

Warsteiner brewed by ProLeiT

AUTOMATION MIGRATION | The comprehensive modernization of process control systems or the migration of automation software to state-of-the-art technology are major prerequisites for more efficient and competitive brewing processes. The Warsteiner Brewery has therefore recently converted the automation technology of its entire brewing plant to ProLeiT's modern brewmaxx V8 process control system in several project steps. In this way, the company is creating ideal conditions for extra-high productivity; on the basis of integrated materials management, the company has for the first time also achieved consistent traceability for breweries. This multi-stage project clearly demonstrates that a fundamental modernization approach of this kind can only be successful if all of the operator's and suppliers' specialists cooperate as closely as possible. The automation specialists require a comprehensive understanding of brewing processes because this is the only way to successfully modernize brewing plants during production.

MODERNIZING THE PROCESS AUTOMATION of one of Europe's largest private breweries represents a special challenge. In addition, the consistent upgrade of the process control hardware and software from the brewhouse, fermenting and storage cellar up to filtration during production is a highly complex project. However, size is not the major challenge: Success factors mainly include a sound preparation and a well-founded approach to the project along with close cooperation between the customer and the automation specialists.

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In 2008, Warsteiner awarded ProLeiT a contract for the migration and replacement of the existing control platform by brewmaxx in its latest V8 version.

The partners concluded a master contract for the refurbishment of the brewery's entire process control technology in clearly structured project stages with fixed deadlines over a period of three years. The brewhouse was converted in 2008, followed by the fermenting and storage cellar in 2009 and the filtration plant in the spring of 2010. The brewery's auxiliary plants will be integrated into brewmaxx V8 by the end of this year. The fact that the conversion to brewmaxx V8 was and will be performed during production was of primary importance to Warsteiner.

Understanding of brewing processes

The ProLeiT specialists' high level of brewing process expertise is playing a major role in the success of this project. In contrast to all other industrial sectors, detailed process descriptions for breweries – along with the specifications derived from them – are not created by the operator, but by the supplier or in close cooperation between the operator and the supplier. Fundamental know-how of the individual brewing processes is essential for target-specific implementation.

Migration or replacement?

The goal of each refurbishment should be to eliminate isolated solutions and implement a consistent, system-wide automation structure. To do this, however, the following principle questions must be answered: Is it possible to retain the hardware, and the process periphery in particular, and only migrate the software? Or is it necessary to replace the entire control technology?

Existing, but obsolete control systems with a structured software concept can be conveniently migrated to brewmaxx using simple conversion tools. Provided that no technological modifications are required, most of the parameter settings can be transferred to the new solution.

The customer can order either full migration or a step-by-step migration solution. The strategy pursued must be carefully selected in order to best maintain the brewery's production availability. In addition, it must be determined whether brewmaxx should be used to combine existing automation systems, or whether it is necessary to modify or expand the controllers.



Fig. 1 Warsteiner is modernizing its entire automation solution

Project preparation

Like any other company, breweries are also based on infrastructure and process structures established over a long period of time. Automation structures have grown parallel to them. Due to the overall structure, single programs, program adaptations and extensions are not linearly interlinked, but implemented as isolated solutions connected together. This provides the basis for complex automation landscapes for which no sufficient documentation is usually available.

For the complete mapping of an existing brewing process with all of its different variants and special process technology features in a modern process control system, ProLeiT first created a comprehensive control process description in close cooperation with the Warsteiner brewery. With regard to process sequences, this approach ensures that the operator does not need to accept any compromise with the future automation solution and that all processes, including new functionalities, can be implemented according to the requirements of the Warsteiner Brewery.

ProLeiT uses this detailed process description as a basis for the engineering of the user program. In order to involve the operator in the development of its new generation process control system and allow Warsteiner to constantly monitor the project progress, the ProLeiT and Warsteiner specialists held several discussions to provide one another with the necessary engineering feedback. Uncertainties could be clarified at an early stage and additional operator requirements could be taken into consideration for project planning.

This approach provides major benefits for both partners: The operator is provided an insight into the implementation of his project in sufficient time. Since the customer identifies with his new automation system, the factory acceptance test (FAT) and commissioning are usually no problem at all and require only minor corrections.

Since Warsteiner did not require any changes to the existing process technology, measurement technology or automation peripherals, only bus and signal tests had to be performed prior to commissioning. This ensured that existing peripherals could actually be connected. An additional benefit: Thanks to the existing peripherals, wiring errors during commissioning could not occur.

The final phase followed directly afterwards, because the commissioning of Warsteiner's brewhouse was scheduled to take place by December 31, 2008, at the latest. Thanks to comprehensive preliminary work, ProLeiT was even able to convert the brewhouse to brewmaxx V8 as early as the end of October.

