Hygienic design in a brewery

NEW CELLAR | The wheat beer brewery Schneider in Kelheim has a current annual output of about 300 000 hectolitres of Schneider Weisse and is experiencing continuous growth, particularly in terms of exports. It was decided to remain true to the natural production method of bottle fermentation. Despite the risk potentials involved, thermal treatment of the beers with flash pasteurisation and/or filtration is definitely out of the question for the brewery. A beer tower now houses the core of a modern plant following the guidelines of HACCP, GMP, EHEDG and FDA.

THE TRADITIONAL BAVARIAN BREWERY has decided to stick to the natural production method with bottle fermentation also in times of rising sales.

Against this background, some ambitious project aims have been formulated and discussed and could finally be achieved in accordance with real economic aspects. The most important prerequisite for production was the perfect implementation of consistent hygienic design with optimum process flexibility and reproducible, constant quality.

Standards from the pharmaceutical industry were used as the basis for process determination and a practical process structure. These standards did not only cover the plant-specific part, they also included room hygiene as well as the implementation and auditing of aspects of personnel hygiene.

Following the principles of HACCP, GMP, EHEDG and FDA, the basic engineering and also the detailed implementation planning was carried out in close cooperation of the planning team of Weißbierbrauerei Schneider and Tuchenhagen Brewery Systems.

Innovations that were not at all typical for a brewery were perfectly implemented and the requirements for a future-proof procedure for the production of wheat beer in compliance with the specifications of the QA management system of Weißbierbrauerei Schneider were met. An essential element of the project is the beer tower built by Weißbierbrauerei Schneider. This tower houses the core of the modern plant. The process tanks for the entire range of brands are located there. Product transfers within the plant during the production process are realized with the novel ECO-MATRIX® piping concept for tank systems from Tuchenhagen Brewery Systems.

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ECO-MATRIX® system

In the ECO-MATRIX® system, the valves and pipes are connected directly beneath the tank outlet. The process valves are mounted laterally at the central tank outlet tree and thus ensure an arrangement from the tank to the valve seat without any dead spots. The usual branch lines between tank and periphery are completely avoided. All supply and drain lines are not part of the tank, but adequate pipe areas that are fully available for the corresponding process versions for product and CIP applications. The pipe system is arranged separate from the tank and therefore allows separate cleaning and disinfection with optimum effects for the product and also for cleaning efficiency. The main features of the system are as follows: small product losses, no tank outlets and thus optimal mass transfer between tank and tank connection. This application results in a clearly-structured system with low floor space requirement.

Room air conditioning

The temperature conditions in the beer tower were also taken into consideration when the concept of consistent hygienic design was developed. For this purpose, the beer tower was divided into two different temperature zones, each zone having its own specific requirements:

Temperature zone 1 is the cone zone of the beer tower. For this zone, a ventilation system that is led through particle filters

ECO-MATRIX® tank connection in the new beer tower of Weißbierbrauerei Schneider, Kelheim

GEA Diessel equipment for exact Speise dosing

Tank connection in the tank top for CIP and gas management

was installed to obtain an atmosphere with a reduced bacterial load. A room temperature of 12 °C was specified for this zone to prevent the formation of condensate caused by the temperature falling below the dew point. Following the concept it was also tried to realize an aerosol-free design, if possible. Puddles of water promoting bacterial contamination are effectively prevented.

Sampling often involves the risk of contamination caused by unsterile piping. In the system at Weißbierbrauerei Schneider, cleaning and sterilisation is integrated in the piping and the process flow. The valves are installed flush with the tank, which allows optimal cleaning on the tank side

Temperature zone 2 is the headspace or the cylindrical tank area of the beer tower. For this zone, a room temperature of 18 °C was specified.

Floor and equipment draining/ drain systems

All room and plant-specific drain systems have been centralized and equipped with collecting vessels with a water seal for odour prevention.

With this piping concept, a contamination barrier can be created in the drain containers by means of a layer of disinfectant liquid supplied by the respective CIP plants. Thus it is ensured that an open exchange between the drain environment and the room atmosphere and plant periphery cannot take place.

