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TESTING

Trialing Innovation

New products undergo extensive research and collaboration before real-time testing.

By Susanne Retka Schill

PHOTOS: SUSANNE RETKA SCHILL, BBI INTERNATIONAL

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The ethanol industry is known to be innovative. But, whether it's testing a new feedstock, incorporating a new enzyme, yeast or other fermentation aid, or perhaps tweaking a parameter or trying out a new piece of equipment, the innovation must be put to the test. Every new technology introduced to the ethanol industry must first prove itself at commercial scale. In practical terms, that means ethanol plants must be willing to conduct trials. But when a lost fermenter, or even an hour of downtime, can cost tens of thousands or even more than $100,000 to the bottom line, the risks involved in conducting trials are big.

For companies like Novozymes and Lallemand Biofuels and Distilled Spirits, whose enzymes and yeasts form the foundation of the ethanol process, the business of conducting trials is taken very seriously.

"We have a lot of respect for the fact our customers are running a business," says Kevin Cox, director of technical services for bioenergy at Novozymes. "We're coming in with our products and we know we need to be seamless. Our objective is to bring value to the customer process and ensure smooth operations."

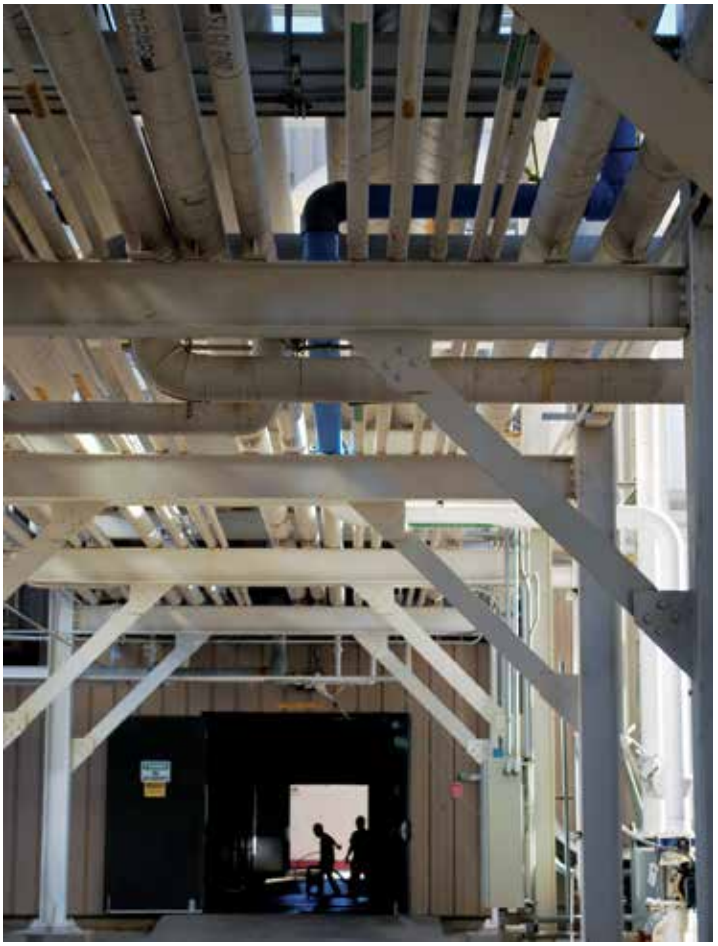
And, while it might be tempting to think of ethanol producers as guinea pigs when doing trials, Jim Miers, TransFerm product manager for Lallemand, says that isn't the case. "The way we're looking at trials is actually to make plants better, to make them more efficient, more profitable."

Planning for a successful trial begins with setting expectations and talking though the protocol. "Several weeks in advance of the trial, we will sit down with the customer to review and align expectations around operational adjustments and product benefits," Cox says.

Similarly, Lallemand sets up a meeting with a group from the plant that can include the general manager or CEO, plant, operations and lab managers. "I like to have as many people involved so we can make sure, when the trial is done, there's not a thought in their minds that, 'We should have looked at this.'"

Protocols can run several pages long, including a description of the plant, the trial objectives and expectations, the sponsor's personnel commitment, operation parameters, data collection—the specific details covering all aspects.

