



BioTimes®

**LESS ACRYLAMIDE,
SAME DELICIOUS FOOD**

NOVOZYMES' NEW ENZYME SOLUTION

Novozymes is the world leader in bioinnovation. Together with customers across a broad array of industries we create tomorrow's industrial biosolutions, improving our customers' business and the use of our planet's resources.

Less acrylamide, same delicious food	4
Dreco – 40 years of adding new enzymes	6
Correcting flour to perfection with the right partnership	8
Beyond bating	10
Nothing worked like NovoCor® AD L for Nova Leathers	11
Khas Industries first with Greasex® Ultra	12

**Published by Novozymes A/S
Customer Communications**

BioTimes® is distributed four times annually
(in March, June, September and December)
in English, Spanish, Portuguese, and Chinese.

Vol. XXII, No. 3, 2007. Total circulation: 9,800

Address

Customer Communications, Novozymes A/S,
Krogshoejvej 36, 2880 Bagsvaerd, Denmark
Tel.: +45 4446 0000
Fax: +45 4446 9999

E-mail: biotimes@novozymes.com

Internet: www.novozymes.com/biotimes

Editor

Susanne Strand

Co-editors

Peter Goddard and Amulya Malladi

Copyright

Reproduction of articles from this magazine
is permitted with acknowledgement of source.
© Novozymes A/S. September 2007

Translation and proofreading

Borella projects

Design and graphic production

Datagraf Auning AS

Next issue

December 2007

Photos

Willi Hansen, Piotr & Co., and Novozymes

Paper

MultiArt Silk, a totally chlorine-free (TCF) paper.

Novozymes A/S accepts no responsibility for any errors
or omissions in *BioTimes* or any consequences of such.
Opinions expressed in this magazine are not necessarily
shared by the publishers.

Letter from the editor

MORE THAN A NEW LOOK – A RETHINK!



To our readers

You may have noticed that this edition of *BioTimes* has a new look and that Novozymes has a completely new appearance. In fact, it is much more than a new appearance. To reflect the fact that Novozymes is now more committed than ever to setting new standards, our company has introduced a new forward-looking brand promise. Together with our customers, we as a company are committed to questioning standard solutions, to rethinking the established ways and to coming up with new ideas. We not only want to provide better business opportunities for our customers, but also to preserve the environment and come up with more sustainable solutions.

All this is captured in our new brand promise: *Rethink Tomorrow*. With *Rethink Tomorrow*, we're signaling that we are looking into the future requirements of our customers by exploring the tremendous potential of bioinnovations. We wish to provide better answers to some of the challenges that society and the business world face – not least when it comes to sustainable development.

Commenting on our new brand promise, one customer said: "I can't think of any other company in this industry that is saying anything like this. It really stands out as being something that will make a difference."

Of course, it is one thing to say that we "rethink tomorrow" and another to live up to this challenge. Read *BioTimes* and you will see some of the latest examples of how Novozymes is actually delivering innovation and setting new standards.

I hope you will enjoy reading the new *BioTimes*.

Best regards,

Susanne Strand

Editor

ssst@novozymes.com



SOLUTIONS FOR A CHALLENGING NEW WORLD

By living up to the brand promise *Rethink Tomorrow*, Novozymes will bring more benefits to customers and partners, and create biological solutions for some of the challenges of the future. Here are some examples.

Cooler washes

For many years, Novozymes has been delivering enzymes that have made it possible for household detergents to wash effec-



tively at lower temperatures. In Europe, for example, typical washing temperatures have come down from 90 °C (194 °F) in the old days to 60 °C (140 °F) and 40 °C (104 °F). And they will be even lower in future.

Today, as the result of a huge research effort, Novozymes offers enzymes that allow washing temperatures to be reduced to just 20 °C (68 °F) – and still give clean clothes. In countries used to washing at higher tem-

peratures, a reduction of the temperature will save energy and limit CO₂ emissions. For example, research in Denmark shows that by reducing washing temperatures by half, consumers will reduce their electricity consumption by around 60%.

The challenge of tomorrow is to lower the temperature even further.

Working at the grass-roots level

Novozymes' goal is to create healthier, disease-resistant, resilient playing surfaces without the use of chemicals. Therefore Novozymes Biologicals has developed a special product called TurfVigor®. By combining organic, nutrition-rich biomass with naturally-occurring microorganisms that colonize root systems, Novozymes found that nutrients can be made more available to the plant. And the better the root system, the better the grass grows with less need for water and fertilizer.

The chance to put this new product to the test came after a World Cup run-up match in 2002 at Korea's largest soccer stadium. The playing field had been laid with turf in the conventional way but the grass had not established proper roots. During the hard-fought match, the turf was ripped up and the surface judged unplayable.

