

Newsline

RENEWABLE ENERGIES

Process measuring technology for biogenic fuel gases

December 2013 edition

The significance of renewable energies for the supply of heat, electricity and gas is becoming every greater. Today, 18 percent of the electricity produced in the world comes from alternative energy sources. Among the most versatile of the new energy sources are biogenic fuel gases from biogas and so-called Power-2-Gas plants. As a leading supplier of process instrumentation, KROHNE offers the right measuring device for many measuring tasks when it comes to the production, processing and use of biogenic fuel gases.



Biogas measurement for the supply of a combined heat and power plant, ara region bern ag, Switzerland

Traditionally, biogas is a product of the fermentation of sludge from wastewater treatment plants, landfills and organic raw materials such as agricultural waste. The great advantage of the gas is that it is easy to store and transport and that it can be used as an energy source in the production of electrical and thermal energy thanks to power-heat cogeneration. With the appropriate connection option, biogas can be processed to gas transport quality and fed into the natural gas grid.

Power-2-Gas

Wind power, offshore and photovoltaic plants convert wind and sun energy into electrical current. Power-2-Gas technology is a way of „storing“ the electricity produced. By way of electrolysis and using electrical energy, the water is split up into hydrogen (H_2) and oxygen (O_2). The hydrogen produced can be fed directly into the natural gas grid or, in a second step with the help of carbon dioxide (CO_2) can be converted into synthetic methane (CH_4) in natural gas quality.

Speak to one of our experts – together, we will find the best solution.

KROHNE portfolio for biogenic fuel gases:

- Flowmeters for raw biogas/biomethane
- Flowmeters for custody transfer
- Level meters for biomass/bio sludge
- Temperature sensors for fermentation
- Calorific value corrector
- Flowmeters for hydrogen
- Leak detection system for hydrogen pipelines

Engineering services through all project stages

- Planning
- Start up
- Product training on-site
- Calibration
- Maintenance

Highlights

- Process measuring technology for the fermentation, processing, combustion or supply of biogas
- Long-term stable, maintenance-free measuring devices for high availability of biogas plants
- Custody transfer measuring devices suitable for billing of biomethane deliveries
- Optimised control of biogas plants with connected combined heat and power plant: high degree of efficiency instead of unplanned downtime



Biogas plant, Burghausen sewage system

Process measuring technology for biogas plants

Biogas plants have many, sometimes complex measuring points – from fermentation to processing right down to the combustion and supply of biomethane.

OPTITEMP industrial thermometers and non-contact OPTIWAVE radar level meters ensure optimal conditions in the fermenter. Their horn antennae are designed to measure the level of agitated media such as bio sludge and they are insensitive to condensation.

The OPTISWIRL 4070 is suitable for use between the fermenter and the gas tank. The vortex flowmeter provides reliable information about the quantity of biogas produced – even at high humidity and low pressure.

