They Pull Clean Water From Dairy Manure

A Wisconsin company says it has developed a process that pulls purified water from dairy manure while at the same time producing dry bedding material, nutrient solids, concentrated liquid nutrients, and methane gas.

NuWay from Aqua Innovations greatly reduces dairy manure volume and releases the equivalent of distilled water. "We were developing our technologies for at least a decade before it was applied to dairy farms," says John Sorenson, NuWay. "We can work with digested or undigested manure, sand bedding, or manure solids."

Wisconsin's Son-Bow Farms, owned by Jay and Kristi Richardson, first approached Aqua Innovations about dewatering manure waste. The company saw potential for a new market and developed NuWay to apply their technologies to dairies.

"Jay tells visitors that in 15 mos. of having the system, it was only down for less than 48 hrs., and that was a problem upstream and not with the system," says Sorenson. "A major feature is alleviating the application of manure. Jay's neighbors couldn't believe how quickly he was done and his lagoon was empty."

Richardson credits the system for saving them more than $500,000 a year in labor and fuel costs on their 1,400-cow farm. It also improves nutrient delivery to their fields.

The process can be used to store nutrient solids for use on the farm or for sale. Sand bedding can be separated and returned to the barns. Pathogen-free liquid nutrients can be stored for soil application or used to add phosphorus or nitrogen to silage crops for dairy rations. The purified water that's extracted is free of all pathogens and nutrients.

"The NuWay system is a large dairy farm solution. The bigger the farm, the better the fit," says Sorenson. "However, it also works as a community model, bringing the solution to multiple dairies."

Sorenson points to the company's second installation near Springfield, Wis., which serves 3 dairies. Situated on one of the dairies, the dewatering system is integrated with a digester system. Manure waste is trucked from the neighboring farms and combined with food waste before going into the digester.

NuWay manure management system pulls purified water from dairy manure while at the same time reducing manure volume.

Gas produced by the digester and used to generate electricity, combined with tipping fees for the substrates, helps to offset trucking fees.

"The Springfield system is set up so incoming trucks will drop the raw manure and pick up concentrate to return to their home farms," explains Sorenson. "Once the nutrient concentration system is fully operational, it will be discharging purified water into a local creek."

He notes that it is impossible to give a price for an installation without seeing the site. "Every farm is unique, and every application custom," he says. "It's not a product you can put in a crate and ship with an invoice."

Photo shows purified water from 3 Springfield, Wis., dairies being discharged into a local creek.

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VYF manure digester separates nutrient-heavy liquids from undigested fiber. The dried material can be reused as bedding.

New-Style Manure Separator

Running dairy manure through the VYF separator saves northern dairymen time and money. Dairy manure averages about 30 percent undigested fiber. Separating out nutrient-heavy liquids from the fiber reduces application labor and expense, but also saves on bedding costs.

"The cost of setting up a system on a farm varies by the farm and the equipment they have in place. However, our separator alone is priced at about $57,000 (Canadian)," says Yvon Vincent, VYF Distribution. "One machine can handle the manure from up to 600 head. Producing an estimated $26,000 worth of bedding material per year, that makes it a paying proposition."

Before building their own separator, VYF was a distributor for another brand. "We decided to build our own. We wanted to make one that's more durable with less maintenance and that would produce a drier material."

The VYF separator is powered by a 10 hp. electric motor that can work at either 240 or 600-volt power. It drives a 12-in. auger or worm screw that can press out the manure from 40 to 50 cattle per hour. It produces 1 to 2 cu. ft. of recycled litter material per cow per day.

"We offer multiple size mesh screens to match the type of manure or other material to be pressed," says Vincent. "The expelled fiber is between 36 and 40 percent moisture. This is lower than most of our competitors, due to more uniform pressing with less air pressure."

VYF recommends holding the material in a silage box or closed container for use as soon as 24 hrs. after separating. More open storage may require 2 to 3 days of storage before use. The drying and storage process destroys bacteria and removes odors. The recycled litter has a high absorption capacity and, due to its low cost, can be used in higher quantity for greater cow comfort.

The company suggests that their separator will outlast competitive equipment. "We focused on reducing wear and tear with the unique design of the worm screw and the wire mesh," says Vincent.

Currently, the VYF manure separator has only Canadian distribution. However, U.S. customers can order a unit direct from VYF. Vincent reports the company is developing a distribution system in the U.S.

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Smaller Manure Digester For Family-Sized Dairies

Brian Langolf has a better idea for handling manure on family-sized dairies - turn it into energy. The University of Wisconsin (UW) Oshkosh researcher helped set up a modular system at a nearby 135-cow dairy to produce biogas. It fuels a 64 kW CHP (combined heat and power) generator.

"There are 42 larger digesters in place at dairies around Wisconsin, but all but two are larger operations," says Langolf, director, Biogas Systems and Research Development, UW Oshkosh. "This one is unique as there are only three digesters in the entire U.S. for herds with less than 200 cows."

The 2,400-sq. ft. system is set up in units that look a bit like extra large shipping containers. It consists of two 40,000-gal. fermentation vessels, a feeding hopper and the CHP system. It produces 25,900 cu. ft. per day of biogas and 481,800 kWh of electricity per year, enough electricity for 40 homes and enough heat for 61 homes. The electricity is sold, and the heat produced is used in the biogas production system and at the farm.

The current facility can handle up to 200 cows. The design can accommodate a third fermentation vessel for an even larger herd.

Langolf serves on the board of directors of the American Biogas Council. He says there has been a surge of interest in biogas production and building new digesters. He explains that there are multiple benefits to digesters for smaller farms.

"Right now, a lot of people are looking at digesters to convert biogas into renewable natural gas (RNG) for vehicle fuel," says Langolf. "If you look at it holistically, you can use the residue for bedding, produce value added (pathogen/odor reduced) soil amendments that would provide better crop nutrients, and produce renewable fuel."

Langolf notes that it is hard to put a figure on cost savings and benefits other than electricity and/or RNG sales. However, that is what this project is attempting to do.

Digester feed products include 6,500 tons per year of liquid manure, solid bedding and crop residue, as well as food waste from a nearby food processor. Tipping fees from the food waste is part of the revenue stream.

Photo above shows exterior view of a smaller modular manure digester set up by Brian Langolf. System produces biogas that fuels a 64 kW CHP generator.

"Our goal is to divert food waste and other organics from the landfill to higher value uses, such as renewable energy generation," says Langolf.

System components came from a variety of research partners, including BIOFerm energy systems, a German company.

"This size of digester is more typical in Germany," explains Langolf.

The entire system required an investment of $1.2 million by the university, the state of Wisconsin and Wisconsin Public Service (electric and gas utility).

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