Fortunately for soccer fans, TurfVigor scored top marks with the Koreans, encouraging firm root development of over 20 cm,

making it the best Korean pitch of the competition.

In the future, Novozymes expects to be offering this world-class solution to agricultural as well as sporting customers – with no penalties for the environment.



Continued fight against bacteria

As antibiotic resistance continues to grow throughout the world, it is vital that we find new substances and methods to combat potentially deadly infections.

Novozymes is already working on this problem and has identified many new candidates for antibiotics that can work against resistant bacteria. One particular strain looks especially promising.

It comes from a small black fungus spotted by one of Novozymes' lab technicians in the pine woods near her home in Denmark. In preclinical trials, the new antibiotic shows some unique properties, including a good safety profile, tolerability in large doses, and effective treatment of infections with little or no adverse reactions.

Turning biomass into mileage

Modern society is still hugely dependent on fossil fuels, though the greenhouse gases they produce are believed to lead to global warming. But the good news is that there are alternative fuels based on the use of renewable resources. Novozymes has already developed enzymes that can transform cereals into fuel ethanol. But there are limits as to how much cereal can be grown for biofuels.

Several companies and government-sponsored research teams are intensively researching the production of fuels from biomass instead. Enzymes are a major focus of the current research because the sugars needed could be provided by the enzymatic breakdown of the cellulose in biomass.

Cellulose is an abundant, readily available resource found in all kinds of plant materials, including waste products such as corn stover, wood pulp, wood chips, sugar cane leaves, and rice straw.

Enzymes convert biomass into fermentable sugars, which can then be converted into alcohol using microorganisms such as yeast. However, Novozymes is still some years away from a commercially viable solution as the performance of the enzymes needs to be improved in order to bring costs down even further.

Once the new technology becomes commercial, it could spawn a whole industry to convert biomass into fuel alcohol.

Although the product is still in the preclinical trial phase, it is an exciting prospect for the future when increasing resistance threatens the use of many conventional antibiotics. Novozymes expects to join forces with an external partner when the time comes for clinical studies and commercialization.





LESS ACRYLAMIDE, SAME DELICIOUS FOOD

Novozymes' new enzyme solution, Acrylaway,[®] substantially reduces acrylamide in various food products without changing their flavor or appearance.

Acrylamide, suspected of causing cancer, is formed when starchy foods are baked or fried at high temperatures. Acrylaway is a natural solution to this natural problem – and it works without changing the taste, look, or feel of the final product.

Acrylaway reduces up to 90% of the acrylamide content in food products such as cookies, crackers, crisp bread, and various snacks. One solution for the food industry has so far been to reduce temperatures if possible, but Novozymes went to the root of the problem instead – the amino acid asparagine that leads to the formation of acrylamide in the first place. Novozymes developed a completely new type of commercial

enzyme – an asparaginase – to break down the asparagine. Acrylaway is now being launched after extensive testing.

“Acrylaway has been tested in Novozymes' bakeries, at independent institutes and in the industry on a variety of food products, and all results show that not only is acrylamide substantially reduced, but the end product's flavor, look, and feel are not affected,” says Anett Lund-Nielsen Colstrup, Global Product Launch Manager at Novozymes.

A natural problem

In 2002, Swedish researchers discovered high levels of the potential carcinogen acrylamide in

many commonly consumed starch-based foods, such as cookies, crackers, snacks, French fries, and crisp bread, which are processed or cooked at high temperatures.

Tests have already determined that acrylamide causes cancer in rats and mice, and tests are being conducted around the world to determine the carcinogenic effects of acrylamide on humans.

A natural solution

A very effective way to reduce acrylamide formation is the enzymatic removal of the amino acid asparagine, the precursor of acrylamide. The asparaginase Acrylaway operates by converting asparagine into another amino acid, aspartic acid.



“With this enzyme solution from Novozymes, food manufacturers can now offer end consumers food products with reduced risks and worries regarding acrylamide.”

Andrew Fordyce, Marketing Director Cereal Food Marketing at Novozymes



Beate Kornbrust, Customer Solutions Manager at Novozymes, tests Acrylaway® in the baking labs at Novozymes Switzerland.



Anett Lund-Nielsen Colstrup is a Global Product Launch Manager at Novozymes and is responsible for launching Acrylaway®.

Tests have shown that Acrylaway® reduces acrylamide formation in a broad range of products by almost 50-90%.

Food product	Acrylamide reduction (%)
Biscuits and cookies	50-90%
Crisp bread and toasted bread	50-85%
Crackers	75-85%
Snacks	75-90%

Acrylamide is the product of a Maillard reaction between the amino acid asparagine and a variety of reducing sugars. The sugars react with asparagine when the food is heated and as a result, acrylamide is formed.

