

# Letter

## Leopold Center grant leads to new fertilizer technology

By **Laura Miller**  
Newsletter editor

Maybe they couldn't build a better mousetrap, but a team of Iowa State University researchers definitely knows how to build a better fertilizer applicator.

A new technology, known as the Impellicone and fostered at Iowa State, has the potential to reduce the amount of nitrogen fertilizer typically used on crops. It was named a top new agricultural equipment design in 2004 by the American Society of Agricultural Engineers (ASAE).

"This is an example of something that could make the world a different place, all because the Leopold Center was willing to look at a problem," said researcher Mark Hanna, ISU Extension agricultural and biosystems engineer.

"This technology allows people to more uniformly apply fertilizer, and if rates of application are reduced to take advantage of this uniformity, it's a win-win situation for everyone," he added.

Although preliminary tests were conducted earlier, work on the project began in earnest with the start of a three-year grant from the Leopold Center in 2000. The grant funded background research into a problem inherent in the application of anhydrous ammonia ( $\text{NH}_3$ ) fertilizer: uneven distribution which can be one possible cause of over-application of nitrogen.

The Impellicone is a self-powered manifold or flow-divider system that more uniformly mixes and distributes the liquid and gas phases of  $\text{NH}_3$  to multiple outlets across an applicator. The equipment gets its name from the cone-shaped impeller (rotor) that mixes and distributes the  $\text{NH}_3$ .

The Impellicone is licensed to CDS-John Blue Company, a manufacturer of agricultural equipment in Huntsville,

Alabama. According to a company official, about 400 units, which cost between \$375 and \$500, have been sold since they went on the market in December 2003.

Hanna's "conservative estimate" is that the technology could result in a 5 percent reduction in applied  $\text{NH}_3$ . In Iowa, that's 50 million fewer pounds of applied  $\text{NH}_3$  for a savings to producers of approximately \$9 million.

Working with Hanna on the Leopold Center grant were Tom Colvin, professor and USDA collaborator at the National Soil Tilth Laboratory; James Baker, ISU professor emeritus of agricultural and biosystems engineering; Michael White, ISU Extension crop specialist in Warren County; former agricultural engineering graduate student Paul Boyd and Kyle Baumgartner, a junior in agricultural engineering from Strawberry Point.

Hanna said the team tested existing equipment in the field, measuring the amount of  $\text{NH}_3$  coming from each outlet supplying a 28-ft. long applicator tool bar. They found that application using conventional equipment could under-apply by as much as 32 percent, which is one reason why farmers may be tempted to over-apply – to guarantee that individual plants receive the minimum recommended amount of nitrogen.

Other solutions to the distribution problem are either more complicated (one model requires changing parts to adjust rates) or more expensive, such as a second pump to re-pressurize the anhydrous ammonia between the nurse



This research team developed a prototype for a new fertilizer manifold. Members are (left-right) Paul Boyd, Mark Hanna, Tom Colvin, Kyle Baumgartner, James Baker and Michael White.

tank and the application toolbar (at a cost of \$6-\$10,000).

"We knew we needed to keep the cost low so that it would be used over a wide range of applications," said Boyd, now employed by the U.S. Army Corps of Engineers in Omaha. "Dr. Hanna challenged me to come up with an alternative design that we could test."

After several designs and months of testing – all funded by the Leopold Center grant, Hanna and Boyd had a prototype. Iowa State's Office of

**APPLICATOR** (continued on next page)

## More uniform application could reduce temptation to use higher settings

**APPLICATOR** (continued from page 1)

Intellectual Property and Technology Transfer and the ISU Research Foundation helped them identify an industry partner and apply for a patent.

The ISU team then worked with engineers from CDS-John Blue to refine the commercial design. The equipment was tested in the field last summer.

"All of our customers are really excited about it," said Seth Ferguson, CDS-John Blue engineer. "They're looking at the benefit of better accuracy so there will not be as much streaking in their corn and more uniformity in their crops."

"We think that a typical corn grower will usually pay for this in 500 to 600 acres in one year," he added.

### For more information

Results of the Leopold Center research project, Reducing anhydrous ammonia application by optimizing distribution, are summarized in the *2003 Center Progress Report*, available from the Leopold Center or on the Leopold Center web site at:

[www.leopold.iastate.edu](http://www.leopold.iastate.edu) [look under Research then Completed Grants]

Read more about the project in *Successful Farming* magazine. Crop editor Rich Fee followed this project's development and the Meredith Corporation also contributed funds for the early testing work.

- NH3 manifolds side by side February 2004, on the web at: [www.agriculture.com/go/5364/](http://www.agriculture.com/go/5364/)
- New NH3 manifolds do better January 2003, on the web at: [www.agriculture.com/go/5366/](http://www.agriculture.com/go/5366/)
- They're taking the mystery out of misapplication -- September 2001, on the web at: [www.agriculture.com/go/5365/](http://www.agriculture.com/go/5365/)

Read this story on the Leopold Center's web site at: [www.leopold.iastate.edu/pubs/nwl/2004/2004-3-leoletter/applicator.htm](http://www.leopold.iastate.edu/pubs/nwl/2004/2004-3-leoletter/applicator.htm)

To see the rest of the Fall 2004 *Leopold Letter*, go to: [www.leopold.iastate.edu/pubs/nwl/2004/2004-3-leoletter/index.htm](http://www.leopold.iastate.edu/pubs/nwl/2004/2004-3-leoletter/index.htm)

Denny Bell, who manages Fertilizer Dealer Supply in Jesup, said he sold several Impellicones last spring and has heard no complaints. The units went to individual farmers, rather than fertilizer dealers, but some people are taking a "wait-and-see" approach before purchasing the device.

Jerry Dove said he had read about the Impellicone in a farm magazine and decided to try it on 550 acres he farms near Janesville. *Successful Farming* followed the research and was an early partner in the ISU project. Dove said he won't know how it helped until he checks his fields for nitrate levels after harvest.

"There are a lot of specialized ways to distribute and monitor anhydrous ammonia but the weak point has always been the manifold," Dove said. "This system seems to make a lot of sense. I'm anxious to do the stalk testing. I think we'll be pleased with the results."



The Impellicone is licensed to CDS-John Blue and is based on the ISU prototype. It went on the market in December 2003.



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The *Leopold Letter* is available free from the Leopold Center at 209 Curtiss Hall, Iowa State University, Ames, Iowa 50011-1050; (515) 294-3711.

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