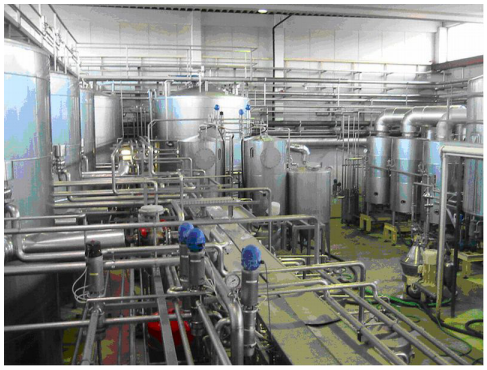
Seamless batch and product tracking with migration

Hardware migration project at the Leiber GmbH foodstuffs plant in Bramsche, Germany

Leiber GmbH is a renowned producer of foodstuffs and animal feeds and has over a period of years utilized the most modern technology for plant automation in order to consistently keep its production plants (including control components) in line with the most up-to-date technology. ProLeiT AG is supporting the company in taking these measures to improve plant safety and in particular to ensure seamless batch and product tracking in the foodstuffs plant in accordance with the IFS (International Food Standard).



Leiber GmbH foodstuffs plant

Leiber GmbH was founded in 1954 and still remains today a 100% family-owned company. In addition to high-quality animal feed products, the company has also been producing foodstuffs since 1994 in the form of flavor enhancers and nutritional supplements. The basis for the production of the foodstuffs is brewers' yeast procured from selected large breweries from which the yeast proteins, amino acids, carbohydrates and vitamins are extracted in their natural structure via a natural enzymatic disintegration procedure and processed into various end products. In relation to nutrition supplement products or products supporting the immune system such as for example beta glucan, the production process must be seamlessly documented and all raw materials must be capable of assignment right through to the end product. In order to satisfy these requirements in accordance with EU Regulation (General Food Law), Leiber GmbH decided on the GMP-compliant, modular Plant iT process control and batch system from ProLeiT AG when faced with the pending replacement of the existing Alfa Laval controller.

Aim of the migration project

The Leiber GmbH foodstuffs plant in Bramsche that was to be automated is a multi-route, multi-product plant for the manufacture of yeast products and was to be equipped with a modern batch control system. The Bramsche foodstuffs plant uses supplied yeast to produce semi-concentrates in the first production step, from which the end products are then extracted. SAP manufacture jobs exist both for the semi-concentrates and for the end products in the form of a weekly production plan.

The aim was to implement a system that could satisfy current statutory regulations in relation to good manufacturing practice and at the same time could be flexible enough to migrate integral parts of the installed hardware. The individual requirements were:

- Process control and monitoring based on process control technology standards with job-related and batch-related event logging and production data acquisition
- Recipe administration and processing using graphical user interfaces
- Job administration and processing, including multi-layer detailed views of current jobs via batch matrix and list
- Job and batch documentation of all data relevant to jobs and batches necessary for ensuring integrated batch tracking
- Materials management and warehouse administration with master data administration, inventory overviews, warehouse movements, job-related and batch-precise logging of all materials movements and inventories

A further demand on the ProLeiT process control system was job-related displaying of process-relevant parameters and characteristic data (checkpoints) for subsequent detailed evaluation of production processes. This display can take place automatically or in the form of manual inputs, which can be entered during an active job or subsequently (laboratory results) for completed jobs. Typical questions for an evaluation of displayed data are for example the pH value, dry substance content, the temperature of a product within a time period or a particular number of completed jobs. These process analyses are not only used for quality assurance, but also at the same time as the basis for future process optimizations.
In order to arrive at a solution to the above challenge, the Plant iT process control system from ProLeiT AG was used, which has client-server architecture based on the Microsoft platform. The modular Plant iT system architecture and the central database-supported configuration form the basis for almost unlimited scalability from the stand-alone system to the multi-server system.

