

Facilities

Waste system reduces emissions

By JACQUI FATKA

MANURE from livestock facilities creates both a potential revenue stream and environmental concerns.

The U.S. Department of Agriculture estimated the annual release of nitrogen in the form of ammonia from dairy, swine and poultry within Pennsylvania's Susquehanna Watershed at 100 million to 140 million lb. The combined capital and operating costs of reducing the nitrogen load from livestock waste once it has escaped into the environment is 3-10 times greater than when treated at scale at the

Key Points

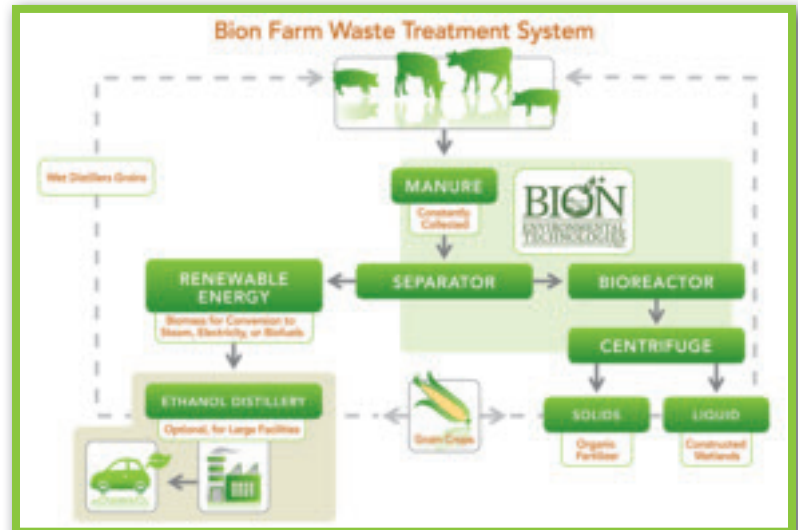
- System works fast to reduce nutrient loss.
- Cellulosic byproduct can be used as power source.

agricultural source.

Technology from Bion Environmental Technologies Inc. puts the livestock waste treatment system on the farm and uses a bioreactor and low-oxygen microbes to enhance nutrient uptake, chief operating officer Jeremy Rowland explained. A stabilized, nutrient-rich fertilizer is generated as a byproduct of the waste treatment process (Flowchart).

Bion's technology platform results in reduced nutrient loss from livestock operations (including significant reductions in airborne ammonia) and also reduces greenhouse gas emissions, odor, pathogens and endocrine-disrupting compounds.

Half of the nitrogen in manure



escapes before it is land applied. Bion's system gets the manure into a bioreactor quickly so the nitrogen isn't lost randomly and can then be captured and put into a usable form, Rowland explained.

Kreider Farms, one of Pennsylvania's largest dairy farms, has partnered with Bion to build a multimillion-dollar livestock

waste treatment system at its operation in Manheim, Pa. Phase 1 will initially treat the waste from 1,200 dairy cows, and plans are to expand that to treat waste from the remaining but separated portions of the dairy herd over time.

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WALINGA

Central-Vac

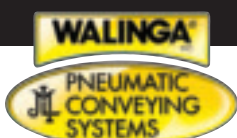
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Efficient cellulosic biorefinery opens

THE ethanol industry is under federal mandate to deliver 36 billion gal. of renewable fuels by 2022, and 16 billion gal. of that total must come from cellu-

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Key Points

- DDCE biorefinery to use both ag residues and energy crops.
- Goal is commercial-scale production by 2012.
- Tennessee farmers to add 4,000 acres of switchgrass.

losic sources.

The future of ethanol production lies in cellulosic advancements, and a new biorefinery in Tennessee hopes to lead the way.

On Jan. 29, leaders from DuPont Danisco Cellulosic Ethanol (DDCE), the University of Tennessee, Genera Energy and Tennessee Gov. Phil Bredesen cut the ribbon on one of the world's first cellulosic ethanol demonstration facilities, which is located in Vonore, Tenn.

The 74,000 sq. ft. plant has started producing ethanol and will deliver low-cost, fully integrated technology for commercial production of ethanol from agricultural residues and bioenergy crops, including corn cobs and switchgrass.

