

Nix the Nitrogen

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In a Cal-Poly research study, nitrogen is removed from wastewater inside two side-by-side rock tanks next to the lagoon at the school's research dairy in San Luis Obispo, Calif.

Biofilter technology removes nitrogen in wastewater

Dairy manure can sometimes be too much of a good thing. As reports of groundwater contamination from manure-generated nitrogen increase government scrutiny and dairy regulations, many dairies have become increasingly worried about manure and wastewater disposal.

Researchers in California are hoping to ease those worries. A California nonprofit called Sustainable Conservation and its scientific partners have joined forces to study a new technology that naturally treats nitrogen in wastewater at commercial dairies.

"This technology offers an innovative solution that's ideal for dairies with surplus nitrogen," says Joe Choperena, senior project manager with Sustainable Conservation.

Called a Reciprocating Biofilter, or ReCip, the technology uses naturally occurring microorganisms to convert nitrogen to an inert gas form, which removes it from lagoon wastewater.

In an ongoing study that began in 2009 at the research dairy at California Polytechnic University, San Luis Obispo, researchers set up a system of two wastewater-holding "rock cells," or tanks. Inside one tank, wastewater moves through rocks of various sizes. The wastewater's "bugs" naturally attach themselves to the rocks. Wastewater is then pumped to the second tank. A back-and-forth transfer of wastewater begins, moving at a controlled rate. The reciprocating motion creates an environment that supports beneficial microbes that remove the nitrogen in the wastewater. The nitrogen generally disperses in 2.5 to four days.

"We've seen impressive results," Choperena says.

Those results include an ammonia nitrogen removal rate of 90%, and a removal rate of about 70% of total nitrogen and total suspended solids. The system has also produced notable air-quality benefits, such as reduced levels of volatile organic compounds, greenhouse gases and odors.

A three-year study to test the biofilter technology at a commercial dairy is just getting under way at Fanelli Dairy, a 750-cow farm in Hilmar, Calif. "If there's something new that can take nitrogen out of wastewater, we're all for it," says producer Vic Fanelli, who's contributing cash, time and space for the study.

"Every dairy has nitrogen, and this could be another tool to control it," he adds. "The potential is great if it works out, not just for us but for other dairies too."



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Choperena is optimistic that the biological wastewater treatment system will offer an effective, energy-efficient and attractive option for dairy farmers who have more manure than they can use to fertilize their crops.

The technology was originally developed in the 1990s by the Tennessee Valley Authority and has been used at commercial swine and non-ag facilities. The installation at Cal-Poly marked the first time the technology has been used at a dairy.

The Fanelli Dairy study is funded in part by a national Conservation Innovation Grant from USDA. Construction of the rock tanks will be finished this summer. The study will also include air-quality testing, economic analyses of the nitrogen-removal process, and other options for managing its removal from dairies.

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