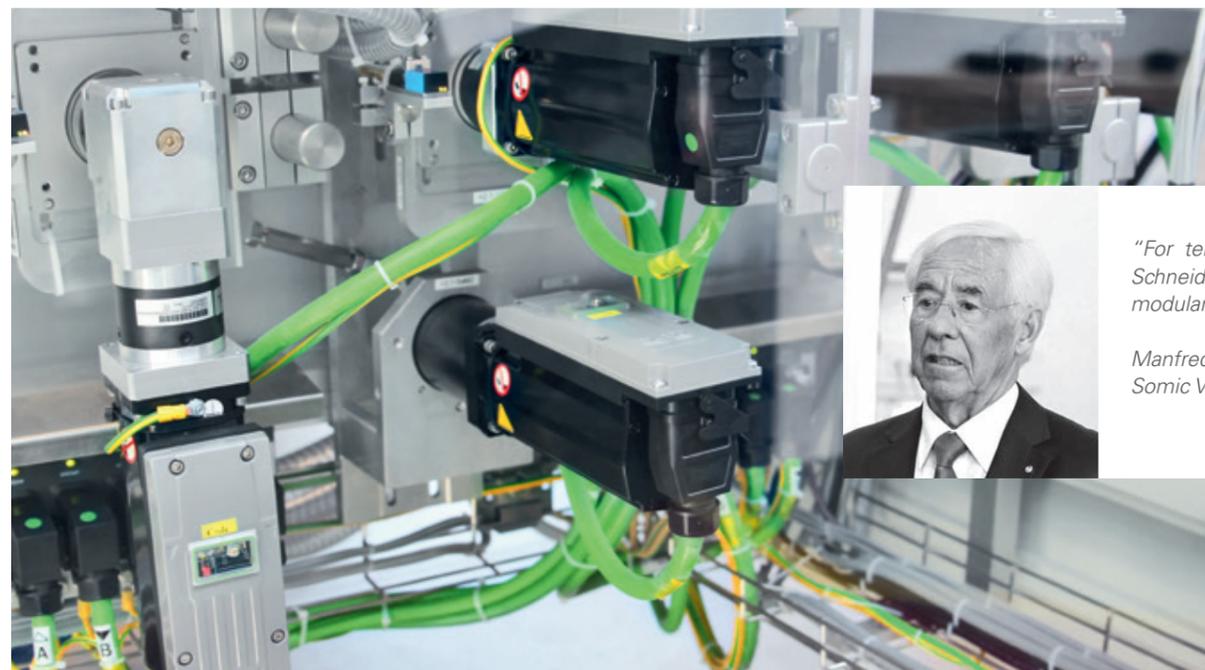


Tapping the potential of servo drives

Somic, an innovative specialist in end-of-line packaging machines, has long advocated the use of integrated servo drives. The benefits produced by these drives go far beyond the ability to create machines with modular mechanical, electronics, and software functions. The company has also come up with some interesting ways to tap into even greater potential benefits using integrated drives from Schneider Electric.



"For ten years now, integrated servo drives from Schneider Electric have formed the backbone of our modular systems and our engineering design."

Manfred Bonetsmüller, managing partner of Somic Verpackungsmaschinen, Amerang

One of the toughest challenges for builders of packaging machines remains the fact that designing these machines is a highly individualized process: short product life cycles in consumer markets and the special role that packaging plays in the marketing process translate into a constant flow of new packaging types. Packaging machine builders need to incorporate all of these design ideas into the technical production process, while at the same time reducing the time needed for development and commissioning. The goal of machine building is therefore to bring serial machine production and custom machine building as far as possible under a single umbrella.

Consistent modularization – the first step

Manfred Bonetsmüller, Somic's founder and managing director, has mastered this balancing act with his company. Early on in the emerging field of mechatronics, which

arose with the growth of servo technology, Bonetsmüller saw an answer to the challenges he faced: "Somic developed a modular system that divides end-of-line packaging machines into 'functional environments'. Products need to be collected, grouped, and packed into cartons. The 424 cartoner series, for example, comprises three, four, or five functional groups, which are further subdivided into categories such as machine frame, collection, cartoning, sealing, and lidding." This modular structure provides appropriate performance for every machine size and output level, and for any number of repetitions.

Bonetsmüller has worked with Schneider Electric for 14 years, having recognized Schneider Electric as a company that closely shares his vision of the mechatronics approach and the principle of modular machine construction as it relates to automation.

The critical technology in this process is the PacDrive automation solution and the principle of integrated servo drives implemented in the Lexium 62 ILM series.

