The smallest totally automatic brewery in the world

COOPERATION | ProLeiT and Rockwell Automation have agreed to port the brewmaxx process control system to the Rockwell Automation Logix control platform for specific applications in the brewing industry. The first implementation step in this development – porting the basic functionality form brewmaxx – is available as an application example, in the form of a fully functional and fully automated mini-brewery. This mini-brewery will be presented to the visitors of the drinktec 2009 in Munich by the networked stands of the participating companies.

THROUGH A COOPERATIVE project between the companies GEA Brewery Systems, Kitzingen, and Büchen, Endress+Hauser, Weil am Rhein, ProLeiT, Herzogenaurach, Rockwell Automation, Milwaukee/WI/USA and the Technical University of Munich in Weihenstephan a fully functional brewery in miniature scale was implemented. The plant consists of a two-kettle brewhouse with two fermentation tanks and can produce 20 liters of beer per batch. It is automated with brewmaxx installed on a Logix controller from Rockwell Automation – brewmaxx based on Rockwell Automation PACs.

How can one explain the functionality of a fully automated brewery in a simple way? How can one represent the link between total automation and its integration in the IT environment of an enterprise at a glimpse? And how can one demonstrate that there are cooperating enterprises that offer intelligent and mutually fine-tuned solutions for these tasks?

ProLeiT and Rockwell Automation asked themselves these questions at the beginning of the year and thereupon defined the goal of realizing a functioning „miniature" brewery, completely automated and representing the full integration of the plant floor up to the management level.

Together with Endress+Hauser, GEA and the Department for Food Packaging Techniques of the Technical University of Munich (TUM), this aim was implemented in Weihenstephan (fig. 1).

▌Miniature scale

The fully functional mini-brewery that only occupies 2.4 square meters, basically consists of a two-kettle brewhouse with wort cooler and two fermentation tanks. Nearly all parts of the plant were handcrafted by GEA and the plant was equipped with sensors and measuring instruments from Endress+Hauser.

For the control system of the mini-brewery, a ControlLogix controller from Rockwell Automation was used as an integral part of the brewmaxx process control system. All pre-defined process parameters were specified by the TUM; the programming, parameterization and commissioning was performed by ProLeiT.

The basis for this ambitious project was the cooperation between ProLeiT and Rockwell Automation announced on March 2, 2009. Firmly connected with this international partnership is the close cooperation

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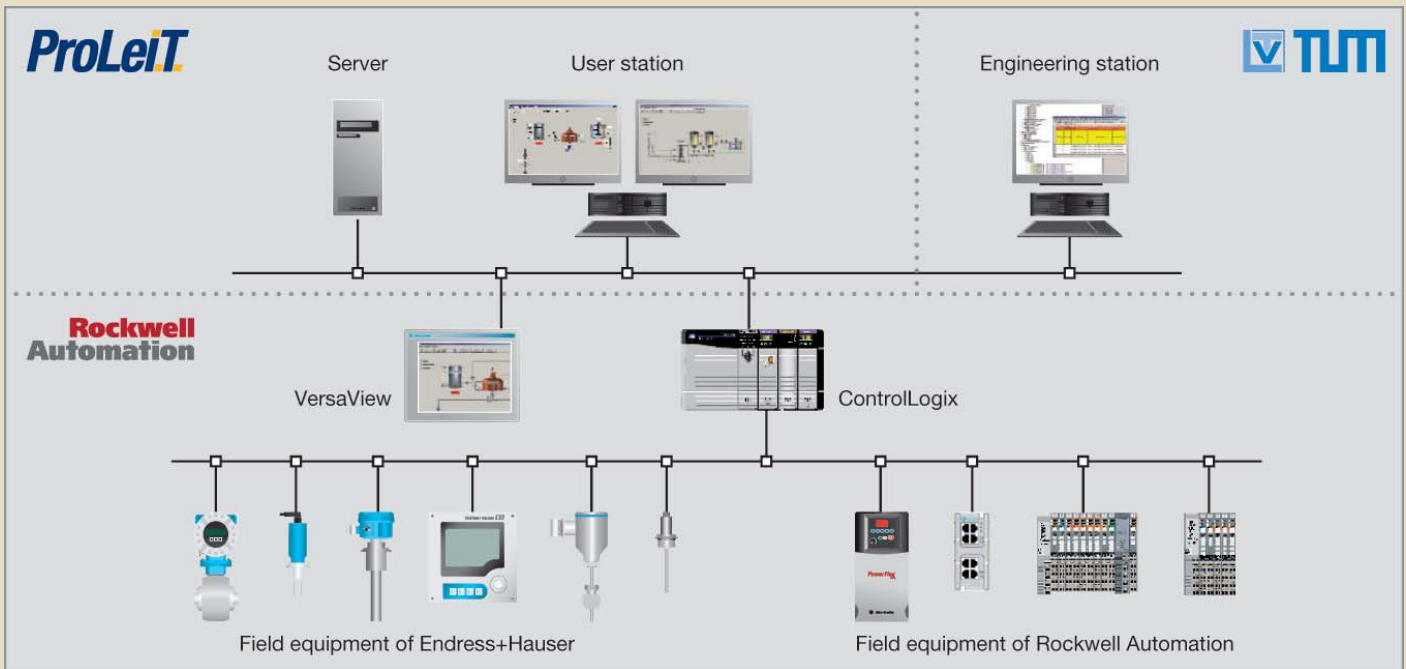**Fig. 1 Mini-brewery with two-kettle brewhouse and fermenting cellar**

