PENTAIR

BioSENSE

ONLINE VOC SENSOR

UNDERSTANDING QUALITY.
FOR LIFE.

BIOGAS.PENTAIR.COM

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MINIMIZE YOUR HIDDEN COSTS FOR CONTAMINATED BIOGAS

THE IMPORTANCE OF MANAGING YOUR BIOGAS QUALITY

The important focus on carbon footprint reduction, and the utilisation of waste as green energy, is pushing requirements for the equipment & technologies involved.

Nowadays biogas goes beyond the digestion of energy crops and manure. The increased utilisation of bio-waste is resulting in raw biogas containing previously disregarded impurities such as volatile organic compounds (VOCs). These contaminants, predominately terpenes and ketones, not only endanger the pipe integrity of the gas grid, they can also impact the odorization of the gas, leading to safety issues when gas leakages cannot be detected (smelled) anymore.

BIOSENSE ADVANTAGES

- Developed specifically for the application
- Unparalleled in robustness, reliability and operability

TYPICAL APPLICATIONS

- Agricultural plants with bio-waste as co-digestate
- Bio-waste treatment plants (industrial, supermarket & residential sources)
- Anaerobic digesters on waste water treatment plants

ADDED VALUE

- Reduce operational costs for activated carbon by up to 30%
- Increase uptime by 1-2%
- Safeguard membrane performance and service life
- Reduce biomethane production costs by 3-5%

Your key to profitable biogas upgrading is a cost-efficient raw biogas pre-treatment
Pentair's BioSENSE is a new and unique sensor with which the VOC load of biogas can be continuously determined by means of optical absorption spectroscopy. BioSENSE has been developed together with Camlin Technologies and provides a robust cost-effective way of measuring the contaminants before and after pre-treatment of the raw biogas. This also includes the detection of H2S and NH3 breakthroughs to the purified raw biogas in case of saturated activated carbon filter fillings. Your overall plant operation is optimized and the costs for biogas purification are minimized.

