Burning Biogas
for Energy Savings

Santa Cruz WWTF generates its own electric power by using internal combustion engines that burn a mixture of methane gas produced by the anaerobic digestion process and purchased natural gas, producing 74 million kWh of electric power per year.

Historically, WWTFs around the globe have used differential pressure devices for their gas measurements. These devices proved to be expensive to maintain, clogged easily and required a separate pressure and temperature transducer and flow computer to deliver true mass-flow. In the late 1980s, Santa Cruz WWTF made the switch from these costly, maintenance-ridden differential pressure devices to thermal technology, which measures true mass flow directly with one instrument and has excellent turndown and accuracy at low flows, as well as a lower cost of ownership.

Valuing responsive customer service and low maintenance costs, in spring 2002, Santa Cruz WWTF decided to change vendors, ultimately choosing Sierra Instruments. By 2007, the WWTF had replaced all of its meters with Sierra’s immersible thermal mass flowmeters.

Capturing Biogas
The cornerstone of Santa Cruz WWTF’s unique renewable energy program is producing abundant, healthy amounts of biogas each day in its digesters. Acting like a large stomach, the solids from the wastewater treatment process are “digested” in four large, domed digesters, heated to 98°F for optimal digester gas production.

When methane-forming bacteria breaks down the acids in the digesters, large amounts of anaerobic digester gas made up of 60% methane and 40% CO₂ are produced. Facility operators, the “brains” of this stomach, use their SCADA computer system to check that each digester is producing optimal amounts of digester gas. If the digester gas readings are low, the stomach is upset, so the operators will check various process parameters (e.g., pH levels, alkalinity ratios, temperatures and feed rates) to increase the production of digester gas.

“We are not able to make operational adjustments if we don’t have the right accuracy of our gas meters,” said Senior Plant Operator Dave Meyers. “These gas readings are the first indicator of the health of the stomach.”

Because digester gas applications operate at relatively low pressures, it is essential that instrumentation has the ability to remain accurate at these low pressures. Immersible thermal mass flowmeters create virtually no pressure drop and accurately measure these low flow rates, whereas orifice plates could not be used at all. With Sierra’s thermal technology installed, Santa Cruz WWTF can measure true mass flow directly and have outstanding 40:1 rangeability and an accuracy of ±1% of reading, plus 0.5% full scale and repeatability of ±0.2% of full scale.

Fueling Cogeneration System Engines
According to Al Locatelli, co-gen and standby generator specialist, preparing this raw biogas into fuel for internal combustion engines is no simple task, but it is what makes Santa Cruz WWTF unique. In Waukesha’s 7842 GLD 520AF engines, coined Cogeneration 1, biogas is mixed with air in burner the fog levels closer to digester gas. This biogas emits a manifold-system
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Energy Cost Savings

By using the sophisticated SCADA system and the ION meter, which automatically calculates the WWTF’s monthly energy bill, Meyers makes important energy-saving decisions each day. Depending on the power demand, the WWTF prevents 41 tons of CO₂ emissions each month, according to Locatelli. Meyers and other operators save Santa Cruz WWTF money on energy by choosing to pay for the natural gas to run Cogeneration 2 during peak demand times rather than using energy from the grid.