Wilbert Streefland discusses an alternative use for barcodes

In nearly all packaging magazines or in any conference related to packaging and distribution of goods today we hear about Radio Frequency Identification tags (RFID) as the follow-up to the barcode. I will leave that subject to a later date but maybe this article will result in printers and print buyers making longer use of barcodes as a reference for checking the print quality. The reader will see immediately the limitation in this idea because the barcode is only printed in one colour and mostly print uses more then one colour. However the method can be implemented easily if one has a barcode verifier. Be aware that a barcode reader will not be enough.

The history

The barcode originates from the 70s and there are different designs for them but they all have in common that they consist of printed bars and that the coding principle is based on the differences in the width of the bar and the space between the bars. There is an example.

Barcodes started to appear on nearly anything that was packed. Today it is the main tool to identify products in the supply chain.

Around 1995 I became involved in customers' complaints. Barcodes, printed on corrugated boxes, were not readable. The producers involved claimed that this was the first time they had problems with printed barcodes on boxes although they had been using them for many years. It transpired that the barcode reading problems were detected because the retailers began to read them. The problem was that the printers were not verifying the barcodes and thus did not know that there was a problem.

Printed barcodes can not be perceptually evaluated which is still common practice in the print industry for print. A measuring instrument is needed to provide quality assurance about the readability of a barcode.

Some printers used barcode readers but that only indicated that specific barcode reader could read that particular barcode; it indicated that a different barcode reader could not read the barcode. Barcode verification became a hot topic.

Up to this point I have been writing about my past experiences regarding barcodes. Let me now continue with an explanation of how barcodes can continue to be used in printing. It may disappear from packaging but there is still good use for barcode verification equipment in relation to analysing the capabilities of your printing process.

The problem

Immediately after the introduction of the barcode it was discovered that the printing process influenced the actual printed width of the bars. Solutions were found in the repro of the barcode to compensate for average bar width gain better known as bar width reduction.

When checking a barcode with a barcode verifier it will give a value for the average bar width gain for all bars in the barcode. It is this value which is of interest.

If the width of the bars in a barcode changes during printing relative to the original design specification then there will be 'bar width gain' variation in the process.

There are many possible reasons for this variation it can be related to:

- Raw material properties;
- The roundness or total indicated run out of the cylinders;
- The alignment of the cylinders in the printing press.

Checking the alignment of the cylinders in a printing machine is important. It is not always easy or possible to get access to the printing nips in a printing press and check the evenness of the gaps between the cylinders across the width of the machine. The result is that mostly printers are not aware of a misalignment and are continuously adjusting the printing machine to compensate. Talking to the printers they can describe accurately the problems they have but are not able to relate it to gap variation and misalignment.

Thus there is a need for a testing method to link what the printer sees in his day to day job and the status of the printing machine. The print needs to be evaluated quantitatively and the results related back to the process.

In earlier articles I have written about colour to colour register variation and colour variation in relation to the print process. This time it will be printing pressure variation and then specifically the impression pressure variation.

The theory

Bar width gain can be influenced by:

1. Changing impression pressure;
2. Slurring of print;
3. TIR of the rolls;
4. Alignment of the cylinders

Changing impression pressure will give an overall change in the bar width gain. It is difficult to detect if there is no reference. It can be checked if pressure settings are the same as the last time but what the level should be is something that can be done only by systematic testing.

The slurring of print would result in a different gain for the barcode width of the bars in print direction, the bottom barcode in the picture and the bars in cross print direction, the top barcode in the picture. In the case of slurring the bar gain will be greater for the top barcode in the picture.

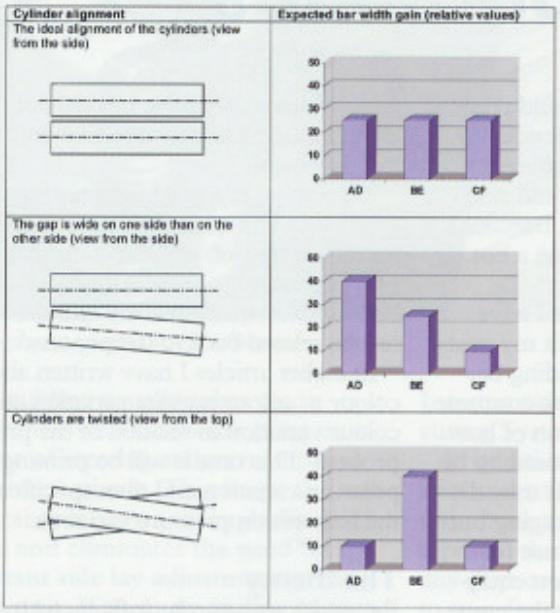
The total indicated run out is a bit more difficult. In this case the overall variation in the bar width gain data needs to be looked at. Thus a large variation in the bar width gains data points to a large total indicated run out of the plate cylinder and/or impression cylinder. This is also detectable in the print direction colour to colour register variation data being larger then the cross print direction data variation.

