

Open heart surgery successful

RETROFITTING BAVARIA | The work accomplished by ProLeiT on behalf of Colombia's Bavaria brewery can be best compared with open heart surgery on a top athlete performing under stress on an ergometer during the intervention. ProLeiT has successfully managed to gradually upgrade this large brewery with an annual production of around 11 million hectoliters, which is currently undergoing a capacity expansion, to the brewmaxx V8 process control system. This modern control system not only reduces the number of isolated solutions and optimizes process sequences, but also enables consistent tracking and tracing on the basis of its integrated MES functionality.

BAVARIA IS COLOMBIA'S NUMBER ONE BEVERAGE PRODUCER

and one of the largest producers in South America. The present Bavaria brewery was already built in the open countryside in Tocancipa in the Bogota region in 1994. Initially, this plant was dimensioned for an annual output of 6.5 million hectoliters. Thanks to modernizations and expansions, the capacity is currently being increased to 11.2 million hectoliters. This corresponds to approximately half of Colombia's beer consumption and gives reason to draw the following reverse conclusion: the fact that this brewery exists clearly demonstrates that Colombia is thirsty.

It therefore comes as no surprise that the urgently required modernization of this large brewery's process control system was crucial for the operators, who there-

fore wanted to "play safe". During an initial phase, Bavaria entrusted specialists with the creation of a neutral specification which provided a detailed description of all the requirements and functions to be fulfilled by a modern control system. Following an extensive tender and analysis phase, ProLeiT was awarded the contract for the modernization of the brewery's process control technology on the basis of the new brewmaxx V8.

The main reasons for this decision were that this process control system is independent of hardware component and machine or plant manufacturers. In addition, the materials management supported by it enables complete tracking as an integrated MES (Manufacturing Execution System) functionality. Last but not least, the video recorder for the logging and visualization of all operator steps and actions has proven its worth as an important optimization tool for daily operation.

Another important criterion: The Bavaria brewery did not want to risk having this project implemented by a company which is not familiar with the brewing process. In contrast to all other industrial sectors, detailed process descriptions for

breweries – including process optimization within the framework of modernization – are not created by the operator under his own responsibility, but rather by the supplier or in close cooperation with the operator. To this end, however, fundamental know-how of the individual brewing processes is essential for target-specific implementation.

Since many employees of the Herzogenaurach-based company have special training and degrees in the brewing sector, they are well aware of the automation problems from the receiving of malt, to the brewhouse and on to the fermenting cellars and filling stations. "Bavaria and ProLeiT are on the same wavelength, and this was the basis for the successful completion of our brewery's comprehensive modernization", explains *Fredy Alberto Romero Roncancio*, Production Automation Engineering Manager at Bavaria Tocancipa.

No old wine in new bottles

To achieve sustainable optimization, the new process control system must utilize the performance of the mechanical engineering concept, systems and components to their full potential. Since an old control system cannot provide all the system functions required, it is by no means capable of fully utilizing a plant's ever-increasing physical performance. Therefore, substantial progress must also be achieved and new concepts must be implemented for the process control and automation structure.

To effectively improve efficiency, not only the software needs to be updated, but the entire process, and even the process technology must undergo modernization. A detailed process description is of primary importance in this context. As mentioned above, this is not possible without profound knowledge of the process. Experience has shown that a sophisticated process description is almost as extensive as the design of the corresponding



Bavaria brands: Aguilera and friends

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Complex routing in the cellars automated via brewmaxx



brewmaxx controlled filtration to ensure "clear beer"

software. With the contract awarded for the complete refurbishment of the Bavaria control system, the starting gun for the project was fired at the end of 2006.

First of all, the three project phases of brewhouse, cellar and filtration were defined. Clearly defined interfaces ensured that these individual process areas could be configured separately. In addition, this clear differentiation facilitates upgrading activities and the necessary tests and commissioning under full production.

Following the brewhouse and filtration, the four fermenting and storage cellars along with the yeast plant (with approx. 86 tanks in total) were upgraded to brewmaxx V8 in 2010. At the same time, ProLeiT implemented a comprehensive reporting system which provides the operators with a complete overview of the production data, weekly and daily production figures, water and malt consumption, and incoming and outgoing materials in silos and tanks in real time through the Intranet.

Materials management as an integral part

The materials management system integrated in the process control system is at the core of this approach. With its function modules, brewmaxx maps the entire brewing process and generates a consistent data, information and communications structure—from the process level (including sensors, fittings, motors and pumps) and the MES level (including production, operational and machine data processing) to the higher-level ERP system (Enterprise Resource Planning).

The materials management module connects all internal movements of materials to the brewery's process control level. This ensures consistent traceability of production materials and batches – from the pressure tank to the malt silo.

Integration of additional isolated solutions during the project

During gradual modernization, Bavaria's automation specialists decided to automate not only the entire brewing process, but also all the entire auxiliary equipment. The water and sewage treatment plants are now also working under the new process control system, while Bavaria relies on the brewmaxx system platform for the refrigerating system, and soon also for the compressed air generator and the boiler house. In future, a specific program mod-

ule developed by ProLeiT will ensure that the steam boiler can always be operated at the optimum operating point in order to further increase the plant's energy efficiency. Even plant sections equipped with individual miniature PLCs and operator panels, including e.g. blenders and carbonators in the filtering area, are now completely integrated in the program structure.

In 2011, an additional new brewing line will be integrated into brewmaxx; furthermore, the planning of a Production Data Acquisition (PDA) concept for the 11 bottling lines is in full swing. On the basis of this approach, all isolated automation solutions can be integrated into a consistent system based on a uniform operating concept. Thanks to the integration of all third-party systems, the number of different operating and control systems has been reduced accordingly.



Bavaria's 6000 hl fermentation tanks, 60 of them



Brewhouse

This further increases operational safety and thus the plant's efficiency.

Even complex operator control actions come under close scrutiny

For Bavaria, not only is consistent tracking and tracing is a key prerequisite for quality assurance, the company is also striving for comprehensive transparency in the field of process control. The video recorder supported by brewmaxx serves exactly this purpose. After all, it enables the documentation of each of the brewery's operator control

and process steps. Highly detailed information concerning e.g. the opening of a valve, a program start, the tanks currently involved, the path of each product within the plant and also operator interventions are automatically documented. To this end, the video server only records pictures from the process visualization. Each operator intervention is additionally marked in the user log with the precise date and time stamp.

Operator control interventions can now be traced back in a transparent manner, which facilitates the search for incorrect operator control actions. This system proves particularly beneficial during the first

months after commissioning because not every error in a program sequence or operating error can be detected immediately. To quote an example: The causes of pikes in the opacity can be traced back immediately, because the question "What has happened where and why?" can now be answered immediately on the basis of video recording analyses.

In addition, this analysis option provides further potential for optimized plant operation. In video mode, the program sequence can be conveniently checked and parameters can be adapted if required. brewmaxx provides an analysis tool for the fast tracking of sequential errors and thus for process optimization. Thanks to fast weak point detection options, these records also provide significant benefits for maintenance and repair.

Results

Thanks to the restructuring of the processes and optimization of critical sequences, up to 20 minutes of buffer time per brewing process could be saved in the brewhouse. These buffer times add up to an impressive time reserve which can e.g. be used for cleaning in the last shift in order to reduce this shift by half without affecting the configured number of 10 brewing processes per day. ■