



BioSpec[®]
VOC



Online Analyser for Biogas Upgrading Plants

Volatile Organic Compounds,
Hydrogen Sulfide, Ammonia
and Other Contaminants



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



BioSpec VOC

- ✓ Enabling more efficient biogas upgrading
- ✓ Protects membrane performance
- ✓ Reduces operational costs for activated carbon
- ✓ Increases overall upgrading plant uptime
- ✓ Easy and hassle-free to install and operate with no need for recalibrations



Overview

BioSpec VOC is an online sensor for volatile organic compounds, hydrogen sulfide, 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 will be saturated with VOCs allowing site operators to safely maximise the life-span of their carbon media
- alerting of imminent VOC breakthroughs to prevent them from reaching and harming separation membranes (CO₂ 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 optimisation and can prevent expensive gas-to-grid shutdowns due to VOCs
- identifying changes in the biogas quality and composition, enabling process optimisation, 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 optimise site performance, discover changes in feedstock, minimise 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 to biomethane upgrading plant!"

Why choose BioSpec VOC?



Reduce operational costs for activated carbon



Safeguard membrane performance and maximise membrane service lifetime



Reduce overall biomethane production costs and avoid costly plant shutdowns



Return on investment typically less than one year

BioSpec VOC Technology

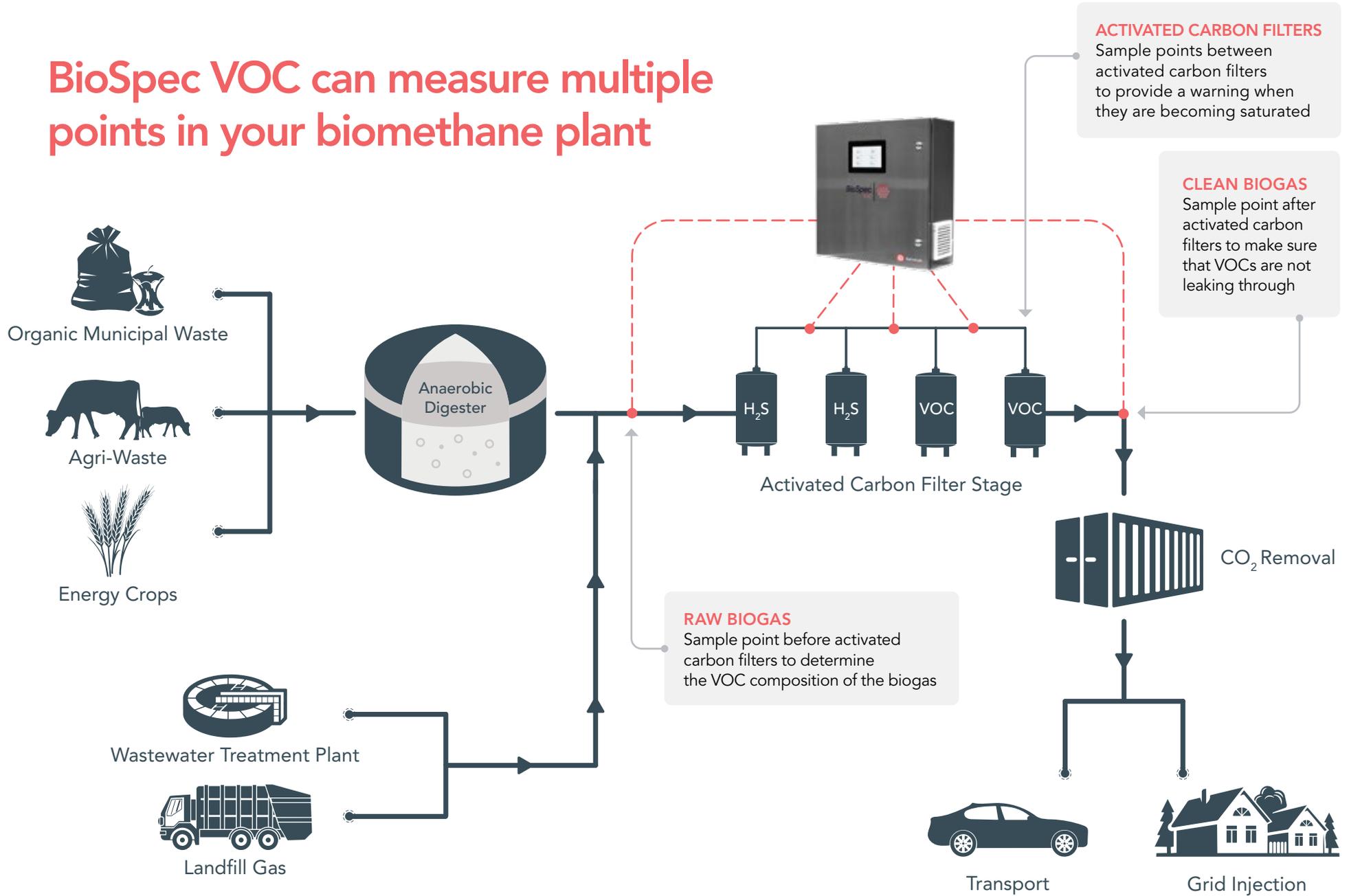
- ✓ Optical spectroscopy: accurate and repeatable
- ✓ Low maintenance: No sensor drift and no recalibration required.
- ✓ No calibration or carrier gas consumables needed
- ✓ No electrochemical sensors
- ✓ Easy to use without expert knowledge
- ✓ Measures VOCs and other impurities in raw biogas and clean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

