

Efficient wort separation and beer filtration

To ensure an efficient brew house process and longer beer filtration cycle, viscosity-increasing components and water-binding cell walls must be minimized. The enzymes in malt are not heat-stable and do not possess the capabilities to ensure consistent process conditions.

With Novozymes Ultraflo[®], the viscosity of wort and beer can be further reduced. The results increase brew house efficiency and extract yields, achieve a faster filtration and minimize process fluctuations.

Benefits

- Consistent and high speed of wort filtration
- Consistently high utilization of beer filtration equipment
- Consistently high brew house capacity
- Possibility to eliminate production variations due to varying quality of raw materials
- High flexibility in choice of mashing temperature profile
- Possibility of using High Gravity Brewing and Very High Gravity Brewing
- Secure minimal investment in brew house and beer filtration capacity
- Higher extract yield

Products

Ultraflo[®] Max is a high-performing blend of β -glucanase and a GH-10 family arabinoxylanase that makes it possible to degrade both major cell wall components to ensure minimum viscosity and get the best wort separation and beer filtration.

Ultraflo[®] Core is a highly effective β -glucanase ensuring good wort separation and beer filtration when using adjunct or under-modified malt.

Ultraflo[®] XL is a classic multi-active β -glucanase and xylanase preparation for improved wort separation and beer filtration.

Performance

Filtration enzymes are often added to all brews to level out fluctuations in brewing raw materials, secure consistently high brew house performance, and reach consistently high beer filtration rates. All Novozymes' filtration enzymes break down the unmodified cell walls from barley malt and unmalted barley. The more intact the cell wall materials, the higher the dosage of enzymes required to attain acceptable brew house performance and beer filtration. The most advanced filtration enzymes, such as Ultraflo® Max, provide significantly better performance than even the best well-modified malt, especially for beer filtration.

Only Ultraflo® Max contains the GH-10 family xylanase, which very effectively breaks down arabinoxylans to non-viscous polysaccharides, resulting in a reduction in viscosity that cannot be matched by standard filtration enzymes. This can be seen in figure 1 below.

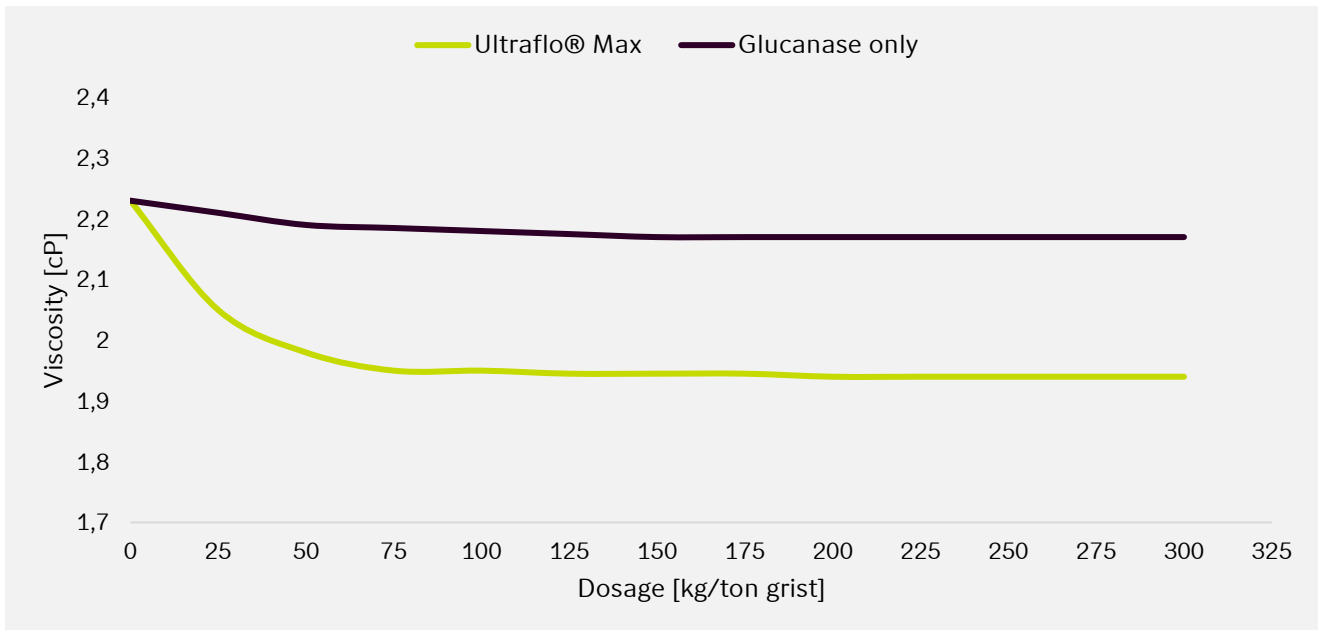


Fig. 1. Lowest viscosity level delivered by Ultraflo® Max across all dosage levels

