Gas Analyzer Technology Boosts Potential For Converting Biogas To Electric Power

Special To ***Pipeline & Gas Journal***

The ability of advanced, laser-based sensors to detect moisture, hydrogen sulfide and other contaminants in gases can smooth the way for biogas as a resource for electric utilities.

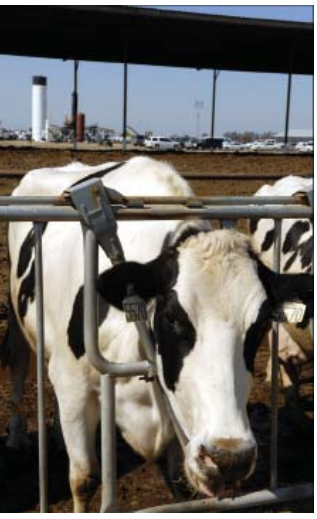
Wouldn't it be great if some of the expensive green power programs you hear about actually worked? Experts and financiers are predicting it will take billions of investment dollars and decades to get any meaningful quantity of energy from alternative resources.

Perhaps not. One of the oldest and most widespread forms of potential energy — methane gas — promises to give those efforts a sizable boost — right now.

The main component of "natural gas," methane is found in abundance in many places other than subterranean gas wells. Landfills, oil pipelines, pasturelands, forests and waste treatment plants all contain methane or the biomass from which methane can be formed.

"Although methane gas contains plenty of energy, until recently the gas available from many sources has been considered economically unviable as a source of energy," explained Sam Miller, a senior official with SpectraSensors, Inc., Houston, TX.

In the traditional natural gas production and pipeline market, the SpectraSensors gas analyzer has emerged as a standard for ensuring accurate readings in gas streams, without expensive labor and replacement costs.



∂ Last spring BioEnergy Solutions of Bakersfield, CA launched California's first biogas-to-pipeline injection project in Fresno County. This project is using renewable natural gas derived from animal waste at a PG&E site.

"Whatever the source of methane, you have to get it to market, which often means getting it into a pipeline that delivers gas to users such as power plants and industrial companies," he said.

Transporting and marketing methane through pipelines requires that it meet safety and quality standards, Miller said. Virtually all biogas contains significant amounts and varieties of impurities that must be removed before pipelines will transport it and customers will accept it. Such impurities can disrupt the flow of gases, damage pipelines and contaminate the air with toxins that can be deadly to breathe.

PG&E Harnesses Cow Power

Last spring BioEnergy Solutions, Bakersfield, CA, launched California's first biogas-to-pipeline injection project in Fresno County, central California. The project is using renewable natural gas derived from animal waste at a PG&E site.

"With nearly 2 million dairy cows in California, there is great potential for the state's agriculture and power sectors to work together to address the challenges of climate change," said Roy Kuga, vice president of energy supply at PG&E. "This project is yet another example of our company's commitment to add innovative forms of clean renewable energy to help meet our customers' future power needs."

PG&E is one of California's largest investor-owned utilities. The state's recently enacted Renewable Portfolio Standard (RPS) Program requires each utility to increase its procurement of eligible renewable generating resources to achieve a goal of 20% of load by 2010. The RPS Program was passed by the California Legislature and is managed by the CPUC and California Energy Commission.

Under a long-term contract approved by the California Public Utilities Commission (CPUC), BioEnergy Solutions will deliver up to 3 Bcf of renewable natural gas a year to PG&E. Using SpectraSensors' laser-based gas analyzer technology, this is the first project in California to deliver pipeline-quality, renewable biogas to a utility.

"We are using these analyzers to monitor moisture in the methane," said David Albers, BioEnergy Solutions president. "And of course we're checking for hydrogen sulfide content and carbon dioxide content."

Albers said the project, located in the town of Riverdale in western Fresno County, will use manure from the Vintage Dairy's 5,000 milk-producing cows and calves. The waste is flushed into a covered lagoon — equal in size to the area of nearly five football fields and over three stories deep — that traps the methane gas produced as the manure decomposes. The biogas is upgraded, or "scrubbed," to remove corrosive materials to meet PG&E's industry-leading environmental standards for power plants and then delivered to PG&E through the utility's pipeline.

PG&E uses the natural gas to deliver renewable electricity to its customers in central and northern California. The methane production system also reduces emissions of methane, a greenhouse gas 21 times more potent than carbon dioxide, by 70%.

Albers said SpectraSensors moisture ana-

lyzer offers assurance that the project will continually meet PG&E's high standards. He said that in addition to offering the highest reliability of gas analyzers, this technology has a track record for considerably lower maintenance costs in both labor and consumables.

PG&E, a leader in utilizing biogas, is also a user of SpectraSensors technology. In addition to the utility's contract with BioEnergy Solutions, it is working to cultivate the next generation of biogas technologies through its biomethanation research project.

Depending on what impurities might be contained in "polluted" gas — substances such as H2O, H2S, CO2, unsaturated hydrocarbons and glycols — it is vital to use monitoring equipment that can accurately read the levels of contaminants in gas streams.

The "gas analyzer" technology needed to quickly and accurately measure a wide variety of contaminants and background gases has been advanced to new heights by SpectraSensors, which makes Miller optimistic about the safety and economic viability of using non-standard sources of methane and other biofuels.

"There has been a significant rise in activity in production and distribution of 'green gas' as an alternate fuel," he said. "Our company considers this a growth market. And while a primary market for our analyzer instruments include pipeline-quality natural gas from traditional producers, we can also help non-traditional producers deliver clean methane to various power generation customers."

Miller cited several examples of sources for methane, which together could amount to a very sizable reduction of greenhouse gases as well as renewable resource for generating electric power for a grid that every year experiences added demand and will soon have to accommodate plug-in passenger cars.

"Waste-to-energy methane from human and livestock digesters has the potential to become a major source," he said. "But other, smaller sources are becoming increasingly viable. For instance, the methane gas pockets present in pipeline oil have traditionally been burned off when it reached the oil refinery. Now, it is economically feasible to feed that gas into a gas pipeline and use it to generate electricity."

The patented technology that SpectraSensors employs in its gas analyzers is tunable diode laser (TDL)-based absorption spectroscopy. This is an optical measurement technology used to detect moisture (H2O), carbon dioxide (CO2), hydrogen sulfide (H2S), ammonia (NH3), oxygen (O2) and more.

In the traditional natural gas production and pipeline market this technology has become the de facto standard for ensuring consistently accurate readings in gas streams. Not only is it in use among many leading pipeline operators, but is also the technology of choice among leading utility companies.

Fast, Accurate And Lower In Costs

Essentially, the SpectraSensors TDL-based gas analyzer uses laser (light) absorption spectroscopy to identify and measure one or more gases in a flow of mixed gases. This type of analyzer is typically "tuned" to monitor a target gas (e.g. H20, CO2, H2S) by monitoring the absorption of light at wavelengths specific to the target gas.

The SpectraSensors gas analyzer line is designed to provide extremely fast and accurate readings without expensive labor and replacement costs. That is because the gas is analyzed away from the stream in a sample cell. As the laser light passes through the gas sample in the cell, the presence of any target gas is detected and its concentration measured.

"This design is very process worthy," said Miller. "The TDL-based analyzer technology has proven to be so reliable and trustworthy that it is the new standard in the natural gas pipeline industry, and is being adopted by oil refineries, petrochemical plants and process industries all over the world." ***P&GJ***