CASH CROP

By Nathan Jones

As Stahlbush Island Farms of Oregon planned the launch of North America's first-of-its-kind biogas facility, it recognized an opportunity to make the facility truly unique. Digesters are renewable energy plants that convert waste products—manure or food waste—into electricity through anaerobic digestion. In other words, they turn waste into revenue-generating power.

Digesters turn waste into revenue-generating power

Anaerobic digestion is a flexible technology that comes in all sizes. Small family-farm installations in the developing world are designed to power a cook stove and a few lights and help manage manure runoff. Use is particularly widespread in India, Nepal, China and Vietnam. At the other end of the spectrum are large industrial-farm facilities that generate more than 4 MW of electricity. In the case of Stahlbush, enough electricity will be generated to power up to 1,000 homes.

Besides generating electricity, there are additional environmental benefits of biodigesters. For example, while they trap and burn methane, they eliminate a potent greenhouse gas that traps heat at 23 times the rate of carbon dioxide. That methane normally would be released into the environment, as the manure is kept in waste lagoons.

Problem Equals Opportunity

Digesters themselves produce a high-volume, difficult-to-process waste stream that is normally disposed of by land-spreading. In Oregon, land-spreading can take place during only a few dry months of the year due to concern of nutrient runoff to nearby waterways. The storage and hauling of the constant waste stream can be both burdensome and expensive.

Stahlbush saw this problem as an opportunity. If the waste stream could be concentrated, not only would the hauling and storage issue be minimized and freshwater reclaimed, but the resulting concentrated product would qualify as a high-value organic fertilizer replacing the expensive fertilizer that the farms had been buying to feed crops.

The already green technology of the farms' anaerobic digester would instantly become twice as green and doubly profitable. The idea appealed to Stahlbush both as a commercial business and as a farming operation committed to sustainable farming practices.

Green Waste

Digester waste streams are very high in solids, making traditional separation technologies useless for concentrating the stream. Stahlbush turned to Hydration Technology Innovations (HTI), an Oregon company whose proprietary forward osmosis technology has proven itself in other challenging applications such as the concentration of landfill leachate.

HTI was founded in 1986 in Albany, Ore., and quickly established itself as a leading innovator in membrane technology. HTI is the first company in the world to commercialize forward osmosis products, a technology it applies to such diverse markets as personal hydration products and oil field waste stream cleanup.

Dewatering, or concentrating, a digester waste stream is extremely challenging. On the one hand, a concentrated waste stream would be rich in nutrients and have value as an organic fertilizer. Retaining those nutrients in the concentrate is critical but requires very tight separation technology. On the other hand, the waste stream is high in solids and would quickly foul traditional filtration processes that are tight enough to retain the nitrogen, phosphorous, potassium and other desirable components.

The methane production in a digester does not reduce the water and nutrient load from the digested waste: What goes into the digester at the front end is what comes out. Any technology used to concentrate this stream must be able to handle this high-volume continuous flow.

HTI's forward osmosis systems are designed for this type of challenge. Instead of hydraulic pressure, the process uses salt brine on one side of a membrane. When the waste stream is introduced on the other side of the membrane, the salt pulls water from the waste stream by osmosis. Because hydraulic pressure is not required, the process is extremely resistant to fouling or clogging. Forward osmosis removes 75% to 90% of the water from the waste stream, and the membrane is tight enough to retain the nutrients. The diluted salt brine is then reconcentrated using standard reverse osmosis technology, recovering the brine for reuse and generating clean water for use in the food plant or disposal.

Sustainable Farming

Because no additional chemistry is required, the separation process produces a concentrate that potentially qualifies as an organic product. While the organic fertilizer market still represents a niche in the larger fertilizer market, the organic food market is both profitable and growing in the U.S. and represents a viable strategy for farms to remain profitable.

HTI's forward osmosis concentration system is expected to be fully operational by 2011. When it is, instead of buying expensive organic fertilizer, Stahlbush will be producing it internally, transforming what was once waste into a valuable resource and furthering the Stahlbush goal of sustainable farming. WWD

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ARTICLE SUMMARY

Challenge: Farms both large and small produce waste products and strive to control costs.

Solution: Some, including Stahlbush, have put waste products to environmentally and financially friendly use by installing biodigesters.

Conclusion: Biodigesters can generate electricity and eliminate greenhouse gas. Those featuring forward osmosis technology also can produce a concentrate that qualifies as an organic fertilizer.