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

BioSpec VOC can measure multiple points in your biomethane plant



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 the saturation point results in an unnecessary increased spend on activated carbon.

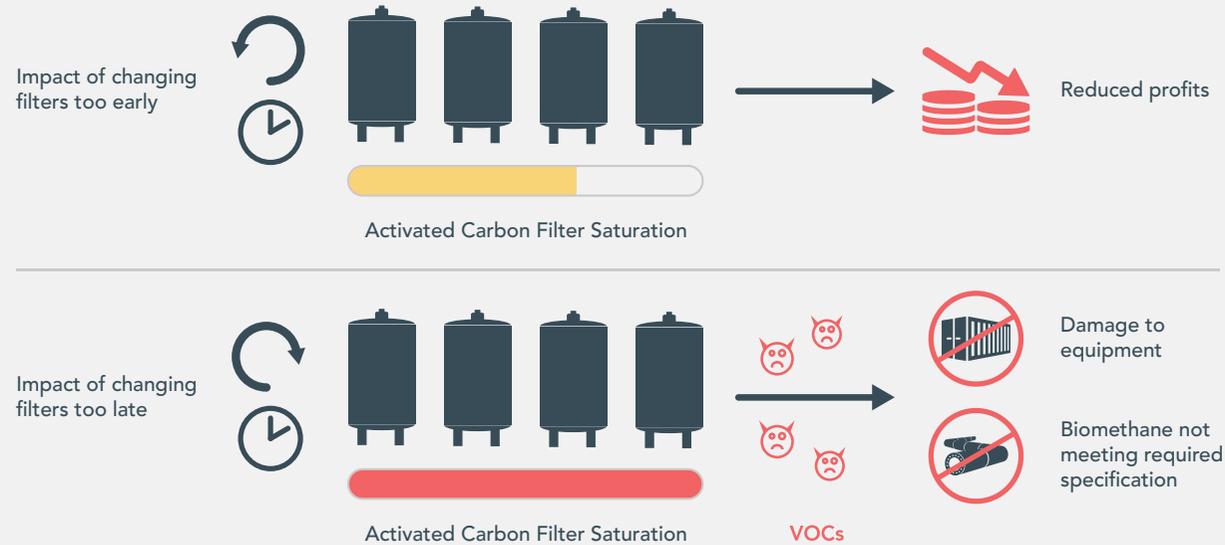
Replacing the activated carbon filters too late when the filters have become oversaturated can have a detrimental effect on the biomethane plant. Harmful VOCs can leak through the

saturated filters and damage the 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.

