



*every*  
**SHEET COUNTS**  
**INSPECTING CORRUGATED PRINT**

by Melissa Donovan

**P**ackaging comes in all shapes and sizes, from an Amazon shipping container to the box that holds the product in that container. With everything in a package, this means work for the presses.

“The market for printed corrugated board has grown massively and rapidly in recent years. The demands on the quality of the printed image and the variety of

applications have also increased. In digital printing low runs are often produced, and here every sheet counts,” explains Lucia Dauer, product manager surface and print inspection, ISRA VISION GmbH.

While the digitally printed corrugated market expands, it leads to complications that are only solved with the help of precise technologies like inspection and verification systems. These tools monitor and

alert the operator when need be, for example proofing for print quality issues like color or banding. Catching problems before a full print run minimizes waste and other costly errors.

**DIGITAL ATTRACTION**

Converters and manufacturers alike bring digital print in house for a number of reasons.



As it pertains to corrugated packaging, “digital print platforms are super at delivering short-run print efficiency. The corrugated space is driven by brand owners. The days of simply printing millions of fixed content, single-color boxes are going away. Brand owners demand better targeting, often expecting the printer to support multiple, regional flavors of a given product,” admits John Cusack, business development manager, Baldwin Vision Systems.

With a big shift toward customization, personalization, and serialization, “businesses that primarily use traditional printing techniques are starting to become ‘hybrid’ printers where they add digital print to produce small variable content features on their boxes such as serialized codes or even content directed at a specific consumer,” continues Cusack.

Adding digital print allows for what he refers to as overall equipment efficiency or OEE, which is the ability to allow each piece of equipment to perform its best. “Balance the load—put short-run jobs on the digital press and long-run jobs on the traditional presses,” says Cusack.

For those looking to eliminate flexographic printing costs altogether or even box plants with limited flexographic print capabilities, digital presses offer enhanced print quality, according to a representative from Kento Digital Printing. Other benefits are speed to market, inventory reduction, lower minimum quantities, as well as variable data and versioning.

“Reasons include quality and cost control, speed to market, agility, and higher automation. Converters turn to digital presses for short-run work for their clients to reduce waste and to react fast to changes in customer



demand,” notes a representative from Koenig & Bauer Durst.

Converters and manufacturers also choose to implement digital technology due to it being an “easier entry to high-quality print without the capital cost of high graphic RDC and no need for highly skilled operators,” adds the Kento Digital Printing representative.

### INSPECT AND VERIFY

As digital press speeds reach new heights, it is paramount that checks and balances are in place to ensure error-free printing. While manual processes open the door for human error, today’s inspection and verification technologies for corrugated boxes target code reading, box orientation, and adhesive verification in addition to verifying print.

“An inspection system that reliably detects and reports defects as quickly as possible—and thus before they are recognized by the human eye—offers the fastest possible option for eliminating a defect,” says Dauer.

Cusack points out that there is nothing specific to corrugated print when it comes to the verification and inspection processes. “It faces all the same quality challenges any other print market does.”

What is interesting, in his opinion, is that “the corrugated market has avoided being the test case for 100 percent inspection technology. While 100 percent inspection technology has been around for a good 25 years, it primarily focused on flexible packaging and labels. Over that quarter of a century, inspection products have matured and today offer extremely powerful performance and reliability.”

Inspection systems are important for digital printing of corrugated because they “ensure the overall print quality is acceptable; allow/aid in digital print

COMPANIES MENTIONED  See page 16 for more information.

INFO#	COMPANY	WEBSITE
110	Baldwin Vision Systems	baldwinvisionsystems.com
111	Baumer hhs	baumerhhs.com
112	ISRA VISION GmbH	isravision.com
113	Kento Digital Printing	kentodigitalprinting.com
114	Koenig & Bauer Durst	koenig-bauer-durst.com

1. The image shows typical defects that occur during digital printing. These defects can be detected reliably with inspection systems from ISRA VISION.



## After Print Inspection: The Finishing End

Beyond monitoring print, inspection or verification systems are useful for other parts of the corrugated process. While this is alluded to in the body of this article, Ken Robinson, business development manager for corrugated, Baumer hhs, shares some other tasks inspection systems conduct in relation to digitally printed corrugated boxes.

Robinson separates his explanation into two different types of corrugated machines, explaining that each have different inspection requirements.

### Inline Flexo Gluer

An inline flexo gluer typically runs at higher speeds and produces boxes in a finished bundle. This is more suitable for straight line boxes with no complicated folds.

"Although flexographic printing increased in quality over the years, the highest quality boxes are produced with offline digital printing or litho-laminated blanks. The printed blanks are then brought to the flexo gluer for high-speed finishing. These boxes are typically finished at high speed with bundles exiting the machine and are stacked and strapped to facilitate shipping," explains Robinson.

