By Ron Irwin

Where to inspect for the higher profits?

Vision technology at the press or on the inspection machine?

If you have read any of my past articles, you know that I am a proponent of moving information technology to the press, where operators and floor managers can benefit from its value in real time. In my own area of focus — DMM technology, direct machine monitoring of time, waste costs and plan to actual performances — I know that operators and floor managers are in the best position to improve today's profits today.

In line with this strategy, I felt that a discussion of print inspection would be in order. Will moving our inspection processes to press be the right move for some? To help answer this question I have asked Stephan Krebs, president of Nyquist Systems and an expert in print inspection, to address the concerns and opportunities. — *Ron Irwin*

I have visited many production sites where inspection operators proudly told me what their rewinder inspection system could find. (Some of these lines even print critical pharmaceutical products.) They point to small ink splashes or scratches on labels collected during production. What they don't know, however, is: Which defects were not detected and went into the finished roll?

Although happy with the inspection results, they had to turn down the original sensitivity settings because the stop-and-go operation of the rewinder caused significant web stretch, which made the system stop frequently. The system was still able to find the defects mentioned previously, but can it still detect a missing decimal point or a small, partly broken character? The answer is very likely no, and a question arises whether vision inspection systems that are installed on rewinders really are the best choice for ensuring outgoing print quality.

Let us take a closer look at this concept:

Using an inspection system on the rewinder cannot improve the production quality, because the waste was already created on the press. This also means that the money was already spent and the printer will try to get as much "good" product as possible out of the door.

The stop-and-go operation of the rewinder stresses the material significantly and triggers false defects that lower the productivity of the process until inspection tolerances are set less tight.

High-resolution vision systems that are required for finding small defects like broken characters or missing decimal points cannot be operated at the maximum speed of the rewinder; another reason for decreased productivity.

So is there a better way to ensure print quality via vision inspection?

In the last few years, the printing press has become a focus in terms of workflow integration and improved production cost management. It is clear that waste is generated on the press and every measure that will improve the print quality will also have a major impact on the finished roll.

REI has already proven that quality and profit improvement is possible using direct to machine monitoring (DMM technology). This system collects data such as press counts, material consumption, press speed and good product, and provides real-time information on machine productivity. The collection of the data, though only partly automated, still helps identify the major causes of waste, allowing for analysis of the production. The situation improves dramatically when this DMM system is supported by or even integrated with a vision inspection system that is installed on the press.

We have touched upon the problems that these systems have when they are operated on rewinders. What makes the in-line approach better?

- The press is far better controlled without the constant stop and start;
- The operator can immediately react to defects detected by the vision inspection system and thereby avoid waste before it is created;
- Today's operating personnel are usually highly skilled and familiar with modern computer systems;
- The press speed is typically below 500 feet per minute, and therefore matches the scan rate of modern high resolution cameras.

One more technical advancement that makes the inline approach work today can be called "the ultimate solution", which is in-line inspection with roll mapping. Using an inspection system on the press will have a significant influence on waste reduction and the related costs. But the one thing missing up until now was the finishing tie-in: How can the defects — which must not end up in the finished roll — be eliminated?

Roll mapping

With the advances of modern computer systems, it is possible today to store in a database all defect information that is collected during production. The database may be considered a "virtual roll" or a roll map, because it provides complete quality information about a roll. The roll map can now be used for postpress analysis in the QA department and then further used for scheduling a rewinder. Herein lies the beauty of the concept: The rewinder can be operated at its speed limit, stopping only for defects that were previously defined as such.

