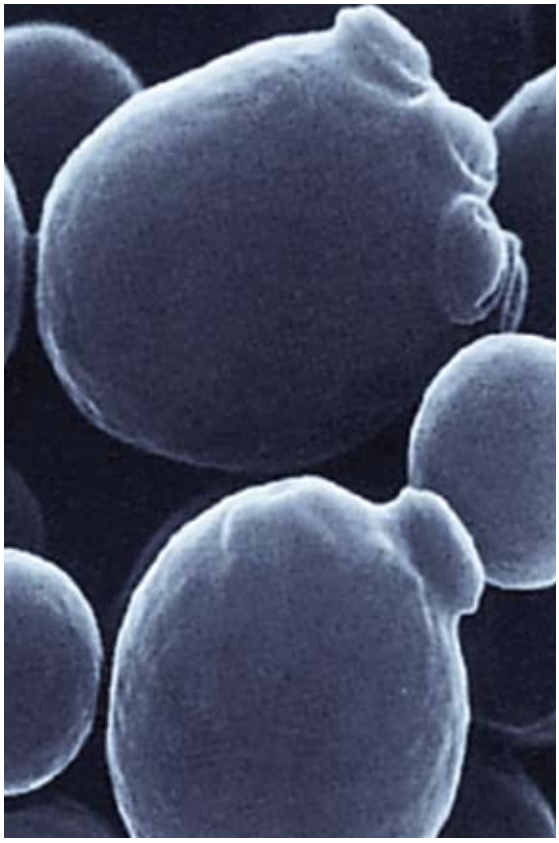
Making it Work Yeast counts are part of the routine work at an ethanol plant, pictured above. Lallemand and Xylogenics are developing enhanced yeasts offering increased yields.



Under the Microscope The yet unnamed yeast offers increased yield, and reduced ingredient costs and fermentation time, Lallemand says.

PHOTOS: LALLEMAND

More Yield Strategies

Other companies introduced new products or displayed equipment at the FEW.

Almost a year after signing an exclusive agreement to develop and commercialize yeasts for the grain ethanol industry, Lallemand Ethanol Technology and Xylogenics Inc. have delivered. The new patent-pending, as yet unnamed, yeast offers ethanol producers an uptick in yield. "We have seen anywhere from 2 and 4 percent increase in yield," says Craig Pilgrim, marketing manager for Lallemand.

The new yeast is currently undergoing plant-scale testing at two or three ethanol facilities and is available in liquid form for long-term plant trials. Besides producing more ethanol with the same amount of corn, the yeast reduces the time needed for fermentation. Pilgrim said he couldn't give exact figures but that it might be somewhere around a couple hours. "That's one of the things that we're trying to pinpoint in testing on the larger scale," he tells EPM.

Unlike other yeasts, the new yeast prefers maltose to glucose. In fact, it's designed to remove glucose repression, preventing the formation of lactic acid or glycerol. "The sugar uptake kinetics are a little bit different," he says, adding that's what allows for increased yield and shortened fermentation time.

It's obvious that increasing yield can have a big impact to the financial health of an ethanol plant, Pilgrim says. Lallemand calculates that increasing a 50 MMgy ethanol plant's yield of 2.75 gallons per bushel of corn by just one percent can bring in $1.29 million in additional profit. That's calculated with a $2.59 market value of ethanol and excluding the cost of the process change. Increasing the same plant's yield from 2.75 gallons of ethanol per barrel by 4 percent would bring in $5.1 million in profit. "Our success is defined by our customer's success, whether it be efficiencies attained, increased volume output or greater profitability," says Bill Nankervis, Lallemand general manager. "Because of the introduction of this technology, we expect our customers to realize real benefits that help them remain in the black in today's challenging market environment."

Surprisingly, the new yeast has roots in research at the Indiana University School of Medicine to inhibit the growth of cancer cells. After realizing what they learned could be applied to the ethanol industry, and eight more years of study, Xylogenics, an Indianapolis-based company, was formed in 2008.

The partnership between Lallemand and Xylogenics came about to engineer a new class of industrial ethanol yeast and bring it to the market. Under the terms of the agree-

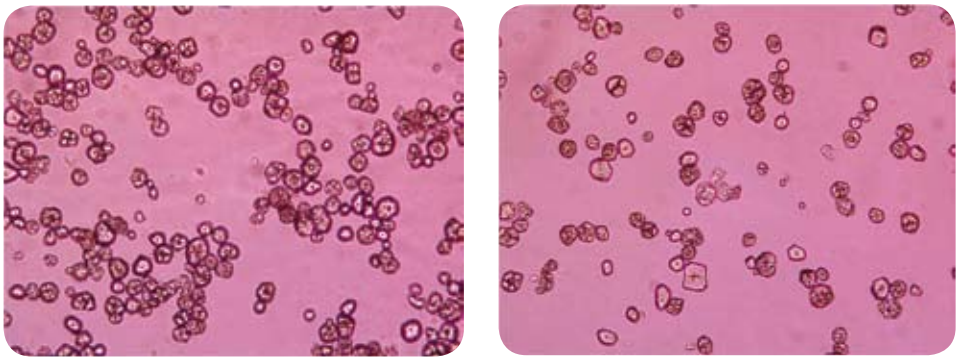
ment, Lallemand, a U.S. business unit of the Canadian yeast and bacteria producer Lallemand Inc., is responsible for process development, manufacturing and commercialization of the new yeast while Xylogenics will receive patent license fees and royalty payments.