Due to this, it not possible to manually inspect for defects. Enter inspection/verification systems. They check for things like ensuring every box is fully glued and withstands the structural requirements of the end user. Also, skew detection is important, ensuring the box is folded and glued squarely. Complementing skew detection is the measurement of the manufacturer's gap. "The manufacturer's gap is the distance between the two edges that have been glued together. If either of these inspection criteria fail, the box is likely to cause a jam at the automatic case erectors typically used at the filling plant

causing downtime, waste, and loss of production," explains Robinson.

### Specialty Folder Gluer

Specialty folder gluers are usually used for higher quality boxes found in point of purchase displays or complex styles that cannot be produced on a flexo gluer.

With these complexities in mind, a specialty folder gluer produces less boxes per hour. The boxes in question usually require multiple folding operations and the finished boxes exit the production line in a shingled stream of overlapping boxes.

"This process does allow limited opportunity for manual inspection, however, manual inspection will typically only catch gross errors such as a misfolded box or significant printing voids and requires additional labor," notes Robinson.

Vision inspection systems or camera systems are used to automate the verification process. Tasks include verifying the folds are completed properly, the box is straightly aligned, and the critical printed areas meet the control pattern. Code verification might also be useful here, which ensures the code is correct in value and machine readable. This is more important is certain verticals over others, for example the pharmaceutical market.

"In today's labor market, the frequent turnover of machine operators may cause additional inconsistencies. In the end, these inspection systems will ensure the end customer receives only boxes that are 100 percent machine inspected to meet the quality requirements guaranteed by the box manufacturer. Automated inspection is necessary to meet the repeatability and quality targets of today's more demanding customers," shares Robinson.

adjustments to enhance print quality; detect blemishes, nozzles out, banding, and overall print uniformity; notify operators when further review is needed; and minimize the cost of waste by ensuring multitudes of sheets are not printed with blemishes and therefore not being accepted by the end user," explains the Kento Digital Printing representative.

Other tasks related to verifying printing on a digital device include inspecting a full sheet via a PDF file, making corrections at the beginning of a print shift, looking at printhead consistency and correcting as needed, and rejecting sheets prior to being palletized, lists the Kento Digital Printing representative.

"With the use of inspection systems specially developed for digital printing, 100 percent print image inspection can be achieved. Typical print defects such as register errors, splashes, streaks, or color deviations are detected as well as the common defects that occur in digital printing—mottling or banding. The early warning of the system when errors occur gives operators the opportunity to eliminate the source of the error in a timely manner and the inspection system also allows for an ejection process of defected boards," adds Dauer.

Sequential numbering applications benefit from inspection systems. "They ensure that the correct number for barcodes or quick response codes are printed," says the representative from Koenig & Bauer Durst.

With the growing prevalence of variable content like serialized codes or variable, customized text elements, inspection systems can offer content verification. "This would be the ability to compare a constantly changing element to a reference dataset in real time. So rather than making out the area that constantly changes, it is now possible to prioritize this content to ensure perfect reproduction," explains Cusack.

In addition, "converters use inspection systems to verify precise quality param-



eters defined by their brand partners. This is important when some of the production is produced using a different marking technology to ensure that the same level of quality for all boxes is produced,” continues the Koenig & Bauer representative.

“Proofing systems compare the first printed box off the press to the brand owner approved PDF reference file to ensure the press is set up correctly. With the introduction of digital printing, access to files like PDFs is more commonplace,” adds Cusack.

Beyond monitoring print, there are other parts of corrugated workflow process that require inspection. Ken Robinson, business development manager for corrugated, Baumer hhs, lists areas like adhesive verification, bar code and color code reading, box orientation, and gap and flap detection.

