New Transit Time Flowmeter for Biogas Applications

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FORMAT

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ABSTRACT

Using anaerobic digesters to treat sludge is a common practice for the municipal wastewater industry. This process uses microorganisms to breakdown and reduce biodegradable material (biomass) in the absence of oxygen, but also results in the production of biogas.

Biogas can be captured and used as an energy source which helps to sustainably reduce a wastewater treatment plant's overall energy costs. Anaerobic digestion is done in 3 basic stages:

1. Production of carbon dioxide and organic acids from fermentation
2. Metabolizing of organic acids to hydrogen, carbon dioxide and other organic acids
3. Conversion of acids along with hydrogen and carbon dioxide to Methane

Once the methane is captured, it can be used as an energy source. Up to now, the monitoring of biogas flow is typically measured with a thermal mass flow meter, with a separate analyzer required to provide methane or energy content.

One of the biggest issues facing municipal wastewater treatment facilities is energy management. Methane is a greenhouse gas twenty-one times more potent than carbon dioxide, and to just flare it off is not only bad for our environment but a waste of usable energy.

The biggest challenge to overcome in this application is the wet, dirty biogas. Biogas is primarily methane and carbon dioxide with sub-percent levels of hydrogen sulfide and other gases. The wetness, H2S and other particulates in the gas create a corrosive condensate that will coat the pipe wall and instruments. Typically biogas is a very low flow and low pressure application. Although the monitoring of biogas flow rate has historically been done with thermal mass flow meter technology, this type of meter is not ideal in wet biogas applications for two reasons:

- Biogas is typically warmer than ambient temperatures and saturates due to the water vapor as it exits the digester. This water vapor then condenses causing instability in the thermal mass flow reading.

- Thermal mass meters require knowledge of the thermal conductivity properties of the gases present in order to correctly calculate mass flow.

The new Ultrasonic Transit Time flowmeter is specifically designed for this type of application – wet, dirty biogas, and with very low flow, low pressure and variable composition.

- Greater accuracy: ±1.5% of reading flow accuracy independent of gas composition
- Continuous calculation of methane fraction, calorific value and energy flow
- Maintenance free: robust, no moving parts with “self-cleaning” ultrasonic sensors
- No pressure loss: flowmeter is obstruction less
- More energy efficient: low energy consumption with 2-wire (loop powered) device
- Flexible and easy to install: versatile mounting by means of lap join flanges

ABOUT THE AUTHOR

Alan Vance *is the Industry Manager for Wastewater at Endress+Hauser and has 25+ years in process control instrumentation.*