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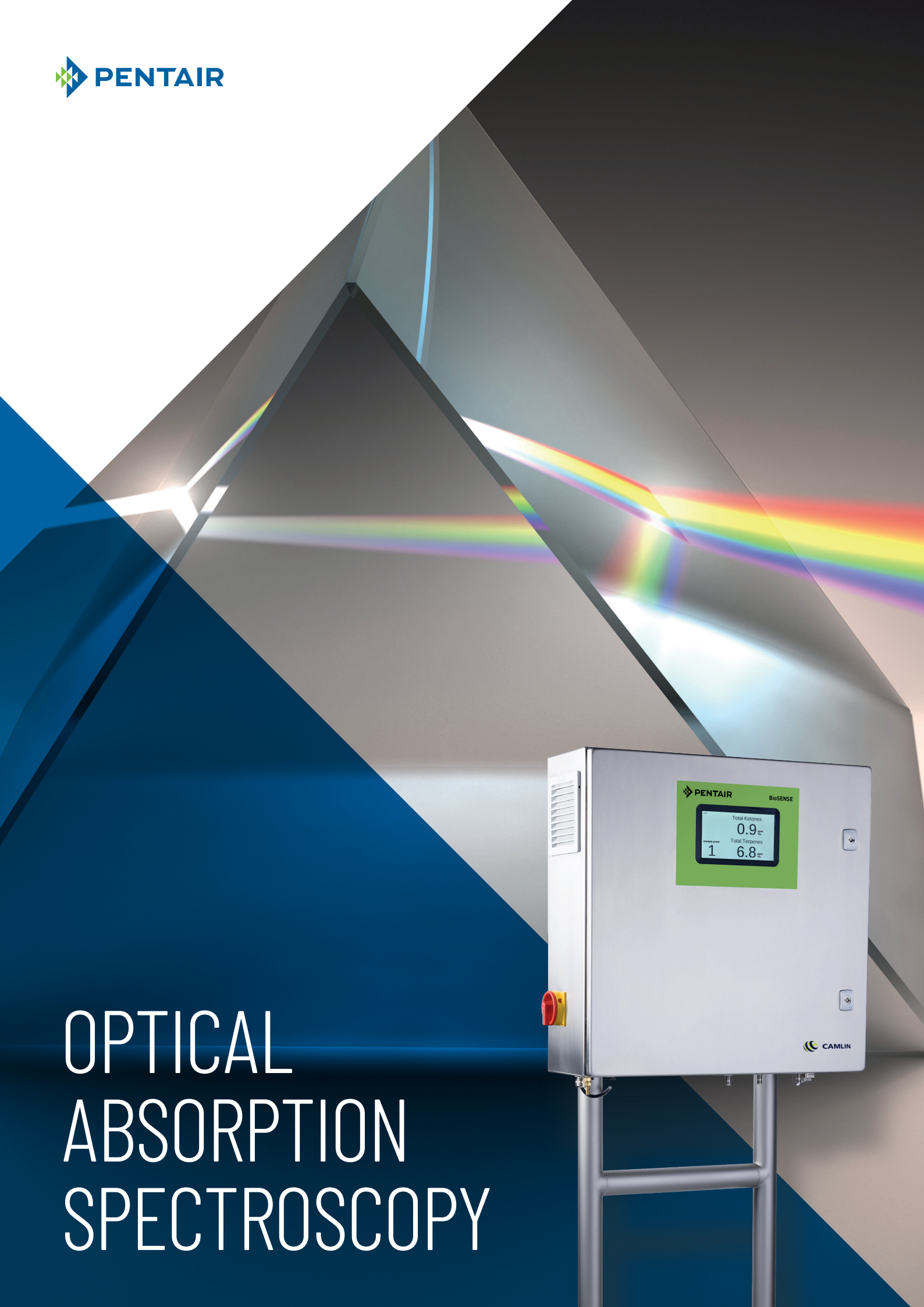
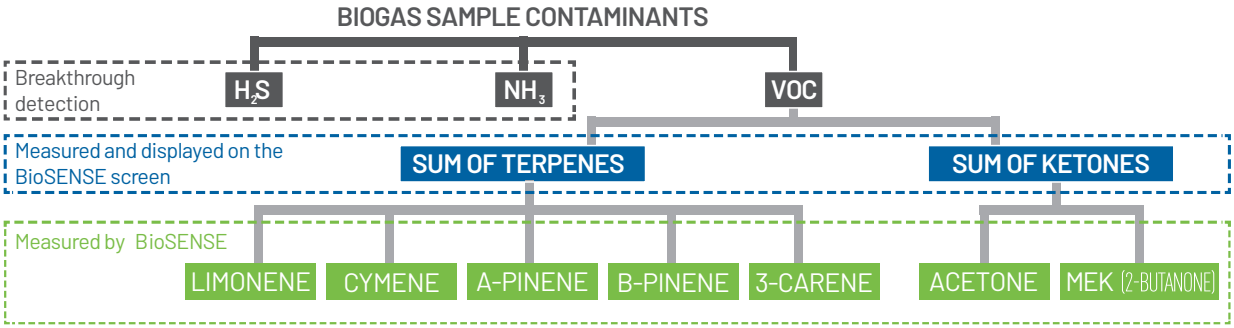
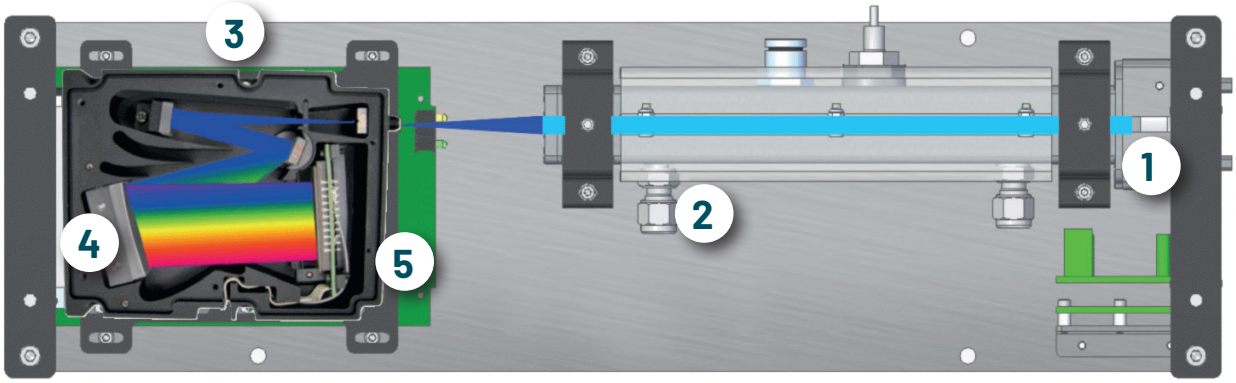


OPTICAL ABSORPTION SPECTROSCOPY

BioSENSE TECHNOLOGY



PROCESS OF OPTICAL ABSORPTION SPECTROSCOPY



The optical absorption spectroscopy used in the BioSENSE operates with a UV light source (1) which emits light that penetrates a gas sample in a measuring cell (2). Here light is partially absorbed by the gas molecules. Since each molecule has its own typical absorption spectrum, it is possible to simultaneously determine the concentration of different components of the gas. The remaining light is captured by the receiver (3). The receiver splits the light into narrow wavelength bands using an optical grating (4). Finally the light is captured by a CCD (5) and transformed into an electrical signal for processing. By adapting spectrometric technology to the analysis of biogas, its typical contaminants like VOCs, H_2S and NH_3, can be continuously monitored.

