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Creating Pipeline-Quality Renewable Natural Gas from Digester Gas:

Sustainable Energy from the Hale Avenue Resource Recovery Facility in Escondido, Calif.

Southern California Gas Company (SoCalGas®) has launched a research, demonstration and development (RD&D) project to advance the production of pipeline quality renewable natural gas from raw digester gas generated by the wastewater clean-up process at the Hale Avenue Resource Recover Facility in Escondido, California. As part of the 12-month technology demonstration, SoCalGas will evaluate, validate and improve the feasibility of 1) advanced pressure swing adsorption (PSA) gas separation technology; and 2) digester gas sampling, analysis and monitoring instruments and protocols.

Methane contained in the gases produced by anaerobic digesters at wastewater treatment plants is a largely untapped source of renewable natural gas. At the Escondido Hale Avenue Resource Recovery Facility (HAARF), for example, all of the gases produced in the waste digester are combusted by an industrial flare. By demonstrating the safe and efficient upgrading of digester gas to pipeline quality standards, this project will help to make this renewable natural gas available to residents, businesses, power producers and natural gas vehicles throughout California.

The city of Escondido currently flares raw digester gas at a rate of about 175 cubic feet per minute. This digester gas contains enough methane to satisfy the natural gas demand for nearly 1,200 homes. By reducing the amount of gas flared by over 90 percent, the city could reduce its emissions of nitrous oxides, particulate matter, air toxins and greenhouse gases.

From Household Waste to Pipeline Quality Renewable Natural Gas

During the normal course of the day, homes and businesses produce waste. That waste, or sewage, is transported to the Hale Avenue Resource Recovery Facility. The solid waste is sent to an anaerobic digester where microbes naturally decompose it into carbon dioxide and methane. SoCalGas will demonstrate an advanced technology that recovers gas from anaerobic digesters and purifies it to meet California's stringent gas quality standards. If the technology works, it could create a foundation for eventual use in homes and businesses.



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Pressure Swing Adsorption Technology

SoCalGas is demonstrating an advanced Pressure Swing Adsorption-based methane recovery and purification system developed and manufactured by Xebec Adsorption, Inc. of Montreal, Quebec. Xebec's PSA system separates the methane from other digester gas constituents such as carbon dioxide, water vapor, nitrogen, and silicon compounds. Xebec's PSA system operates at higher cycle speeds than conventional PSA systems, thereby increasing the process efficiency while reducing the cost of the gas purification equipment. The system also uses two simple, reliable rotary valves instead of the complex maze of solenoids, valves and piping found in conventional PSA systems.

Pressure Swing Adsorption is a technology used to separate a specific gas – in this case methane – from a mixture of other gases, according to its molecular size, shape and affinity for special adsorptive media called "zeolites." In the Xebec PSA system, digester gas is pumped into a zeolite media contained in nine large pressure cylinders. The methane from the digester gas is adsorbed by the zeolite media under pressure and then, when the pressure is relived,

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the unwanted gases flow out from the zeolite vessels. As the pressure is decreased even further, the concentrated methane is channeled into other zeolite-filled vessels for additional purification. Ultimately, the raw digester gas is completely separated into streams of low-energy "tail gas" and high-energy, methane-rich "product" gas.

Analysis and Monitoring

In addition to demonstrating advanced PSA technology, SoCalGas will test instruments and protocols for sampling, analyzing and monitoring digester gases. The mass and energy of all inputs and outputs will be precisely measured and monitored. This includes the three primary streams of gas: untreated gas from the digester, the purified "product gas" and the "tail gas." After passing through the analysis system, the product gas and the tail gas will be remixed and returned to the existing flare. Process condensate byproducts will also be tested and returned to the anaerobic digester. Thus, the demonstration project will provide a valuable opportunity to assess the efficacy and reliability of the digester gas purification and quality control systems over an extended operation period, without disturbing ongoing operations at the Hale Avenue Resource Recovery facility.

Timeline

SoCalGas broke ground in August and began testing the pressure swing adsorption technology system in the fourth quarter of 2010. The demonstration period will last up to 12 months. At the conclusion of the demonstration period, the system will be converted to commercial use or moved to another location.



SoCalGas has retained Burns and McDonnell, a full-service engineering, architecture, construction and environmental and consulting solutions firm headquartered in Kansas City, Missouri, to oversee onsite construction and equipment installation. Burns and McDonnell also will operate the gas upgrading plant throughout the demonstration period.



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