APPLICATION REPORT

ORGANIC WASTE IN A BIOGAS PLANT

Power

Measuring Task

Non-intrusive flow measurement of organic waste in the inlet feed line of a biogas plant

As the push towards green energy from sustainable sources continues to grow, biogas plants offer interesting applications for clamp-on ultrasonic flow measurement.

Biogas is produced from organic waste (carbon) which biodegrades by means of bacteria in an anaerobic environment. This process is expedited at a process temperature of 100 °F (mesophilic) or 125 °F (thermophilic) in the plant's digester. Typically, the biogas is utilized to produce electricity and district heat in the plant's gas engine (CHP unit). The electricity is sent into the power grid and the heat is used by local consumers. Furthermore, biogas can be upgraded to natural gas and injected into the natural gas grid or be used as fuel for transportation.

Although Flexim is a technology leader in the field of non-intrusive gas flow measurement, the produced biogas itself most commonly cannot be measured by means of clamp-on ultrasonic technology due to the low pressure and the undefined and varying gas composition. On the other hand, non-intrusive clamp-on flow measuring technology shows its full potential at the inlet feed line.

Bigadan's biogas plant in Sinding near Herning has the capacity to treat 55,000 t of biomass per year which it receives in form of manure from local farmers and industrial organic waste from local food processing companies. Mag meters have been installed on the inlet feed lines for conductive media. They suffered from wear and tear due to the high solid content and did rarely reach a satisfying lifespan. Furthermore, the inflow of the non-conductive animal fat which is received on another line was merely estimated. Therefore, the plant operators searched for a clamp-on ultrasonic measuring solution which works independently of the media's conductivity.

Customer requests

- Flowmeter of a clamp-on nature meaning no wear and tear from a solid entrained media
- Reliable measurement with good repeatability
- Data logger with easy user interface (USB preferred) for logging e very 10 min (legislations)
- Looking to replace mag meters
- Easy installation
- Calibration certificates / data sheets / serial number-based installation reports

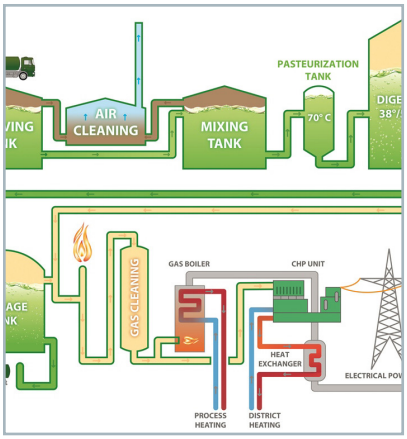

Chart of the biogas processes
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Bigadan's Sinding biogas plant
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Measuring point with a stationary FLUXUS® F721 measuring transmitter and the transducers (integrated into the insulation)

Solution

Sales engineers from Insatech, Flexim 's sales partner for Denmark, went on site to make some test measurements with the portable FLUXUS© F601. The particular challenges of this measuring task are well-known and similar to those found in waste water applications: Highly viscuous liquids with elevated solid contents which attenuate the acoustic measuring signal. Nevertheless, Insatech's measuring experts succeeded to realise convincing flow measurements with good signal qualities and plausible readings on all three tested lines, i.e. food-waste slurry, animal fat and farm-waste slurry. Further evaluation and visualization of the measured data with Flexim 's software FluxDiag confirmed the viability of the non-intrusive flow measurements.

After further discussions the customer decided to go ahead with the order for the flowmeters on the food-waste and organic oil lines. It was decided that the farm-waste measurement point would remain as a mag meter for the near future.

The supply itself was relatively standard: The meter requirements were simply to measure the volume flow and output this via a 4 – 20 mA current output in a stable manner. The delivered measuring systems consisting of stationary FLUXUS© F721 transmitters and type FSM transducers are powerful enough to ensure proper signal propagation through a highly attenuating media.

Measuring Points and Instrumentation

Pipelines	3 pipes 4”, carbon steel
Medium	Food-waste slurry, animal fat

2 stationary clamp-on ultrasonic FLUXUS® F721 flowmeters, one of them dual channel version for simultaneous flow measurement at two measuring points

3 pairs of clamp-on ultrasonic transducers type FSM, installed in Variofix L transducer mountings

Advantages

- Robust and reliable non-intrusive flow measurement
- Reliable signal strength and good measurement diagnostics to work through any media conditions
- Not subject to wear and tear by the medium, therefore no need for regular maintenance
- Works independent of the media’s conductivity

Customer

Bigadan A/S, Herning Bioenergi, Herning, Denmark

Bigadan’s main business activity is to provide engineering and construction services to large-scale co-digestion biogas plants with a capacity larger than 100 t/d. Today, Bigadan has more than 30 years of international experience in practical use of biogas technology, including renewable energy production, manure and organic waste treatment as well as nutrient recycling.

Ownership and operation of large scale biogas facilities are two other of Bigadan’s main business fields. Since the end of 2009 Herning Bioenergi A/S has been owned and operated by Bigadan A/S. Herning Bioenergi A/S consists of the biogas plants in Studsgaard, built in 1996, and Sinding, built in 1988. The plants receive manure from local farmers and industrial organic waste from local food processing companies.

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