

## **Network PC and natural sour dough**

### Automatisation technology for dough production in a large bakery

No computer can take the place of a baker's competence and experience. It is nevertheless an undisputed fact that a modern large bakery can no longer cope without computer-controlled dough preparation, large baking lines and automatic packing machines. ECKELMANN AG develops PC-based control systems for automatic weighing, dosing and mixing of bulk goods and liquids. A particularly powerful system was produced for dough production at a bakery belonging to Harry-Brot GmbH at their Magdeburg location.



### Automation in the bread roll bakery

Since 1997, Harry-Brot has been establishing supermarket bakeries in more than 3,000 foodstuffs markets in which loaves and bread rolls are finish-baked. For delivery to these baking stations, the first biscuit bakery specialising in bread rolls, baguettes and baguette rolls launched production in Magdeburg in 1999. A second installation was commissioned last year to boost capacity. From the automation technology point of view, such an installation for bread roll production represents a complex and extensive task. From inbound delivery and raw materials storage through weighing, dosing and mixing, long-term fermentation and the oven to packing and outbound delivery, a large amount of data relevant to production has to be prepared, administered and coordinated.

ECKELMANN AG develops automation solutions to optimise individual production areas or process control systems for their global data processing integration. In both cases, particular value is placed on ergonomic operation and visualisation and smooth interfacing to the higher control level of the commercial IT. For the installation in Magdeburg, the weighing and dosing control and also control of the subsequent kneaders, which supply dough mixtures to production, were realised in the dough production area. To this end, the proven standard in-house system E•MIC-NT was adapted exactly to the specific requirements of the customer Harry-Brot GmbH and

its systems. The current system, including its predecessors, has been operating successfully in more than 700 installations throughout the world up to now.

### Dough mixtures on the production line

To cover the needs of the baking lines, the testing bakery and sour dough production, the system must produce up to 64 mixtures of diverse formulations per hour and must transfer them to the kneader stations. To reliably realise this high rate, flour and ingredient dosing are distributed over a total of three conveyor lines. First of all, flour from four silos and special flour from two additional silos are emptied via dosing scales, in a time-optimised fashion, into two of the conveyor lines, where they also pass through sieves. Via a third conveyor line, ingredients are provided, also in a time-optimised fashion, from six further silos via two dosing scales.

All three lines convey their volumes into the input receptacles of the individual baking lines and their kneaders. Via corresponding flow measuring facilities, warm, mains and cold water as well as fat and yeast are dosed directly into the kneaders, supplying the dough mixture with the necessary liquid components and adjusting the dough's temperature via their mixing ratios. Subsequent manual admixture of special additives also takes place directly at the kneader. With the aforementioned rate, a total of less than one minute is left over for formulation-dependent filling of the kneaders. The weighing and dosing control finally transfers the program data, also depending on the formulation, to the kneader control.



### Above-average demands on the control technology

The system described places high demands on the accuracy and reliability of the control technology employed. Only in this way is it possible to achieve unchanging quality of the baked products and, at the same time, to do justice to the extensive legal verification regulations in conformity with the product liability law and the QM regulations.

The application even poses above-average demands in terms of speed. To some extent, different products are processed on the baking lines. Irregular and changing demand also arises in the testing bakery and sour dough production. Therefore, the weighing and dosing control has to provide mixtures in different orders. It is nevertheless necessary to keep to a parameter-definable order of priorities. Thus, for example, the demands of the baking lines have priority over sour dough production or the testing bakery.

