An introduction to...

Biogas measurement devices

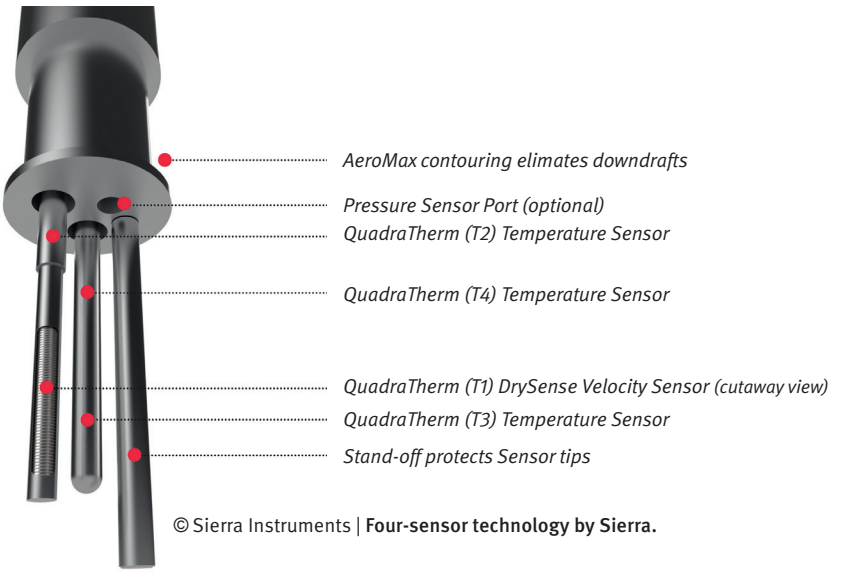
As global oil prices remain high, countries around the globe are seeking renewable energy sources to increase energy efficiency and security. Among the sources of renewable energy is the production of biogas from landfill gas (LFG) or digester gas. To monetize biogas and create the most efficient fuel sources, it is critical to accurately measure how much biogas is produced in each stage of the process. This biogas boom has created an opportunity for industrial gas measurement companies.

Many flow measurement companies with varying technologies are interested in measuring the biogas as it leaves the landfill or digester tank, but precise biogas measurement is an inherently challenging application with its changing gas composition, low pressure and dirty, wet gas that can clog up devices like annubars, orifice plates, turbine meters and other similar instruments.

Traditionally, thermal mass flow meters have been the instrument of choice. They offer reasonable accuracy for the price (2% of reading) and use a convenient insertion design that eliminates pressure drop. They also have no moving parts and can measure high and low flows with a 100:1 turndown.

While such meters do many things well, one thing they cannot do is account for changes in biogas composition. These flow meters must be calibrated for a specific biogas mix and rapidly lose accuracy if gas composition changes which means the instrument must be sent back to the factory to recalibrate for the changing gas composition – wasting time, resources and money.

One way to account for variable composition would be with a continuous real-time sampling system integrated with a flow meter. A few systems are available, with more in development, but integrating such a system into a flow measurement system is typically expensive and high-maintenance. The landfill gas is sampled (using a chemical cell) and the CO_2 content is analyzed and a mini computer uses this compositional data to correct the flow rate.



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In general, while biogas composition does change over time, it doesn't change that quickly. In current practice, the composition of the biogas is calculated by periodic manual sampling of the various digesters or landfill collection points, avoiding the need for an expensive system. Ideally, composition management would be moved into the flow meter itself; recent advances in the field of thermal technology make this possible for the first time.

Sensor Innovation

Recently, thermal technology has undergone significant advancements, moving from two-sensor to four-sensor technology **(pictured, above)** which yields unprecedented accuracy for thermal insertion flow meters of +/- 0.75% of reading. The inline flow conditioned version of four sensor thermal improves even more to +/- 0.5% of reading. New four-sensor technology, invented by Sierra, is branded as QuadraTherm and is emerging as an optimal solution for accurately measuring and managing biogas, even with its changing compositions.

Along with this new four-sensor technology, traditional analog measurement circuits, like the Wheatstone bridge, have been superseded by more powerful hyper-fast microprocessors that run comprehensive flow-measurement algorithms to compute mass flow. This algorithm allows the management of gas composition because, now, recalibration every time the gas changes is not required – a true breakthrough in mass flow measurement. By combining four-sensor technology with this algorithm set, the meter has the ability to change gas and compositions without losing accuracy.

In the effort to harness biofuels such as biogas, the demand for accurate flow measurement for varying gas compositions is growing. Finding the best flow meter for this biogas measurement technology is critical for optimizing the energy yields of biogas production. With these new advancements in four sensor technology, operators now have higher accuracy with changing gas composition and more field flexibility.

WITH THANKS

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