application profile

New automation concept

Controller retrofit for mineral springs smoothes the path to the integrated quality assurance

Like many other mineral springs in the 1980s, the Bad Dürrheim company, Mineralbrunnen GmbH+Co. Heilbrunnen, has established a syrup room. The controller concept using a Texas Instruments TI 555 was adequate for the small number of mixed products produced then. Today, the product range is significantly larger with the consequence that these systems have long reached their limits. The hardware situation is even more severe. If this controller hardware that is becoming old fails, it is scarcely possible to obtain a replacement nowadays.

With a modern controller concept, both problems of the syrup room, namely the capacity and the hardware problem, could be solved with a single step. The example of the Bad Dürrheimer Mineralbrunnen shows how this is possible, simply and economically.

Customer satisfaction based on highest quality.

In only five days, the obsolescent controller was replaced with a Siemens SIMATIC S7 and the software updated to the highest level with the ProLeiT Batch iT developed specially for batch mixing processes. In this short time, the existing switchgear cabinet was completely emptied and reinstalled. The interface for the automation retrofit was the terminal strip in the switchgear cabinet on which the wiring of the field devices is made. The completely open ProLeiT Batch iT was installed on a server provided by the plant operator.

This retrofit gives Bad Dürrheimer Mineralbrunnen decisive advantages in the daily production, such as:

- Fault tolerance for the hardware
- Modern flexible recipe management
- Each supply of material is stored unambiguously in the system
- Rearrangements of containers are tracked
- Complete documentation for batch tracking
- Residual quantity management with automatic recipe change
- Consistent system structure

The use of open and independent hardware of the latest generation ensures the highest degree of plant availability for the plant operator: this so immediately establishes the fault tolerance as highest priority. Even for serious defects, a replacement can be installed within maximum 12 hours. In addition, because neither hardware nor software is locked, the complete system is also available without problem for the maintenance personnel.

Clean interaction of the software modules

The consistent strategy of the Bad Dürrheimer Mineralbrunnen for the monitoring of all significant quality parameters necessitated, in particular, a renewal of the automation and process data acquisition. The first modernization step was made using the Plant Acquis iT system solution from the ProLeiT Plant iT system family popular for filling engineering applications. This system summarizes, processes and displays the process, production, operating and machine data to provide a plant-wide information management. This data is recorded and can be searched not only time-related, but also batch-, shift- or order-related.

A further module from the Plant iT system family, ProLeiT Batch iT as high-performance system for the recipe and order management, has now been implemented for the modernization of the syrup room. The plant, process and recipe modeling is performed, when required, in accordance with the stringent ISA S88 conditions or using derived simplified models. The processing of bills-of-materials, which can also be transferred from external systems, in conjunction with process descriptions, simplifies the processing of a large number of different recipes. The complete recording and logging of all order and batch data provides security for the proof of verification. The integrated materials management provides, in addition to the storage management, a complete data basis for the tracking of batches. The central engineering environment with shared data and a consistent parameterization user interface for all Plant iT system modules is the significant advantage for a fast integration in the various production areas. In this environment it is possible to access all system and configuration data using a tree structure similar to Windows® Explorer. It provides not only user administration, message profiles, pools of graphical elements

The quality of mixed beverages is decided in the syrup room. ProLeiT's Plant Batch iT performs the acquisition and exact recipe-based control of all material flows – from the raw material acceptance through to the filling.

for the visualization, etc., but also the complete plant structure through to individual actuators and sensors that can be parameterized using arbitrarily cascadable location keys. Because even complete sequences within the process can be largely parameterized, the programming is replaced mainly by just parameterization.

Materials management with complete transparency

Batch tracking and an immediate response to deviations from recipe specifications are today the key quantities for quality. Batch iT means no production step remains unlogged or left to chance. The acquisition of all material flows, from the provision of material through to the filling, forms the basis for this comprehensive transparency. To ensure that this is also possible with the highest flexibility in the syrup room, wireless terminals with hand scanners connected using a WLAN network have been installed at Bad Dürrheimer Mineralbrunnen. This allows all raw materials in their associated containers to be recorded when they are delivered. The scanner reads all product- and vendor-related data stored in a barcode directly from the raw material container.

If, for example, new raw material containers are brought to an appropriate location, the operator reports them to the control system using the wireless hand scanner. The control system uniquely assigns the raw material containers to a metering or storage location. This system also guarantees that relocations of raw material containers are recorded correctly,

because also here the scanning of the barcode always ensures a unique identification of the raw material with the resulting preclusion of incorrect batches caused by mistakes. Consequently, all the data is always anchored in the batch documentation in real-time. This so automatically establishes an integrated batch tracing capability.

Defined mixing sequence

The original concept allowed only the individual components of a recipe to be mixed using fixed specifications. This is no longer acceptable today, because the modern product design requires ever more different mixtures. ProLeiT Batch iT stores for each individual component and each recipe flexibly-defined parameters for each product. Such parameters include

- not only definitions for an exact metering sequence, but also
- the definition of speed ramps for the pumps in order to take account of the viscosity of the base material, or
- filling-level-dependent feeding, mixing and emptying speeds for the pumps

and many other production parameters. This allows the reliable and fast response to new product requirements or changed mixing proportions.

Bad Dürrheimer Mineralbrunnen uses ProLeiT software modules to pursue the continuous monitoring of all significant quality parameters starting with at the water house, including the syrup room, through to the filling plants.

Remaining quantity management with automatic recipe conversion

When a mixing order is created, the system automatically checks the availability of all raw materials required for this recipe in their individual containers. If the required quantity does not suffice in one of the containers at the storage

locations in the production, the system uses the materials management module to automatically check the availability of this raw material in the warehouse. If this raw material is present in the warehouse, the system supervisor can decide whether the plant should run with a normal approach even though one of the containers must be replaced during the production.

If the system supervisor decides, possibly because of the non-availability of a raw material component, to adapt the complete recipe to the remaining stock for this one raw material, the control system fetches this remaining quantity as first component for the new approach. This ensures that the actually available quantity of this raw material is exactly recorded as basis for the other recipe components at the start of the new approach. This is necessary because the theoretically managed quantity can differ from the actually delivered quantity. The system in a recipe correction then automatically updates all other recipe components proportional to the metered actual value of the residual component.

Added value thanks to an integrated solution

The ProLeiT system has already proved itself at many companies for the beverage production. This system with its open hardware structure and the Open Source software offers all options for extensions. Now that Bad Dürrheimer Mineralbrunnen has been using the ProLeiT Plant Acquis iT system for the quality-based monitoring of the filling plant for more than six years, the integration of the syrup room and the pending integration of the water house now realizes a complete monitoring using ProLeiT Plant iT. The data from the water house, the syrup room and the filling plant provides all relevant information on a standardized platform for an optimized production execution with the complete automation and the production data acquisition.

This central data storage with long-term archiving allows a comprehensive quality assurance and transparency. A signaling and report system from the order management through to the weak-point analyses is integrated automatically. This gives the operator, shift and production manager, laboratory, electrical workshop and the company management at every position a hierarchical password-protected online access to information from the running production, and this in real-time.