



## APPLICATION REPORT Power Generation

### Flow measurement of wet biogas

- Biogas produced from sludge digestion for the energy neutral operation of a sewage treatment plant
- Ultrasonic flow measurement and control of biogas production
- Integrated methane content measurement of digester gas with a varying composition and high CO<sub>2</sub> content



### 1. Background

The Dutch Water Authority Rivierenland (WSRL) has expressed the ambition to operate completely energy neutral by 2030, with 40% of its own energy generated sustainably as an interim step by 2020. The energy factory in Tiel is fully in line with this goal. Having started operation of the sludge digestion plant, the wastewater treatment plant (WWTP) in Tiel is 100% energy neutral. The plant uses the residual sewage sludge to generate biogas, which is then used as a raw material for energy production.

### 2. Measurement requirements

WSRL produces biogas by digesting sewage sludge in a digester tank, which has been raised to +52°C / +125.6°F. The biogas is then used to meet the energy demand of the treatment plant. The biogas flow between the digester tank and the power plant must be accurately measured and monitored for the control and safety of the energy plant.

It is a challenge to measure the biogas that leaves the digester wet, pressureless and with varying methane and CO<sub>2</sub> content. A gas flowmeter especially developed for this application must therefore be used. WSRL also needs to monitor and record excess gas quantities that are flared off for the information of the inspection authorities.

### 3. KROHNE solution

KROHNE supplied the OPTISONIC 7300 Biogas, an ultrasonic gas flowmeter with integrated temperature measurement, specifically developed for biogas applications. With this meter WSRL can measure the corrected gas volume flow accurately in real time.

Due to the flowmeter design, the measurement is not influenced by moisture content, and therefore the OPTISONIC 7300 Biogas can be mounted directly behind the digester. This provides direct information of the gas amount leaving the digester. Independent of the gas composition, the ultrasonic measurement also makes it possible to measure varying gas composition without any pressure loss.

Moreover, WSRL is now able to use the measured velocity of sound of the medium to analyse the methane content of the gas.

### 4. Customer benefits

By opting for a flowmeter with integrated analytical capabilities as well as an integrated mass flow calculation independent of the installation environment, WSRL significantly reduces operating costs.

There is no need for a separate gas analyser as the OPTISONIC 7300 Biogas features integrated methane content measurement in real time based on the velocity of sound of the biogas. In this way, the operator is always provided with information on the gas composition and can take steps to maintain the efficiency of the CHP plant or maximize the biogas yield as necessary.



Flow measurement of biogas behind the digester

The customer benefits from a flowmeter that is insensitive to moisture, allowing the measurement to be carried out directly in the wet biogas stream, without having to dry it in the first place. It works independently of the gas composition and is therefore suitable for a varying biogas composition.

As compared to conventional mechanical flow instrumentation, WSRL benefits from an extended maintenance interval. As the device doesn't cause any pressure loss, the operator saves on pump capacity and thus energy costs in the long run.

### 5. Product used

#### OPTISONIC 7300 Biogas

- Ultrasonic flowmeter for biogas (dry or wet), landfill and sewage gas applications with a high CO<sub>2</sub> content
- Integrated gas volume correction and methane content measurement
- With integrated temperature sensor and optional pressure sensor
- Lap joint flange: DN50...200 / 2...8", max. PN10 / ASME CI 150
- Large turndown ratio (100:1), no periodical maintenance needed
- Available as remote version with field converter
- Also for use in hazardous areas zone 1
- Full bore design: No moving parts, no wear, no pressure loss
- High accuracy:  $\pm 1\%$  error of measured value



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