A concentric setup instead of a linear installation, is how Gima S.p.A., an Italian machinebuilder, could reduce the space requirements for the production of coffee capsules dramatically: only four square meters footprint are required. The strength of this “little” unit is the production of small batches - and it is as fast as a high volume machine. The key to success is compact motion control and weighing technology from one source.

Whether coffee, tea or cocoa – hot drinks made from capsules or pads are the latest trend. Coffee capsules are especially popular in Germany: An estimated two billion portions are consumed there each year. One of the companies behind this success is the Italian manufacturer Gima S.p.A. headquartered in Bologna. The company specializes in automated packaging solutions for tea, coffee, beverages, foods such as dairy and convenience products, as well as cosmetics and toiletries. The plant manufacturer has many years of experience in capsule filling, for example, for coffee and other soluble products, and in packaging the completed capsules in folding cartons and/or flow packs. Combined with a complete solution from Siemens for the control and automation process, Gima has now successfully launched its latest machine for capsule production on the market.

The task: Quick adaptation to the production requirements

A compact and low-price machine designed for small to medium production quantities, but which has the same technical characteristics as its “big sister,” the series 595, was the development goal for the new series 590 filling machine.

The machine not only fills a gap in the mid-market segment but is also appreciated by so-called “big end-users” for testing new mixtures and products and for its high filling capacity of 100 to 200 capsules per minute.
Despite its small size, it achieves the same performance as its larger relative, but with space savings of up to 70%. The 590 is a modular machine with a rotary flow function and can be personalized to meet individual production requirements. Its mechanical modules are quick and easy to replace, thus ensuring fast, efficient maintenance. Its compact design, with a footprint of little more than four square meters, means the machine can be moved without the need for disassembly. This substantially shortens installation times.

The solution: Powerful, but space-saving components

The intelligence of the compact filling machine is based on Siemens technology. Gima made a conscious choice for a solution from Siemens. In the words of Davide Azzolini, responsible for electrical design at Gima Spa: “We decided to use the Siemens solution to build the 590 for a number of reasons. Above all, we benefited from the power and flexibility of the Simotion D controller, which provides a single automation environment for axis control, drives, and the associated motors. This enabled us to take a modular approach to configuring the software. This modularity is also reflected in the mechanical structure of the 590. Moreover, it turned out to be very simple to configure the optional modules and different formats that the machine can manage from the operator panel.”

The compactness of this solution entailed more confined spaces in the switchboards and on the machine. The SIMATIC ET 200SP distributed I/O system was chosen for the task. Thanks to its scalable design, the I/O station can be geared exactly to the requirements on site. Its compact size means it can easily be fitted into tight spaces in the control cabinet. That also applies to the weighing system used at Gima: The SIWAREX WP321 is the weighing module for SIMATIC ET 200SP and, with its module width of only 15mm, it is one of the smallest electronic weighing systems in the world. Compact, but also fast and flexible were the requirements for the components used. “The aspect we most notice,” Azzolini adds “is the availability of high-performance products, such as the Simotion D445-2 controller, the SINAMICS S120 drives, and motors with a Drive-CliQ interface, SIMATIC ET200SP distributed input/outputs, and the PC panels with the Windows Embedded operating system.

All the equipment is interlinked via Profinet, while a telecontrol unit sets up a secure outbound SSL VPN connection to enable full access to the entire system via the Internet. Thanks to this full Profinet architecture, it is possible to perform exact and extensive diagnostics of all the devices in the network with the added benefit of being able to access some system data. This is done using the web server integrated into all the components. Another decisive factor is the Safety Integrated management via the field bus, which also has the added benefit of saving space in the control cabinet and reducing cabling. It is a fully integrated solution that is completely in line with the compactness requirements of the machine.

The benefit: Compact and universal system technology from on hand

Gima has put its faith in the innovativeness of the integrated motion control technology from Siemens, which is able to ensure synchronized control of the 23 brushless servo drives in extremely tight spaces. The axis control manages all machine functions. This includes control of the axes, dosing of the product, alarm functions, statistics and recipes, as well as temperature control, to name just a few.

Miniature design load cells have also been used for weighing. The SIWAREX WL260 SP-S AE is a small scale platform load cell made of aluminum and is suitable for the smallest load ranges from 0.3 kg to 3 kg.
SIWAREX WP321

- Uniform structure and universal communication through the integration in I/O SIMATIC ET 200
- Parameterization of the scale via operator panel, CPU or PC
- Flexible configuration possibilities in SIMATIC TIA Portal resp. SIMATIC Step 7
- High resolution of up to +/- 2 million parts
- 100/120 Hz measuring rate (efficient 50/60 Hz interference frequency suppression)
- Scale internal control of freely definable limit values
- Easy commissioning via software SIWATOOL without SIMATIC knowledge
- Direct use in ATEX zone 2 possible
- „Ready for use“ sample application

All this ensures high levels of precision and performance. It is the first machine with rotary product flow and, thanks to this characteristic, it saves space while matching the performance of its big sister.

„In addition to the state-of-the-art systems,“ Azzolini concludes, „we have also found in Siemens a dedicated structure specializing in the packaging sector and a company able to understand the needs and requirements of the sector and provide competent answers and prompt and direct technical support.“ One machine, one single automation system, and a partnership between two leading companies for thousands of capsules in the distinctive Gima signature style.

Overview SIMOTION

SIMOTION is recommended for all machines that perform motion control tasks, the focus being on simple and flexible solutions. The modular design makes it suitable for modular machine concepts – that is to say multiple different machine variants can be implemented with just a few modules, as long as each module has built-in intelligence.

The offered technology functions as well as the integrated PLC-functionality of SIMOTION cover all functions which are usually required for packaging applications. Profibus or Profinet ensures fast communication within the application and with superposed control levels.

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