The use of Ultraflo® Max as a filtration enzyme makes it possible to combine High Gravity Brewing and Very High Gravity Brewing with efficient mash filtration, as demonstrated in figure 2.

High gravity vs. viscosity (0.08 kg enzyme/ton malt)

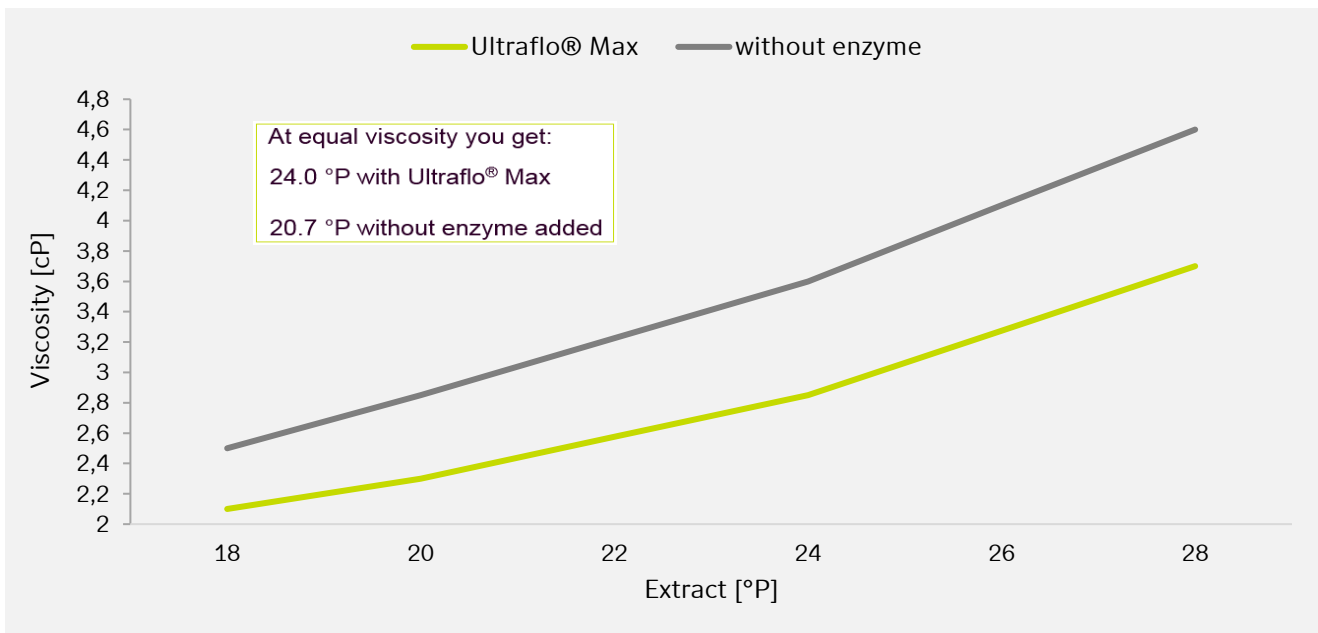


Fig. 2. Wort viscosity as a function of gravity when no enzymes and Ultraflo® Max is added

At lower gravity, the difference in mash separation performance between the two enzymes is less pronounced, but for beer filtration, Ultraflo® Max is always superior. This can be seen in figure 3.