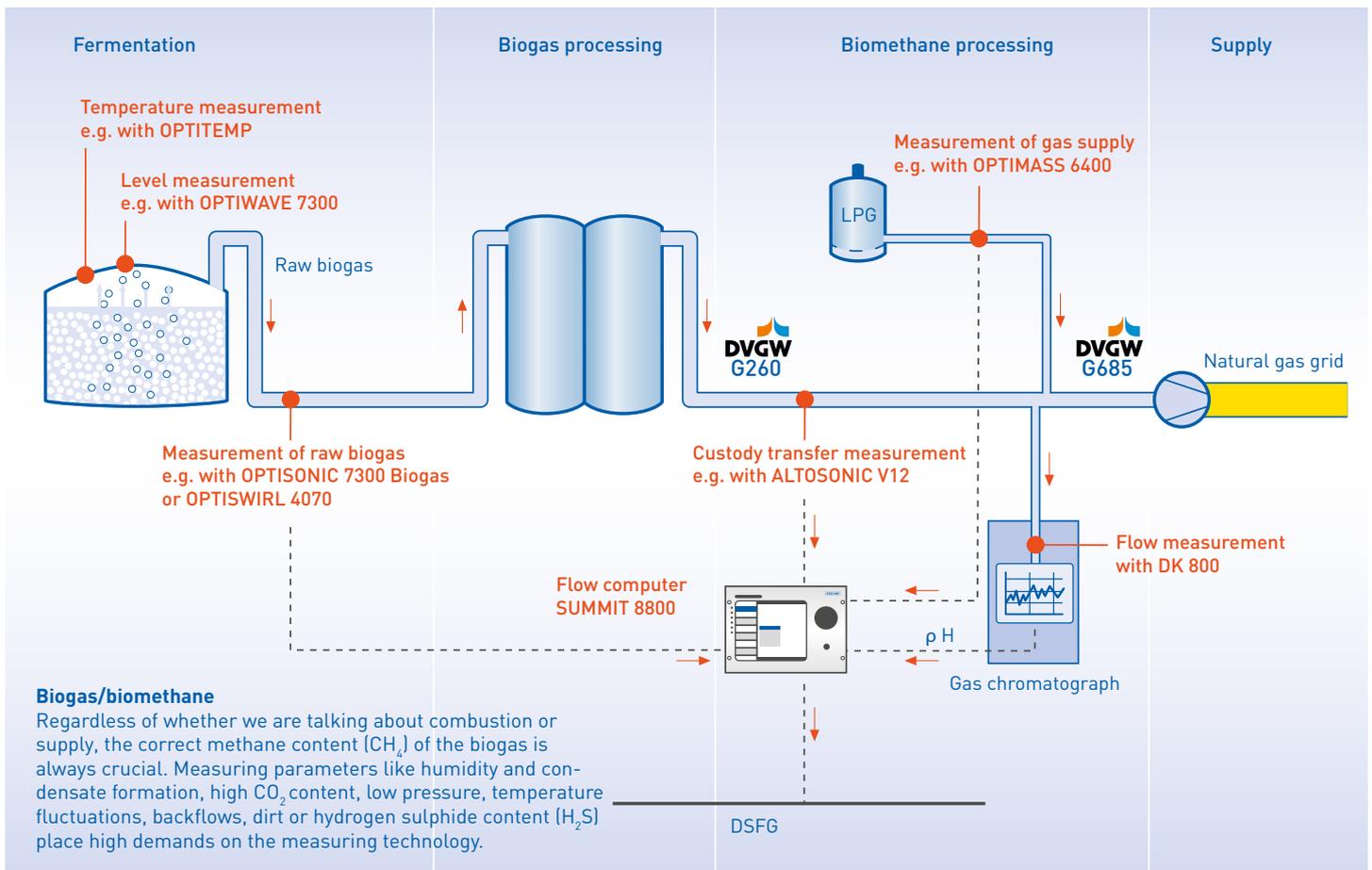
The OPTISONIC 7300 Biogas ultrasonic flowmeter showcases its strengths in front of the gas tank or in the treatment of raw biogas. Featuring integrated pressure and temperature compensation, it measures methane content and standard volume with no additional measuring devices. And it measures without losing pressure. Its electronics make it possible

to process sound signals highly damped with CO_2 that are typical of biogas applications. On top of that, titanium signal converters make the OPTISONIC 7300 Biogas resistant to corrosion caused by hydrogen sulphide (H_2S).

High biogas plant availability is generally required for the biomethane supply permit. For this reason, an ultrasonic meter such as the 12-path, custody transfer ultrasonic flowmeter ALTOSONIC V12 is superior to classic mechanical counters. It is maintenance-free and measures volume without a flow straightener and without losing pressure.

The DK 800 variable area flowmeter measures the very low volumes of gas supplied to the gas analyser to check the gas quality.

The SUMMIT 8800 flow computer calculates the standard volume based on the input variables pressure, temperature, calorific value and operating volume. If the calorific value of the gas needs to be adjusted by adding liquid gas, the OPTIMASS 6400 mass flowmeter is the right measuring instrument.



Measuring instruments for Power-2-Gas plants

The „saving of electrical power“ by Power-2-Gas technologies makes continuous monitoring of hydrogen quantities necessary – from production right down to transport for supply or methanisation. Since hydrogen is extremely volatile and highly flammable, only measuring devices made of stainless steel and with special gaskets may be used. They must also have approval for Ex-areas.