Eagerly anticipated: the first brewing activities

14 brews were planned for the first week of production of the migration from Braumat to the future-oriented brewmaxx V8. Since brewmaxx V8 started without any problems, these activities could already be completed on Tuesday afternoon.

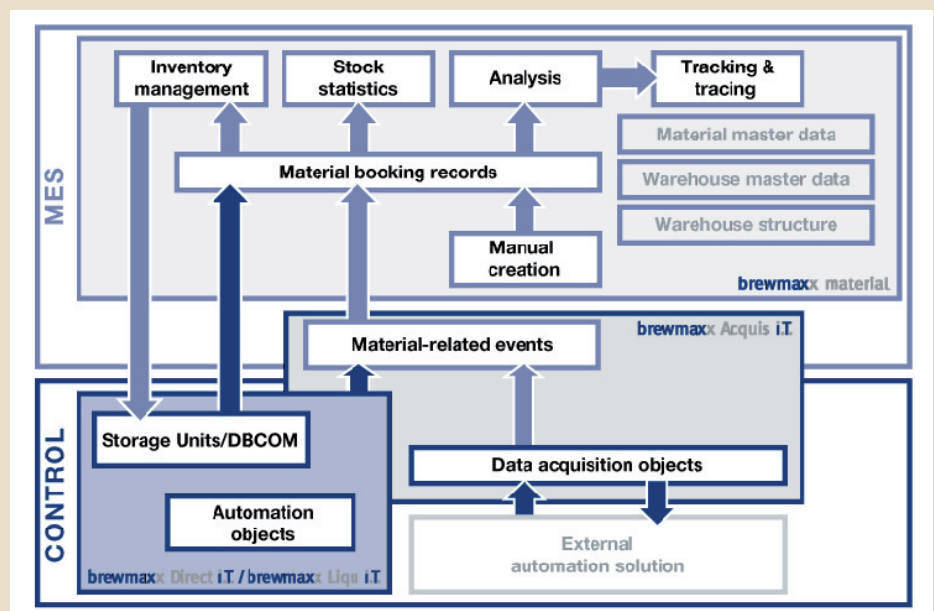


Fig. 2 In terms of movements of materials, the data acquired in this module for process-oriented materials management maps the entire brewing process, including all auxiliary plants

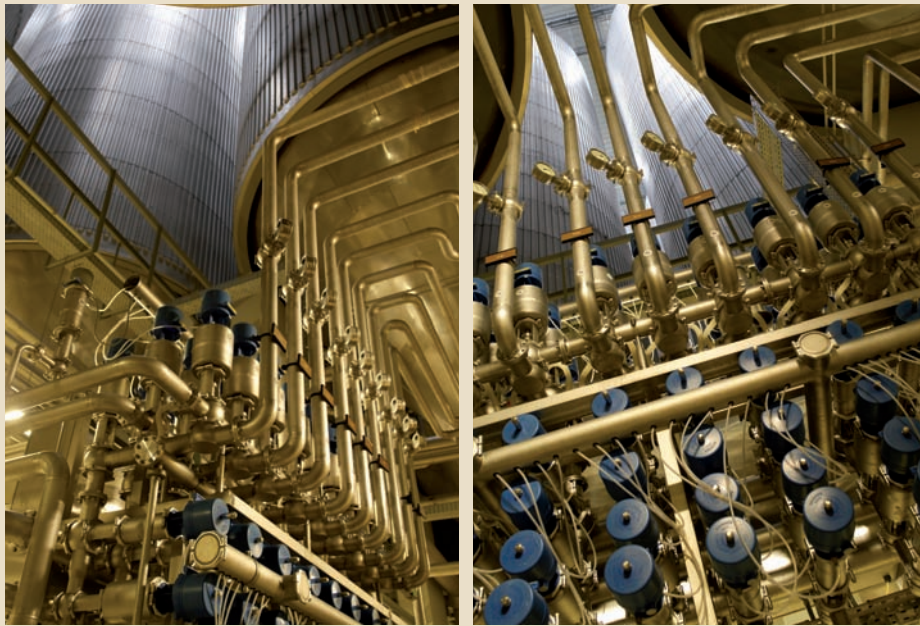


Fig. 3 Fermenting and storage cellar with valve node

Warsteiner therefore spontaneously decided to immediately start another 14 brews, which could already be completed on Wednesday evening. This means that twice the originally planned quantity could be produced in half the commissioning time.

On October 29, 2008, ProLeiT received the following e-mail message from *Ulrich Brendel*, Technical Manager and Authorized Representative of the Warsteiner Brewery: “The first 6 fermenting tanks of ‘Warsteiner brewed by ProLeiT’ are full! The conversion has been really smooth so far, with thanks and congratulations to our teams.”