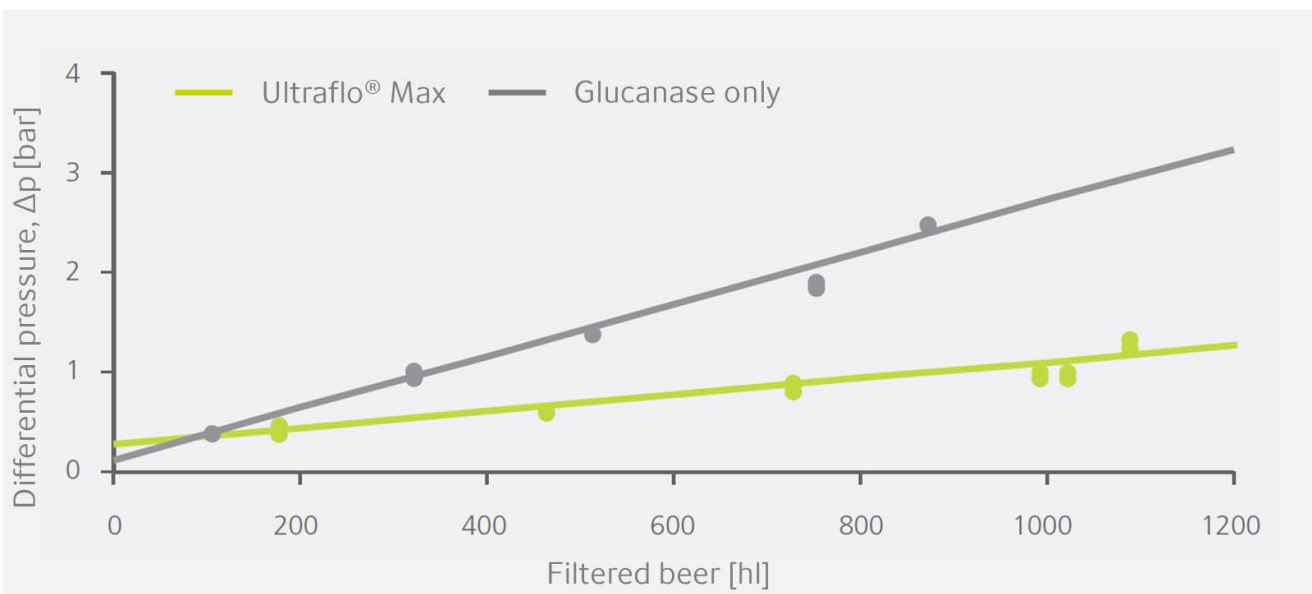


Fig. 3. Filtered beer volume as a function of differential pressure, showing significantly improved beer filtration when using Ultraflo® Max compared with standard filtration enzymes containing β -glucanase + GH-10 family xylanase

The low wort and beer viscosity results in a significantly slower differential pressure increase across the filter over time, producing more filtered beer per filter run and minimizing beer loss. Compared with no enzyme use, beer filtration cycles can be reduced by up to 50%. Compared with filtration enzymes including the family GH-10 xylanase, beer filtration is improved by up to 25–30%. Ultraflo® effectively breaks down cell walls, which allows for higher extract yields in the order of 0.5 to 2.0%, depending on the quality of raw materials.

Standard filtration enzyme vs. Ultraflo® Max

Ultraflo® Max was evaluated against a standard β -glucanase in a trial series of 30 brews. The trials were carried out in a brewery using 12 MT moderately modified malt per brew. Dosages were 1.8 kg of Ultraflo® Max versus 2.5 kg of standard β -glucanase per brew. The average trial data is summarized in the table below.

Significant improvements in brew house performance and beer filtration were observed when using Ultraflo®. This is shown in table 1. Total beer volume per filtration cycle went from 3,800 hl to 4,900 hl, resulting in kieselguhr savings of 15%.

Parameter	Average improvement (30 brews)
Extract yield	0.5%
Brew house capacity	15 minutes per brew
Beer filtration cycles	30% more throughput

Table 1. Brew house performance and beer filtration improvements from replacing traditional filtration enzymes with Ultraflo® Max

Usage and dosage

Ultraflo® products are added to the mash tun during mash-in, starting when around one-third of the grist has been loaded into the mash tun.

Ultraflo® products

0.100–0.25 kg/ton of grist, but depends deeply on malt quality, adjunct ration and type of raw material

More dosage information can be found in the “Brewing Handbook” and “Brewing Calculator,” both of which are available at Novozymes Market. The “Brewing Calculator” supports you in calculating your specific dosage, considering your recipe and grist ratio.

