



APPLICATION NOTE Water & Wastewater

Flow measurement of fat for CO fermentation

- Increasing biogas yield during anaerobic sludge stabilisation in a digestion tower
- Flow measurement of highly adhesive fat mixture for billing and dosing purposes
- Replacement of conventional electromagnetic flowmeters (EMF)

1. Background

A municipal water management company in Saxony-Anhalt, Germany, operates a sewage treatment plant for wastewater from approximately 90,000 inhabitants. In order to provide its own energy and heat, the utilities company also operates a combined heat and power (CHP) unit fed with biogas. Sewage sludge from the sewage treatment plant is used in biogas production.

To optimise biogas yield from the sewage sludge, the digestion tower is enriched with external carbon sources for the digestion process (CO fermentation). This includes grease/water mixtures from grease separators, commercial kitchens, fish and meat plants as well as oil mills and chocolate factories, all delivered in vacuum tankers with a capacity of 12 m³ / 3,170 gal (US).

2. Measurement requirements

The customer has been using conventional electromagnetic flowmeters (EMF) for billing the grease quantities delivered and subsequent loading of the digestion tower. However, the grease/water mixture is only very low conductive and leaves large fat deposits, especially on the inside of the pipe walls. As a result, the electrodes on the measuring devices became clogged. This meant that the EMFs sometimes displayed a flow rate even during downtime.

Unlike for the measurement of wastewater loads in sludge acceptance, these types of EMF are not suitable for CO fermentation. Transparent billing and other optimisation of CO fermentation is not possible with these devices. For this reason, the sewage treatment plant operator was looking for a measuring device that came in at the same price point as conventional EMFs but that could measure extremely greasy and adhesive products.



Pipeline from CO fermentation with large fat deposits

3. KROHNE solution

The operator of the sewage treatment plant replaced the existing EMFs with two OPTIFLUX 7300 C (DN80 / 3") flowmeters. These electromagnetic flowmeters feature large-area, non wetted electrodes installed behind the liner that enable capacitive signal pick-up. The signal pick-up between the product and the electrode is thus not affected by the fat deposits.

For billing purposes an OPTIFLUX 7300 was installed directly at the collection point and in front of the storage containers in which the fat is mixed into a uniform suspension. Behind the containers, a second OPTIFLUX 7300 measures the flow to the digestion tower. In keeping with these measured values, the PLC controls a pump to evenly load the digestion tower with fat.



Installation of OPTIFLUX 7300 C for billing purposes

4. Customer benefits

Unlike conventional EMFs, the OPTIFLUX 7300 C ensures long-term stable measurement of the fat mixture. The design of the KROHNE device eliminates measuring errors such as those that occurred with the old devices. This now allows the customer to transparently bill fat quantities and to run the dosing process efficiently and with the best possible gas yield in mind.

On top of that, CO fermentation can now be optimised further. In the future, even higher-quality fats from oil mills and chocolate factories can be strategically collected in a tank and precisely added as needed. This also makes it possible to achieve consistent fat quality, even if the fat delivered over a prolonged period of time has a low energy value. Thanks to the use of the OPTIFLUX 7300 C, the operator is one step closer to the goal of self-sufficient energy supply to the sewage treatment plant.



Flow measurement of fat for pump control

5. Product used

OPTIFLUX 7300 C

- Electromagnetic flowmeter with non wetted electrodes and ceramic liner for the measurement of fat quantities for CO fermentation
- No insulation, corrosion or wear on the electrodes due to fat deposits
- Suitable for low conductivities up to 0.05 $\mu\text{S}/\text{cm}$ / $\mu\text{mho}/\text{cm}$
- Excellent accuracy and long-term stability
- ATEX (zone 1)
- HART®, FOUNDATION™ fieldbus, Modbus, Profibus®-PA/DP, PROFINET



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