Maillard reactions, also known as non-enzymatic browning, typically occur at temperatures above 100 °C (212 °F) and are responsible for important color and flavor development in fried and baked starch products.

“The process that gives the delicious brown crust and fried or baked flavor also creates acrylamide. But with Acrylaway, asparagine is converted to another amino acid, leaving all other ingredients to contribute to the Maillard reactions. You keep the good crust and the taste, and reduce the potentially carcinogenic acrylamide,” says Beate Kornbrust, Customer Solutions Manager at Novozymes.

For the good of the food

Today’s consumers are health conscious and cautious about what they eat. In the future, health and food quality will become even more important, and enzymes have a key role to play here.

“It is a fundamental need for consumers and society that our food is safe and healthy. With this enzyme solution from Novozymes, food manufacturers can now offer end consumers food products with reduced risks and worries regarding acrylamide,” says Andrew Fordyce, Marketing Director Cereal Food Marketing at Novozymes.

Food manufacturers are showing great interest in Acrylaway and are especially excited about its ability to reduce acrylamide without altering the quality of their finished product.

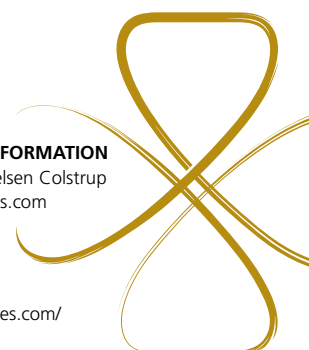
“The food industry cares about acrylamide and we’ve worked with many industry players during

the development of Acrylaway,” says Andrew Fordyce.

“This is an exciting product launch for us. Acrylaway is an excellent product that works very well to make food safer and healthier.” ■

FOR MORE INFORMATION
Anett Lund-Nielsen Colstrup
aln@novozymes.com

READ MORE
www.novozymes.com/acrylaway



DRECO

– 40 YEARS OF ADDING NEW ENZYMES

Dreco sells both private-label products and its own brands. One of its main private-label detergents already contains Mannaway®. The plan is that Dreco's light-duty detergent (shown here) will also contain Mannaway in the future. Marcus Peterrek is in charge of quality assurance at Dreco.



Dreco celebrated its 40th anniversary last year and is one of the first detergent manufacturers to incorporate Mannaway® since it was launched worldwide in January 2007. It was added to a detergent that already contained four enzymes.

Based in Dusseldorf, Dreco is a German detergents company supplying private-label products primarily for the German market. The company was founded in 1966 and has just celebrated its 40th anniversary. Dreco makes a whole range of detergents for both laundry and dishwashing but has found a special niche in light-duty detergents for delicate fabrics such as linen, wool, silk, and blends of cotton and polyester.

One of Dreco's detergents for delicate fabrics now contains no less than five enzymes from Novozymes: Polarzyme®, Stainzyme®, Lipex®, Carezyme®, and now Mannaway®. This detergent is being sold as a private-label product at one of Germany's leading chains of supermarkets. Dreco has been supplying different versions of this particular product brand for more than 20 years.

Tough competition

In Germany, the competition among private-label detergents is tough and there is a challenge to gain additional market share from the established branded products. Standing still in the private-label business is just not an option according to Dreco, who pride themselves on delivering high-quality products at a reasonable price.

"We have to be proactive because it is a very competitive market. Some of our customers want

their own label detergents to perform as well as the big brands. We aim to go to our customers with improvements almost every year," says Marcus Peterrek, Head of Quality Assurance and Quality Management at Dreco, a chemist who is also the acting R&D Manager at the Dreco site in Dusseldorf.

These improvements often result from the introduction of new enzymes. Dreco has always been willing to adopt the new enzymes launched by Novozymes. Mannaway, a mannanase developed especially for detergents, is the latest Novozymes product that Dreco has incorporated into one of its detergents.

"Mannaway is not just a new version of an existing enzyme in this formulation. It is a completely new enzyme type. It removes stains that consumers could not remove effectively before," comments Petra Salzmann, Account Manager at Novozymes for the detergent industry in the German-speaking parts of Europe. "I believe Mannaway will become a standard enzyme for laundry detergents."

Proven improvements

Dreco is a fast-acting company – the case of Mannaway is an example. The company received samples of the product in late 2006 and was

quick to test Mannaway and present the findings to one of its main customers, a big German supermarket. By August 2007, the improved product was on the supermarket shelves.