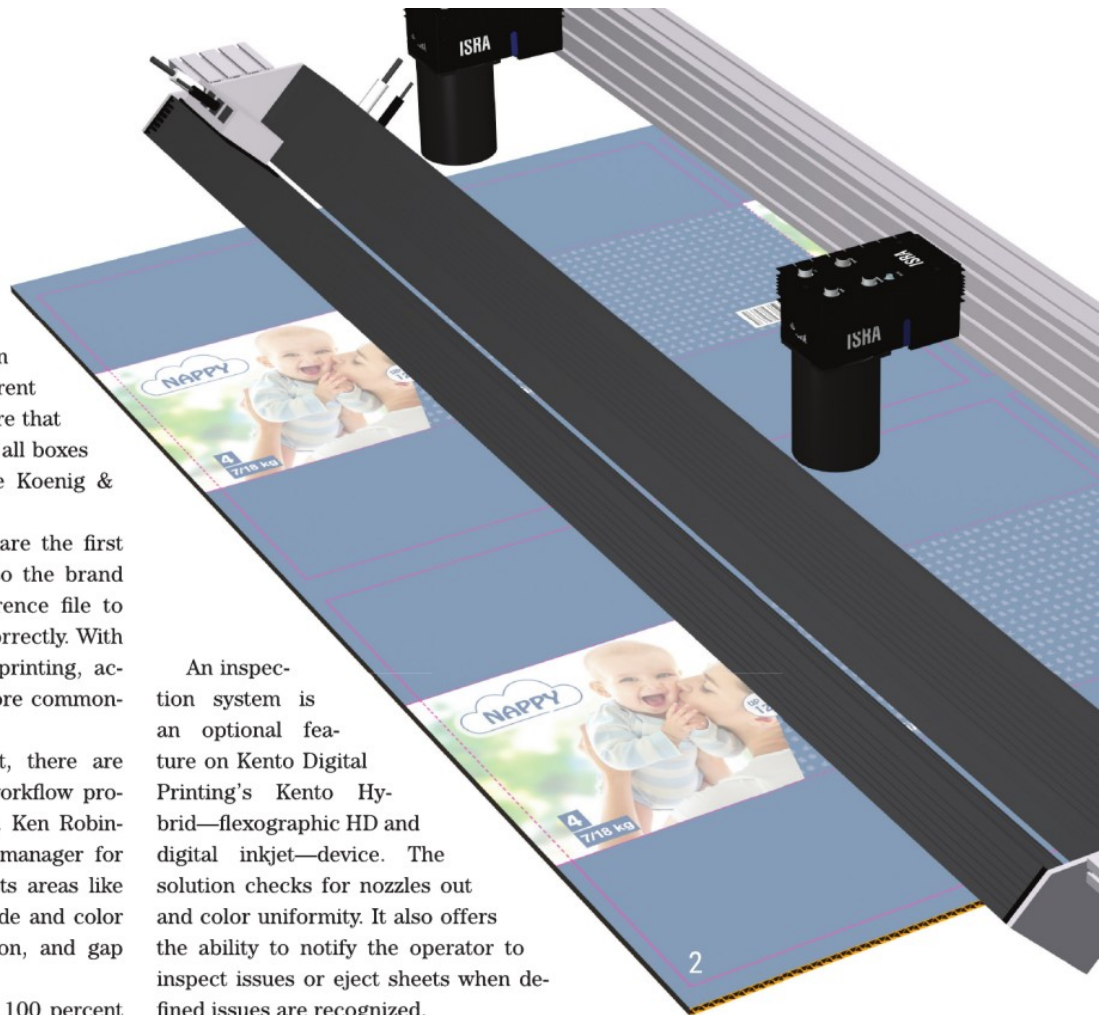
“Camera sensors provide 100 percent machine inspection at production speeds. Without machine inspection in place, the plant is in jeopardy of producing defective boxes, that in the best scenarios, are found after the conveyor is filled with what will become dunnage. In the worst case, these defects will ship to the customer, resulting in hand sorting, financial penalty, or even loss of contract,” shares Robinson.

Lastly, verification and inspection systems offer a way to capture data. “They typically come with a defect database that allows the user to review jobs to track waste, review performance, and to identify opportunities to improve processes. In the case of variable digital content, the systems can generate reports showing which codes did not get printed correctly,” says Cusack.

## IT'S ON

Depending on the printer manufacturer, the digital corrugated printer in question could include inspection system-like features.

2. Inspection systems from ISRA VISION are configurable to a print width of 2,800 millimeters or more.



An inspection system is an optional feature on Kento Digital Printing's Kento Hybrid—flexographic HD and digital inkjet—device. The solution checks for nozzles out and color uniformity. It also offers the ability to notify the operator to inspect issues or eject sheets when defined issues are recognized.

Koenig & Bauer Durst offers optional inspection systems on its Delta SPC 130 single-pass digital printer. These are fully available as an integrated, inline system from ISRA—adapted specifically for the Koenig & Bauer Durst systems. Didn't purchase the printer with the inspection system option—an in-field upgrade is available at any time.

## ADD IT

An alternative would be including a verification or inspection system on the printer using a third party.

Cusack recommends using a third-party add-on when possible. “Through the combination of upfront proofing, 100 percent inspection of the entire print run, and the ability to manage waste material inline or track to a subsequent step, it's a no-brainer for printers.”

An example is in proofing. If something isn't correct on a job setup it may be easily missed by a human operator. “From the operator's perspective, the number is printed perfectly—good structure, register, and

color, but it is the wrong value. If not identified, the print run may be garbage. A proofing system will find this variance from the approved artwork and pay for itself with one check,” shares Cusack.

“While we do not manufacture the inspection system/camera, the return on investment of these systems is quite short and not having this could be costly,” cautions the representative from Kento Digital Printing.

Dauer agrees, citing the purchase price of an inspection system usually pays for itself after six months—but the savings continue to add up afterwards through higher yields.

## CHECKS AND BALANCES

As short runs, versioning, and personalized components become mainstays in packaging, less static information and increased variation leads to more opportunity for error. Why take a chance? Options are available thanks to inspection and verification systems ideal for digital presses. **IPM**