Fig. 2 System architecture of the fully automated miniature brewery

in the implementation of the ProLeiT system solutions on the Logix control platform from Rockwell Automation.

Since then, both manufacturers have been working together on the development and on the international marketing of the ProLeiT Plant iT and brewmaxx process control systems for the consumer goods industry, particularly for the brewing, dairy and non-alcoholic beverage industries.

Through the integration of hardware and software components of the respective enterprises, a strong global alliance is created that leads them both closer to their customers, while at the same time giving them access to new market segments.

As they offer innovative solutions that meet the actual requirements of the manufacturers regarding economy and safety, both enterprises are able to react more adequately because of the broadening of their supply lines to additional requests from the customers.

This cooperation generates valuable synergy effects for the customers, who profit from the automation solutions that are mutually adapted and specially developed for the consumer goods as well as from the newly created global partner network.

The Logix PAC platform from Rockwell Automation is used as the basis for the hardware because of the extensive system integrity; this, in combination with the brewmaxx process control system,

contributes to minimize the effort for project development, engineering and training.

The system features a coherent condition monitoring system, integrated as a process control function, through the cooperation of Rockwell Automation and Endress+Hauser in the integration of field instruments (fig. 2).

The automation

With the implementation of brewmaxx based on Rockwell Automation PACs for the mini-brewery, both companies emphasize the joint development for carefully tuned automation solutions and demonstrate how a turnkey solution looks when associated enterprises work together.

As an example, the easy integration of powerful sensors from Endress+Hausser for registering process values with the Control-Logix controller from Rockwell Automation should be considered.

This is also valid for sensors and actuators in the fermentation tanks, which, through the integration in the decentralized Point IOs from Rockwell Automation, are easily connected to the controller using an EtherNet/IP network.

Allen-Bradley's frequency controller, Powerflex, for the speed control of the agitators in the brewing kettle/filter kettle is also connected to this network. Besides the direct connection to controllers

through DeviceNet, the field instruments from Endress+Hauser feature standard mechanisms that allow the connection to the process control system. This functionality is used by brewmaxx to integrate the status supervision of the connected sensors in the process visualization, using the so-called Condition Monitoring. The FieldCare system, the asset management system from Endress+Hauser, for managing, configuring and diagnosing intelligent components and field instruments, is available as an add-on.

Process control system

The component-based process-control-system brewmaxx with object-oriented class concepts focuses the technological, branch-specific requirements and can draw upon more than 20 years of process experience. ProLeiT implemented its brewery specific brewmaxx process control system in version 8 for the mini-brewery.

In the meantime it is also available for the Logix control platform from Rockwell Automation.