DuPont and Danisco created DDCE, their 50/50 joint venture, in 2008 to integrate their state-of-the-art technologies and engineering expertise, and today, the venture is accelerating commercialization of cellulosic ethanol.

The facility is focused on process and data validation to achieve commercial-scale production by 2012.

The University of Tennessee Biofuels Initiative (UTBI), championed by the governor, is a farm-to-fuel business model funded with support from the Tennessee General Assembly to create a renewable energy industry in the state.

UTBI established a bioenergy crop research and production basis for the burgeoning industry and attracted second-generation biofuel leader DDCE to participate as an industrial partner in developing the cellulosic ethanol biorefinery.

UTBI, with the support of Genera Energy, is establishing a supply chain for fuel development. Genera Energy is wholly owned by the University of Tennessee Research Foundation and focuses on developing integrated biomass supply chain solutions and strategic partnerships to support the bioenergy industry in Tennessee.

The state-of-the-art facility in Vonore has the capacity to produce 250,000 gal. of ethanol annually, though its focus will be on optimizing technologies for large-scale production. It represents an investment of more than \$50 million, including funding from UTBI and DDCE.

The project also integrates an approximately \$100 million investment in proprietary research by DuPont and Danisco, highly valuable intel-



Photo: DDCE/Chad Greene.

STARTING UP: A grand opening for the DuPont Danisco Cellulosic Ethanol demonstration plant was held Jan. 29 in Vonore, Tenn. The biorefinery aims to optimize cellulosic ethanol technologies and accelerate production.

lectual property platforms and talent pools from both companies. The Vonore facility currently has a full-time staff of about 20 people.

“The Tennessee biofuel initiative already is creating new jobs and opportunities, and I believe the Vonore facility is going to be a real catalyst for additional economic activity in Tennessee,” Bredesen said. “I’m pleased with the progress of this partnership and believe this marks an important step forward in our state’s efforts to develop clean energy technology.”

DDCE president and chief executive officer Joe Skurla added, “Here in Vonore, DDCE and Genera Energy are well ahead of the curve as we develop the entire value chain, from feedstock to production. We ... initiated start-up at the end of last year and are on track to provide the industry with investment-grade packages that meet demands for low cost, scalability and sustainability.”

Kelly Tiller, CEO of Genera Energy and director of external operations for the University of Tennessee’s Office of Bioenergy Programs, noted that UTBI “is the only fully integrated program that is working with farmers and the agricultural industry to reliably supply the necessary feedstock so biorefineries can produce plentiful, affordable, renewable and sustainable fuels.”

She said plans are for Tennessee farmers to place an additional 4,000 acres of switchgrass into production this spring, bringing the state’s total production to nearly 7,000 acres.

Genera Energy was formed in 2008 as a vehicle to carry out the cellulosic biorefinery activities and capital projects of UTBI. ■

Waste system reduces emissions

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ROWLAND said frequent collection is an important key to preventing emissions loss. The Kreider facility collects manure three to four times a day.

Hydrogen sulfide emissions are reduced, and ammonia levels are decreased as much as 90%. Because the manure isn’t sitting there for a day or two, the odor impact decreases.

Rowland said research assessing Bion’s system on a 14,000-head dairy cattle operation showed it to have the same or improved odor as a 400-head dairy farm (depending on whether the smaller farm land-spreads manure).

He said smaller herds can aggregate manure or livestock to take advantage of treating nitrogen on the farms.

Bion has collaborated with the Pennsylvania Department of Environmental Protection and representatives from Pennsylvania State University to establish a nutrient credit calculation and verification methodology for the Kreider Farm project.

In the partnership between Bion and Kreider, Bion gets the nutrient credits and then uses those credits to pay for the infrastructure installed on the farm.

Renewable energy

Bion’s technology also generates renewable energy from captured cellulose.

Rowland said the company is working with community leaders in upstate New York to use Bion’s system in a closed-loop biorefinery with up to 70,000 beef cattle.

Cows would be fed wet distillers grains from the ethanol plant. Captured biomass from the waste manure treatment system would power the plant and replace any natural gas usage.

Bion is also working on a second phase of the Kreider Farms project that includes a renewable energy production facility that will convert both poultry manure and cellulose in the dairy waste stream into usable thermal energy. The company believes this could generate hundreds of thousands of additional nutrient credits. ■