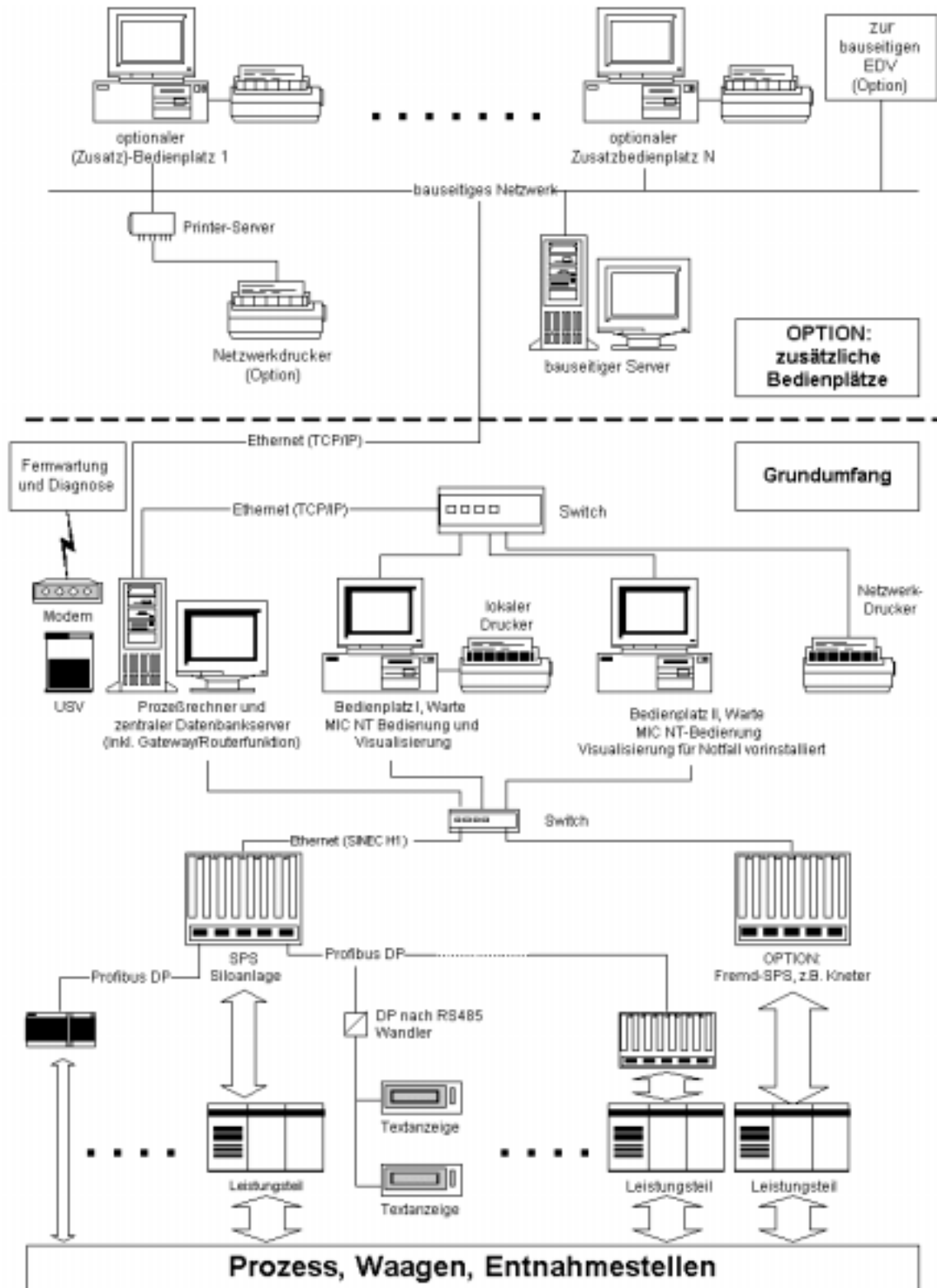
Therefore, the weighing and dosing control must transform the production planning inputs into a time-ordered job list for dough production and must optimally distribute its implementation over the existing weighing, dosing and conveying capacities. The control system's performance therefore crucially influences the overall production system's productivity.

### Solution on the basis of industrial standards

Central weighing and dosing control is realised by the ECKELMANN E•MIC-NT dosing and mixing control system which, in this case, was designed in a network architecture as a client/server solution, for the first time under the WINDOWS 2000 Professional operating system. The central process computer and database server is a high-end PC which features RIAD 5 hard disk mirroring and a redundant power supply to ensure optimum failsafe operation. The process and control programs of the E•MIC-NT run on this server PC. Among other things, they serve the following functions:

- Job processing as specified by the production planning department
- Control of weighing, dosing and conveying operations by communication with the subordinate control level on the basis of a Simatic S7-400 type PLC
- Master control of the individual baking lines' kneaders by transfer of the kneading programs for each dough mixture
- Acquisition, preparation, presentation and long-term archiving of all relevant operation, production and quality data

The following illustration provides an overview of the overall system.