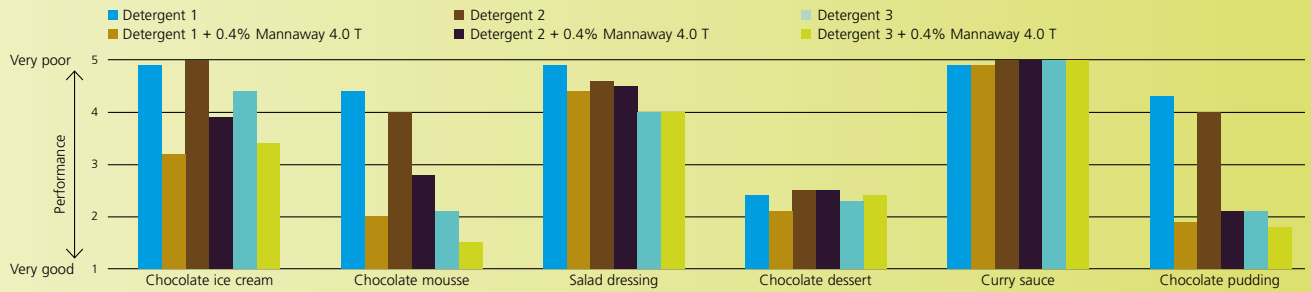
Dreco was able to present convincing proof of the improved performance to its customer. They commissioned tests with the famous Hohenstein Institute in Germany. "Mannaway gave a great improvement in our light-duty detergent when tested on a chocolate ice cream stain," comments Marcus Peterrek.

Chocolate ice cream is an ideal stain for testing Mannaway's effect because ice cream often contains guar gum. Mannanase works on mannan – a general term for galactomannans, often simply referred to as gums. Many everyday foods contain gums because mannan is widely used as a thickener. Personal care products such as shampoos and lotions also contain mannan.

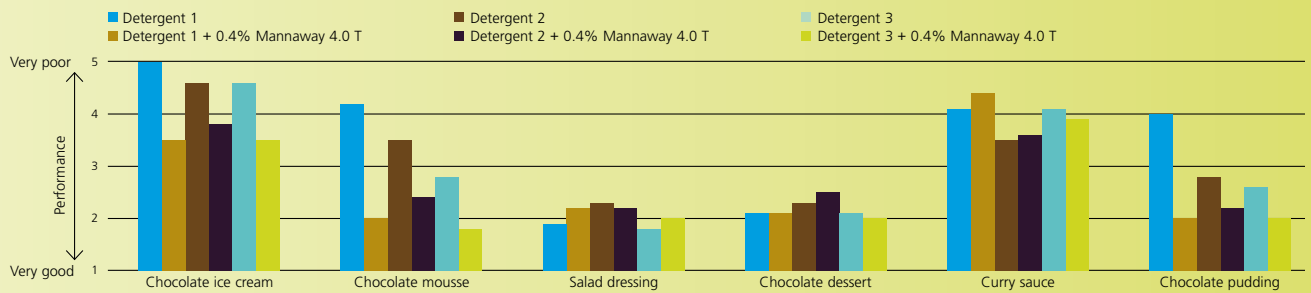
"People are buying more convenience foods with sauces so the mannan-based stains are an increasing problem. You can clearly see the effect of Mannaway in removing these stains," says Marcus Peterrek.

Mannaway has been tested by the Hohenstein Institute in other commercial European detergents using its standard range of mannan-based stains. The results are shown in the graphs. As can be

EFFECT OF MANNAWAY® ON SIX HOHENSTEIN SWATCHES IN EUROPEAN COLOR DETERGENTS



EFFECT OF MANNAWAY® ON SIX HOHENSTEIN SWATCHES IN EUROPEAN BLEACH-CONTAINING DETERGENTS



Three color detergents and three bleach-containing detergents purchased at retailers were tested for the effect of adding Mannaway® on top of the enzyme system used today. The detergents were tested at the well-known Hohenstein Institute using its standard range of mannan-based stains. On a number of these Hohenstein stains, it is clear that Mannaway has a significant effect on stain removal in both color and bleach-containing detergents even in detergents already containing a number of other enzymes (European washing machine, 5 g/L, 40 °C/104 °F).

seen, Mannaway has a significant effect on stain removal even in detergents already containing a number of enzymes. This confirms the specific findings in Hohenstein's test with Dreco's light-duty detergent.

Low pH, low dose

A light-duty detergent does not contain such strong chemicals as a heavy-duty detergent. "The role of enzymes is more important in a light-duty or color detergent because there is no bleach and you have a lower pH," argues Petra Salzmann of Novozymes.

