When dancers hardly dance, for winders, this always speaks in favor of the dynamic behavior and quality of the associated closed-loop control. The French manufacturer Monomatic performs this on nonstop unwinders directly in the drive system and, for the first time, with SINAMICS S120. The basis for this are predefined “Drive Control Blocks”, which interconnect with each other graphically for individual winding applications, can easily be parameterized and quickly optimized. The result is highest productivity and quality.

For almost six decades, Monomatic, a company of NSC Group, is developing and producing tailor-made unwinders and winders for processing paper, cardboards, laminate, foil, fleece, fibers and other products. A focal point are nonstop unwinders for packaging cardboards normally used on printing, coating and laminating lines. They achieve production speeds as high as 700 m/min with butted joint-to-joint connection and web buffer or more than 1,000 m/min with overlapping connection, for web widths of up to currently 3.20 m and roll diameters of up to 2.20 m. Monomatic exports more than 90 % of its products and, also for this reason, prefers control and drive technology from Siemens, thus benefiting from the resources of a capable, worldwide-present equipper renowned in its own target markets.

First unwinder with new drive generation

Monomatic also trusts in Siemens for the development of the new MS VT nonstop zero-speed unwinder, which stands out for its new, patented mechanism for manufacturing butted joint-to-joint connections with oblique section and is designed for production speeds of up to 600 m/min, with roll diameters as large as 1,850 mm and web widths as large as 850 mm. The basic variant includes spindles with single-sided bearings, motorized roll loading directly from the floor, two unwinding directions and a goods buffer with precise electronic web tension control. For the first time, the modular SINAMICS S120 motion control drive system was used for the MS VT. Monomatic has developed the new SINAMICS solution largely by itself, after a one-week basic training session. A primary requirement was to transfer the proven winding functionality, if possible unchanged, to the new drive system. According to the programmers, this could be realized very quickly with the help of the Starter software tool and its integrated Drive Control Chart (DCC) configuring tool.
DCC – drive configuring using “drag and drop”

SINAMICS DCC allows the open- and closed-loop control concept to be exactly simulated on the PC: by simple graphical interconnection of predefined, multi-instance control, computing and logic blocks, so-called Drive Control Blocks (DCBs), from a comprehensive block library. This allowed the Monomatic diameter computation routine familiar from the predecessor system and proven in many applications, proven PID structures for dancers and also all other open- and closed-loop control tasks to be simulated and quickly optimized without any functionality restrictions. For this purpose, the system also provided tailored diagnostic tools, such as “Trace” and “Control panel”. The SIMATIC S7-300 sequence control system has been retained.

Unwinding directly in the drive

The closed-loop control is realized directly in the CU320 control unit of the SINAMICS drive system, which further reduces the load on the PLC. Via a fast, digital system interface (Drive-CliQ), the control unit is connected with all other components of the drive system, such as Active Line Module (ALM, controlled infeed/recovery), Motor Modules, 1PH7 induction servomotors and Sensor Modules (SMC30), which results in extremely short control cycle times. The resulting higher control quality is especially advantageous for low unwinding speeds and larger roll diameters, i. e., large moments of inertia, where previously, under some circumstances, vibration problems could occur. The high stability of the closed-loop control made itself apparent with the minimum dancer movements, in particular when the motors run torque-controlled. The more constant the unwinder controls the tension of the unwound web, the less a line realized in this way needs to be corrected. It can be ramped up faster and also run with somewhat higher speed and register accuracy.

Lower cost and more compact

The new solution, including the supervisory SIMATIC controller, costs less than the previous system. To this must be added a saving effect provided by the energy recovery via the SINAMICS Active Line Module (ALM) when the winder is braked. In addition, the modular SINAMICS system is somewhat more compact. This allowed, for the first time, the switchgear cabinet to be installed directly at the unwinder and not, as was sometimes the case, at distances as far as 30 m away. This in turn saves time-consuming and error-prone wiring during commissioning, and the unwinders/winders can be fully assembled and tested at the manufacturer’s site. Possible faults can thus be detected earlier, delays after production start can be minimized and deliveries can be realized much faster in the required quality.

Step by step: innovation goes on

From the machine constructor’s view- point, the conversion to the new SINAMICS S120 drive system was realized very successfully. In parallel, a new HMI system based on SIMATIC WinCC flexible was also introduced with the SIMATIC MP277 multi panel, which guides both fitters and operators through the process. Now, the company wants to gain practical experience with the new developments, followed by further development steps, e. g. winders with PLC- or drive-integrated safety functionality (Safety Integrated).