The drive electronics and the servomotor together form a single unit, and a flexible networking concept connects all of the drives with the central shared power supply and the controller. The networking concept includes distribution boxes and double-ended, pluggable hybrid cables, combining power supply and Sercos® data communication in a single cable.

The Sercos bus comes from the PacDrive controller and is led into the shared power supply together with the power supply for the drives and the motor feedback signal through a connection module. This module has a single hybrid cable that runs from the control cabinet to the machine's first distribution box. From that point, the cable branches off to all integrated servo drives in tree and line structures or using a daisy-chain topology.

Continuing the modularization concept in software

Somic uses the Lexium 62 ILM to integrate the complete servo drive technology in every mechatronic machine module. It can be inserted into the automation solution for an individually configured machine with only one cable per plug for every module, without any effect on the contents of the control cabinet. The cabinet continues to contain only the central PacDrive controller for

all machine functions and the central power supply for the machine's entire servo drive solution. This concept not only maximizes modularization, it is also highly energy-efficient: All of a module's drives are integrated through coupling in the servo solution's bus. The decentralized design also eliminates the need for climate control within the control cabinet.

Approximately seven years ago, Somic completed the next step toward full software modularization, with its implementation of Schneider Electric's template-based software concept. This offers an alternative to traditional programming with Application Function Blocks (AFBs), which is also possible with PacDrive, and allows designers to rapidly integrate machine functions: A master program, with components for machine operating modes, diagnostics, and handling of exceptions, creates a framework for assembling the machine program using preprogrammed and tested IEC-61131-3-compliant software modules. Each component can be customized and enhanced with company-specific know-how.

Thanks to this modular software approach, machine modules can now form a single closed unit, not only for mechanics and electronics, but also for software. This allows Somic to create standardized machine programs that include every conceivable machine configuration for a given model. When the unit is commissioned, the controller performs a hardware scan via the Sercos bus, recording all of the modules active in the machine and activating the appropriate program parts.



Image 1: Mechatronic modules with complete modular servo drive technology on rollable assembly and transport frames



Image 2: Modular end-of-line packaging machine: Functionality is enhanced through customized configuration of mechatronic units within the machine frame.

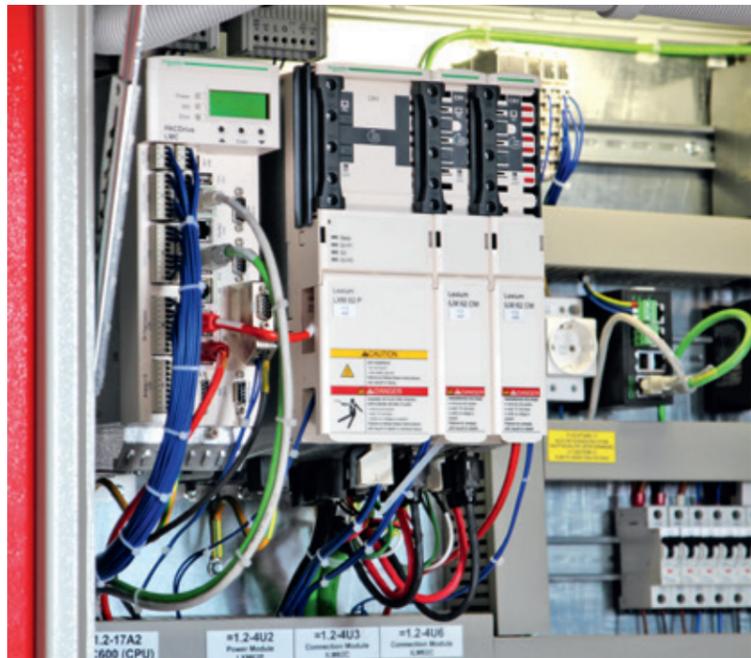


Image 3: The heart of each machine: the PacDrive controller (left), the shared power supply for the machine's entire drive solution on the right next to the controller, and (in this case) two modules for connecting the networked servo drives to the controller and the shared power supply

Servo technology replaces asynchronous motors

With this idea, the potential of an integrated servo drive solution would seem to be exhausted – but not for Somic: Somicon, its wholly-owned subsidiary for conveyor solutions in packaging applications, is now also equipping its conveyor solutions with servo technology. Instead of classical drive solutions based on asynchronous motors (AC motors) and variable frequency drives, Somicon is designing modular conveyor belt units with complete on-board drive solutions based on integrated Lexium 62 ILM servo drives – just like Somic's machine modules. Here also, a cable with a plug connection forms each module's interface to the complete solution.