Tank engineering

Detail engineering of each tank was made so that the entire measuring/control and process equipment forms an inner tank surface without any corners, thus there are no blind spots and perfect flushing and cleaning is ensured.

Automatic sampling

The sampling system has been designed in such a way that automatic sampling from tanks and pipes is only possible if an absolutely dead-space free sterilisation of the sampling system has been carried out prior to sampling.

Therefore, a program that ensures faultless operation has been developed for each sampling point. The sampling systems are cleaned with the respective CIP of the immediate process areas. Cleaning is monitored with regard to process accuracy.

Tank top

The tank top with CIP equipment and safety fittings is fully automated and designed with a control valve for exact tank top pressure control.

CIP/SIP process

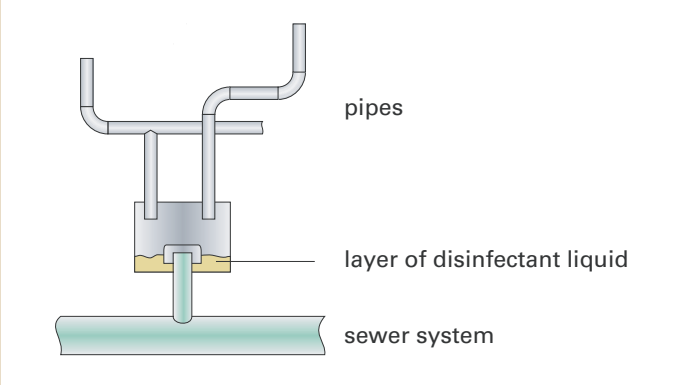
Hot and cold cleaning of the tank is possible and, if required, fully automatic steam sterilisation can also be performed. The process periphery is designed so that CIP cleaning can be done under pressure or without pressure.

CIP/Gas management

CIP/Gas management is organized via a fully automatic valve block, different head pressures or pressurizing modalities with CO_2 or sterile air can be selected from the process menu. The pipes are designed with double-seat valves and are contamination-proof.

Thermal treatment and dosing of "Speise"

The so-called "Speise" (wort) required for bottle fermentation is sterilised prior to inline dosing. For this purpose, a heating system, in principle a flash pasteurizer, is installed with the necessary measuring and control equipment. The flow rate in this system is exactly adjusted to the downstream



The drain construction with a layer of disinfectant liquid provides for an effective contamination barrier

dosing of Speise. The installation of the new equipment had the following objectives:

1. Elimination of fluctuations in the extract content in the bottling tank.
2. Minimisation of manual extract measurements at the fermentation vessel, particularly during night shifts and on weekends.

Speise dosing is done according to the online measurement of the apparent extract. The apparent extract is determined in the mixture. However, as this measured value is influenced by the CO_2 content in the beer, the CO_2 content in the mixture is also determined and the measured value is compensated with this value. The control for Speise dosing is designed as cascade control with a secondary ratio control to compensate variations in the flow rate, especially during desludging of the separator. Furthermore, this system also compensates short-term flow rate variations in the mixing system at the start of dosing and after discharge of the centrifuge. An absolutely constant apparent extract value is important to obtain the required uniform CO_2 content during secondary fermentation in the bottle.

Separator for green beer clarification

A separator from Westfalia Separator is used to separate the excess yeast and to adjust the yeast cell number for bottle fermentation. The cell number is adjusted with a bypass control by means of turbidity measurement in the inlet and outlet of the separator. The separator is designed for a capacity of approx. 300 hl/h.

CIP systems

Altogether, three fully automatic CIP plants are available or have recently been installed for the brewhouse, fermenting room, beer tower, Speise tanks, storage and mixing tanks up to the filling station.

Outlook

Weißbierbrauerei Schneider will continue to invest in plant equipment in 2008. The new dealcoholisation system, a kieselguhr filter and further pressure tanks are currently being installed. In the course of the 41st Technological Seminar (chair of Prof. Back), the plant can be visited in January/February 2008. ■