INFO

Leiber
Excellence in Yeast

Company:	Leiber GmbH
Sector:	Food
Location:	Bramsche
Country:	Germany

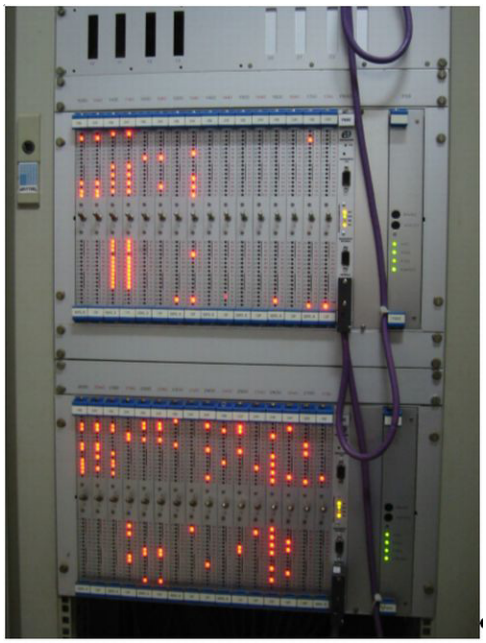
Plant iT modules

In addition to basic process control technology functions such as operator control and monitoring (Direct iT) or production data acquisition (Acquis iT), the system also has an innovative batch management system that

complies with the ISA S88 standard.
Plant Batch iT is a system for the specific requirements of batch-related processes taking into consideration aspects of materials management. The Configuration Client configuration tool parameterizes the technological plant structure. Specific parameters for plant sections and the necessary phases, operations, partial recipes and recipes are configured here. In this way, a plant model emerges for the creation of manufacturing guidelines and control recipes. The Batch iT server executes central coordination functions, and production guidelines (basic recipes) are created and administrated using the Plant Batch iT Manager. Plant Batch iT contains a materials management element with integrated batch tracking and thus ensures seamless documentation of all relevant process data and materials flows.
In the case of the Leiber GmbH foodstuffs plant, this means that even at the stage of the weighing of the incoming new yeast, each portion can be identified automatically in the batch system using the weight, supplier, delivery batch number and time of receipt (date). These unique identifiers for the incoming yeast raw material accompany the batch through the entire batch process at the foodstuffs plant and are supplemented with quality data from the laboratory at the various process steps. Even in the cases of mixing processes of different raw materials batches, combining additives (such as for example enzymes) and the autolysis process, etc., the knowledge of the proportional amounts of the individual raw materials within the end products and their direct correlation to the delivery batch number is retained. A particular challenge in relation to seamless tracking concerning the present migration project was the transition from a pure batch process (enzymatic autolysis) to a continuous preparation process for the yeast. With batch modeling with precise batch delineation that is closely coordinated with Leiber GmbH, it could be ensured that even with such a critical transition, the batch assignment was not lost in the Plant Batch iT material management.

Control layer / linking existing subsystems

Within the framework of the project, the existing SattCon200 controller from ABB (formerly Alfa Laval) was replaced with a SIMATIC S7-400 controller. In addition, a separator line was newly automated, whereby the control tasks of the outgoing SattCon5 controller were transferred to a SIMATIC S7-300. Communication between the two PLCs and to the redundant server and the operator stations takes place via Ethernet.
To reduce the project costs, the existing I/O modules of the field layer were to be retained and linked to the new process control system via Profibus DP-capable interfaces. In the case of the newer I/O modules from ABB, the installed ControlNet adapter (200 ACN) could be replaced with Profibus adapters of the 200 APB 12 type. A large proportion of the field signals was however based on SattCon I/O modules, to which ABB does not supply suitable adapters. A Swedish manufacturer was found for these modules with a special communications card (PBI) developed for this application. This meant that the existing CPU / communications card had to be replaced in the SattCon 35 rack with the PBI card. After connection of the Profibus adapter to the SIMATIC S7 400 hardware configuration, direct access could be gained to the I/O signals in the field.



SattCon 35 rack with PBI card

In addition to the two PLCs in the foodstuffs plant, two further SIMATIC S7-400 controllers of the feed plant were connected via Ethernet. The communication between the foodstuffs plant and the feed plant serve to exchange the truck receipt data (raw materials, supplier, vehicle license plant, weighing ID, weight and receipt location) of a jointly used truck-weighing machine and to exchange further binary and analog data (pumps and valve controllers, enquiry of tank level status etc.). Due to the newly installed integrated Ethernet network across the entire plant, it was possible to realize comprehensive signal exchange.