According to Bonetsmüller, a cost analysis of the complete solution (drive components, engineering, integration in the complete solution) refutes the suspicion that servo technology would make conveyor units more expensive: "Our studies have shown that overall costs are more or less comparable to those of solutions using traditional AC motor-based solutions. At the same time, however, they provide the advantages of fully integrated system communication and diagnostics, complete software integration into the machine program, and thus ultimately much greater flexibility." Servo drives also meet energy efficiency class IE3 requirements. This makes conveyor solutions with servo drives a viable solution for meeting future energy efficiency mandates.

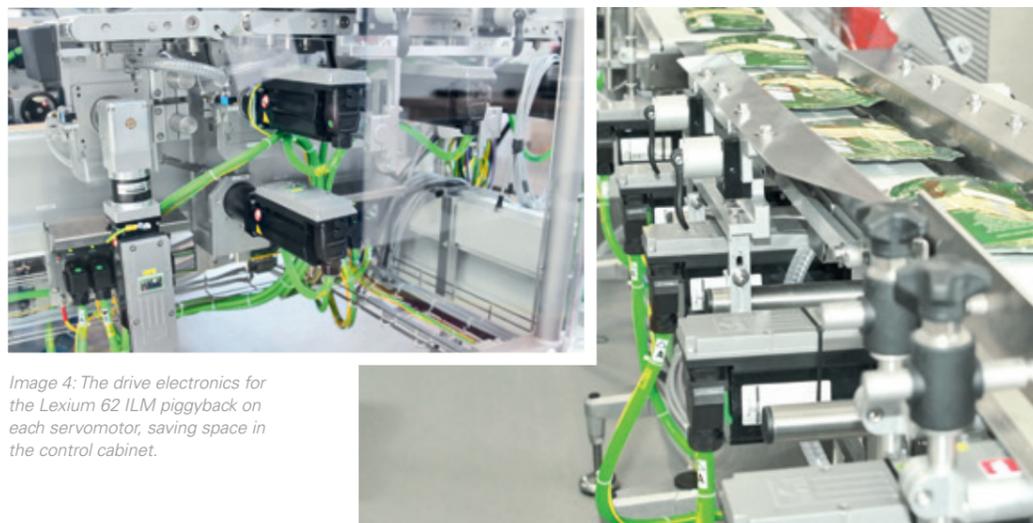


Image 4: The drive electronics for the Lexium 62 ILM piggyback on each servomotor, saving space in the control cabinet.

Image 5: Innovative approach: Conveyor system with servo technology instead of asynchronous motors controlled by variable frequency drives: full integration into the motion control unit's communication and software solution, engineering advantages, and much greater flexibility offset higher product costs on the purchasing side.

Somic itself has provided input for further innovations based on the Lexium 62 ILM technology. "In the future", predicts Bonetsmüller, "we will significantly increase the number of servo drives installed in each machine. This applies above all for small servos with a 40 mm flange width. We want to incorporate these motors in our machine solution based on Lexium 62 ILM."

Remote motor electronics allow greater range of motors

Schneider Electric responded to this idea with a new spin on the concept of integrated drives: Three servo drives with a structure similar to the electronics of a Lexium 62 ILM were combined into a single assembly with an IP67 safety standard, including all connections and heat sinks. These can be locally mounted on the machine chassis and seamlessly integrated into the Lexium 62 ILM networking concept. This version, designated as the Lexium 62 ILD,

opens the door to incorporating all PacDrive-compatible servo motors (including the Lexium SHS stainless steel series) for cabinet-free automation. It also allows the control of asynchronous motors with servo drives, even for the local Lexium 62 version.

Bonetsmüller sees two important aspects to including smaller servo motors in the decentralized drive solution: Firstly, drives mounted on mobile module parts can be as small as possible: reducing the moved mass positively influences the achievable dynamic range and also directly influences machine speed. Secondly, the Lexium 62 ILD is a further step toward greater energy efficiency. As Bonetsmüller notes, "Because the Lexium 62 ILD allows us to use the entire motor range, we can more precisely match the motor output to each drive solution's individual load."



Image 6: Somic provided the idea, and Schneider Electric took up the challenge: In the future, the Lexium 62 ILM integrated servo drive concept will be supplemented with fully compatible, remote IP67 units for multiple motors, opening up the possibility of decentralized, cabinet-free automation for the entire range of PacDrive-compatible servo motors (and asynchronous motors as well!).