

New brewhouse and cellar technology for divinely inspired beer

FERMENTATION CELLAR EXTENSION | Exceptional beers require extraordinary design. Retrofitting new outdoor tanks and process technology at the Jopen Brewery near Amsterdam has created new opportunities for further developments in beer production while simultaneously increasing process reliability.

CRAFTING DIVINE BEER – this is precisely what the brewers at Jopen have been pursuing since 1994. Anyone who has ever been to Haarlem, a stone’s throw away from Amsterdam, understands that this is more than just mere marketing. The gleaming 20 hl copper brewhouse was manufactured by BrauKon GmbH and is equipped with components developed by Banke process solutions. The brewhouse has been located in the heart of the former Jacob’s cathedral on Haarlem’s market square since 2010. The colourful stained-glass windows in the church create a unique ambience in the brewpub they surround (fig. 1). In order to accommodate steadily increasing demand, a second production site in the district of Waarderpolder was commissioned in

2015. This facility boasts a 40 hl brewhouse and its own tap room, which also rapidly reached its capacity in 2018. Given the situation at hand, this posed an opportunity to further expand capacity while at the same time making comprehensive improvements to modernize the brewhouse and cellar.

Project phase 1: fermentation and storage cellar

Satisfying the requirements of a brewery that produces over 100 different beers every year is no easy task, but BrauKon GmbH placed their trust in the Banke process solutions team to do so. Phase one of the project called for the addition of four outdoor 320 hl cylindroconical tanks and their integration into the existing semi-automated fermentation and lager cellar. Furthermore,

the project involved updating the equipment in the cellar to fulfil the ever-changing requirements for process reliability and the handling of raw materials.

Brewmasters Chris Wisse and Jaap Litjens from the Jopen brewery collaborated extensively with project manager Marc Schurmann who was on site to assist in the extensive preliminary planning for this project. Their valuable contributions laid the groundwork for the new concept, integrating modern process technology into this highly dynamic and versatile brewery setting. The new technology was incorporated into the newly-constructed fermentation and lager cellars as well as in pre-existing areas of the brewery.

Automated dry hopping

The new HopGun Pro dry hopping system (fig. 2) creates a hop/beer suspension within a very short amount of time. This has effectively rendered the manual addition of hops on the cold side obsolete. Previously, dry hopping was carried out from a cumbersome and precarious position above the tank dome at heights of up to 15 meters. Equally difficult is handling the large quantities of hops required for this procedure, in some



Authors: Michael Kohles, M.Sc., R&D Engineer, Armin Pillmeier, M.Sc., Project Engineer, Banke process solutions GmbH & Co. KG, Taufkirchen, Germany

Fig. 1
The stained-glass windows of the former cathedral Jacob-skerk surround the 20 hl copper brewhouse, evoking a unique atmosphere at the brewpub Jopenkerk





Fig. 2 The HopGun Pro, integrated in a dry hopping loop, allows for automation of the dry hopping process

cases up to 400 kg per batch. Instead, a fully automated process enables an oxygen-free hop suspension to be dosed directly into the dry hopping loop which has been recently installed throughout the entire cellar. This hard-piped dry hopping loop allows the tank contents to be recirculated and mixed using a single pump positioned at the centre of the system. Two inlets were mounted on the new tanks at different heights to achieve ideal mixing conditions for the hops. Due to their angle and opposing orientation, these inlets ensure that the contents of the tank remain homogenized during dry hopping, which enhances aroma transfer. At the same time, the configuration hinders the migration of hop particles to the surface.

■ Yeast cropping and foam capture

In order to avoid the labour-intensive manual removal of yeast and spent hop material that ends up as sediment at the bottom of the tank, a progressive cavity pump and an inline turbidity measuring device have been installed. This creates a fully automated process, which can be carried out without the presence of brewery personnel.

Although the new tanks were dimensioned with a generous head space of 50 %, it became clear during the planning phase that this would not be sufficient for some of the specialty beers produced at the brewery which tend to foam excessively. Therefore, a new foam trap system (fig. 3) was designed for this project to accommodate the larger amount of foam generated during the fermentation process. It was particularly important that up to eight new tanks could be independently connected to and removed from the foam trap system by the time the final expansion phase was reached. The system can capture excess foam from several tanks concurrently while at the same time also enabling the cleaning in place of individual tanks. This guarantees the greatest degree of reliability and flexibility in production.