Optimum pH and temperature

The optimal working conditions for the Ultraflo® series is 45–70/75°C and a pH of 4.0–6.5.

The figures below show the influence of temperature and pH on Ultraflo® Max and Ultraflo® XL performance under brewing conditions.

Figures 4 and 5 show the influence of temperature and pH on Ultraflo® performance

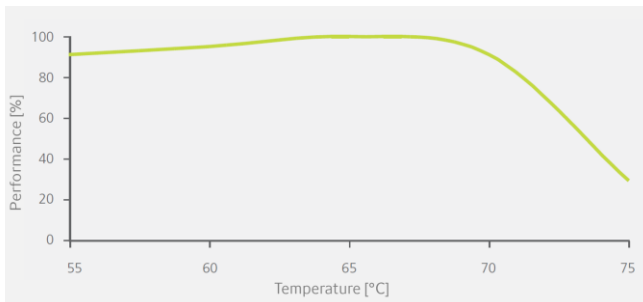


Fig. 4. Temperature dependency of Ultraflo®

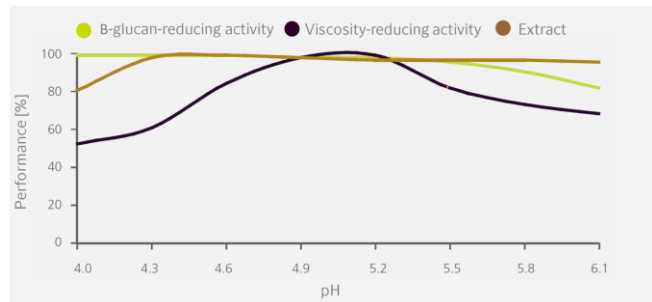


Fig. 5. pH dependency of Ultraflo®

Product data

Enzyme data for wort separation and beer filtration products

Ultraflo® Max

Declared enzyme	β -glucanase (endo-1,3(4)-) and Xylanase (endo-1,4-)
Catalyzes the following reaction:	Endo- β -glucanase that hydrolyzes (1,3)- or (1,4)-linkages in β -d-glucans Xylanase that hydrolyzes (1,4)-beta-d-xylosidic linkages in xylans
Declared activity	700 EGU/g 250 FXU-S/g
E.C/ I.U.B. no.:	3.2.1.6 and 3.2.1.8
Physical form	Liquid
Production method	The enzyme product is manufactured via fermentation of microorganisms not present in the final product. The production organisms are improved by means of modern biotechnology
Density	1.18 g/ml

Ultraflo® Core

Declared enzyme	β -glucanase (endo-1,3(4)-)
Catalyzes the following reaction:	Endo- β -glucanase that hydrolyzes (1,3)- or (1,4)-linkages in β -d-glucans
Declared activity	700 EGU/g
E.C/ I.U.B. no.:	3.2.1.6
Physical form	Liquid
Production method	The enzyme product is manufactured via fermentation of a microorganism not present in the final product. The production organism is not modified using modern biotechnology
Density	1.22 g/ml

Ultraflo® XL

Declared enzyme	β -glucanase (endo-1,3(4)-)
Catalyzes the following reaction:	Endo- β -glucanase that hydrolyzes (1,3)- or (1,4)-linkages in β -d-glucans
Declared activity	45 BGU/g
E.C/ I.U.B. no.:	3.2.1.6
Physical form	Liquid
Production method	The enzyme product is manufactured via fermentation of microorganisms not present in the final product. The production organisms are not modified using modern biotechnology
Density	1.21 g/ml

More information about these products is available at [Novozymes Market](#).

Stability

Please see the Product Data Sheet at Novozymes Market.

Safety, handling and storage

Safety, handling and storage guidelines are provided with all products.

Get ahead

Staying ahead of the dynamic food and beverage market requires the best technology and expertise to become even more flexible, efficient and profitable. With our solutions and expertise, Novozymes can support you on that journey. Let's transform the quality and sustainability of your business together.

About Novozymes

Novozymes is the world leader in biological solutions. Together with customers, partners and the global community, we improve industrial performance while preserving the planet's resources and helping build better lives. As the world's largest provider of enzyme and microbial technologies, our bioinnovation enables higher agricultural yields, low-temperature washing, energy-efficient production, renewable fuel and many other benefits that we rely on today and in the future. We call it Rethink Tomorrow.

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