Complexity under control

During the second migration stage at the end of 2009, the fermenting and storage cellar was upgraded to brewmaxx V8. This step proved to be a particularly complex automation task. Due to the different capacities in the various production areas, different volumes of fermenting and storage tanks and a process structure which evolved over time, it was e.g. necessary to distribute the cooling of a brew output to two fermenting tanks via two cooling lines in parallel, and several storage tanks had to be simultaneously filled from different fermenting tanks for the cooling of young beer. Furthermore, up to 18 storage tanks were always emptied towards the filters at the same time in order to ensure uniform product quality and to distribute the high flow rates at the emptied end of the production line. During this project stage, also, no major problems

occurred during commissioning thanks to the extensive preparation and smooth cooperation. After just a few hours, it was possible to manually start programs via the new brewmaxx V8. Only one day later, the first fully automatic cleaning process could be initiated via brewmaxx.

ProLeiT was therefore able to transfer beer from the fermenting and storage cellar to the filtration – at first in manual mode – after just two days of commissioning and thus ensured that smooth production operation could be maintained. After a commissioning period as short as just one week, the first automatic transfers took place from the storage cellar to the filtration plant – followed by transfers from the brewhouse via the Gyle cooling station to the fermenting cellar only three days later.

Filling according to schedule

As already mentioned, the third migration stage, consisting of filtration and pressure tank cellars including filling, was already converted to brewmaxx V8 in the spring of this year. In terms of process engineering, this production area is implemented as a dual filter line. Furthermore, the complex combination of numerous circular and branch lines in the area of the pressure tank cellar and filling represent a special design challenge.

At the Warsteiner brewery with its huge variety of different containers, tight filling plans only allow short downtimes. In addition to the preparations described for the

previous stages, the different commissioning steps had to be adjusted as precisely as possible in order to ensure that all sequences could be started via brewmaxx fully automatically and well on schedule within one week.

Smooth operation

For the commissioning of a new process control system, ongoing production always has top priority. The objective was a smooth migration of the automation system. The handling of scheduled fall-back scenarios also demonstrates the project’s success. These are necessary in order to secure production under any circumstances on the basis of the optional use of the old system.

Following the perfect start under brewmaxx V8, after only 14 days the old system provided at the brewhouse for this purpose was considered to be no longer required and was uninstalled.

Only three weeks after commissioning, the old system components of the fermenting and storage cellar were urgently required as spare parts for the controller in the filter cellar, so that no fall-back option existed after such a short time.

This necessity provides impressive proof that the refurbishment of the old process control systems was of great importance. After all, no spare parts are available for numerous existing automation systems. The fact that – thanks to the migration – an old system component was no longer required just at the right time turned out to be a fortunate coincidence.

Benefits of integrated materials management

With its function modules, brewmaxx V8 creates a consistent data, information and communication structure which extends from the process level – including sensors, instruments, motors pumps – to the MES level (Manufacturing Execution System) – including production and machine data acquisition, the control center and the system control – and even includes the higher-level ERP system (Enterprise Resource Planning). On the basis of brewmaxx V8, it has now also been possible to implement real materials management in the brewing sector. The materials management module integrated in brewmaxx V8 connects internal movements of materials to the brewery’s process control level. This ensures

consistent traceability of production – from the pressure tank up to the malt silo.

An automatic silo management system, which has been specifically developed for Warsteiner on this basis, also ensures that all malt silos are correctly sorted. During the receiving of malt, the brewmaxx user interface only displays those silos for selection which are empty and have been cleaned or those which have already been filled with the same kind of malt.

The silo paths could be optimized thanks to silo management. The conveying paths between the silo and the brewhouse therefore never run empty, and malt can be transported without interruptions. If malt from different silos is used, the malt is not necessarily extracted in the order of the recipe, but rather the system calculates the optimal order. This approach is not only faster and

involves shorter waiting times, but it also keeps the conveyor belts filled. Gaps when switching over to another silo are excluded, and even small quantities can be extracted from the silos precisely and transported to the weighing machine. All silos are called up sorted according to their filling levels. Since the fullest silo is always called up last, problems with regards to insufficient silo quantities cannot occur.

By means of so-called task parameters, brewmaxx V8 can be operated so flexibly that individual production orders can be modified according to the actual demand without the need to create a new recipe. For example, for brewing with a specific kind of malt, a different quantity of the same kind can be called up for the next brew.

Materials management via brewmaxx also captures the complex production steps

in the fermenting and storage cellar. Blending during the filling or emptying of the storage tanks also causes complex situations for entries in the materials management system, and these are essential prerequisites for proper batch tracing. Thanks to brewmaxx V8, it is always possible to provide secure evidence as a basis for traceability.

■ Outlook

During the last stage of the modernization process, all auxiliary plants will be integrated in the automation technology of the future-oriented brewmaxx V8 process control system by the end of 2010.

This date marks the completion of a project on which ProLeiT Project Manager *Stefan Herrmann* commented: “To successfully implement this project, it was necessary to utilize all of the system’s features“.