In order to ensure leak-proof separation of individual processes, dual panels were installed for the four new tanks and the existing panels were modified to include all of the process options, significantly expanding on what was previously possible. Swing pipes and flexible hose connections were primarily employed to accomplish this (fig. 4). All are fully equipped with a position feedback control system to fulfil safety requirements for both the process and the brewery personnel. This allows the entire path to be checked and approved from the central con-



Fig. 4 Pipe manifold with hose connections and a position feedback control system for maximum flexibility and process reliability



Fig. 3 A newly developed foam capturing system for up to eight tanks and a semi-automatic CIP distribution panel with swing pipes

trol unit for the fermentation cellar before the program starts. Similarly, should any of the processes be altered in any way, the program will be interrupted.

■ A universal automatic dosing system

The brewery's extensive range of beers is also reflected in its yeast portfolio. Up to 10 different yeast strains are regularly used in addition to bacterial cultures – nothing out of the ordinary for the brewers at Jopen. This has, nonetheless, rapidly pushed traditional yeast management to its limits, so that dry yeast products are seeing more frequent use. Prior to this project, the yeast was pitched through the swivel cone or the dome of the tank. This practice is no longer considered acceptable, neither from a hygienic, nor a practical perspective, especially with the new, much larger outdoor tanks. Consequently, Banke process solutions quickly developed a system to suspend and pitch the yeast, one which is tailored to the brewery's individual needs. The system is integrated into the cold wort line. It enables the dry yeast to be suspended or rehydrated without clumping by creating a central vortex inside of the dosing vessel. In order to hygienically transfer the yeast to the dosing vessel, it is flooded with sterile air to prevent ingress of any harmful microorganisms and bacteria

which might be in the ambient air, especially from the adjacent milling area. This yeast suspension can be pitched in a fully automated fashion by metering it into the line during wort chilling. Similarly, the dosing vessel is cleaned and sterilized inline together with the wort line. Installing a universal dosing system ensures the highest process reliability possible for the entire fermentation cellar. In addition, the system can be used to dose other ingredients, such as aromas or clarifying agents into the cold wort.

■ Project phase two: brewhouse

In February of 2019, as the last steps in phase one were being carried out in the fermentation cellar, head brewer Chris Wisse and his team were already looking to the future. Together with project manager Marc Schurman and the technologists from Banke process solutions, the group began moving into the second phase of the project, i.e. optimizing the existing three-vessel brewhouse with mash filter.

The notion that extraordinary beers are brewed with extraordinary ingredients and unusual grain bills was clear from the very first glance at the recipes. Big beers, brewed to an original gravity of 16°P to 20°P with significant proportions of rye, oats, buckwheat, pumpkin puree and a wide variety of other ingredients abound at the Jopen brewery. The brewing system was retrofitted with an AlloySius grist hydrator and a GentleMix agitator, both developed by Banke process solutions, to meet these de-



Fig. 5 The recently installed AlloySius grist hydrator and GentleMix agitator help achieve a thoroughly mixed mash, free of clumps

manding mashing conditions and to deliver the performance required.

■ New mash concept

The recently installed grist hydrator (fig. 5) guarantees complete homogenization of the grist and liquor during the process of mashing in. The grist hydrator features wetting technology achieved by directing the brewing liquor through a ring nozzle around the entire circumference of the unit. A double cone is centrally positioned in the unit and serves to thoroughly mix the grist and liquor before they enter the mash vessel. Even large grain bills with a grist to liquor ratio as high as 1:1 can be mashed in uniformly with almost no oxygen uptake.

Since the resultant mash is already thoroughly homogenized, the recently installed GentleMix agitator is free to carry out its pri-

mary task of stirring the mash to maintain uniformity since it does not need to break up clumps or localized regions of dry grist at excessively high speeds. Compared to previous models, the reduced speed of the new agitator lowers energy consumption. As a consequence, the mash is more uniform which improves saccharification and ultimately saves time.

Since the existing wort aeration system had been identified as a hygiene risk, it was also completely overhauled. The changes include digital measurement of air volumes for aeration and improved, automatic CIPing of the pipes. A duplex strainer with differential pressure monitoring was retrofitted to protect the plate and frame wort chiller.

■ An expansion of creative freedom

All of the measures described above, both small and large, have allowed Chris Wisse and his team to again fully explore their potential, without relinquishing process reliability or profitability. In addition, both brewmasters Chris Wisse and Jaap Litjens have noticed that “contrary to its name, the Hop-Gun Pro is also equally suitable for cocoa or purees”. The greater degree of freedom will enable them to expand their already abundant creativity. With this in mind, it will be interesting to see what is on tap during the next visit to the Jopenkerk – perhaps something from the 112-liter barrels known as “Jopen”, the barrels that gave the brewery its name. ■