The process to name the new yeast began at FEW. More than 100 attendees responded to an invitation to submit ideas for a name. The company is currently going through those suggestions to pick a winner, Pilgrim says.

At the AkzoNobel booth, Danny Haynes, senior technology coordinator, talked about an experimental product that works with enzymes to increase yield. It's an enzyme accelerant in the product-development phase at Eka Chemicals, a business unit of AkzoNobel. The accelerant could increase ethanol yields by 2.2 percent, Haynes tells EPM.

AkzoNobel is a global paints and coatings company that also produces specialty chemicals. With a focus on sustainibility, the company became interested in the second-generation fuel ethanol industry due to its knowledge of the chemistry of cellulosic materials. "[That's] now being refocused into the corn ethanol initiative," Haynes says.

Amount of Corn Starch Solubilized
30 min - 200x

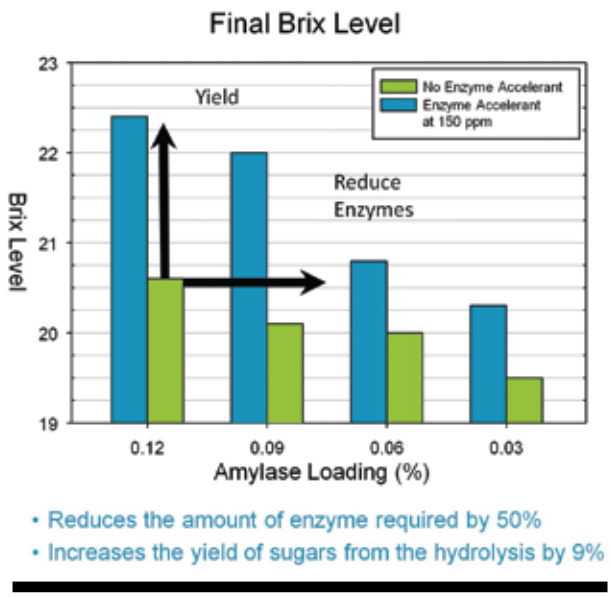


Cornstarch with alpha amalyse

Cornstarch with alpha amalyse and enzyme accelerant

See the Difference Microscopic images of corn starch with alpha-amylase enzyme, on the left, compared to corn starch with alpha-amylase enzyme and an enzyme accelerant show the increased starch conversion.

SOURCE: AKZONOBEL-EKA CHEMICALS; PHOTOS: KENDRA MAXWELL



SOURCE: AKZONOBEL-EKA CHEMICALS

During early testing, the company found that its enzyme accelerant increased yield or reduced conversion time for cellulosic ethanol, and soon discovered that it worked for corn ethanol too. "Development work has been under way for a couple of years and the product can now be provided in commercial quantities," he says. "The product is currently not being offered to the industry, but we intend to build a partnership agreement with a business that can deliver the most customer benefits out of the technology."

A third company, Arisdyne Systems Inc., announced during FEW that the National Corn-to-Ethanol Research Center had agreed to license and support Arisdyne's Controlled Flow Cavitation system. It will be offered as an adjunct test feature of NCERC's pilot-scale test facility on the campus of Southern Illinois University Edwardsville.

Tests of Arisdyne's patented methods and devices were conducted at NCERC in 2009, demonstrating yield increases of 2 to 3 percent with low flow rate of 5 gallons per minute. Since then, more than five full-scale tests have been initiated at plants using corn, milo or a mix of both with flow rates of 600 to 1,800 gallons per minute, the company says. The commercial-scale tests of the cavitation system have shown yield improvements of 3 to 5 percent. "Arisdyne is extremely pleased that NCERC provided opportunities to advance ethanol's position as a clean, alternative energy," says Peter Reimers, president and CEO of Arisdyne. "We are most grateful to the many industry participants and to NCERC for the support they have provided in helping to verify the effectiveness of our technology in the laboratory and at full commercial scale. Further research involving the CFC system is expect-

PHOTO: ARISDYNE SYSTEMS INC.

Wringing out More Ethanol A Controlled Flow Cavitation system from Arisdyne Systems Inc. will be installed at the National Corn-to-Ethanol Research Center, located at University Park on the campus of Southern Illinois University, Edwardsville.

ed to help the ethanol industry secure better margins, reduce energy consumption per gallon of fuel produced, and provide a pathway to hybrid production of ethanol from grain and other related fiber materials."

The technology reduces energy consumption, results in higher nutrition distillers grains and offers other related savings, Arisdyne says. With this and other process enhancement NCERC's pilot plant can now produce more ethanol with the same amount of feedstock. "It's small, it's simple, it's durable," says John Caupert, managing director of NCERC. "That is what this industry needs. We are working on solutions that convert current starch-based ethanol plants into 'Generation 1.5' ethanol plants that convert not only starch but also cellulosic feedstock."

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