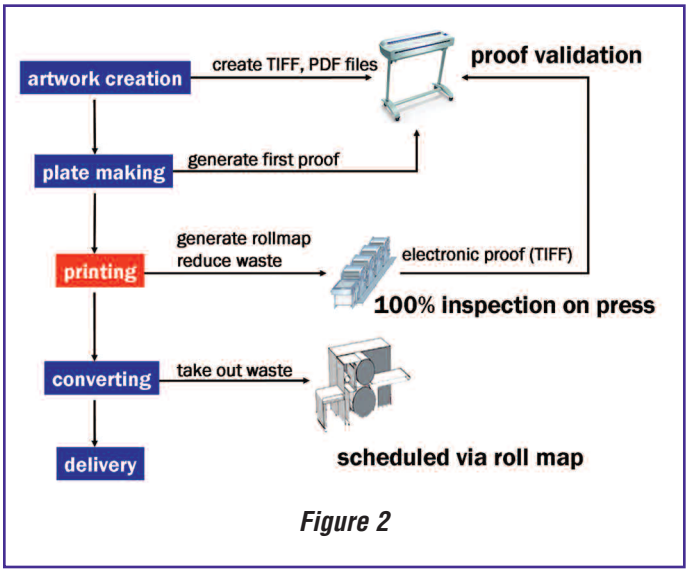

Figure 2

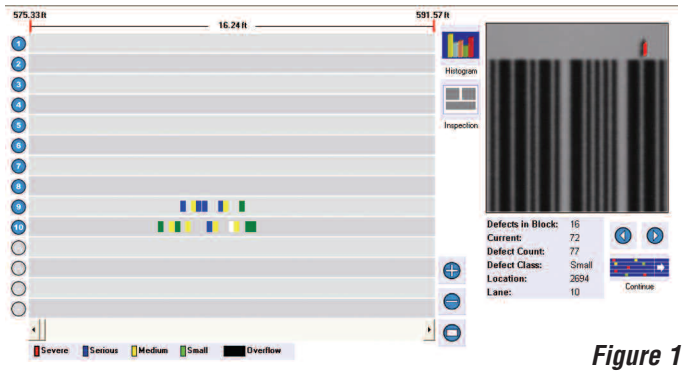

Figure 1

The advantages of the roll mapping concept:

- Most important is the reduction of waste and therefore the impact on cost savings. Research shows that a payback can be obtained in less than a year;
- The vision inspection system can find very small defects up to its limit as it is operated in a controlled fashion. The system can display small defects that may give some early indication of future problems but it is up to QA to decide about the relevance of such defects;
- The roll map created by the vision inspection system can be analyzed and then used for quality improvement purposes before it is used for scheduling the rewinder;
- Scheduling the rewinder via the roll map means optimal productivity. The rewinder control already knows the future and can operate accordingly;
- The quality of the finished roll can be proven to your customer via the roll map report;
- The accuracy of the inspection can be quantified, or rather certified, which is especially important for security or pharmaceutical applications;

We have learned that vision inspection systems operated on rewinders can cause many problems without providing sufficient inspection accuracy. The concept of in-line inspection can overcome all these problems and provide another important step toward Total Quality Control (TQC).

Roll mapping takes advantage of almost infinite bandwidth and memory space available with modern computer systems. The system takes an image of every defect found and stores it in a database. These images are arranged according to their location in the roll, thus generating the impression of a "virtual roll" that can be analyzed, zoomed in and out, and further processed. The screen shot in Figure 1 shows a part of the web with each colored tile representing a defect. Clicking a tile reproduces the defect image shown to the right. The color of the tile corresponds to a certain defect class (e.g., size of the defect).

After analysis and editing, the roll map can be fed into a rewinder control, which places the defective web locations in

an opposite order. Again, the operator can see what is coming next and make an intelligent decision in order to maximize the productivity. The roll map can be printed by using a color inkjet printer and serves as a proof of quality.

Vision inspection technologies in modern print production are best used in two different locations. First, they are used to compare the first proof against the original artwork. A scanner is used when proof prints or printing plates are compared against the original. Having a vision inspection system on the press can significantly improve this process because sample images can be directly taken from the press via the camera.

Second, they are used for inspection of the printed web directly on the press. A roll map stores all the defects in a database. In the converting process, the roll map is used to control the rewinder automatically. The resulting print production workflow is shown in the illustration in Figure 2.

This presentation by Stephan Krebs challenges traditional thinking of how and where the inspection process is best handled. With advances in PC and database technology, our presses are fast becoming real-time controllable and measurable profit centers.

Thanks for listening. ●

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