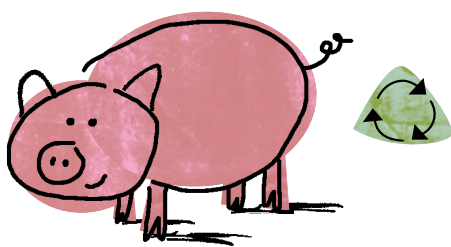


# Converting hog waste into energy



If you visit Tom Butler's hog farm in Harnett County, N.C., you might spot a covered trailer bearing the faint logo of a rodeo clown.

But don't think there's funny business inside.

The unlikely laboratory is the place where Mike Aitken, PhD, chair of UNC's Department of Environmental Sciences and Engineering, is conducting research to stem water and air pollution that comes from treated hog waste, a big issue in North Carolina, the second largest pork-producing state behind Iowa.

Through a Gillings Innovation Lab, Aitken and his team purchased the trailer second-hand. The ESE Design Center equipped it to operate as an onsite laboratory. Now parked by a hog-waste lagoon at Butler's farm

near Lillington, the lab is testing Aitken's idea for removing ammonia, a noxious form of nitrogen, from the waste.

Ammonia is a desirable fertilizer, but too much of it damages soil and denigrates groundwater. "There is more nitrogen produced from hog waste in eastern North Carolina than could ever be used for crops in that region," Aitken says.

Furthermore, when farmers spray ammonia-rich waste on crops as fertilizer—a common practice—much of the ammonia is released to the atmosphere, generating the smelly odor ►►



Field technician John McNeill (left) and Dr. Glenn Walters, director of the ESE Design Center, discuss design strategies for maintaining pressure in a tank used to remove nitrogen from hog waste. At right, plastic covering over a hog waste lagoon not only contains the noxious smell of ammonia but also captures methane, which will be used to generate electricity instead of being released as a greenhouse gas.



DR. MIKE AITKEN



Dr. Mike Aitken

for which hog waste is well known.

Ammonia also reacts in the atmosphere to form fine particles that cause respiratory problems such as asthma.

"This is a big public health problem," Aitken says, going on to describe the process. "We are converting ammonia to nitrate, and then nitrate to nitrogen gas, which represents 79 percent of our atmosphere and can be harmlessly released."

The process consists of conventional wastewater-treatment technology, but two aspects of the project are unusual, Aitken says.

It's coupled with another project at the site which captures methane from the treated hog waste to generate electricity and thus minimize the release of the potent greenhouse gas.

Under a pilot program the state began in 2007, investor-owned utilities in North Carolina are required to buy the electricity. The farmer receives up to 18 cents per kilowatt hour, Aitken says. That far exceeds the several cents per kilowatt hour that utilities typically pay other power producers and thus could significantly help offset the farmer's technology cost.

The other innovative part of Aitken's project is technical. At a nominal cost, InVentures Technologies Inc. is providing a "bubble-less" aeration system that supplies oxygen

required to convert the ammonia to nitrate. This method is superior to traditional tank-and-bubble systems for two reasons, Aitken says. It minimizes the release of ammonia from the treatment system and also may minimize emission of the greenhouse gas nitrous oxide, a by-product of the process.

Aitken began testing the ammonia-removal system in the first quarter of 2009 and expects the demonstration to last a year. Assisting him are graduate students Sarah Bunk and Eric Staunton, as well as Joe Rudek, PhD, a hog-waste policy expert with the Environmental Defense Fund in Raleigh, N.C., who holds master's and doctoral degrees from the UNC department Aitken heads.

While there are state incentives for the energy-conversion process, both Aitken and Rudek hope additional incentives, including credits for carbon and nitrogen removal, will emerge as legislation.

So far, Aitken says, "The state is not connecting the dots."

He hopes to make the connections clear soon. But for now, he says with a chuckle, "The trailer is turned so that you can't see the clown logo from the road." ■

—Susan Shackelford