The typical pH for Dreco's light-duty detergents is 9.5, which is lower than for a heavy-duty detergent. The dosage per wash is also lower – 50 g compared with around 70 g. A light-duty detergent should also be able to wash effectively at low temperatures such as 30 °C (86 °F).

The protease Polarzyme and the amylase Stainzyme both work well at low temperatures. Carezyme is a cellulase for fiber care and color care so it is ideal for light-duty and color detergents. Lipex is a lipase giving an effect in the first wash on stains containing fat and grease. Last but not least, the fifth enzyme Mannaway removes troublesome gums.

Dreco is convinced about the Mannaway

concept. In the near future, they plan to include the enzyme in other products in their light-duty detergent range. If customers wish, it can also be incorporated into private-label heavy-duty detergents.

Back in 1963, Novozymes manufactured the first commercial detergent enzyme, called Alcalase®. In the early days, detergents simply contained one enzyme – a protease. The range of detergent enzymes available has expanded over the years. New enzymes enhance wash performance and have allowed Dreco to steadily improve its products from year to year – ever since 1966. ■

Dreco has a factory for powder detergents in Dusseldorf and a factory for liquid detergents in Bitterfeld in the former East Germany. The Trabant car outside the factory in Dusseldorf is a reminder of days gone by in East Germany.



FOR MORE INFORMATION

Petra Salzmann
psal@novozymes.com





Left to right: Nele Eerdeken (lab technologist), Ward Uyttersprot (lab technologist), and Peter De Saert are part of the Univar team, working extensively with baking trials, enzymes, and Novozymes.

“Last year for the first time we introduced the use of separate and pure enzyme types to flour mills, and it is a great success.”

Peter De Saert, Technical & Development Manager at Univar Benelux

CORRECTING FLOUR TO PERFECTION WITH THE RIGHT PARTNERSHIP

Novozymes and Univar are successfully working together to deliver the optimized blend of ingredients – including enzymes – to flour mills in Central Europe, both to correct their flour and to satisfy the needs of bakeries.

Bread improvers, and not individual flour mills, are and will be the main market for Novozymes' enzyme solutions. But in the new partnership with Univar, Novozymes now penetrates the bakery sector further.

The enzyme expertise of Novozymes and the experience Univar has with the flour mill industry open up the potential for enzymes in yet another important market segment.

“Last year for the first time we introduced the use of separate and pure enzyme types to flour mills, and it is a great success,” says Peter De Saert, Technical & Development Manager at Univar Benelux.

Univar supplies flour mills with various ingredients that are complementary to enzymes, and distributes Novozymes' enzymes to the flour mill industry in parts of Europe.

The new partnership gives Novozymes the opportunity to learn more about the flour mill industry and stay closely informed about wheat quality trends.

“It was natural for us to partner with Univar as they have the flour industry expertise and contacts with the agricultural sector that we do not.

Novozymes in turn offers its broad range of enzyme solutions and expertise with baking trials,” says Leo Nieuwenhuis, Account Manager at Novozymes and member of the Univar Account Team.

Qualitative advice

Bakeries expect flour mills to deliver wheat flour that suits their baking needs. The flour, in general, must not have any off-qualities that hinder the baking process.

Without correction, wheat quality fluctuates dramatically from year to year; factors include the climate, the use of new wheat varieties, and more stringent legislations regarding the use of fertilizers. With every harvest, flour mills analyze the deficiencies in the flour and improve it so that bakeries get the flour with the exact properties they need.

“Flour from last year's harvest is different from this year, and we continuously adapt the flour to offer the bakeries the quality they need,” says Peter De Saert.

To do this, flour mills receive practical information about the flour related to specific baking applications from well-equipped and specialized organizations like Univar.

Flour mills send samples of their flour substrate for each new season to Univar for analysis. The substrate is not just one variety of wheat but a combination of many different wheat species based on the qualifications required by bakeries. The substrate is not corrected and is pure with all the deficiencies of the new crop.

“We analyze the substrate and offer the option of a customized study for each flour mill so that they can see how they are positioned in the market and what they need to do to correct their wheat flour,” adds Peter De Saert.

Flexible flour correction

Univar provides flour mills with a FARICO (Farine Correcteurs range) report of their substrate, which is an extensive report based on lab analyses and baking trials.

First Univar runs a lab analysis and baking trials on the uncorrected wheat flour to reveal deficiencies and define the most appropriate dosage of ascorbic acid and diastatic active malt or buffering systems. Then this information and samples of the flour are sent to Novozymes Switzerland AG, where further baking trials are performed.