Batch control

The foodstuffs plant placed high demands on the batch control as the manufacturing process contains both batch elements and continuous elements. Therefore, the outgoing materials are presented batch by batch in the form of individual batches in autolysis containers and the individual batches are begun at deferred time intervals. A quasi-continuous process results from the batch perspective. Commencement of the job takes place automatically at a point in time defined by production planning (date/time). In this way a job start can also take place when the operating personnel are not present.
As each job passes through various plant sections in the course of the making of a product and at the same time several jobs can be active simultaneously in the same plant, precisely coordinated timing is necessary. Plant sections need to be reserved within a job for the time of their use and must then be released again so that they are available for the following job. In the event that there are times when plant sections are not reserved for an active job, it must be possible, for example, to start a CIP job (Cleaning In Place) in a flexible way.

The above time-optimized production processes make just as high demands on batch tracking, as more and more jobs can become active in the plant at the same time. Required technical process changes to the source-target combinations during the active job (i.e. the source and target containers from which raw materials are taken from and to which manufactured products are added) mean that the user program must execute the movements in a correspondingly flexible way.

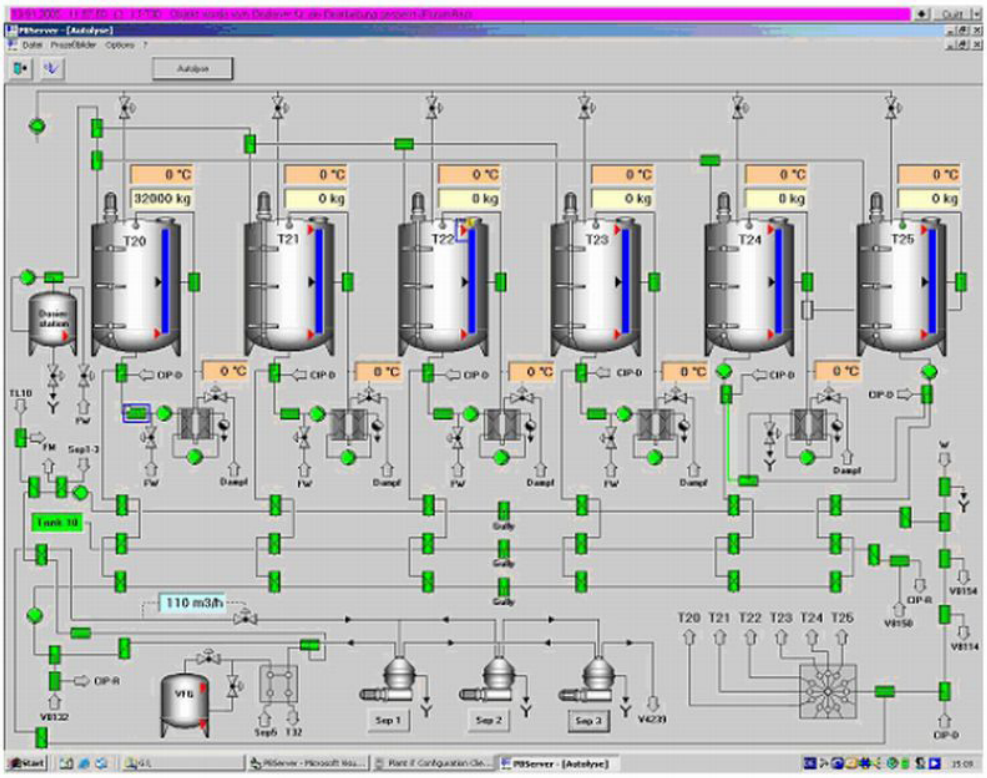
The entire batch controlling takes place within the Plant iT process control system via the central tool, the Batch iT Manager that essentially provides the following functions:

- Creation and administration of recipes including version management and transfer of parts lists from superimposed systems such as for example SAP R/3
- Creation and processing of jobs via a central job list
- Monitoring and controlling of active jobs via the batch matrix and the batch lists

- Monitoring and controlling of all resources relevant to processes in relation to their status and availability for the processing of jobs
- Creation and archiving of batch logs (electronic batch recording)
- Access to current and archived batch logs or export for further processing (Microsoft Excel)

Conclusion

It is on the record that utilization of the Plant iT process control and batch system from ProLeiT AG enabled mapping of the complex manufacturing process of the Leiber GmbH foodstuffs plant and realization of seamless batch tracking even with a flowing transition of a batch process to a continuous process. This ensures the vital prerequisite for permanent quality assurance at Leiber GmbH.



Autolysis process picture