Some moments, like that view of the sea during last summer’s holidays or that encounter with the herd of cows in the mountain pasture, are forgotten much too soon. But instead of keeping such snapshots just in a photo album or hanging them on the wall, it is now possible to print them on napkins. Printing quality at a good price/performance ratio, even for small print runs for invitation cards or photo books, for instance, has been a reality in digital printing for quite some time. Until now, however, napkins have been excluded from this progress. The absorbent paper did not seem to be suitable for printing with ink-jet printers.

First-class printing quality
With the world’s first digital napkin printing machine for advertising, high-quality custom napkins in small print runs will soon become a reality. The new machine prints napkins according to the customer’s specifications over the full area, in photo

Memories captured on pulp

A cutting, printing, and folding machine manufacturer from Monheim, a German town on the eastern bank of the river Rhine, has for the first time managed to integrate an ink-jet printer into a napkin printing machine. Siemens’ integrated automation and drive technology, together with the TIA Portal engineering framework, contributed significantly to this success.

Napkin printing machine with Simotion and TIA Portal
quality, and, of course, using food-safe inks. The DigiPlus 430S, a machine designed and developed by SDF in Monheim, rolls, prints, and cuts in only one pass. A Canon Océ ink-jet printer has been integrated into the machine.

The machine conveys the paper, which is coated by spraying on liquid and then dried before the actual printing process, over large rolls. The coating prepares the surface by making it denser and smoother to prevent the ink from running without compromising the napkin’s absorptive capacity. After printing, the napkins obtain their characteristic embossing on the margin and are cut, folded, and transferred to a packaging machine in stacks of 10 to 150 pieces.

Complex configuration of the leading axis

“Unlike with flexographic printing machines, a foreign system is integrated into the machine with the printer,” explains Günther Kluge, electrical design manager at SDF. “The printer constitutes the leading axis that all the other axes need to follow with angular synchronism and maximum precision. This inevitably introduces disturbance values into the system that must be filtered out in order to maintain the exact same repeating pattern.”

The Simotion D445-2 motion control system is the centerpiece of the drive technology. The Simotion functionality is directly integrated into the control unit of the Sinamics S120 drive system. This makes the overall system, consisting of control and drive, considerably more compact and particularly fast reacting. The printer’s high speed places extremely high demands on speed synchronization and the angular accuracy of the axis unit. Even minute deviations would result in the images being positioned off the exact center of the napkin or the embossed margin shifting – and either would be noticed immediately. “With this machine, we were able to learn about the new qualities of Simotion and considerably extend our experience with this system,” states Kluge.

Integrated automation

Using the Simatic S7-1500 and project planning in TIA Portal were also new for SDF. “TIA Portal and the Simatic S7-1500 became interesting for us when the engineering system for Simotion was integrated with Scout Version 4.4,” says Kluge.

A higher-level fail-safe Simatic S7-1500F controller is responsible for the safety functions and processes distributed signals. “The fact that safety functions are integrated into the control system saves time and effort both in wiring and project planning, as the same programming language is used for standard and safety functions,” explains Kluge. The display on the CPU was very helpful during commissioning, as it could be used to read out the statuses of all the connected Profinet bus members, specifically, the inputs and outputs of the distributed ET 200SP. A few small switch boxes within the machine are enough for these compact I/O devices. According to Kluge, the Simatic KP8F Key Panels with fail-safe inputs are particularly useful, because all emergency-stop switches are wired over them. The freely configurable buttons clearly indicate the machine status with five freely selectable colors.

The machine can be controlled and monitored via a high-resolution Simatic TP1500 Comfort Panel. “The control interfaces must be largely self-explanatory,” says Kluge. “This reduces personnel expenses and increases competitiveness for our customers.” He adds that the storage capacity and the reader integrated into the Simatic Comfort Panel help satisfy these customer requirements.

Integration increases efficiency

Project planning in TIA Portal impressed Kluge, especially the symbolic programming. “If the motor or load change, the limit values can also be changed without us having to rewrite the modules,” he says. “Once the standards have been generated, their long-term usability makes us independent from inevitable mechanical changes, thus protecting our investments and, in the end, those of our customers.” According to the electrical design manager, the integration of automation and drive technology significantly increases transparency and engineering efficiency.

“TIA Portal and Simatic S7-1500 became interesting for us when Scout was integrated into the engineering framework as well – at exactly the right time, from our point of view.”

Günther Kluge, Electrical Design Manager, SDF