ENZYMES USED BY UNIVAR FOR FLOUR CORRECTION		
Product family	Enzyme type	Benefits
Fungamyl®	Fungal alpha-amylase	<ul style="list-style-type: none"> Increases loaf volume
Pentopan®	Xylanase	<ul style="list-style-type: none"> Improves loaf volume Extends dough tolerance
Celluclast®	Cellulase, hemicellulase	<ul style="list-style-type: none"> Improves loaf volume Extends dough tolerance (whole-grain bread applications) Enables reliable dough handling
AMG®	Amyloglucosidase	<ul style="list-style-type: none"> Shortens fermentation time Improves crust coloration
Gluzyme®	Glucose oxidase	<ul style="list-style-type: none"> Strengthens gluten network Acts as (partial) gluten replacement
Lipopan®	Phospholipase	<ul style="list-style-type: none"> Stabilizes dough Refines bread crumb Increases loaf volume



In the milling and baking industries a common standard procedure to characterize the baking quality of wheat flour is the Falling Number (FN) test. Flours with very high falling numbers require the supplementation of malt flour or the addition of fungal alpha-amylase. When malt flour is added, the effect can easily be controlled by the FN test. However, the FN value of flour remains unchanged when fungal alpha-amylase is added in amounts recommended for the baking industry. Fungal alpha-amylases are sensitive to the heat in the FN test so the improved flour characteristics can only be measured in baking trials.

“During the baking trials we add enzymes and fine-tune the dosage of the enzymes to reach the targets defined by the customer,” says Leo Nieuwenhuis.

The finishing touches are added at Univar to adjust the water-binding capacity with farico proteo. This is a unique functional protein/fiber complex, which will be available on the European market for the first time in the coming season. It is part of an economical package with Novozymes enzymes that can replace the addition of more expensive vital wheat gluten. Last but not least, Univar does practical tests to check the compatibility of its final correction formula with commonly used bread improvers.

Univar not only offers standard enzyme cocktails to flour mills, but also provides customized solutions, especially to the larger mills. These solutions, using individual, pure Novozymes enzymes and tailor-made concentrates, give flour mills the flexibility they need to correct their flour.

“This is just one of the many examples of the strength of the Novozymes–Univar partnership, and I am certain that this and the other initiatives the Novozymes–Univar team are

constantly working on will lead to even greater success for the joint team in the future,” says Damian Gill, Distribution Manager CWE at Novozymes.

Flour mills also receive information regarding each enzyme and its activity. They can then adjust individual enzyme levels to correct their flour as efficiently as possible. In addition, pure enzymes are more cost-effective than enzyme cocktails, making them even more attractive to flour mills.

“We believe selling pure enzymes individually is a breakthrough in this field. We started to sell enzymes like this last year and our customers are very happy,” says Peter De Saert.

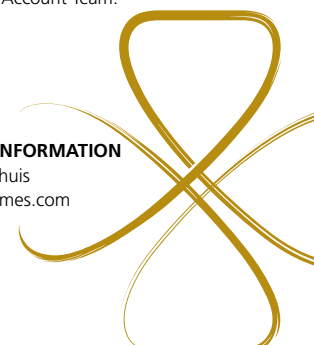
The flour mill industry has moved from being very traditional to dynamic and innovative, embracing new technologies like enzymes and new ideas more openly.

“Today we have possibilities that didn’t exist 5 to 10 years ago,” says Peter De Saert. “And our partnership with Novozymes is definitely a step in the right direction to both move the industry forward and prepare it for tomorrow.” ■



Leo Nieuwenhuis is an Account Manager at Novozymes and a member of the Univar Account Team.

FOR MORE INFORMATION
Leo Nieuwenhuis
leon@novozymes.com



BEYOND BATING

Most tanners only think of enzymes for bating – the use of proteases to soften leather. However, in the future, a new type of enzyme will be used increasingly in tanneries – lipases for the removal of fat.

Fat is a challenging component of leather for tanneries. When processing small skins from goats and sheep, tanneries aim for a residual fat content of no more than 5%, but they are not always able to achieve this. The problem is that the fat is embedded between the grain surface and the corium (the deep inner layer of the skin). This makes it very hard to remove. That's why dry cleaning with strong solvents is a widely used technique. However, dry cleaning is expensive and the results are not optimal due to possible damage to the skins. Explosive compounds such as kerosene and white spirits are sometimes used to dissolve the fat with all the inherent hazards. Tanneries have been known to burn down when the fumes accidentally ignited.

Surfactants are a milder and safer chemical alternative but not as effective. Yet another method is to press out the fat. However, the latest method developed by Novozymes is lipases – fat-degrading enzymes that can simply be added to the drums.

Leader in lipases

Novozymes is a leader in lipases. The original Greasex® for degreasing in tanneries has been used since 1991 but it has just been improved with the development of a completely new enzyme molecule called Greasex Ultra.

