
SAVE
THE
STARCH!

In times of rising costs for resources, gas and energy, the savings of raw materials and reducing energy and electricity consumption in additive processing within the paper and board industry is more important than ever. New technologies can support producers in this matter.

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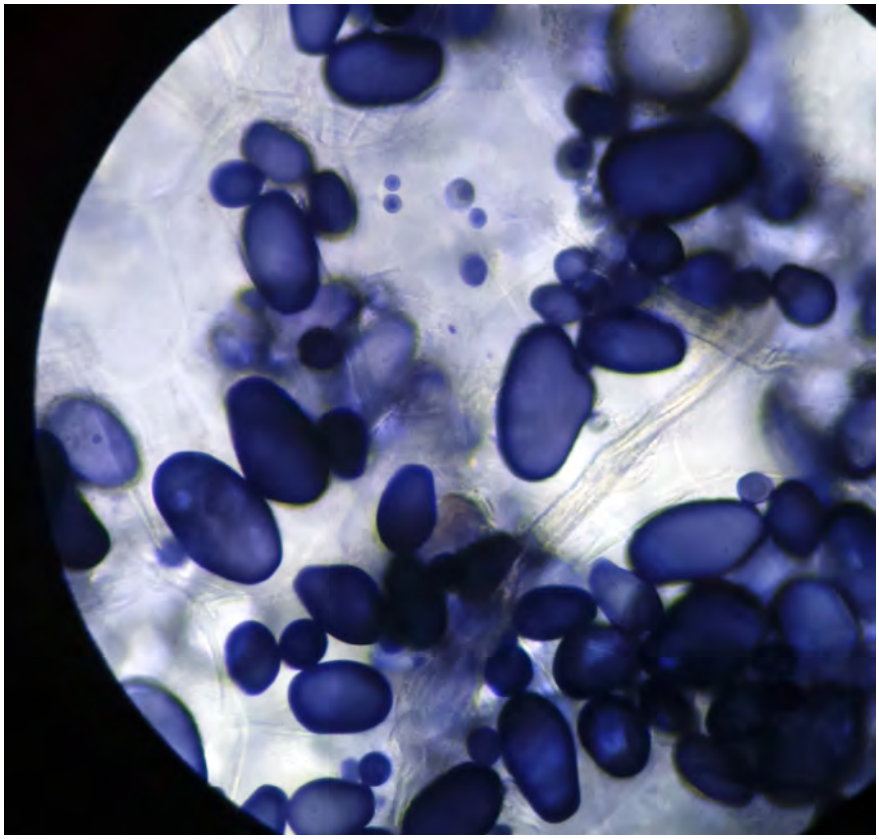
The paper industry is a large industrial consumer of starch. Significant price increases for this important raw material are therefore affecting paper and board producers worldwide. Prices on the market have multiplied during a short period. In times like these, savings are no longer just a "nice-to-have", but have become an important cost factor.

The use of starch as an additive in the paper industry is very versatile. For example, starch is used to treat the paper surface, the so-called sizing or impregnation. Thanks to improved surface properties, starch also helps to improve writing property and printability. Furthermore, the strength and rigidity of the sheet is improved by applying surface size. In the manufacturing process of corrugated cardboard, starch is used as an adhesive to bind and glue the layers of paper. However, when native (unmodified) starch is used, it must be prepared in advance in order to be able to use it as an adhesive. For the processing of starch, the colloquial term "cooking of starch" is also used.

If you mix starch powder with (cold) water, you get a cloudy liquid that looks like diluted milk. In contrast to milk, which can be mixed/diluted with water indefinitely, a water/starch mixture (starch slurry) is a two-component mixture, since the starch powder does not dissolve in water. Thus, the starch granules are undissolved and finely distributed as a solid in the water. Such a two-component mixture is also referred to as a suspension. If a sample is left to stand for a longer period of time, the sedimentation of the starch granules can be observed.

If the starch suspension is heated, the starch granules will swell. The solid particles "grow" continuously in volume until the cell walls of the starch granules burst open. Only then, is the starch able to dissolve in the water and can be used as a paste for the paper web. The swelling and subsequent "going into solution" of the starch granules is also referred to as "gelatinization" in technical terminology. As an undesirable side effect, however, there is also an increase in viscosity during swelling.



The project focuses on saving starch. This is achieved by increasing the strength-increasing properties of the starch by optimizing the molar mass distribution during the cooking step.

Figure 1. Starch cells under a microscope

CLASSIC ENZYMATIC STARCH PREPARATION

The tried and tested GAW systems are a good example of how to achieve impressive savings in resources when processing starch. For decades, GAW has been focusing on new technological developments on reducing the use of water, energy and raw materials in the customer's production process. In the GAW enzymatic starch processing - when native starch is used - two operating methods are combined in a very special way. At the end of the modification process, a starch glue is produced with the viscosity and optimised molar mass distribution required for the respective application – regardless of the starch type, starch temperature and solids content. Since the dwell time in the system can be adjusted as required - and is also kept constant during a stop or start of the system - expensive raw material losses can be significantly reduced. In addition, this ensures an almost waste-water-free operation.