KEY PARAMETERS

Specifically designed to measure contaminants in biogas:

- Sum of Terpenes
- Sum of Ketones
- H_2S (breakthrough detection)
- NH_3 (breakthrough detection)

AUTOMATIC SAMPLING SYSTEM

- Up to 5 different sampling points
- Up to 6 measurements per hour

TECHNICAL ADVANTAGES

- Purpose-made for the application
- Delivers accurate, reliable and validated results
- Robust (light source and sensor not in contact with gas sample)
- Easy operation without expert knowledge
- Low maintenance
  - No need for calibration gas
  - No on-site calibration
  - Only one inspection service per year

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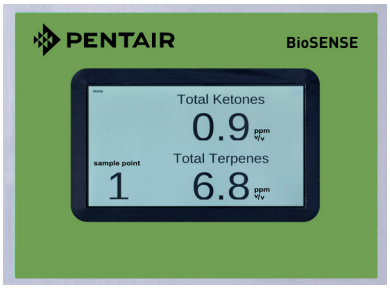
COMMERCIAL BENEFITS

BioSENSE = CREATING VALUE FOR YOU

BioSENSE was developed with the aim of improving your plant performance. Pentair's BioSENSE will keep your downtime and raw biogas pre-treatment costs under control.



BioSENSE display showing "Total Ketones and Total Terpenes"

Following a 72 week field test involving 3 customers, the benefits of BioSENSE were demonstrated with following results:

Reduce Operational Costs for Activated Carbon by up to 30 %

Ketones and terpenes are usually removed by activated carbon filters. Measuring VOCs with the BioSENSE before and after the biogas pre-treatment system provides you several options for minimizing expenses for activated carbon:

- Precise determination of when the activated carbon filling of the filter reaches saturation and needs replacement; the amount of activated carbon being wasted is minimized.
- Comparison of different types of activated carbon in regard with purification and cost efficiency; the best suitable activated carbon can be selected for the prevailing feedstock.
- Identification of substrates causing extra-ordinarily high contamination levels in the raw biogas; these substrates can be diverted directly to composting or the biogas can be combusted in a CHP.

Cost savings on activated carbon of more than 30 % were achieved in the field test.

Increase Uptime by 1 to 2 %

When the activated carbon filling of a VOC filter is not replaced in time and a breakthrough of contaminants is only detected by inefficient upgrading performance, the required shutdown will cause production losses. Having installed the BioSENSE online sensor, the plants in the field test managed to increase their revenue from grid injection by 1 to 2 %.

Safeguard Membrane Performance and Service Life

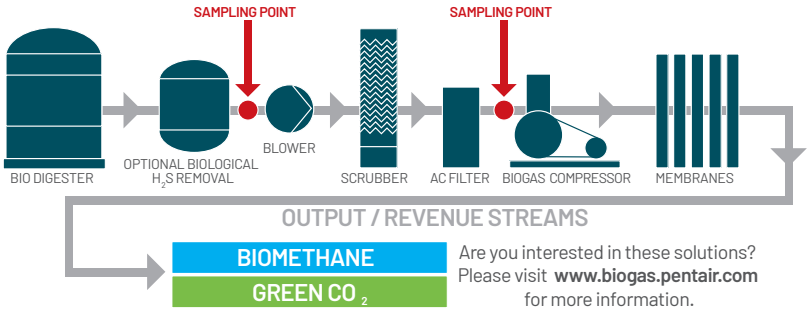
The membranes are the costly and sensitive heart of a biogas upgrading system. When contaminants are not removed, the membranes lose their efficiency and might eventually be damaged. The BioSENSE protects you against inefficient biogas upgrading and unplanned membrane replacements.

Reduce Biomethane Production Cost by 3 to 5%

Selecting the right feedstock, reducing the cost for activated carbon, minimizing downtime and avoiding the rejection of biomethane at the gatekeeper, has improved the overall economic yield of the feedstock of the plants in the field test by 3 to 5 %.

Excellent Return on Investment

Dependent on the size of the biogas upgrading plant, the feedstock and the resulting amount of raw biogas contaminants, the BioSENSE payback period can be as little as one year or less.



Are you interested in these solutions? Please visit **www.biogas.pentair.com** for more information.

AFTER MARKET SERVICES.
OPTIMIZING PERFORMANCE. FOR LIFE.

You are operating a state-of-the-art production plant that requires optimal performance over the life cycle, with minimum production losses and strict compliance with industry regulations.

Together we achieve this with aligned service schedules, supported by adequately trained personnel and supply of original spare parts and consumables - to run your plant at full capacity and guaranteeing the required quality level at minimum operational cost.

Scope of Supply
Pentair's After Market Service offers a variety of options, tailor made to meet your specific requirements. After sales support, on-site repairs, training and supervision, original spare parts and consumables, preventive and corrective maintenance plus remote program management will keep your plant up and running – that's what we call optimizing performance.

CUSTOMER BENEFITS

- Less downtimes
- More process control
- Lower operational costs
- Optimal utilization
- Better product quality

PROVIDED SOLUTIONS

- After sales support
- On-site repairs
- Training & supervision
- Original spare parts & consumables
- Preventive & corrective maintenance
- Remote program management via connected products

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