Just Cardboard? Think Again!

Automated Visual Inspection and More: Process Optimization for Manufacturers of Folded Boxes

The quality of packaging plays a critical role for the product overall. Color, finishing and surface must satisfy the highest demands. It is absolutely crucial that the information found on packaging is accurate and clearly legible. This especially the case when it comes to folding boxes in the pharmaceutical, food and cosmetics industry. That is why each individual manufacturing process – from printing through to further processing – must undergo a 100% inspection. Solutions based on fully automated inspection systems help in optimizing automated processing sequences by networking the monitoring and documentation of each individual processing step.

Printing and embossing defects, color variations and surface defects can significantly reduce the value of a product overall. In effect, for reasons that concern product liability, product and user information listed on the packaging must be accurate, complete and clearly legible. In part high levels of surface finishing of, for example, packaging for cosmetics, luxury and premium cigarettes make the quality monitoring process complicated. Up until now, more often than not, manufacturers have had to rely on spot checks, which, however, were unable to systematically guarantee that the products were monitored 100% of the time. Added to that is often times a high amount of effort and expense for manual sorting tasks.
Monitoring the manufacturing processes 100% of the time

Monitoring and documenting 100% of all of the processing steps during manufacturing of folded boxes is assured by automated solutions created on the basis of fully-automated inspection systems, which as such contribute significantly to maximizing profits and, because of their high level of flexibility, can be used to monitor entire process chains. The highly reliable systems can be used for any possible printing process, size and material, even for the highest throughput rates and production speeds for both in-line as well as off-line inspection. This allows dedicated off-line systems for sheet-offset printing to provide much needed support functions when it comes to critical print orders. They make it possible to flexibly determine which order should be inspected if not every available printing machine has been equipped with an in-line inspection system.

The fully automated inspection systems, directly integrated in the printing machine, ensure a 100% inspection of the printed image of both text and color with objectively reproducible inspection results, even in the event of lateral off-set or any other deviations in product guidance. Typical defects like chips, scratches, spots, streaks in the register and color variations are recognized reliably. What's more, defects in the embossing or the foil, such as nicks in the surface, even on high-gloss materials, can be detected. Defective products are detected at the moment they are created; these defects can then be marked. The inspection systems are capable of inspecting numerous product properties such as print image, color and embossing at the same time.
A new system for 100% inspection of single repeats

By making use of increasingly more complex printing methods and materials, the goal is to enhance development even further to keep amount of spoilage to a minimum. The ability to lock out single repeats using precisely designed inspections systems before folded boxes reach the gluing stage is receiving a higher amount of interest: The ability to lock out single repeats is undoubtedly more cost efficient than having to scrap an entire printed sheet. Furthermore, not until the process reaches this point, do the added applications such as making use of hot stamping films and embossing techniques come into play, which might also lead to defects and should therefore also be monitored.

Especially when dealing with complex single repeats, because of the high quality demands of the end customer, in the past each stack had to be visually inspected before being placed in folded box gluing machine.

Because of the high throughputs that are required – tens of thousands of single repeats per hour – this can tend to involve costly man-hours and still be prone to defects.

In this regard, the new SMASH Blank system offers a highly flexible, scalable solution, which can be optionally designed as a stand-alone system to include feeder, integrated transport segment, discharge unit and delivery devices. The combination of high resolution, high throughput and adaptability to the variety of demands allows optimized solutions that significantly add value to any discerning folded box manufacturer.
State-of-the-art computer and software technology

The inspection systems apply black and white or color high-speed cameras. They provide statistics in real time and deliver meaningful protocols. In the process, state-of-the-art computer and software technology is employed that make use of highly-efficient algorithms. The systems are freely scalable in terms of their number of cameras, camera banks, lighting technology as well as resolution. Because of the modular design, the systems can be integrated into any process environment quickly and easily – in the shortest set-up times. The users profit from the simplified and clearly arranged system controls.

During the printing process, the print image is defined in the pre-press stage and is typically exchanged digitally. By means of the Job Definition Format (JDF), the digital print order can be passed on from one processing step to the next – an important part of the automated production flow. This makes it possible to pull up relevant information with regard to the order even for automatically setting up the corresponding inspection system.

Valuable options add to the inspection systems

The inspections systems can optionally also perform a 100% inspection of even the PDF verification of the artwork. Based on a halftone image extracted from the PDF template, which is automatically set to match resolution and illustration properties of the system by using reference images supplied by the camera, the system can carry out a verification process based on reference images defined by the operator. This ensures that even content of flawless print quality, and yet with defective image content, is reliably detected.
An added benefit is the Color Monitoring software module that in addition to the print inspection also monitors the color output of the print using already installed color line cameras, meaning without the need for any additional components. The master image is used as a reference for the color monitoring process, in which the user can define measuring fields for color monitoring. Any color deviations are exported into DeltaE (lab) and shown in a trend chart.

**Seamless integration into the workflow**

Even downstream post-finishing processes can profit from the flexible systems, for example hot and cold stamping foil finishing processes, embossing processes, lamination or coating processes. The inspection systems monitor, for example, 100% of the foil and in this case inspect that the transfer is fully completed, checks the intensity as well as the register off-set.

After the stamping process, the single repeats are inspected. Even the embossing processes can be monitored. Any defective repeats are sorted out automatically. Costly manual post sorting is no longer necessary. This way, the systems make it possible to ensure the correct production quantities by handling a predefined batch size of flawless blanks. In doing so, spoilage is prevented almost entirely. If the boxes include windows, the inspection systems can also monitor the process of gluing in the window foil. The folding and gluing process of boxes are inspected in exactly the same way.

The inspection systems of the individual processing steps are networked. This way, the transport of the products between each individual processing steps is controlled and if need be, the production processes are adjusted. All inspection results can be extensively documented in the Enterprise Data Mining System. By using this...
optional tool for fully automated inspection systems, the user can perform an analysis by date or time, batch, type of defect, product type or shift. This consolidated view using the information collected during the inspection process can then be drawn upon to optimize the processes in their entirety. By making use of intelligent interconnections, the information platform uncovers interrelationships, which at first glance would not be recognizable and in doing so frees up enormous potential for optimization. The result is an increased system operation time with reduced amounts of scrap. Even throughout various different locations, the production resources can be ideally utilized and allocated.

The automation solution that the inspection system is based on is integrated completely in the workflow and makes it possible to seamlessly exchange information from the sensor through to the BDE system. They increase processing reliability as well as the productivity and assure its users a competitive advantage in the global market place.
No defect remains undetected: Reliable detection of smallest print defects on blanks by 100% print inspection

Simply simpler: Reliable print defect detection on blanks (left: defect-free, right: speck defect)