Furthermore, GAW also makes this process available in a modular block design in the form of a rental system. Customers are happy to use this to bypass production in the event of failures or bottlenecks, but also for planned parallel run raw material tests.

In addition, a very compact and modular system for heat recovery was developed - the patented Heat Recovery System. This ensures that the flash steam produced after the starch is cooked (including the heat energy it contains), does not escape unused into the atmosphere. More than 50% of the energy required by the jet cooker can be saved with this heat recovery system.

PREPARATION OF STARCH VIA CAVITATION / THE NEW STARCH SAVER FROM GAW

But not only proven technology is used: A completely new process for starch processing using cavitation is recently in the test phase together with the customer W. Hamburger GmbH in Pitten.

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In the new GAW process for starch preparation, cavitation impacts are generated in a targeted manner by using several Venturi nozzles. The introduction of these pressure shocks reduces the cooking time, since the starch granules are exposed to a shearing force during the "swelling phase". This shearing force breaks down the cell wall while the size is still swelling and the starch can dissolve earlier. Furthermore, due to the increase in speed and the turbulence that occurs, the mixing of the enzymes is improved. Due to the shorter cooking time and the improved mixing, there is a statistical reduction in the short-chain glucose content of the cooked starch and thus a more favourable molar mass

distribution of the cooked starch. Due to the lower glucose content, a starch saving can be expected.

The plant has already been put into operation and the exact results are eagerly awaited. Potential savings of more than 5% are expected. An improvement in the molar mass distribution has already been proven in laboratory tests. “We are very pleased about the months of close and excellent cooperation with the customer W. Hamburger GmbH in Pitten and the PTS Papiertechnische Stiftung in Heidenau, as it not only reflects the trust in our technologies, but also underlines the commitment to research and development of all participating companies.” reports Wolfgang Schmölzer, Head of Technology Management at GAW technologies. “It is only thanks to the great support and commitment of the technologists and operators at W. Hamburger GmbH Pitten that the planned series of tests for optimising the process in the installed GAW starch processing can be carried out,” adds Albrecht Matl, project engineer at GAW.

Figure 2. Mobile rental unit GAW starch preparation

Figure 3. Diagram of a classic enzymatic starch preparation from GAW

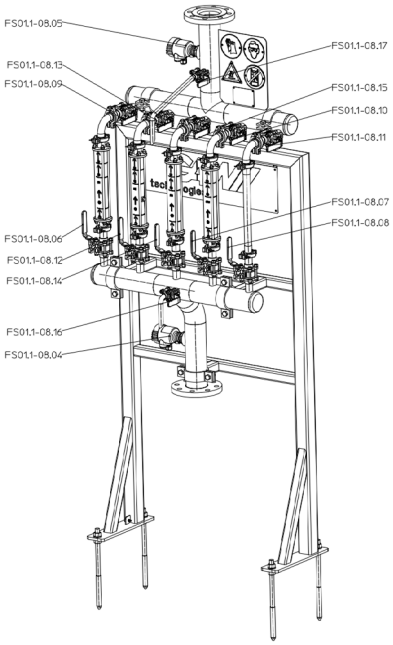

Figure 6. Diagram of the GAW cavitation unit

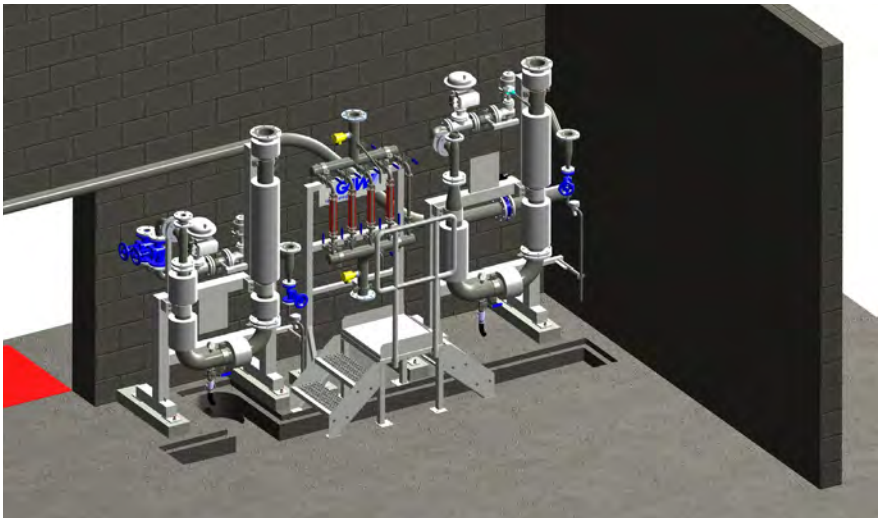

Figure 4. 3D diagram of the GAW cavitation unit for starch preparation