

## Wood chip bioreactors remove nitrates

By LYNN BETTS

**D**ENITRIFYING bioreactors — underground trenches filled with wood chips — are still few and far between.

“We’re trying to get more bioreactors installed in Iowa so more farmers can become familiar with them,” says Keegan Kult of the Iowa Soybean Association. The ISA manages and carries out projects for Agriculture’s Clean Water Alliance, a group of 13 ag retailers organized to work with conservation partners to reduce nutrient loss from farm fields in the Raccoon River and Des Moines River watersheds in Iowa.

The ACWA and the Sand County Foundation helped fund and install the first bioreactor in Iowa in 2008; Kult says he’s aware of about 10 in operation in the state and a few scattered across Minnesota, Illinois and Pennsylvania.

Working with the University of Illinois, a bioreactor was installed at the Farm Progress Show site near Decatur, Ill., several years ago. The reactor is in a farm field and is used for research, but it is also a functioning bioreactor. Iowa State University water resources engineer Matt Helmers says wood chip bioreactors can remove from 15% to 60% of the annual load of nitrate from drainage water in tile lines. Helmers says there’s still much to be learned about bioreactors and how to maximize their performance.

Arlo Van Diest, Webster City, Iowa, is

### Key Points

- Wood chip bioreactors can remove up to 60% of nitrate load from drainage water.
- One Iowa farmer has two bioreactors on his flat land.
- Bioreactors are easier to install and take less space than wetlands.

likely the only farmer in the country with two bioreactors on his land. He was willing to put his own money into installing them, but ISA found other funding sources, including a grant to ISA’s Ag Technology & Environmental Stewardship Foundation from the Walton Family Foundation. “I got payments from USDA to convert to strip till, and I’d like to use some of that money to demonstrate conservation and water-quality practices to other farmers to encourage them to use these newer practices,” Van Diest says.

### Cost-share possible

Depending on bioreactor size and topography, costs for a bioreactor range from \$6,000 to \$12,000. The first six ISA helped install in Iowa were funded by the ACWA and the Sand County Foundation. In some counties, USDA now offers 50% cost-share up to \$4,000.

Kult says many farmers use wetlands to remove nitrates from tile and surface waters, but adds that the wetlands take up more land, making wetland installa-



**HARDLY KNOW IT’S THERE:** Keegan Kult checks the automated water-quality monitor at the outflow control structure of a bioreactor on the Van Diest farm. The tops of inflow and outflow water control structures are the only visible traces of working bioreactors.

tions a difficult decision for the producer. “Wetlands don’t always fit into the landscape, either. The bioreactor is a nitrate removal option that can be installed at the edge of the field, without losing cropland.”

### How they work

Sizes vary, but most bioreactors are about

100 feet long and up to 30 feet wide. Since they’re underground, bioreactors do their job of reducing nitrates in tile drainage waters out of sight.

Most bioreactors now in use clean water from 6- to 8-inch tile lines that drain from 40 to 80 acres.

A water control structure installed at the upper end of the trench intercepts and diverts tile water into the bioreactor, Kult says. “Stop logs in the structure control flow of tile water into the bioreactor and can allow tile water to bypass the bioreactor in times of high flow,” he adds. “That bypass feature keeps water from backing up into the field.”

Stop logs in a second water control structure at the lower end of the bioreactor control how fast water moves through the bioreactor. Microbes that occur naturally in the soil colonize the saturated wood chips. “The carbon in the wood chips is their food source, and in underground, anaerobic conditions, they break down nitrates in the water and convert them to harmless nitrite gas,” Kult explains.

### Life span still unknown

The life of a wood chip bioreactor is estimated at 10 to 15 years, Kult notes, but adds that early research installations from 12 to 14 years ago are still working. One key to their life span is keeping them saturated, Kult says. If the wood chips dry out, the life span of a bioreactor is shortened.

Betts writes from Johnston, Iowa.

## Travel with Indiana Prairie Farmer!

Exclusive Ag Tour - Limited Seats!



**Tour Host, Mike Wilson**  
Executive Editor, Farm Futures Magazine

**BRAZIL** Feb. 6-15, 2012

Agriculture is booming in Brazil, and here is your chance to see it in action for 10 days, 8 nights! Depart Dallas for Sao Paulo, where you’ll visit the country’s largest fresh produce market, and take a city tour. Then continue to see the country’s agricultural diversity. You’ll visit research fields and tour Embrapa Soybean, the National Soybean Research Center. You’ll also see the largest ag co-op in Brazil, see grain farms and attend the Coopavel Farm Show. Your tour continues with a trip to Iguacu Falls and the Itaipu Dam, the largest hydroelectric facility in the world. Finish your visit with a stay in Rio de Janeiro.

**ITINERARY:** Sao Paulo, Londrina, Campo Mourao, Cascavel, Foz do Igauçu, Rio de Janeiro

**PRICE:** \$5,599 per person, based on double occupancy \$500 deposit due upon registration



**Tour includes:** Round-trip airfare from departure city, superior tourist class accommodations, meals as outlined in itinerary, transportation provided in luxury air-conditioned motorcoaches, sightseeing and technical visits as outlined in itinerary, services of a full-time professional tour manager with agricultural background, all taxes and fees. Price based on current airfare and exchange rates. Itinerary subject to change.

**Discover agriculture in another country. Meet other U.S. and foreign farmers. One good idea pays for your trip!**

For a complete itinerary go to [www.agtoursusa.com](http://www.agtoursusa.com) or call 1-800-758-2042.

Trump Tours 1308 E. Central Ave. Bentonville AR 72712