The system architecture for the mini-brewery, shown in figure 2, represents all the equipment required for the process control system and its interconnections. The client-server structure of brewmaxx allows for a centralized access to the process control system through operating stations. Direct local operation of the mini-brewery
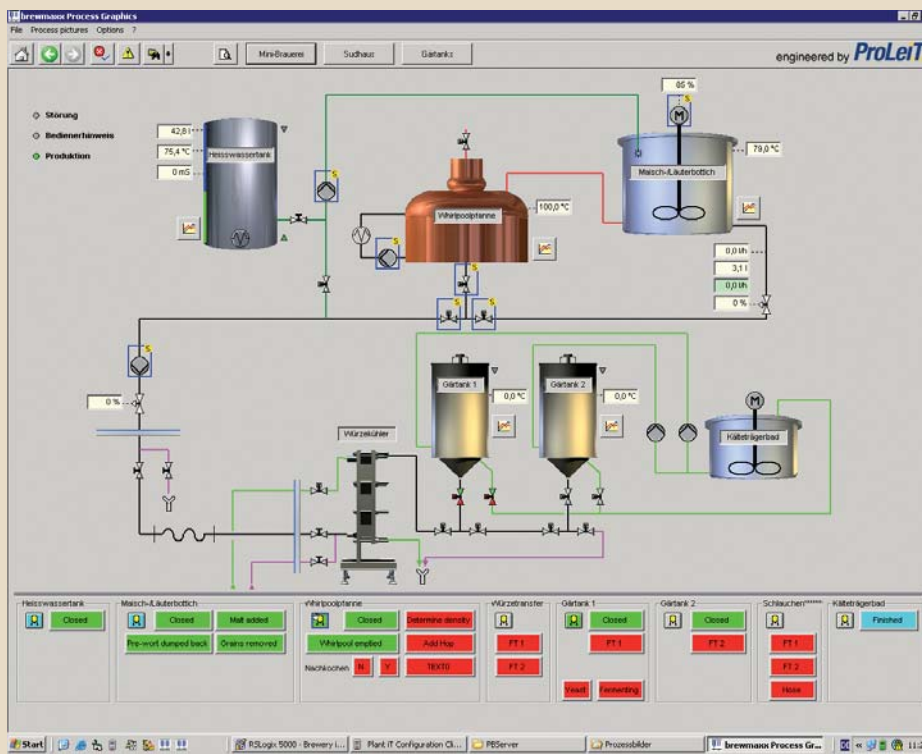
Fig. 3 brewmaxx-process representation of the miniature brewery

is implemented through the use of Allen-Bradley's Touchscreen VersaView.

This distributed structure corresponds to the real-world requirements and also demonstrates how easy the supervision and control of process functions might be handled.

Parameterization instead of programming

Through the distributed operating stations in the expo-stands, the users may not only control the brewing process of the mini-brewery directly but also are able to learn more about the way brewmaxx functions.

In contrast to conventional or compiler-based systems, brewmaxx uses a class concept, through which the generation of a program code is widely substituted by parameterization and data download (object data sets).

The compilerless system allows modifications during the course of the process, so that the process need not stop for necessary program changes.

Because brewmaxx is a process control system with strong emphasis on technological and brewery functionality, the pre-configured classes of the system may be easily used and parameterized on the run (fig. 3).

The simple operating philosophy is exemplified by the sequential processing and the storage of recipes and equipment parameters.

The graphical operation environment for partial procedures and sequential processes – from the brewhouse to the fermenting cellar – gives the users a direct and comfortable access to these brewing-specific classes.

They incorporate functions like route control, storage tank administration or tank cooling systems that control the optimized fermenting process.

Additionally, the process control functionality for the mini-brewery using brewmaxx material is enhanced by a material management system with batch traceability that is close to the process.

To obtain characteristic indicators, reports and plant status for the whole facility, the reporting tool from Rockwell Automation, FactoryTalk Vantage Point (previously Incuity), is used so that the user has direct access to the process data in the ControlLogix controller and also to the data from the brewmaxx system.

The overall reporting system may be consulted using an internet browser. In real-world enterprises it supports the flexible tie-in of isolated IT-solutions often found in production plants by using pre-defined connectors.

Conclusion

The joint project for the mini-brewery demonstrates how process control systems may be realized rapidly and simply by using well-tuned components from different manufacturers of automation technologies.

A unique, fully automated miniature brewery was developed, which, equipped with powerful hardware and software, sets standards for modern process control in the brewing industry.

To be able to use this for the training of students, the mini-brewery will be installed, after the trade fair, at the Technical University of Munich in Weihenstephan for investigation and training. ∎

The mini-brewery will be in Munich at the drinktec fair, from September 14th to September 19th, 2009, in hall A4 on stand 428/329 of Rockwell Automation/Endress+Hauser.
Once a day the complete brewing process may be observed in the form of a live demonstration at the operating terminals – also at the neighboring fair stands from ProLeiT (stand 624) and from the Technical University of Munich (stand 335).