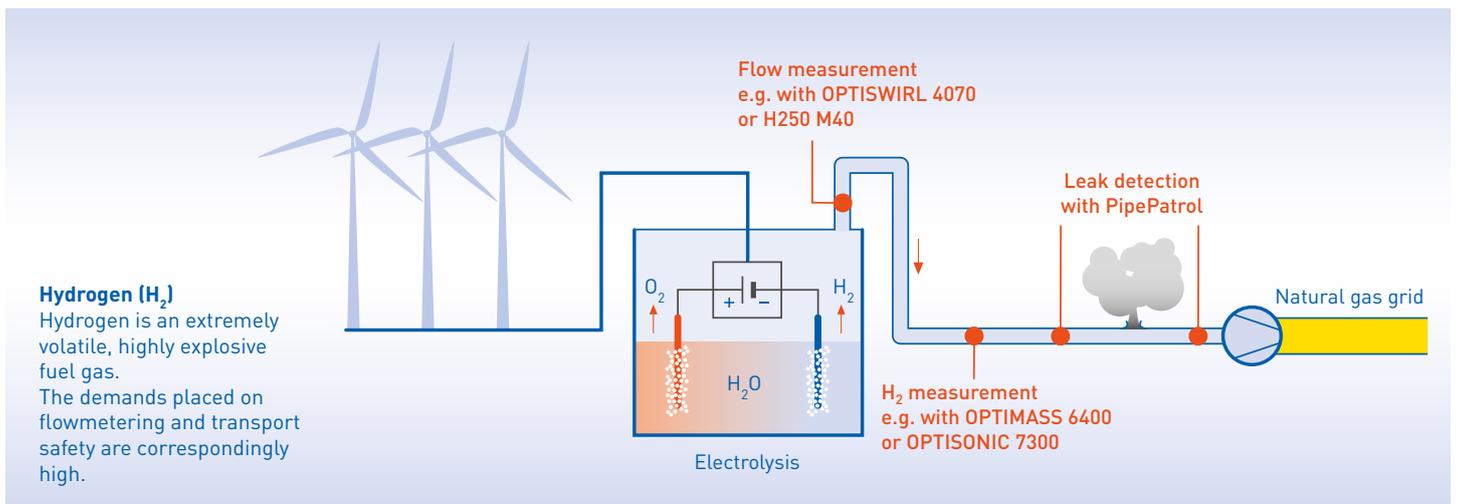
Immediately following electrolysis, an initial measurement of the H₂ produced is possible. Here the OPTISWIRL 4070 vortex flowmeter, which can also measure low-density hydrogen, may be used. As a cost-effective alternative or for redundant control measurement, the H250 M40 variable area flowmeter may also be

the right choice for low nominal sizes up to DN100. However, if greater accuracy and/or a bigger nominal size is required – even after compression – the OPTISONIC 7300 ultrasonic flowmeter with robust titanium signal converters may be a suitable choice. Alternatively, there is also the OPTIMASS 6400 mass flowmeter which, in addition to mass, can also measure the volumetric flow of hydrogen regardless of pressure and with a high degree of accuracy.

When transporting the hydrogen, PipePatrol ensures quick detection and exact localisation of leaks. The leading leak detection system makes it possible to continually monitor the pipeline to guarantee the necessary safety when dealing with hydrogen.

Highlights

- 10 years KROHNE experience in hydrogen measurement
- Wide range of products to measure the flow of hydrogen for different nominal sizes and accuracies
- Leading leak detection system with extremely high sensitivity and very low error rates



Product selection at a glance

KROHNE offers a number of measuring devices for biogas and Power-2-Gas processes. Simply consult the table below to see which device is available for the individual process stage. We would also be glad to meet with you in person and prepare a custom quote.

| Measuring devices for the biogas process | Level measurement | Temperature measurement | Flow measurement | | | | |
|--|-------------------|-------------------------|------------------|----------|------------|--------|---------------|
| | Radar | Pt100 | Electromagnetic | Coriolis | Ultrasonic | Vortex | Variable area |
| Biogas process | | | | | | | |
| Fermenter | X | X | X | | | | |
| Cleaning | | | | X | X | X | |
| Natural gas processing and supply | | | | X | X | | X |
| Power-2-Gas process | | | | | | | |
| Hydrogen processing | | | | X | X | | X |