Besides the server, two workstations were set up in the system control room. These two operator control PCs contain the E•MIC-NT user interface. Graphical system visualisation with the standard software package WinCC is also installed on one of the PCs. Overall networking of the control system is realised with Industrial Ethernet (SINEC H1).

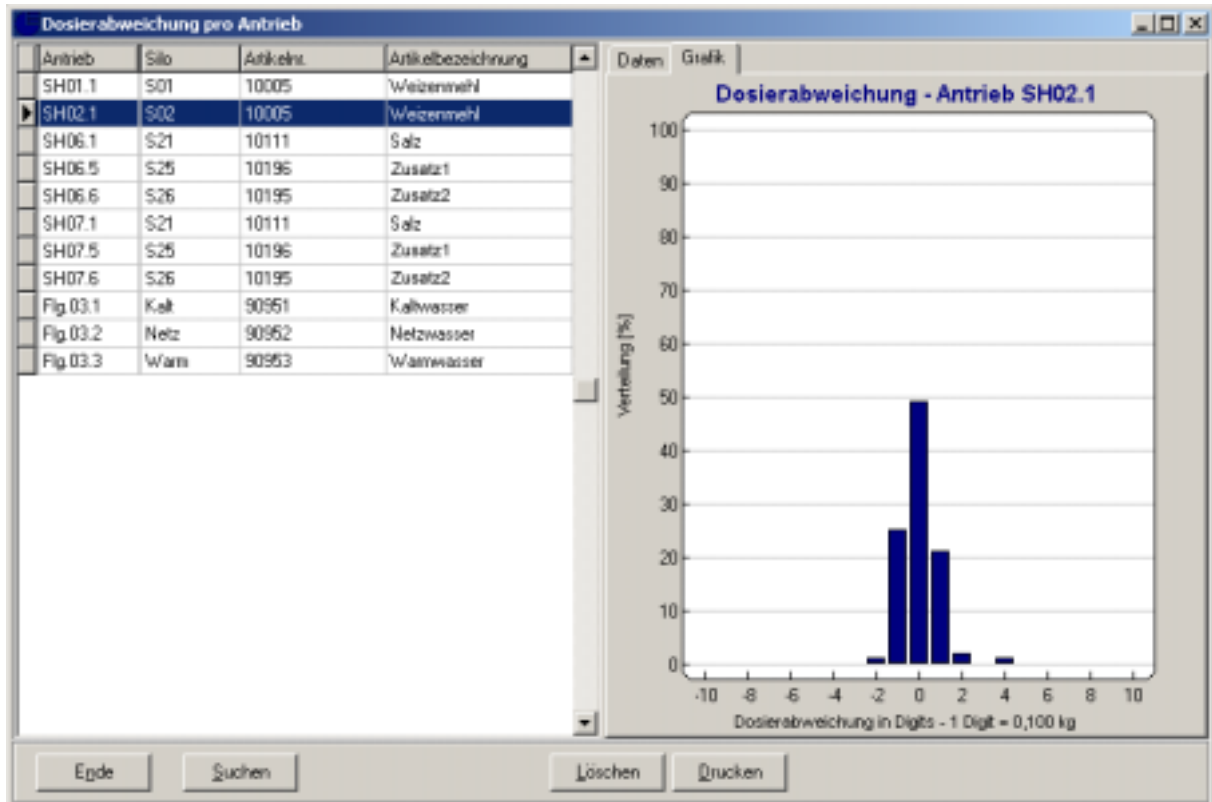


Fig.: The E•MIC-NT user interface

Plain-language displays controlled by the control system are installed at all removal points. These inform operators about the status and the events of each removal point and prompt operators to make formula-dependent manual additions.

#### Automation competence that is typical of the sector

The described system in Magdeburg was commissioned in December 2001. Following the installation or modernisation of dough production installations in the past years, ECKELMANN has now been able to successfully complete the ninth project for Harry-Brot GmbH. Good and close cooperation between the Harry-Brot project coordinators and the ECKELMANN engineers resulted in an automation



solution in which the price advantages of standard technology were optimally combined with the features of tailored solutions.

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