



## Three new enzymes set to boost fuel ethanol production

The production of fuel ethanol from cereal crops such as wheat, barley and rye is lagging behind the production from corn used extensively in the USA. Three new enzymes from Novozymes look set to change all that.

In the USA, fuel ethanol production is big business. Close to 3% of the total fuel used annually for vehicles is ethanol, and consumption is growing at around 20% per annum. However, in regions outside the USA that do not grow corn, the manufacture and use of fuel ethanol is still in its infancy.

The successful scenario seen in the USA is the result of strong political support, a large supply of corn, and the fast implementation and optimisation of technology, including enzymes.

But there are a number of reasons for the slower pace of development outside the USA, where the most common cereal crops are wheat, barley and rye. These include bigger challenges in ethanol production technology, more fragmented policy-making structures, and greater competition from other technologies.

However, three new enzymes from Novozymes - Viscozyme® Wheat, Viscozyme Barley and Viscozyme Rye - should help fuel ethanol manufacturers to create a more attractive scenario for any cereal.

### Higher output and lower costs

The Viscozyme products are specifically designed to give maximum viscosity reduction with wheat, barley or rye mash, a logical approach when considering their differences in viscosity-increasing components and content level.

The production of ethanol from cereal crops requires a number of enzymatic processes, including liquefaction with Liquozyme® SC and saccharification with Spirizyme®.

The high viscosity obtained when using cereal crops requires either the addition of



Viscozyme® has a dramatic effect on cereal mash. The reduced viscosity means that production facilities can increase output while reducing costs.

more water, which reduces ethanol output and increases operating costs, or the use of enzymes that can degrade the cereal-specific components that cause the high viscosity; hence the name for the new enzyme portfolio, Viscozyme.

A thinner mash with lower viscosity allows a higher dry substance level and flows more easily through the pipes in the production facility, meaning fewer stoppages, greater output and lower production costs.

#### How to optimise output and costs

Optimising the design and operation of plants to meet the challenges of wheat, barley and rye is a complex task. Novozymes has also therefore developed and launched a support tool called the Viscozyme Calculator. Using this tool in collaboration with experts from Novozymes, it is possible for ethanol plants to boost capacity and lower operating costs.

"The Calculator will help plant managers construct a number of scenarios that include the use of Viscozyme. It will show them how Viscozyme can reduce viscosity in their existing equipment and how they can optimise operation to increase ethanol output further and thus reduce costs," says Ole Bill Jørgensen, Novozymes' launch manager for Viscozyme.

"The launch of Viscozyme in November 2005 gives ethanol producers an opportunity to increase ethanol output with the use of less water and less energy, thereby improving cost-efficiency. We think the use of Viscozyme can reduce energy consumption for fuel ethanol production and boost capacity, hence offering significant improvements in total ethanol production cost and efficiency."

Humphrey Lau, Novozymes' marketing director for Grain Processing, says: "In general, Novozymes is supporting bioethanol production. The new Viscozyme products set a new standard for cereal-based ethanol

production, and we will continue to develop and deliver more efficient technologies in the expectation that the political support to drive biofuel development will continue to get stronger, with benefits for economies, the environment and energy supply."

#### An alternative to oil

Oil supplies are finite, and 2005 saw huge increases in the cost of crude oil around the world, partly because of ever-increasing demand from rapidly developing countries such as China and India, but also as a result of natural disasters such as Hurricane Katrina, which impacted oil production and refining around the USA's Gulf Coast. Ethanol, on the other hand, is manufactured from cereal crops that are grown commercially in most countries.

In the USA today, fuel ethanol is mainly used in a blend of 85-90% petrol to 10-15% ethanol. Car manufacturers are developing the technology to adapt to higher ethanol content.

However desirable, biofuels do not have the potential to completely replace oil-based petrol, but they can help preserve oil supplies and safeguard refinery capacity.

There is also a strong environmental argument for using fuel ethanol as it reduces emissions of greenhouse gases. Petrol/ethanol blends produce about 5% less carbon dioxide than ordinary petrol, and the crops used in the manufacture of ethanol are carbon-neutral: they absorb as much carbon when they grow as they release when ethanol is combusted.

In Europe there are around 10 ethanol plants already in operation, and a long list of projected plants shows that the industry is set for growth and use of available cereals.

#### Local crops used more efficiently

Ole Bill Jørgensen concludes: "The addition of Viscozyme to our portfolio of enzymes for fuel ethanol production means that Novozymes is offering a logical enzyme solution to viscosity challenges. It allows manufacturers to use local crops more effectively and widens the global perspective for fuel ethanol. In addition, it once again shows that Novozymes is in the vanguard of enzyme manufacturers involved in the development of technologies that promote fuel ethanol production while reducing production costs." ●

The Viscozyme® Calculator will help manufacturers to optimise their plant design and operations.

FOR MORE INFORMATION  
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