

A tasty Solution

What do nougat chocolates or other sweets have to do with electronic cam profiles, servo axes and an industrial PC with touch screen? No idea? Here is the answer:

The company Sollich from Bad Salzlfen, Germany, is one of the leading manufacturers of machines and installations for the candy and sweets industry. They have taken a process patented in 1984 and completely redesigned it based on the most modern engineering and automation technology. The result: The CANDYMASTER™, a machine for producing candies with or without filling, toffees and butterscotch candy using the so-called one-shot technology.

The concept: Continuous process

CANDYMASTER® basically is composed of a conveyor belt carrying the forms which is constantly in motion, the moulding unit, a cooling tunnel and a conveyor belt for transport of the finished products.

The core of the machine is the moulding unit. Here, precisely controlled pistons inject the raw material into the corresponding forms, exactly the way it is intended. Up to three components simultaneously into one form - one shot! The whole process is executed up to 40 times adjacent to each other on the conveyor belt for the forms. With a cycle time of less than one second, that makes for a lot of sweets!

All of the machine's movements are generated using a total of five electric and hydraulic servo drives, with the help of cam profile and synchronization

functions. This results in continuous, harmonic movements. After all, an electronic cam profile is still a cam profile, only much more accurate and with no mechanical abrasion whatsoever!

This way, the maximum possible speed can be utilized with maximum precision, while at the same time going easy on the expensive mechanical parts.

The conveyor belt for the forms, with continuously adjustable speed, represents the master axis. All other movements are coordinated with it. A phase shift can be set for all synchronized machine parts (axes) while the process is running. For example, the coupled movement of the moulding unit can be dynamically adjusted relative to the speed of the conveyor belt for the forms.

These features allow optimal online adjustment to all kinds of raw and finished products within no time.

Operation via fully graphical touch system

The machine is operated completely by interaction with an industrial PC with TFT flat screen using a touch screen or keyboard. The user interface is very convenient and controlled largely by graphical elements. This helps to avoid confusion. The main attraction: the user can generate arbitrary product geometries via the touch screen. That means, he can basically "draw" the chocolate by hand. The IPC automatically generates the corresponding motion profiles from this "drawing" and immediately relays them to the controller. All the

The chocolates can be "drawn" via touch screen.



machine parameters and recipe data can be stored in a recipe management system and on a memory card. This permits easy switching of the machine to various products.

The integration of the machine into a PPC system via Ethernet is of course possible, because of the technologies being used.

The automation solution

Sollich decided to cooperate with B&R Industrie Elektronik GmbH in order to implement this sophisticated solution.

The automation solution from B&R integrates a PROVIT 5000 industrial PC user interface, a B&R 2005 PCC, which handles control tasks, and a positioning system based on NC154 axis controllers. The latter are operated as parallel processors on the backplane bus of the B&R System 2005. The NC154 positioning system calculates electronic profiles using few variable parameters and mechanically oriented constants. The intelligent servo axis controller NC154 uses this data to generate a rigid positioning structure of reference values for the individual hydraulic and electromotoric servo axes. The individual movements can be coordinated as a unit using a configurable cam profile generator.

NC154 modules can be operated as interface for three analog servo axes in a group comprised of up to five modules with three real and three virtual axes each. Axis controllers featuring CAN or SERCOS interfaces with 6 axes each are also possible. The implementation of this complex machine was decisively simplified by the firmware of the axis controller and the open-ended overall concept.

Product and machine parameters, as

well as product geometry, are entered via the PROVIT 5000 IPC, featuring a 10.4" TFT-color display with resistive touch technology. The PROVIT 5000 IPC distinguishes itself by its modular construction, scalable processor and memory performance and the possibility to combine it with various display technologies. The optimal adaptability of the display to the machine was the main criterium for Sollich. By using fully graphical, self-created symbolism and a B&R visualization unit, machine layouts could be created quickly and easily.

The B&R 2005 controller has control properties that can be implemented using

ware configuration, the B&R 2005 system is a modular unit with backplane bus module, power supply module, high performance CPU and standard PLC modules as well as technology processors such as the axis controller NC154.

The Automation Studio™ from B&R is available for software creation, commissioning and testing. This software tool supports programming in compliance with IEC1131-3, but also high level language programming in Automation Basic or Ansi-C. Furthermore, it features technology functions for axis commissioning, regulator configuration and cam profile implementation. In addition, there is an extensive soft-



The CANDYMASTER® plant produces more than 40 chocolates per second.

IEC1131-3 consistent programming languages, Automation Basic or Ansi-C. In addition, it also has the properties of a communication processor. As such, it can exchange data with other systems via serial interfaces, CAN bus, Profibus or Ethernet-TCP/IP. The operating system on the CPU runs in a real-time multitasking kernel, which assures exact repetition accuracy in configurable cycle times of minimum 1 ms. Regarding hard-

ware library for everything from drum sequencers to self-optimizing temperature regulators.

By the way, the company Sollich created all the software required on it's own, with partial support from the B&R technical office in their region.

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