TwinCAT Vision and TwinCAT IoT optimize multilayer label production

Faster and more flexible digital printing with reduced press proof waste

In just a few years, Danish machine builder Refine Finishing has created a secure position among the world's leading suppliers of machines that convert digitally printed labels. Equipped with PC-based control from Beckhoff, in particular TwinCAT Vision and TwinCAT IoT, the machines raise the benchmark for speed, precision and sustainability to a new level. Now even the smallest batches of multilayer labels can be produced on demand.

All mechanical and job-related settings are configured via the CP2916 Control Panel or imported directly from the MES/ERP via order management.

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Established in 2013 as Werosys, Refine Finishing now has a majority shareholder in the form of Nilpeter, a highly competent player in the field of digital printing. Over 95% of the machines are exported, in particular to customers in the pharmaceutical, chemical and food industries. Refine founder and CTO Bjarke Gerdes-Nielsen states: "We have equipped our new machines with the best options available in terms of automation and software and are proving that Industrie 4.0 can now be achieved in the printing industry – and offers great benefits." In terms of applying this to label finishing, the focus is on reducing previously high printing and finishing costs, as well as the enormous amount of paper required for press proofing (test print run for quality control when setting up a job).

In general, the printing industry is currently undergoing extensive transformation. Small and short-run orders need to be profitable, made to a high quality and produced on schedule despite short order times – as print-on-demand jobs. This requires customized production that can be adapted to process orders placed at short notice. Rapidly adapting to these requirements is only possible using more and more software in the machines and the greatest possible degree

of automation. A positive side effect is that less storage capacity is required and extensive planning that can often take months is no longer necessary.

Machine benefits from high software functionality

Designed for a Dutch customer, Refine's first finishing machine with built-in vision technology is a compact machine made of stainless steel. The distinguished design is simple and elegant with no handles, levers or buttons in sight. The sleek appearance is possible because the settings for the various label rollers are conveniently configured via a CP2916 multi-touch Control Panel from Beckhoff or via web browser and tablet. And justifiably so: The machine is designed to perform all finishing processes for digitally printed multilayer labels – as quickly, precisely and with as little press proof waste as possible.

According to Refine, the fully automatic machine optimizes the workflow for customers with the latest technology, highest speed and precision. Where customers once had to order a series of for example 1 million labels for six months, they can now divide the series into several, smaller portions, and just plan a few weeks ahead. The delivery time for these types of orders can often be reduced

to 24 hours. Fast changeovers, fast start-up and small order sizes shorten the warehousing period and create great flexibility and less waste. Gerdes-Nielsen says: "We can get our machines up and running in just a few hours rather than several days. In addition, the machine typically reduces paper waste by a factor of 100 – from approx. 100 m to around 1 m – during proofing, i.e., when setting up a job. In small production series, it is crucial that the waste percentage remains low. The machine must be competitive on all parameters and help make label production considerably easier, faster and more resource-saving."

Since the usual manual settings via levers and handles are configured automatically by the control system, user errors are eliminated and a more uniform process is created. "Operating the machine no longer depends on the individual skills of the operator. You cannot force anything that the machine has not been programmed to do, and you cannot overload the machine. Because everything is digitized, we can monitor and help with the control via remote access, online and in real-time. It has created great value – especially in the COVID-19 era," highlights Bjarke Gerdes-Nielsen.

### TwinCAT Vision and IoT provide core functionality

The challenge with multilayer labels is positioning the individual sheets exactly on top of each other. Print marks on the paper rolls indicate how the layers should be positioned. The controller uses a GigE vision camera that has been seamlessly integrated into the control system via TwinCAT Vision to correct and verify that all layers are placed correctly from the start. All job management takes place via PC-based control in a software environment, which facilitates programming, linking data in Microsoft Azure™ via TwinCAT IoT and remotely accessing the machines. Object-oriented programming has also reduced the need for manual programming. "We can tailor our machines completely to the needs of our customers," says Gerdes-Nielsen, "and that flexibility is crucial to our success."

Refine, formerly Werosys, has been collaborating with Beckhoff since it was founded, as Gerdes-Nielsen confirms: "I started Refine Finishing because I wanted to develop machines based on intelligent software and the IoT. The Beckhoff automation philosophy goes hand in hand with our own, and we received the best support we could ask for in every respect. PC-based control with XFC technology is incredibly accurate compared to other control systems. For example, the tolerance threshold for positioning the multilayer labels is very low, i.e., the maximum tolerance deviation is 1/10 mm. The Beckhoff system can achieve this and also meet the high speed requirements. Our machine can process 200 m of paper per minute, while conventional machines can handle 50 m/min with similar applications."

The wide and universally integrable range of components available for PC-based control offers additional advantages. In the finishing machine, the C6017 ultra-compact Industrial PC acts as a powerful control computer that communicates with the I/O level, which is made up of EtherCAT Terminals, and the drive technology – EL7031-0030 stepper motor terminals and AX5000 and AX8000 Servo Drives with AM8000 servomotors – with high real-time capability. Machine safety is also integrated directly into the standard control technology with TwinSAFE. Gerdes-Nielsen summarizes: "With an innovative single-source supplier like Beckhoff, we are equipped for the future. We can quickly integrate various new products and protocols into our modular machines. That flexibility is a huge advantage."

Harnessing the power of Beckhoff automation technology, Refine raises the benchmark for label finishing machines to a new level in terms of efficiency and flexibility.
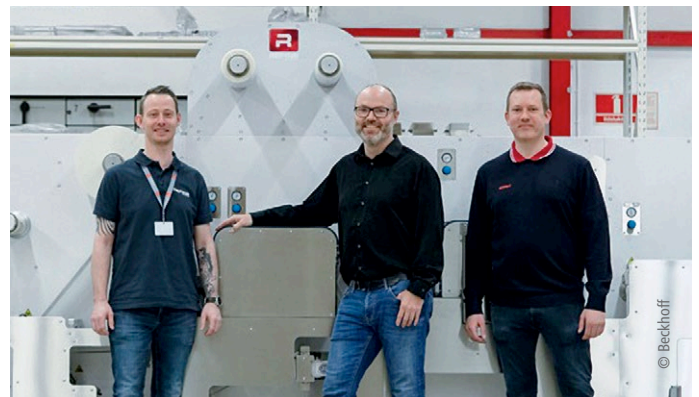
Erik Behrend, Machine Engineer, and Bjarke Gerdes Nielsen, founder and CTO, both from Refine Finishing, and Rasmus Jensen, Support Engineer from Beckhoff Denmark (from left to right), are pleased with the long-term and successful collaboration.
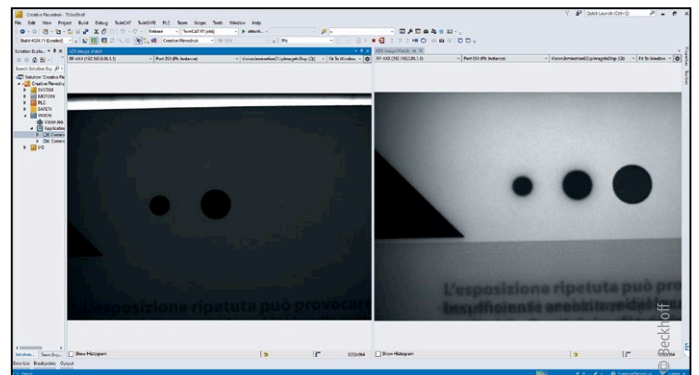
TwinCAT Vision combined with a GigE vision camera ensures there is a significant reduction in press proof waste when setting up and starting new jobs on Refine machines.

More information:
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