, data-driven, decisions to be made. Furthermore, by pulling other data sources into the platform, further insight can be gained.

## Key benefits

- Easily trend VOC data over time and at different sample points to make decisions on activated carbon replacement.
- Ensure biogas is within specification (and warranty obligations) for the upgrading equipment.
- Monitor compliance with gas networks specification requirements for gas to grid projects.
- Review the effectiveness of spend on carbon and optimize selection of activated carbon.
- Simple to use cloud based software, with manual and automated file upload options, and capability to pull in other data from your SCADA system, e.g. to correlate VOC data with biomethane (RNG) production data.



camlin energy

## »» Global Presence Local Support

At Camlin Energy, we support our customers around the globe to build greater reliability and resilience into energy networks. We have a worldwide presence with facilities in 21 cities across 17 countries, enabling us to provide local support to our customers.

Our smart fault and load management solutions allow networks to operate more efficiently, enhance quality of supply and drive a more

sustainable future. Our asset monitoring solutions for transformers, rotating machines, and circuit breakers, deliver key insights into asset health, reducing the risk of unplanned outages. Our gas sensing solutions help biogas plants and gas networks to optimize performance, safeguard assets and transition to net zero.

Get in touch with us for  
smarter and more efficient  
biogas upgrading



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