

DIGITAL printing

for labels & packaging

p.1



Digital Printing— from Corrugated to Cans



p.5





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As Seen at PACK EXPO Las Vegas
 Mounted on a conveyor at PACK EXPO Las Vegas were three digital printing technologies from GSI: Colorize 360 (A), Colorize 180 (B), and NOLabel (C).

In-house CMYK Case Printing for CPG Companies

By Pat Reynolds, Contributing Editor

By combining a sophisticated understanding of inks with the latest in ink-jet print engines, GSI and IP are bringing in-house, on-line CMYK Case printing to the packaging line.

One intriguing innovation to come out of PACK EXPO Las Vegas last September was that thanks to developments in digital printing technology, brand owners are now able to do their own four-color CMYK printing of corrugated cases right on their own packaging lines.

The need for such in-house case-printing capability has been driven by several factors, but at the top of the list is the ongoing trend toward shorter runs due to SKU proliferation. There's money to be saved if a brand owner can order one common case from a corrugated supplier and then print small batches in the quantities needed. Added savings come because this small-batch approach reduces the chance for obsolescence should information on preprinted cases become no longer accurate.

Leading the charge in putting four-color CMYK printing capability immediately downstream from a brand owner's case packing and closing equipment is [GSI](#), or Graphic Solid

Inks. The firm demonstrated at PACK EXPO the Colorize 180, capable of CMYK printing with a resolution of 180 DPI at 1,000 ft/min, and the Colorize 360, capable of CMYK printing with a resolution of 360 DPI at 500 ft/min. Also notable is that [International Paper](#) is getting in on the action by teaming up with GSI on an initiative that will let brand owners do their own full-color, small-run, brand-on-demand printing in a way that's never been possible before. But before going there, it's helpful to look at GSI's back story.

GSI is a company that got its start as a maker of solid blocks of hot melt ink used chiefly by hot melt inkjet printers. Over time the firm took on distribution responsibilities for OEMs such as Linx, Matthews, and others in the marking and coding business. But in 2019, management decided it was time to begin making its own equipment in addition to being an equipment distributor and maker of inks.

"It's not like it came out of the blue, because it was



Both porous and non-porous corrugated cases can be printed by the GSI digital printing solutions.

something that was always on our radar,” says GSI President Chad Pender. “But all the right pieces and people had to come together at the right time, because we weren’t looking to just do another marking and coding machine. We saw an opportunity for something that was really different, something the brand owners really needed.”

Pender emphasizes that offering brand owners equipment capable of high-quality, four-color, digital printing on erected, filled, and sealed cases was actually Innovation 2.0. Preceding the Colorize 180 and 360 equipment was GSI’s NOLabel technology, a way of using digital ink jet printing and UV curing to lay down white ink on corrugated cases followed immediately by black ink for printing of lot and date code information, including bar codes. According to GSI’s Mark Beauregard, NOLabel is a game changer.

“With white you get high contrast and better bar code

grades than you’d get on most print-and-apply pressure-sensitive labels without having to order, pay for, or inventory rolls of label material,” says Beauregard. “Also eliminated is the downtime caused by having to put a new label roll in a print-and-apply labeler. Plus it facilitates recycling because now you no longer have a plastic film label on the corrugated when it reaches the recycling center. Not to mention the fact that by eliminating pressure-sensitive labels, you’re eliminating the release liners that typically wind up in the solid waste stream.”

Adds Pender, “It’s essentially printing a liquid label on a case.”

White inks are challenging

So why has it taken so long for such an obviously beneficial solution to emerge? Largely because white inks are notoriously difficult to handle. The titanium dioxide pigment in the ink is very heavy, which makes it want to sink and separate from the ink formula. The NOLabel system addresses that because its **Seiko Instruments** print heads have a high-flow ink circulation structure so that ink constantly circulates immediately behind the nozzles at high speed. This ensures nozzles recover from blockages automatically and instantaneously, eliminating the need for routine nozzle cleaning during operation and significantly reducing ink wastage. Ink is in constant circulation and always ready to jet, removing the need for priming or purging before starting printing. Moreover, GSI not only makes the NOLabel printer, it also makes the inks, which presents opportunities to optimize the compatibility of the ink with the printing equipment.

“We did a lot of research on market-available white inks, and we had difficulty making them work on a porous corrugated substrate,” says Pender. “So we developed our own specialized formulation that, once cured, results in a beautiful white pop. Having an ink formulation facility on one side of the building and a marking and coding equipment manufacturing facility on the other side played a big role in allowing us to offer a solution that until now has not existed for this market.” And because they’re UV-curable inks, the corrugated cases being printed can be either porous brown kraft or non-porous coated cases.

The original thinking at GSI was to lay down white with one print engine, cure it, lay down black with a second print engine, and then cure the black with a second UV lamp. But two print engines and two curing lamps come with a cost, plus the total solution would have had a larger footprint. So the team devised a way to use one print engine to print white first and black second and then use a single curing lamp to cure both. But it’s not wet black ink on wet white ink. GSI’s “interlacing” technology includes software that keeps the two inks from touching, as Beauregard explains.

“Remember, with ink-jet printing you’re talking about laying down small dots. If your software gives you sufficient control over where those dots are laid down, the laydown of white ink can leave parts of the corrugated—the parts where the black ink will go—without ink.” He adds that It’s

possible that in some applications—perhaps where speed requirements or substrate peculiarity dictate—two print engines and two curing lamps will be needed. But those will be more custom than routine.

