

CHINESE DISTILLERS FOCUS ON SAVING ENERGY



Traditional high-temperature cooking in Chinese distilleries requiring excessive steaming is being replaced by a milder process in a jet cooker using the new liquefaction enzyme Liquoflow®.



High energy prices have increased costs for Chinese beverage alcohol producers using the traditional high-temperature

cooking process. Enzymatic liquefaction technology for jet cooking at lower temperatures using Novozymes alpha-amylases is offering them a way to save energy and also reduce raw material consumption.

Alcohol made by fermentation is a traditional industrial product in China. The production process and equipment are quite dated as many of the distilling plants are old. Today, many producers are looking for an improved process.

Challenging times

With high grain and energy prices, the distilling industry is facing some tough challenges nowadays. At the same time, the national and local governments are strictly implementing energy conservation policies to reduce energy consumption. Some medium- and small-scale producers with dated production equipment and processes are feeling the pinch, especially in comparison to the large modern distilling plants that have been built in China recently.

Under the mounting pressure of industrial competition and tough regulations, it is imperative that processes are optimized, the use of raw materials is maximized, and energy consumption is minimized.

A few Chinese alcohol producers have the advantage of using cheap local coal resources for the traditional high-temperature cooking process. Nevertheless, even for them, there are more and more disadvantages associated with this process.

High priority: lower energy

Coal and oil are finite resources with fluctuating prices, and their combustion leads to global warming. China is urgently looking to reduce its energy consumption and carbon footprint. Therefore the Chinese authorities responsible for various industries have introduced a series of policies and measures to direct producers toward technology that can save energy.

As Chinese distillers are looking for ways to lower their energy consumption, Novozymes in China has been actively proposing the use of jet cooking at medium temperatures.

One prime area where Novozymes has been active is in the Jiaozuo region of Henan Province where the plants use traditional high-temperature steaming. Large amounts of steam are required to ensure that the starch derived from corn is completely hydrolyzed. The process takes a long time and this leads to losses of starch, which in turn result in less fermentable sugars and lower yields

of alcohol. Not only is the raw material conversion rate lower but the production cost is higher. In addition, the high temperatures and high pressure increase wear and tear on equipment, shortening its productive lifetime. Now these producers are looking for alternatives.

Better alcohol and DDGS

Huaxing Distillery has a total production capacity of 180,000 million tons per year and is the largest beverage alcohol producer in the Jiaozuo region and the second largest producer in Henan Province. This was one of the first companies to do trials with medium-temperature jet cooking. The trials were conducted in September 2008 with the assistance of the Novozymes Beverage Alcohol industry Customer Support and sales teams in China.

"We assisted them to optimize their current process," said Changping Sun, a Customer Solutions Application Scientist with Novozymes

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Changping Sun, Customer Solutions Application Scientist with Novozymes China





Liquoflow® is a new solution from Novozymes that effectively increases alcohol output as well as savings in water and energy.

China. “Liquoflow was successfully applied in their production and they were able to decrease the temperature of jet cooking from over 120 °C to 100–105 °C. After two months of continuous full-scale production trials, the energy and water consumption decreased significantly and the quality of the distillers dried grains with solubles – or DDGS – greatly improved.”

Now Huaxing Distillery has switched to the new process with Liquoflow.

New liquefaction enzyme

Liquoflow is a new liquefaction enzyme from Novozymes that increases ethanol output as well as giving savings in water and energy. Depending on the needs of a distiller, Liquoflow can help them to focus on High Gravity Fermentation (HGF), maximize the use of back stillage, and optimize preliquefaction and liquefaction.

Liquoflow offers superior viscosity reduction, helping distillers to achieve increased dry solids and HGF. It is a robust enzyme that gives optimal liquefaction within a wide pH range (5.2–6.0). There are therefore no problems with liquefaction at the very low pH of 5.2.

The typical liquefaction conditions when using Liquoflow are to jet cook at 100–105 °C followed by dextrinization for 1 hour at 85 °C.

“More cost-effective”

Wen Hongjun, who is Technical Director at

Huaxing Distillery, commented: “We succeeded in implementing a medium-temperature liquefaction and saccharification process in two jet cookers thanks to our cooperation with Novozymes. In comparison to various alpha-amylases that we’ve tested, the performance of Liquoflow from Novozymes is perfect for us. Liquoflow is suited to our current production system and does what other alpha-amylases on the local market can’t achieve. In addition, the dosage of Liquoflow is very low, and it offers good performance at low pH. We’ve calculated the cost and found that it’s more cost-effective than previous liquefaction enzymes. It not only improved our production efficiency but also the quality of our DDGS. This new DDGS is much preferred by our customers.

“The CEO and management team have decided to introduce Novozymes enzymes for the medium-temperature jet cooking liquefaction process. We foresee that we’ll continue to cooperate with Novozymes in the future to support us in our efforts to improve alcohol output and reduce costs.”

This trial confirms the results from other production trials in China where clear differences were observed in the quality of the alcohol and DDGS. The taste of the alcohol improved and the DDGS feed by-product from enzymatic liquefaction had a golden color, an attractive odor, and a higher protein content. The high-temperature steaming cooking process produces DDGS that is

black in color and has a burnt odor and a lower protein content. Therefore the price is much lower and there is less demand from the animal feed market.

Changping Sun added: “The use of alpha-amylases for the jet cooking liquefaction application has been accepted by the Chinese alcohol producers and is now a trend in the industry. The advantages are obvious, in particular the energy savings with the HGF process we’re proposing. We continue to improve the process.”

Huaxing Distillery acted as a catalyst of change for other alcohol producers in China. After its success, other producers in Henan Province contacted Novozymes and requested technical support to try the new enzyme application. Meanwhile Novozymes is cooperating with Huaxing Distillery to optimize its production process and improve the performance of liquefaction with Liquoflow even further. ■

Editor’s note: Sadly Changping Sun recently passed away after the writing of this article.

FOR MORE INFORMATION

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