Process measuring technology for biogenic fuel gases

Flow measurement

| | Ultrasonic flowmeter |  | Ultrasonic flowmeter |  | Mass flowmeter |  | Vortex flowmeter |  |
|--|-------------------------------------|---|--|---|--|---|---------------------------|---|
| | ALTOSONIC V12 | | OPTISONIC 7300 Biogas | | OPTIMASS 6400 | | OPTISWIRL 4070 | |
| Measuring principle | Ultrasonic | | Ultrasonic | | Coriolis mass | | Vortex | |
| Application | Biogas plants | | Biogas plants/Power-2-Gas | | Biogas plants/Power-2-Gas | | Biogas plants/Power-2-Gas | |
| Measurement requirement | Measurement of processed biomethane | | Measurement of raw biogas and processed biomethane; Measurement of hydrogen [with standard version OPTISONIC 7300] | | Measurement of liquid gas and hydrogen | | Measurement of raw biogas | |
| Custody transfer | Yes Acc. to MI-002 | | - | | - | | - | |
| Typical turndown ratio (depends on medium and process conditions) | 1:50 | | 1:30 | | 1:50 (LPG) 1:10 (H ₂) | | 1:20 | |
| Measuring range (max.) <small>*heavily dependent on medium and process conditions</small> | up to 30 m/s; 98.4 ft* | | up to 30 m/s; 98.4 ft* | | up to 10 m/s; 32.8 ft (LPG)* up to 150 m/s; 492.1 ft (H ₂)* | | up to 80 m/s; 262.5 ft* | |
| Inlet and outlet sections | 5D/3D | | 10D/3D | | 0D | | 20D/5D | |
| Approvals | ATEX, FM, CSA, IECEx, MI-002 | | ATEX, NEPSI | | ATEX, FM, CSA, NEPSI | | ATEX, FM, NEPSI, IECEx | |

Flow measurement

| | Variable area flowmeter |  | Variable area flowmeter |  |
|--|--|---|---------------------------------------|---|
| | H250 M40 | | DK 800 | |
| Measuring principle | Variable area | | Variable area | |
| Application | Power-2-Gas | | Biogas plants | |
| Measurement requirement | Measurement of hydrogen | | Measurement of biomethane sample flow | |
| Custody transfer | - | | - | |
| Typical turndown ratio (depends on medium and process conditions) | 1:10 | | 1:10 | |
| Measuring range (max.) <small>*heavily dependent on medium and process conditions</small> | up to 20 m/s; 65.6 ft* | | up to 20 m/s; 65.6 ft* | |
| Inlet and outlet sections | 5D/3D | | 0D | |
| Approvals | ATEX, FM, NEPSI, IECEx, GOST, KOGAS, INMETRO, CCOE | | ATEX | |

Level and temperature measurement

| | Radar level meter |  | Temperature meter |  |
|---|------------------------------------|---|--|---|
| | OPTIWAVE 7300 | | OPTITEMP TRA F13 | |
| Measuring principle | FMCW radar | | electrical resistance | |
| Application | Biogas plants | | Biogas plants | |
| Measurement requirement | Level measurement in the fermenter | | Temperature measurement in the fermenter | |
| Custody transfer | - | | - | |
| Typical turndown ratio (depends on medium and process conditions) | - | | - | |
| Measuring range (max.) | up to 80 m; 262.5 ft | | up to 600°C; 1112°F | |
| Inlet and outlet sections | - | | - | |
| Approvals | ATEX, IECEx, cFMus, NEPSI | | ATEX | |

Flow computer and leak detection systems

| | Digital flow computer |  | Leak detection system |  |
|-------------------------|---|---|---|---|
| | SUMMIT 8800 | | PipePatrol | |
| Application | Biogas plants | | Power-2-Gas | |
| Measurement requirement | Flow computing of processed biomethane and liquid gas | | Leak detection in hydrogen pipelines | |
| Accuracies | For use in custody transfer as per MI-002 | | Leak pinpointing: approx. 1% of pipeline length Leak detection: <30 sec. Alarm generated: <1 minute | |

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