There is great potential for lipases. Unlike proteases, there is no worry of hide damage if something goes wrong. Lipases cannot degrade protein

so there are many benefits but no associated risks. The benefits include increased uniformity and chemical uptake. Lipases improve filling and dye penetration to produce a much more uniform appearance. There are special benefits from using lipases to replace surfactants in the making of waterproof leather and automotive leather.

Lipases can be used to disperse natural fat in all stages of leather production: soaking, liming/bating, pickling, wetblue, or natural crust/dyed crust. On the following pages, case studies from two of the leading tanneries in Pakistan show how lipases are used to treat small skins.

Hair removal

Lipases are growing in popularity, not just for small skins but for hides, too.

Residual hair on hides is a major problem today in the leather industry due to lack of penetration of unhairing chemicals. Natural fat is the biggest barrier to the dispersion of these chemicals. Reducing fat leads to easier hair removal.

What makes Novozymes' new lipase Greasex Ultra different from the original Greasex is that it is more effective at removing the sebaceous grease, namely the grease at the root of the hair (see photos). It is also very effective at hydrolyzing the subcutaneous fat. In general, Greasex Ultra gives more consistent hydrolysis when used at equivalent concentrations, possibly thanks to better diffusion of the enzymes into the fat cells. ■

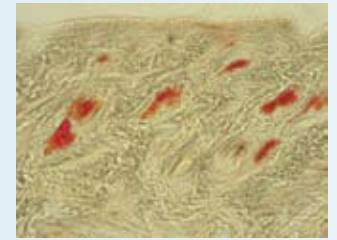


Fig. 1. Control sample.

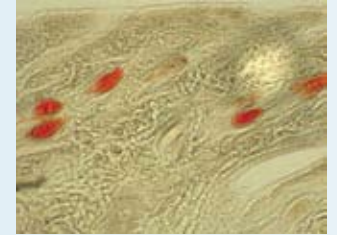


Fig. 2. Treated with 0.1% surfactants during bating.

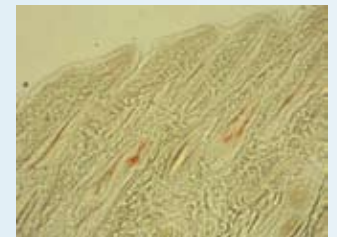


Fig. 3. Treated with 0.1% Greasex® Ultra during bating.

SPOT THE FAT!

These micrographs show a cross-section of bovine hide magnified 10 times. The fat has been dyed red after bating to highlight it. Figure 1 shows the control sample of bovine hide treated without enzymes or surfactants, and Figure 2 shows the sample treated with surfactants. It is apparent how much more residual fat there is in these two samples compared to the sample treated with Greasex® Ultra (Figure 3) where the sebaceous glands on the surface are almost empty. The research was done by the British Leather Confederation.

“In the near future, tanners will come to use lipases on a daily basis. In 30 years, tanning will be a combination of biotechnology and environmentally friendly chemistry.”

Lars Rasmussen, Global Customer Solutions Manager for the leather industry at Novozymes

FOR MORE INFORMATION

Lars Rasmussen
lr@novozymes.com

Irfan Iqbal (left), CEO of Nova Leathers, and Arshad Gazi, Customer Solutions Manager for Novozymes in Pakistan, examine the finished leather. Fatty spews are no longer a problem.



Nova Leathers does not just process the leather but also cuts and stitches it into garments, gloves, and bags.



NOTHING WORKED LIKE NOVOCOR® AD L FOR NOVA LEATHERS

After receiving complaints from international buyers about fatty spews on their garments, Nova Leathers tried various methods to avoid these unpleasant spots. The lipase NovoCor AD L was the only practical alternative.

Nova Leathers in Karachi is the largest tannery in Pakistan. Each month, they process 2.5–3 million sq.ft (230,000–280,000 sq.m) of leather and produce 75,000–80,000 leather garments. This is a high-volume producer with a high throughput and some high-profile customers. The garments are sold through major retailers in Europe and around the world such as the Inditex group, one of the world's largest fashion distributors.

Spews mean spots

The company makes leather almost entirely from imported sheepskins and goatskins. About 70% of the skins are wetblues whereas the rest are natural crust leather. Until 2006, Nova Leathers purchased most of its skins locally or from Africa. The fat content of these skins was quite low (around 10%) due to environmental conditions. However, following a dramatic reduction in the price of skins from Europe, Russia and the Middle East in 2006, Nova Leathers began buying more skins from these areas. The fat content was much higher, causing problems of fatty spews in the final garments. A spew results from a residual fat deposit inside the leather. Depending on the temperature conditions, the fat can migrate to the surface after a few months. Fatty spews are white greasy spots

on the surface and they are unpleasant to smell and touch.

