
# APPLICATION REPORT

Food & Beverage

## Measurement of raw biogas at cheese farm

- Fermentation of whey in digestion tanks to gain fuel gas for steam boilers
- Ultrasonic measurement of wet medium with corrosive $H_2S$ components
- Integrated calculation of methane content to determine biogas quality

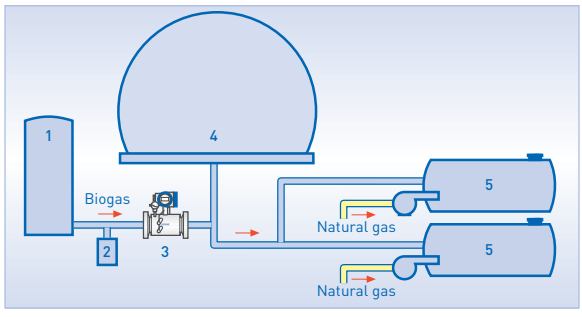
FROMAGERIE Baechler

## 1. Background

The cheese dairy Baechler operates a cheese farm in Le Temple-sur-Lot, France, where different types of cheese are manufactured and aged. In the production process steam is used as an auxiliary medium that is produced by boilers. In the past, natural gas from the natural gas grid was used as primary energy to the boilers. However, in order to be more independent from volatile gas prices, the cheese maker looked out for a more sustainable solution to its energy supply. Therefore, with the help of the engineering contractor Valbio the cheese farm built its own biogas plant. Valbio also operates the unit where biogas is produced in digestion tanks through the fermentation of whey – a by-product of the manufacture of cheese. As the boilers do not work permanently, the gas can also be stored, when necessary, in an adjacent gas storage unit (gasometer).

## 2. Measurement requirements

In order to ensure that the biogas can be used as a primary energy for the boilers, the operator needs to know the quantity as well as the quality of the biogas produced. Only if the methane content in biogas reaches beyond 60 Vol-% can the medium be fed into the boilers. This requires a technical solution that is able to measure the volume flow (40 $Nm^3/h$) and to calculate the methane content in the raw biogas. The medium is very demanding to master because parameters such as low pressure (50 mbar), temperature changes, a high content of $CO_2$, backflows, free water (up to 5 Vol.-%) as well as corrosive $H_2S$ influence the measurement. Given the pressure conditions, the customer required that the pipework not be tapered or reduced.




**1** Digestion tower, **2** Filter, **3** OPTISONIC 7300 Biogas, **4** Gasometer, **5** Steam boiler

KROHNE

## 3. KROHNE solution


OPTISONIC 7300 Biogas in front of digestion tanks

KROHNE recommended using the OPTISONIC 7300 Biogas. The ultrasonic flowmeter was installed directly behind the fermenter into a DN 50 / 2" pipeline that transports the raw biogas from the digestion tanks to the gasometer.

The OPTISONIC 7300 Biogas has been exclusively designed for biogas applications. It determines the flow volume of biogas, using the transit time differential measuring principle. The device also features an integrated calculation of the methane content. In measuring the velocity of sound and with the help of other measuring values such as the gas temperature, the molar gas constant and the adiabatic index the signal converter of the ultrasonic flowmeter can calculate the methane content in the raw biogas. The titanium transducers of the device are particularly suited to resisting the highly corrosive $H_2S$ that is sparked by the impact of free water in the medium.

## 4. Customer benefits

The OPTISONIC 7300 Biogas helps Baechler feed their boilers almost exclusively with biogas today. By using the ultrasonic device the cheese dairy always knows how much biogas is produced as well as stored in the gasometer. The flowmeter also enables the customer to determine the biogas quality and decide whether the methane content is high enough to be burnt or still needs further treatment. The measuring values are also used at Baechler to control the fermenting conditions in the digestion tanks.

The OPTISONIC 7300 Biogas offers a great deal of flexibility in terms of flow rates, installation and medium composition. Unlike Vortex flowmeters, the OPTISONIC 7300 Biogas is able to measure accurately without a reduced or tapered off pipe and also without a minimum flow rate. The ultrasonic device is also far superior to thermal mass flow meters in this application, due to its transducer pocket design that makes it insensitive to liquid water. Whereas in many other ultrasonic flowmeters the high $CO_2$ content in biogas flows have a negative effect on the measuring stability, the enhanced digital signal processor (DSP) of the OPTISONIC 7300 Biogas allows for better detection of small acoustic signals strongly dampened by the high $CO_2$ content.

In essence, the OPTISONIC 7300 Biogas is much more cost-effective for Baechler than a combined solution of a flow measuring device and a gas analyser. It is another benefit to the customer that the ultrasonic device can be operated without any maintenance once it has been installed.

## 5. Product used

### OPTISONIC 7300 Biogas

- Ultrasonic flowmeter for raw biogas with integrated temperature transmitter
- Integrated pressure sensor (optional)
- Integrated calculation of standard volume and methane content
- Certification for hazardous areas according to ATEX (Zone 1)
- Nominal sizes: DN 50, 80, 100, 150, 200 / 2", 3", 4", 6", 8"
- Measuring accuracy: 1 % of measured value
- Output: 4...20 mA, HART®, Modbus (optional)


### Contact

KROHNE Altometer
Kerkeplaat 12
3313 LC Dordrecht
The Netherlands
Tel.: + 31 78 630 300
Fax: + 31 78 630 394
productsupportka@krohne.com

Please visit our website for a current list of all KROHNE contacts and addresses.

www.krohne.com