

High Performance Boxer: Stylish Technology Prevents Bottleneck



At a German diet products manufacturing company, a boxer from the DIENST company processes up to 130 one liter packages from three heat-sealing packaging machines per minute. This machine concept exceeds performance limits of a conventional programmable logic controller (PLC) due to its processing speed. That is why B&R used a PCC for this application, which is capable of multitasking - B&R SYSTEM 2005 with industrial computing functionalities.

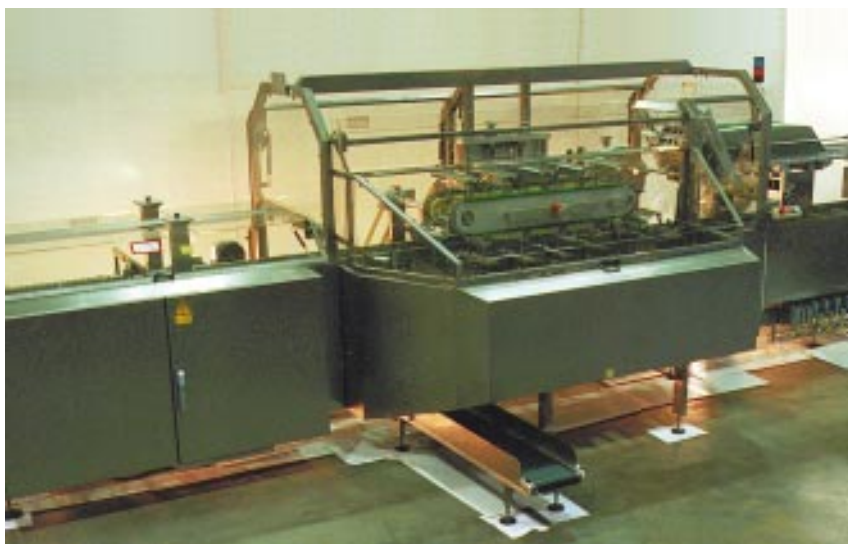
The system, which is suitable for three shift operations, is convincing both technically and because it only has a nine month pay-back period. The fact that the diet products manufacturer decided on a new packing method meant that he also needed new machine technology. Only

a completely automatic solution could be considered due to the sheer volume of the product that is manufactured. As a result, DIENST Specialized Systems GmbH. in Hochheim drew up a custom-made design, in which the three Hassia heat-sealing packaging machines could work

together with one boxer. The boxer comprises of the following machine function units: feeder conveyor belt, timing unit, collapsible box assembler, product boxer, sealer and exit conveyor belt. Next, the 360 gram packages are taken from the control scales and placed on a common conveyor belt at correct time intervals. From here, they continue until they reach the boxer. Due to the fact that the heat-sealing packaging machines fill the drinking pow-

der at 40 cycles per minute, the powder packager needs to process 120 packages per minute; in extreme cases, up to 130. The boxer is moved forward by an indexing table, and the incoming packages are placed in a cassette. The packages are moved into a rotary indexing table, via three feeder conveyor belts, which are each speed controlled with a frequency converter. The packages are then placed into the cassettes at approximately 4 times the acceleration of gravity.

High Operating Speed Requires PCC Power. Due to the speed of the individual function units, the highly dynamic machines must not contain any components of inferior quality. The machine design also deserves tribute with respect to controller technology. This could not have been achieved using a run-of-the-mill controller. Therefore, the DIENST company decided to opt for B&R SYSTEM 2005 PCC. This decision was made mainly due to the multitasking capabilities of the B&R PCC. The various controller operations in the system are defined as individual tasks with different execution times within the PCC. In practice, this means that the



**High Performance
Boxer (Dienst)**

controller guarantees the appropriate execution times for time critical procedures, independent of the other tasks to be executed.

Indexing Table Controllers.

Above all, the indexing table controller is time critical. The two axes positioning module NC150 is used. Using this module, highly dynamic positioning of the indexing table can take place, whereby one complete axis rotation must occur every 65 milliseconds (approx.). It is just as important to have oscillation-free positioning by the axis controller as it is to have synchronization with the lower cassettes. If you set the cassette speed to 26 meters per minute, and take into account the cycle time for standard controllers for middle sized projects is 30 meters per second, you get a reaction distance of up to 1.5 cm. Generally this fluctuates further due to unstable cycle times. Therefore the position cannot be calculated and so can only lead to deformation or even destruction of the product.