Expensive to dry clean

A well known way of reducing the fat content is dry cleaning. Nova Leathers had three dry cleaning machines at the tannery, each with a capacity of treating 500 skins per day. "With our throughput, we would have needed to buy about 100 machines to dry clean all the skins. It would work out to be extremely expensive. Tumbling in these machines also reduces the area by 3–4% and can damage the leather by making it loose. More dye is needed as well. Dry cleaning was just out of the question for us," comments Irfan Iqbal, the CEO of Nova Leathers (pvt) Ltd.

The tannery also tried using two different types of surfactants but the results were not satisfactory.

Acid lipase to the rescue

In 2006, Nova Leathers contacted Novozymes in Pakistan and asked them if they had any solution for fatty spews. The answer was lipases. Under the guidance of Novozymes, they began to test lipases in both small trials and bulk production batches with sheepskins. They tried the unique acid lipase NovoCor AD L designed for degreasing in acidic conditions of pH 3.5–4.5 typical for

pickled skin or for wetblues. In the case of crust leather, Greasex® 50 L was recommended because it is more suitable for pH 6–8 when processing this type of leather.

They were able to remove 90% of the fat deposits, thereby reducing the residual fat content to below 5%. At this level, fatty spews do not usually appear on finished garments.

Nova Leathers has now become a regular user of lipases from Novozymes.

"There are a lot of side-effects when dry cleaning. But with enzymes, the leather does not become looser," says Irfan Iqbal. "Enzymes do not have any adverse effects."

Arshad Gazi, the local Customer Solutions Manager for Novozymes in Pakistan, agrees: "The overall look and quality are much better. You maintain a tight, normal grain." ■

FOR MORE INFORMATION

Umar Riaz
uria@novozymes.com



KHAS INDUSTRIES FIRST WITH GREASEX® ULTRA

GreaseX Ultra consistently reduces residual fat levels to less than 5% in sheepskins and goatskins at Khas Industries, the first tannery to try this new lipase.

The Khas Group is one of Pakistan's largest tannery groups with four tanneries producing 2.5 million sq.ft (230,000 sq.m) of leather per month.

As part of a close co-operation with Novozymes, Khas Industries in Karachi became the first tannery in the world to try GreaseX Ultra in February 2007. The enzyme was tested here before the worldwide launch a few months later.

Khas Industries produces garment leather for clothes and gloves, mainly from small skins in the form of dry crust leather. Soon after the trial, the tannery began to use GreaseX Ultra on a regular basis to remove excessive fat and for soaking. Fat has become a growing problem for Khas as imports have grown. In contrast to the lean sheepskins and goatskins from Pakistan, the imported skins often contain 25–35% fat.

GreaseX Ultra is used in the soaking process for dry salted goatskins from Africa that are difficult to wet back. An excellent wetting effect is achieved by the combination of the protease NovoCor® S and GreaseX Ultra.

The new lipase is also used together with surfactants for the effective degreasing of depickled sheepskins. Before trying GreaseX Ultra, surfactants were used on their own for degreasing but the results were not satisfactory. After treatment with GreaseX Ultra, the content of residual fats is consistently below 5% with the fat evenly dispersed.

"A trendsetter"

Degreasing is just one example of the use of

enzymes at the tannery. Khas Industries uses no less than five different enzymes.

"Khas Industries uses more or less our whole product portfolio," comments Khalid Mehmud of Hostachem, Novozymes' distributor in Pakistan.

"The CEO there, Mr Massood, is a trendsetter. He has a different mindset based on careful control of the enzymatic processes. There is a lot to be gained by substituting harsh chemicals with environmentally friendly enzymes. You are doing yourself a favor and you are doing the world a favor," says Arshad Gazi, Customer Solutions Manager at Novozymes for the leather industry in Pakistan.

Umar Riaz, who runs the Novozymes office in Pakistan, adds: "The thinking at Khas is quite different from many other tanneries in Pakistan, who are conservative and believe that enzymes can damage leather. In contrast, Khas sees enzymes very positively and is very innovative."

With two of the largest tanneries in Pakistan – both the Khas Group and Nova Leathers – now using lipases, Umar Riaz believes that many of the other 2,000 tanneries in Pakistan may soon follow their lead. ■

NOVOZYMES A/S

Krogshøjvej 36
2880 Bagsvaerd
Denmark
Tel. +45 4446 0000
Fax +45 4446 9999
www.novozymes.com/biotimes

FOR MORE INFORMATION

Umar Riaz
uria@novozymes.com

