

Cure for hog-lot stench touted

ISU team developing a way to turn methane gas into energy

By THOMAS R. O'DONNELL
OF THE REGISTER'S AMES BUREAU

Ames, Ia. — Richard Dague believes he has the answer to stinky hog lots.

"It's fantastic," he said. "It's simple."

Dague and his researchers at Iowa State University have patented a process that uses hog wastes to produce odorless methane gas. The gas can be burned for energy.

The process also leaves less waste behind to spread on fields. And what's left doesn't smell as bad, Dague said.

"I think we're onto something," said Dague, a professor of environmental engineering. So do state and federal officials and industries from starch processors to cheese-makers who want to use it on their wastes.

"It's just hotter than a pistol in terms of applications," Dague said.

Big Hog Lots

The only thing hotter may be the controversy over mass hog production facilities. The farms produce thousands of hogs and millions of gallons of waste. Rural residents have fought the plants, saying the stench and possible water pollution would be unbearable.

But Dague said he can make the farms less of a burden. "We'll get rid of most of the obnoxious odors," he said. "I'm not saying the problem is totally solved, but we're very close."

Andy Hashimoto, head of the bioresource engineering department at Oregon State University, said methane generation "is a very active research area. Definitely, (Dague) is one of the leaders."

Dague said ISU has the largest such program in the United States, with 18 graduate students working on projects last year. Hashimoto agreed it's one of the larger programs.

"That's a unique system," Hashimoto said of Dague's reactor, but "there's different kind of systems to do different kinds of things."

He added, "I don't see one system's going to solve everybody's problem."

Pilot Projects

A pilot reactor system is in operation at Penford Products Co. in Cedar Rapids. The company, which makes specialty cornstarches for use in paper production, believes the system could cut its \$1.5 million annual waste treatment bill by as much as 80 percent. Burning gas produced by the reactor could save the company as much as \$800,000 in annual energy costs.

Another pilot project is planned for a farm near Wellington, Colo., with an annual capacity of 3,500 to 4,000 hogs.

Dague is a believer in the technology. The license plates on his burgundy Buick say "METHANE." In his office last week, he bounced out of his chair periodically to dig out files and papers. Ideas and data pour out of his mouth.

"People never figured this out before," Dague said. "We have actually zeroed in on this in the last six years."

Dague has been studying anaerobic waste processing since making it the topic of his doctoral dissertation in the 1960s. Things kicked into high gear with the creation of the Iowa Biotechnology Byproducts Consortium. The consortium is supported by the U.S. Department of Agriculture and brings together ISU, the University of Iowa, the city of Cedar Rapids and Iowa industries.

New Twists

Anaerobic reactors aren't especially new. But Dague's process adds a few twists to make it more efficient.

With Dague's reactor, hog manure would be flushed out of

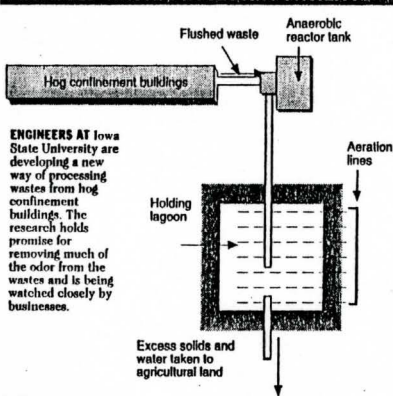


Richard Dague, professor of environmental engineering at Iowa State University, displays a test tube of bacteria that eats hog

THE DES MOINES REGISTER ■ MONDAY, JULY 4, 1994

BOB MANDELL/THE REGISTER

PROPOSED WASTE-PROCESSING FACILITY



SOURCE: Iowa State University

confinement buildings and into a large sealed tank or a lined, covered lagoon. Large hog farms now use huge open anaerobic lagoons. The open lagoons also use bacteria to break down wastes, but they can be difficult to control and the lagoons often generate odors as the wastes decay.

"They're sticking with technology that's 60 years old," Dague said. "They've got the solids cooking and fermenting for a year, year and a half" before they're spread on farm fields.

But with Dague's system, "It's totally sealed, so there are no odors."

Bacteria similar to those found in sewage treatment plants thrive in

the reactor's environment. Different species work together to break down wastes and produce natural gas. The most efficient "consortiums" of bacteria form large clumps.

Feast to Famine

In conventional anaerobic reactors, it takes a long time for the bacteria to grow. The bacteria population also has to rebuild each time the reactor is drained and refilled.

But Dague's process puts the bacteria on a feast-to-famine diet. Wastes are pumped in in cycles. After the waste is consumed, solids — including the clumps of the most efficient bacteria — sink to the

waste, producing methane and reducing the smell of hog manure pits.

tank's bottom.

Liquid is siphoned off the top of the tank, taking with it the least efficient bacteria. The most diligent, successful bacteria are left behind, awaiting their next meal.

Dague demonstrated by shaking up a test tube full of the black bacteria granules. The clumps of hard-working bacteria sank to the bottom. Small specks of lazy bacteria floated to the top.

"If they don't get their hind ends in gear, they're going to be wasted," Dague said.

After the liquid is drained off, a fresh batch of hog manure is pumped in and the process starts again. Each cycle can take as little as six hours.

Some of the liquid that's pumped off can be used to flush out the confinement building again, reducing water consumption. The rest would go into a holding pond and eventually would be spread on fields.

Not Free of Odor

"I would be the last to say there would be no odor" from the liquid, Dague said, "but the obnoxious odors, the very terrible odors" would be gone.

An anaerobic processing system is likely to cost less than the lagoons hog producers use now, Dague said. Hashimoto disagreed.

"It takes a lot more management" than an open lagoon, he said. "It's going to cost more because of the equipment needed."

But Hashimoto and Dague agree that because the technology is new, it's difficult to get farmers to try it. "People don't want to go into anything that's new. They really don't," Dague said.

Charles Johnson, an environmental engineer for hog producer Iowa Select Farms of Iowa Falls, agreed. Johnson said he lobbied for a batch reactor when plans were being made for a new hog farm.

"People don't accept new technologies for the most part until they're forced to do it," Johnson said. Dague's system was new and it wasn't clear how much it would cost, he said. There's also the "misconception that it's management-intensive. It's going to take management like anything else," but many of the steps can be automated.

Watched Closely

Johnson will be watching the Colorado test closely. "His system would certainly solve odor problem. No doubt about that," he said.

Dague and his researchers are continuing to test and refine the process. A patent is being sought for a process using tandem reactors operating at different temperatures. It can remove nearly 100 percent of organic materials from wastes, Dague said.

Last week, Dague showed a visitor one test reactor after another in a large lab at the Town Engineering building at ISU. Each looks like a large transparent plastic pipe hooked up to tubes and holding dirty water. Some are in refrigerators or warmers to test their efficiencies at various temperatures.

Each reactor represents a test by a different graduate student. Members of Dague's team come from as far away as Nigeria, China and the Netherlands. They're working with companies such as biotechnology firm Genencor, pet food-maker Iams and grain-processor Cargill.

But Dague is itching to get the technology into the big hog-producing plants.

"There really aren't any silver bullets" for eliminating hog waste odors, Dague said. "They're talking about a chemical or some kind of enzyme" that could be added to wastes.

"Nah," Dague said. "Mother Nature's got the answer."