Nondisclosure agreements have become standard as well, outlining information and trade secrets to be kept confidential. Protecting intellectual property—particularly when doing trials on precommercial products—is important for companies that invest resources into research and development. "In general, once a concept is published or described publicly, it changes the landscape for patentability," Cox explains. Thus, keeping new innovations quiet is important—and for both parties. "A lot of our customers have innovation they are developing as well," Cox says.



Baseline Start

The next step after planning is gathering baseline data. "If you're going into a trial situation, you're comparing with the baseline—which was how the plant was running before," Cox explains. "It's really important to maintain consistent operating conditions, as much as possible, between the baseline and the trial period. That allows you to do an apples-to-apples comparison." It can be a challenge at times, he adds, because plants to have to run their businesses, and a trial may require operational changes. "As much as we can keep the process steady and consistent, we will get the best possible evaluation of the technology." When the trial itself starts,

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Small-scale Test Tanks

Pinal Energy LLC, A 60 MMgy corn-ethanol plant in Maricopa, Arizona, has pint-sized fermentation tanks nestled in the middle of its fermentation tanks that are fully integrated into the plant. They were installed as part of a University of Arizona research project on sweet sorghum as an alternative feedstock. Since then, Pinal has found the system useful for other product trials, even one looking at watermelon rejects as a feedstock.

the Novozymes scientists watch the process data closely, looking for product fingerprints—measureable indicators that the products are working as expected. "Once we see the fingerprints, we are confident the products are running correctly, then we are able to demonstrate and capture the benefits the enzymes provide." A high percentage of the Novozymes technical services team are trained statisticians, he adds, "who can really dig into the data to insure adequate and fair comparisons."

Lallemand approaches trials in much the same way. "When we go into a trial, we want a month's worth of baseline data, so we can compare a month's worth of data from the trial," Miers says. The first three weeks of a trial are covered by a Lallemand tech specialist working on site, followed by remote coverage for the remainder of the trial through a daily phone call and the daily sharing of data by email. "The first couple of weeks we focus on enzyme load and yeast to avoid different stressors and find where the plant's yield is best," Miers says. "Yield is key in all these plants, so over the course of the five to six weeks, we're looking at yield and what will be the best conditions for yield—the temperatures, the pH, and so on."

All trials are a minimum of 42 days, he continues. "It's a commitment on both sides. Not only are they committed to running the trial but it's a commitment of our resources going out and focusing on making sure that we do our very best to get them what they're expecting. We promise a range of expectations. We need to succeed in that."

The protocol is much the same when running the first commercial trials of brand new technologies, both gentlemen report. New products are well tested and understood before they hit full-scale fermentations. The biggest difference is that more specialists from the companies will be involved in the first trials, generally being on site for the entire length of the trial.

Project Payoff

The obvious benefit of a new enzyme by Novozymes or a yeast from Lallemand will be yield improvement. Even a seemingly modest improvement of 1 percent brings a significant return to a 100 MMgy plant. There are other positives, however.

Doing a product trial can benefit plants that may not be running as smoothly as they'd like, Miers suggests. "When we have a plant with some variability, we do our very best to help them stabilize it so we can run the trial sooner than later." He adds that the stability of plants overall has improved. "The industry has become more educated—they take a more technical approach to running."

"The biggest benefit for customers from running trials is access to new technology," Cox says. "There's lots of great technologies being developed. Trials gives them a chance to evaluate them

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and see how they fit in to their process." There are different philosophical approaches, he adds. "Some folks want to be first movers, they want their hands on the best and brightest new technology when it first comes out. There's certainly an advantage to going first because you get to capitalize on the benefits in advance of everyone else." Others prefer to wait, letting the first movers test out new technologies and work through any issues that might arise.

"The industry has evolved," Cox continues. "It is much more sophisticated. And complex. These plants are getting really good at refining their ability to manage and analyze their data. The products are much more complicated as well. It requires a more sophisticated trial approach—not just enzymes, but all technologies being evaluated."

Both Novozymes and Lallemand have technical service teams that bring their experience in conducting multiple trials each year to each new plant trial. Smaller companies may not have the same resources to deploy, but Miers suggests all vendors do their best. "Every company, every vendor, is out there to help the facility be better."

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