

Digester gobbles up odors

As a bonus, it produces usable methane and recycle-ready water **By Becky Mills**



It is a fact of life in the dairy business. Where there are cows, there is manure. Where there is manure, there is odor. Throw in a new subdivision downwind, and you've got a recipe for trouble.

Help is here. A new fixed-film anaerobic digester at the University of Florida Dairy Research Unit is scarfing down 90% of the smell before it can drift to the dairy's many neighbors. Dubbed a microbial high-rise by designer Ann Wilkie, the digester puts the bacteria in the flush water to work gobbling up odor-causing compounds.

In two to three days, the water comes out of the digester ready to go through the dairy's center-pivot irrigation rigs or to recycle back through the freestall flush system.

It is a new twist to a not so new idea. "In previous designs, the manure flows in and flows out and takes the bacteria with it," says Wilkie, researcher with the University of Florida Soil and Water Science department. "Bacteria need time to grow."

She says that means wastewater has to stay in the old-style digesters 20 to 30 days, which either requires an enormous digester or a backlog of wastewater. The other option is the traditional lagoon, which takes a lot of land, not to mention a 30- to 60-day holding time for the bacteria to do their thing.

Or, as they were doing at the university dairy before the digester was installed, flushing the barns, then warehousing the water for two to three days in holding ponds before putting it out through the center pivots. That was OK, as long as the wind wasn't blowing toward town.

In Wilkie's system, the bacteria are ▶

already in the digester. "When we bring in new wastewater, there is an army of bacteria already at work," she says. The secret—plain plastic pipe like you see in septic field drainage areas. It has lots of surface area for the bacteria to hang out.

The plastic pipe is housed in a 100,000-gal. enclosed tank. The bacteria form a biofilm (a fancy name for slime) layer on the pipe, thus the term *fixed-film*. The digester is a key component of the waste-management system at the 500-cow dairy.

Flush water from the freestall barn, along with wash water from the parlor holding area and the parlor itself, flows down a channel to a sand trap where the sand is collected and recycled for bedding. Next, the wastewater flows to a mechanical separator that takes out most of the fibrous solids. Then, it flows across a settling basin and over a weir, which collect more solids, and into a sump which feeds the digester.

Once the solids and the liquids are separated, both are more manageable than the original flushed manure. The solids are land-applied on dairy cropland and pastures. The sump pumps the wastewater into the digester. When the digester has done its work, the wastewater flows into a holding pond where it then makes its way to the center-pivot irrigation systems at the dairy.

If nearly odor-free water isn't enough, there are more benefits. First is biogas, a mixture of methane and carbon dioxide. For now, Wilkie and dairy coordinator David Armstrong are flaring the gas until they can get an accurate handle on just how much the digester produces. They have several options, though, including using the methane for space heating in the milking parlor, heating wash water in the parlor, or generating electricity.

"It is an energy-producing system as opposed to an energy-consuming system," Wilkie says. Since it is a completely closed system, the digester also minimizes the amount of methane that is released into the air—a plus on the global warming issue.

There is also the treated water. Even though most of the smell is gone, the digester leaves the nitrogen, phosphorus and potassium in-



AN IFAS FIXED-FILM anaerobic digester cuts odor by 90% or more at the University of Florida Dairy Research Unit.

fact, meaning the cropland is fertilized as it is waters. Wilkie says the organically bound nutrients are mineralized to soluble forms in the digester, which transforms them into a more predictable fertilizer product.

The digester also does a number on the pathogens in wastewater, providing cleaner water to recycle back through the freestall flush system. How much the cleaner water will help, they don't know yet. They are researching it to find out. But Armstrong says, "We assume there will be herd health benefits."

The list of pluses continues. Maintenance is a breeze. "It is the least of anything we do," Armstrong says. "We go out and check and make sure the electricity hasn't blipped."

"There are no moving parts inside the tank," says Wilkie. "The system is continuously fed, and it does not need daily attention. The bacteria do the work. That was my goal."

She adds, "The only operating cost is the cost of running the feed pump and recycling pump."

OK, there is one drawback to all this. And you've probably guessed it. The digester is pricey. Wilkie estimates the tab on the Institute of Food and Agricultural Sciences (IFAS) Fixed-Film Digester, funded primarily by the Florida Energy Office, is \$150,000.

However, she says part of that cost is due to research gadgets. She also figures there must be a savvy producer or two who can adapt the system to their own operations for less. She says it should work on any dairy (or swine or poultry) operation with a hydraulic flush system. She has already gotten calls from Washington state to New York.

She says economies of scale should also kick in for larger operations. While the tank would need to be bigger, the system would be similar.

Kurt Roos, manager of the Environmental Protection Agency AgSTAR program, says that anaerobic digesters are a better deal than they appear, especially since they provide a renewable energy source as well as air and water quality benefits. "When they are compared to conventional manure-management systems, they are more cost effective than many realize," Roos says. "Particularly so for larger farms or farms in expansion."

While there are different types of anaerobic digesters available for different types of manure-handling systems, Roos believes the IFAS Fixed-Film Anaerobic Digester will be the next commercially available system for operations with flush manure-handling.

In the meantime, it is a workable, needed idea. "Odor is an issue now," states Art Darling, executive director of Sunshine State Milk Producers. "We need to be ready with this kind of technology for dairies that are in close proximity to populated areas."

"We shouldn't wait to be driven by a court case or a regulatory challenge before we find answers," he says.

Armstrong agrees with that. "This unit fills a need. It helps us be good neighbors and it is an answer to the regulatory question." DT

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EPA's AgSTAR program provides information, tools, and guidance to help in the development of commercial biogas systems for livestock operations. Its hot-line telephone number is (800) 95AGSTAR, and the Web site address is www.epa.gov/agstar.