Custom labeling

Printing gets personal

With Heidelberg's innovative digital printing machine, even small to midsized companies are now able to offer custom printing of three-dimensional objects. Whether it's a box of muesli, a soccer ball or a running shoe – the compact Jetmaster Dimension can print on nearly any object quickly, economically and in high quality. For its precise movement sequences and perfectly synchronized components, the Jetmaster relies on B&R technology.

Customers of the MyMuesli shop in Heidelberg, Germany, carry their personal muesli-mix home in a custom package they get to design and print on-site.

Photo © Heidelberg

Christmas, weddings, birthdays. They could all be so wonderful – if it weren't for the torturous task of finding the perfect gift. No wonder, then, that big-name sporting goods companies, Internet platforms and online retailers have been so successful offering custom-printed items such as greeting cards and t-shirts. Until now, these personalized novelties have been limited to flat or "two-and-a-half-dimensional" objects that can be printed using conventional presses. For three-dimensional objects, personalization has traditionally been cost-prohibitive – except in quantities of around ten and up (pad printing) or mass-produced items like beverages or cosmetics. Heidelberger Druckmaschinen AG (Heidelberg for short) is now opening up this coveted service for batch sizes as small as one.

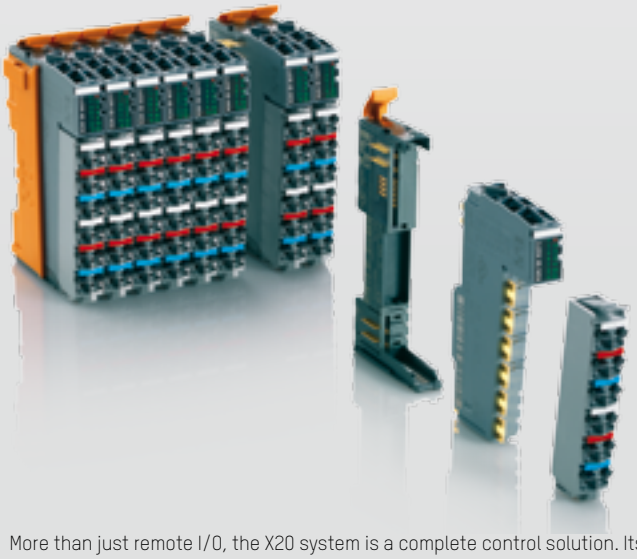
Custom-printed 3D objects

"We collaborated closely with B&R and other leading technology partners to create the Jetmaster Dimension," says Heidelberg's head of advance development, Dr. Bernard Beier. "For the first

Holger Leonhardt
Team Leader - 4D Technology, Heidelberg

"B&R's technology is 100% series production friendly and fits perfectly into our production process."

ACOPOS drives draw their software from a central location on the B&R controller without requiring any manual intervention. Increased precision allows for larger quantities, shorter production cycles and better quality.



More than just remote I/O, the X20 system is a complete control solution. Its modular components can be arranged in whatever configuration is needed for the application at hand.

time, this standard machine can print custom text and photorealistic images on virtually any 3D object with minimal adaptation. And, it can do it quickly and in high quality. Now, even smaller enterprises can win new customers by offering personalized products at attractive prices." A number of companies have already taken advantage of the opportunity. MyMuesli recently set up a Jetmaster Dimension 250 at its store in Heidelberg, Germany. On top of creating their own personal muesli-mix, customers can now also choose the images, color and text that go on the package.

Single-pass printing

"If you look closely, you can see that the objects we're printing on – like MyMuesli's paper cups – often deviate from their ideal shapes," reveals Beier. "That's why each object is measured individually prior to printing." After that, an atmospheric plasma coating is applied to prepare the surface. One of the reasons the printer is so fast is that it uses a 6-color single-pass print head. Unlike conventional inkjet printing, this process deposits all the ink for each dot in the image in a single pass. An ultraviolet LED lamp immediately dries (or "pins") each dot to prevent unwanted mixing. Once complete, another ultraviolet lamp cures the finished image so that the product is immediately ready for use.

The Jetmaster Dimension 250 features a four-axis robot that positions and rotates the object for each of the fixed processing stages – measurement, surface preparation, printing and curing. To achieve good quality at a resolution of 300 dots per inch, these positioning movements have a tolerance of less than 20 micrometers. That means the robot axes need to be controlled with absolute precision and perfectly synchronized with the printhead controller.

Leading technology partners on board

"We knew from the start that we wanted to team up with partners who are specialists in their fields," says Beier. "The idea is that this approach gets us access to the most advanced technology and ensures that projects run quickly. And we were right – it only took us ten months to get from the first CAD drawing to a working prototype."

Going into the project, the requirements for the drive and control technology demanded not only extreme path precision, but also an automation system open and flexible enough to incorporate the various subsystems into single, homogeneous unit. "We were looking for automation technology that offered the functions we needed," explains Holger Leonhardt, who headed Heidelberg's 4D technology team. "But at the same time, it also had to be suitable for series production, which many of the controllers on the market are not."

For Leonhardt, a controller is only suitable for series production if it can be commissioned without having to go through the development environment and if it can be configured at runtime. Also, a source control system must be in place for the control software, and it must be possible to update the controller and connected automation components automatically.

100% series production friendly: B&R technology

The first exploratory discussions at drupa 2012 were soon followed by more intensive talks with B&R experts. "We were surprised to see that B&R met 75% of our requirements right from the outset," notes Leonhardt. "That was impressive."

One of B&R's most convincing arguments was its suitability for series production. The Automation Studio engineering environment features built-in source control. As Heidelberg required, software can be loaded onto B&R controllers via USB drives or via an Ethernet connection. Each time the system is started up, the controller checks a definable location for updates and installs them automatically.

ACOPOS drives also draw their software from a central location on the B&R controller without requiring any manual intervention. "Since the control software can be configured at runtime and the wiring lists can be manipulated using the tools provided, we're able to use the same software project for multiple machine configurations," says Leonhardt. "B&R's technology is 100% series production friendly and fits perfectly into our production process."

Technological convergence made easy

With that, B&R was a sure thing for Heidelberg. Its expansive portfolio of fully scalable products played a pivotal role in helping the company keep pace with its ambitious development schedule for the Jetmaster Dimension. The openness and flexibility of B&R's solution made it easy to bring together new and diverse technologies to be handled by a single controller.

Leonhardt was equally impressed by the support his team received before and during the project: "After a less-than-enjoyable experience with a very large controls supplier, we were pleasantly surprised by B&R's service, which far exceeded our expectations," praises Leonhardt. "Their employees are experts in their fields and extremely knowledgeable on the topic of automation. They were able to see the challenges from our perspective and find appropriate solutions." ←

The Jetmaster Dimension from Heidelberg introduces one-off custom printing for 3D objects such as cans, balls and athletic shoes.

B&R's control and automation technology is perfect for series-built machines and grants the Jetmaster Dimension the precision it needs for optimum printing results.