Print engine architecture

GSI's ability to pull this off has a lot to do with the architecture of the Seiko RC1536 print engine. Each of its four nozzle arrays has 90 orifices, which means the engine is capable of delivering 360 dpi. If half the nozzles are dedicated to black and the other half to white, then one print engine can print in two colors at 180 dpi. That's how the NOLabel solution works.

Moving on to the Colorize 180, two print engines are used. The first has half its nozzles dedicated to cyan and the other half to magenta. The second has half its nozzles dedicated to yellow and the other half to black. The resulting capability is four-color printing at 180 dpi. And then on the Colorize 360, where four print engines are used, all 360 nozzles of each engine are used for each color, which results in four-color printing at 360 dpi.

While it was the huge market opportunity for black and white print on corrugated that got things rolling at GSI,



Watch a brief video of Colorize and NOLabel technology in action at PACK EXPO Las Vegas.



once the NOLabel technology was more or less sorted out management thought, why stop there? "We quickly found ourselves morphing into CMYK, to be honest," says Pender. "It relies on the same Seiko print engine, which does a phenomenal job with color printing."

"It's hard to tell the difference between the 180 dpi and the 360 dpi," says Beauregard. "But the option is there. Feedback from most packaging consumers indicate the 180 dpi is good enough for porous media, and 360 dpi delivers better print and color quality when needed."

According to Beauregard, using marking and coding equipment to print full-color CMYK directly on a corrugated case in a brand owner's manufacturing facility is considerably different than printing CMYK on a sheet-fed or roll-fed press. Because on a press the distance between substrate and ink jets is optimally controllable. This is not the case when a corrugated shipper is the target.

"No two corrugated cases are the same," says Beauregard. "Once a case is formed, whether it's taped or glued, if the flaps don't align perfectly, that case is going to be slightly skewed. So when it goes past the ink jets, the leading edge might not be the same distance from those jets as the trailing edge. Without a very good controller and a print engine capable of throwing the ink far enough and accurately enough, the ink droplets can start to break up or become misaligned, causing suboptimal print quality. Our print head controller's electronics and software are very powerful, and the Seiko print engine is designed to throw the inks far enough to maintain accuracy. On top of all this, if you're going to fit this kind of marking and coding equipment on a brand owner's packaging line, it has to be delivered in a compact package. And that's what we showed at PACK EXPO. It was three compact systems—the Colorize 360, the Colorize 180, and the NOLabel—mounted on stands that can be wheeled right up to a conveyor."

International Paper's role

Now let's circle back to where International Paper and Jeff Grossman, Manager CVA/MPS, fit in. CVA stands for Customer Value Analysis, and MPS stands for Mechanical Packaging Systems. Grossman and his team are laser focused on understanding how to help IP customers optimize value, sometimes by capitalizing on new developments in packaging machinery. For years they've been hearing customers ask for better ways to personalize and customize corrugated cases in short runs without being penalized by Minimum Order Quantities (MOQs). More recently, Grossman encountered an IP National Accounts Manager that works with a CPG company who also had an idea that lent itself to on-case advertising—though once again, in multiple SKUs each in relatively small quantities.



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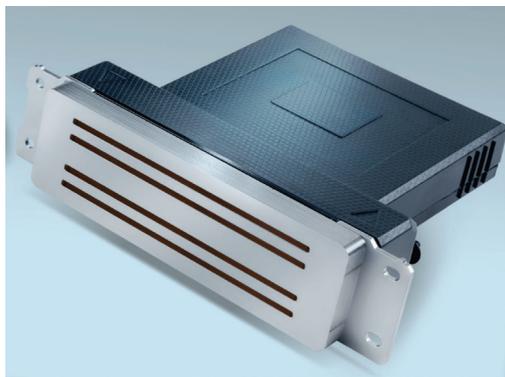
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This prompted Grossman and his team to redouble their efforts in the search for possible solutions, and that's what led them to GSI. After one meeting in the GSI facility, IP recognized a great opportunity.

"Their technology far surpassed anything we'd been seeing partly because of its simplicity," says Grossman. "There are so many things brand owners can do with this. And it's not just SKU reduction or on-case advertising. It's the internal cost savings, warehouse reduction, and eliminating obsolescence because the information pre-printed on their cases is no longer accurate. Or think about seasonal promotional opportunities and other kinds of small-volume customized graphics that a brand owner might want to do. Some of our customers have shied away from these kinds of opportunities because the timing made it impossible for them to get it through their systems. Now there's a way."

What IP announced at PACK EXPO is an IP & GSI exclusive offering called Digital Print @ the Customer powered by GSI's NOLabel and Colorize 180 & 360 technologies. It's a digital print solution designed to be



The Seiko RC1536 print engine plays a key role in both the NOLabel and the Colorize technologies that made their debut at PACK EXPO Las Vegas.

installed at the customer's location utilizing 4.25-in. print heads that can be stitched together for larger print areas. Part of the package is the NOLabel black & white in-line digital printing, though a brand owner wouldn't necessarily have to install both NOLabel and Colorize capabilities. It all depends on customer requirements. Beta testing is now underway, and in Q2 of 2022 comes IP's official launch of Digital Print @ the Customer. Grossman is mighty excited about the prospects.

"For years," says Grossman, "brand owners have been asking for SKU reduction where corrugated cases are concerned, and until now the stock answer from the industry has been this: 'You can have it in any color you want with current in-line ink-jet printing—as long it's black and the print doesn't have to be particularly legible.' Digital Print @ the Customer from IP & GSI changes everything. It enables SKU optimization and puts the ability to seize seasonal promotional opportunities, for example, at the fingertips of the brand owner customer. And it means we can produce what customers need without having to ask them to meet an MOQ." **PW**

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