Multitasking Guarantees Fast Response Times. B&R SYSTEM 2005 sees to it that there is a secure cycle time of three msec. This rules out the possibility of imprecise processing. These times can also be freely assigned parameters per task class. It is not only important to

have the exact timing in the cassette, but also to have regulated feeding of the products to the indexing table. The packages from the heat-sealing packaging machines are placed at various distances on the feeder conveyor belt. The packages are separated just before the indexing table onto three conveyor belts, driven by asynchronous motors, and are pushed into the indexing table at exactly the right time.

High Level Programming Languages and Mathematical Functions. The speeds for the three frequency converters must be calculated again and again dynamically and according to the process involved. The mathematical operations necessary for this make programming languages of conventional controllers seem restricted and confusing. The high level programming language PL2000 in B&R PCC systems control these tasks clearly, quickly and without extensive programming overheads. All basic arithmetic operations including trigonometric and logarithmic functions can be programmed in the form of mathematical expressions as usual. This is also necessary when converting a given number of cycles into indexing frequency and for the speed of the cassette. This leads to maximum user-friendliness, because he

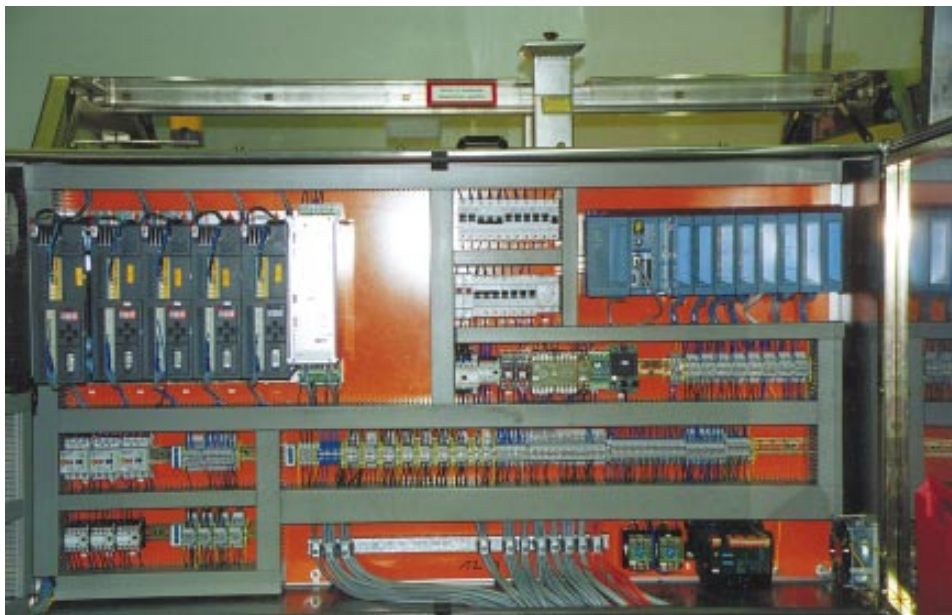
can communicate with the machine via comprehensive parameters (e.g.: number of cycles). The controller takes over any necessary conversions. The project designer is also supported by an extensive on-line help system. Everything you need to ensure time saving work is available here, including case examples.

Visualization Using PANELWARE. DIENST used modular PANELWARE operator control panels to enter machine parameters, the number of cycles, and to display the actual status, and errors which may occur. Because of its modular construction, the control panel is perfectly suited to the ever changing needs of the customer with regards to MMI. Operators are highly satisfied due to the individual design of the operator panel including the integration of, for example, an emergency stop switch. The fact that the program desktop is easy to learn and makes it easy to convert a project design into a functional machine contributed to the decision by DIENST to use this operating panel.

Shorter Start Up Times Using Performance Start Up Tools. Starting up a machine must also be carried out optimally as the project design times become shorter and

shorter. So that this can be achieved, effective start up tools are needed to test a program. The B&R SYSTEM 2005 PCC enables the use of performance tools including a process variables debugger and single step debugging. With these tools, the shortest start up times can be achieved.

Summary. Mr. Katzwinkel (B.Eng.), who is responsible for machine programming at DIENST reports on controller problems: 'Machines like these require industrial PCC performance. That also includes real-time performance, which would otherwise not be possible at a comparable hardware cost. B&R controllers enable programming with high level languages which therefore leads to shorter programming time. This is a very important point for us. Adapting machines to make them customer-specific is a question of existence for a company like DIENST.'



**Control Cabinet
with B&R 2005**