

Radical overhaul of the grinding machine series

PC technology supports new approach for knife grinding

food industry was presented with the first CNC-controlled grinding and polishing machine, the B 600. The core of the new machine is formed by an Industrial PC from Beckhoff, the TwinCAT NC I automation software for CNC functionality and digital Bus Terminals with a Profibus Bus Coupler as distributed I/O station. A knife changer with magazine enables automatic processing of up to eight knives.

The end for templates – displays and keyboards take over

“Activate the control, select the knife type and press start,” this is how Peter Heine summarizes the advantages for the user. Previously, the user had to rely on a fully automatic, template-controlled system for guiding the knives to generate linear or circular tracks. Today he simply selects one of the knife types stored in the PC. “The old system did produce good quality,” reports the chief designer, “but set-up times and reproducibility had reached their performance limits.”

Another disadvantage: The expensive grinding templates became obsolete when the knife was changed. “With the increasing variety of cutter knives, our customers wanted a more advanced system”, the grinding expert recalls. The experts from Knecht responded accordingly. Over the last few years, intense efforts were made to adapt the machine concept to CNC.

→ Replacing a conventional, fully automatic template-controlled system for blade grinding with a Compact PC saves expensive grinding templates, reduces set-up times, achieves better reproducibility and offers the option of remote maintenance.



It is a well known problem in the butcher trade: A correctly grinded knife increases the quality of the cutter products, while imperfect grinding not only has a negative influence on the emulsification or mixing of the raw meat materials, but also significantly reduces the service life of the knives. The company Knecht GmbH, based in Bergatreute, Germany, is serving this market niche of grinding and polishing cutter knives for nearly 45 years. The construction of machines for complicated grinding operations is also part of the company tradition.

In May 2001, developers from Knecht made a strong appearance at the IFFA in Frankfurt, one of the largest trade fairs for meat industry investment goods. The

With the Beckhoff system, the CNC concept of the new B 600 machine generation was launched. “Our main aim,” said Peter Heine, “was the realization of an advanced, clearly user-oriented control concept.” The main requirements can be summarized as follows: First of all, the machine set-up times had to be reduced. Other aims were better reproducibility and thus improved quality. The system had to be user-friendly and easily comprehensible and produce the optimum blade shape and blade profile for each knife type with maximum precision. “What we had in mind,” reports Heine, “was an open control system, which on the one hand was suitable for adaptation to new grinding tasks and on the other hand offered

the user simple operation." Beckhoff offered such a system. The developers from Knecht chose the CP7130 Control Panel with add-on PC and integrated keyboard extension as the operating station. Mounted on an adjustable supporting arm, the system offers optimum ergonomics for the operator in each machine installation situation. The advantage of this add-on PC solution is that the fully-fledged PC is mounted at the rear of the Control Panel, thus saving valuable space at the machine. TwinCAT NC I (NC interpolation) based on the Windows NT operating system is used as automation software in the production machines from Knecht. Via the axis interpolation CNC functionality, TwinCAT NC I controls the knife support through set value generation and position control. For communication purposes, the machine developers selected the Profibus, since the valve group integrated in the control system is equipped with a Profibus interface.

Complex control enables intuitive operation

The different knife shapes and sizes are stored on the hard disk of the PC. The intuitively simple operation means that the operator merely has to select the knife type on the TFT display of the Control Panel. Once the machine is started, the knife changer positions the first of eight knives from the magazine in the right position

count of through appropriate additional cutting contours in the description of the geometry. This description is stored in XML files in a structured way. It is processed via a second XML file containing the stored processing steps and the actual condition of the knife. The curves for the respective machining and feeding steps are calculated and stored in tables. The NC calls up the specifications from the tables and moves along the paths with the knife. If a wear limit is violated, the computer does not activate the grinding process.

An important difference compared with the old template technique is that the PC can handle a complete signal processing. "Such digital positioning enables high precision and dynamics to be achieved with minimum expenditure," says chief designer Peter Heine. Unlike a simple three-phase drive, TwinCAT can also deal with fine interpolation and position control without additional cost."

Remote maintenance via modem

For Peter Heine, a big advantage of this solution lies in the option of remote maintenance and fault diagnostics. "The program PC-Anywhere enables us to log in to our customers' machines worldwide via modem," as Heine describes the advanced approach. The grinding experts can thus not only immediately detect ma-

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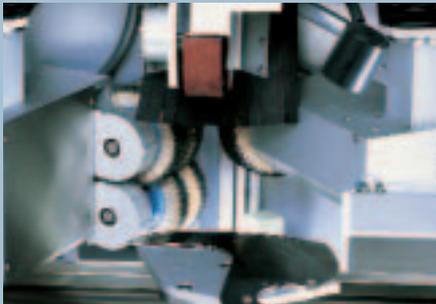
Grinding



Polishing



Deburring



Control Panel

via vacuum. Sensors check the position and transmit their signals to the control via a Bus Terminal system. Only then does the knife travel to the grinding device which grinds, polishes or deburrs it according to the selected program. A special feature is the detection of the degree of knife wear. This is achieved via the current rise of the grinding belt drive when contact is made. This position is then compared with the set position of a new knife stored in the computer. The operator is thus not only immediately informed about the condition of the knife, the TwinCAT control also immediately adapts the grinding paths to the changed contours of the worn knife. The changes in contour depending on wear are taken ac-

chine or operator errors, but also maintain the software and install new updates. Peter Heine: "This has drastically reduced our service expenses and made most journeys to our customers superfluous."