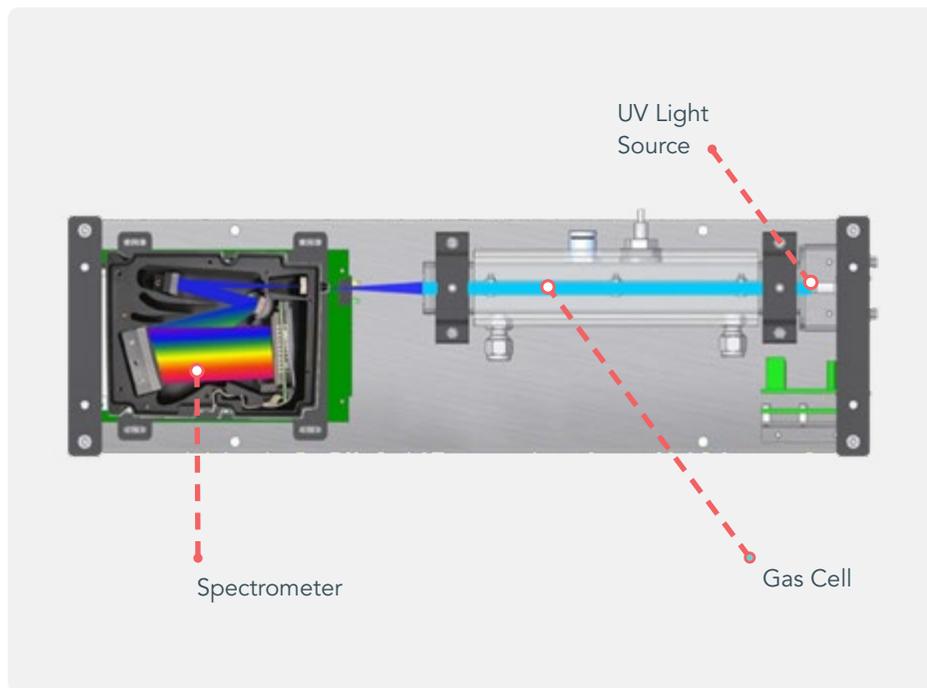
BioSpec VOC solves these problems and allows the user to replace the activated carbon filters at the optimal time for maximising plant efficiency and operational performance and reducing expenditure and potential plant downtime.



Avoid unnecessary costs and mitigate against plant downtime



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."

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 (H₂S)
- Ammonia (NH₃)
- 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.



Multi-point Sampling

A single BioSpec VOC instrument can be used to measure before and after biogas treatment and between different treatment stages in the upgrading plant. Kelvatek 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

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.

BioSpec VOC can also operate in manual single measurement mode. For example, this facilitates the user measuring individual samples from Tedlar bags allowing for spot-checks to be carried out.

Customer Focus

As well as the technical innovations, Kelvatek 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.



»» About Kelvatek

For over two decades, Kelvatek has been working collaboratively across the UK & Irish Energy industry to accelerate network performance and drive a more sustainable future. We provide industry leading solutions and services for Fault & Load Management, Asset Monitoring and Biogas & Gas Monitoring.

Data – and the insight it provides – drives everything we do. The powerful insights we deliver from our clients' data allow them to maximise returns from current network investments, make strategic decisions, deliver improved customer outcomes and embrace the opportunities of net zero. The data we

collect is transparent and open, putting Network Operators firmly in control of their networks.

We exist to engineer better futures. You'll see that commitment reflected in initiatives to make our operations more sustainable, and to help our customers on their own journey to net zero.

Kelvatek is part of Camlin, which has a worldwide presence with facilities in 21 cities across 17 countries. Camlin's goal is to optimise the critical infrastructures that people, cities and communities around the world depend on, all day and every day.

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



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