The alignment of the cylinder would show a bar width gain variation of the barcodes across the machine. This is what is of interest here.

The following drawings show some misalignment and graphs of the expected bar width gain. The characters in the graph correspond with the position of the barcode as shown in

figure 2: the five colour test form.

It is assumed that the smaller the gap the higher the bar width gain.



Tests

So how can the alignment of the impression cylinder and plate cylinder be checked?

The procedure is based on a print test by print station, using the same print plate and colour in each print station. Preferably a black colour should be used for this on all print stations and a white substrate.

The test plate can look as the one shown in Figure 2. Only the cyan colour is used and in principle only the barcodes in position A, B, C, D, E and F are needed.

The barcode is in each position with the bars in print direction and in cross print direction.

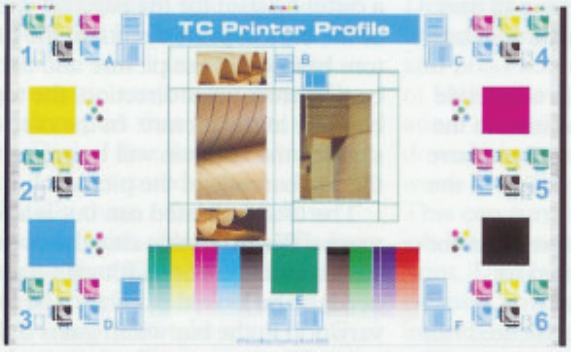


Figure 2: Five colour test forme. Only barcodes in cyan are used.

For the evaluation an Axicon 6000 series barcode verifier was used.

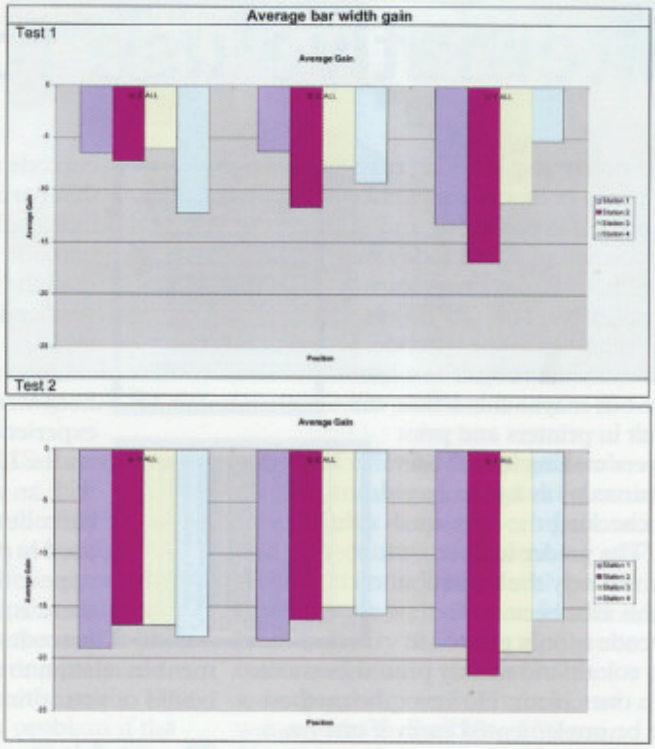
On each print station the cyan plate was printed using a black colour and a sample was taken of 10 consecutive printed sheets.The samples were measured and the data accumulated in a excel spreadsheet. To avoid errors all 12 barcodes in the test forme have a different code.

From all data collected by the barcode verifier the 'average bar width gain' data only is used for the evaluation.

Results

The same machine was tested on two different occasions.

The following are the bar width gain results for the two tests.



Test 1 was the first time the machine was tested and it was noticed that there were larger differences in the average gain for all the bars. Test 2 is the second test.

Notice that in both test negative values are found for the bar width gain. Thus the bars were actually printed smaller than expected. The more negative the value the lower the pressure between the cylinders thus the wider the gap.

The graphs show the average of all measurements for the bars in print direction and cross print direction for positions AD, BE and CF across the printing machine. The first graph bar blue is print station 1 then follows 2, 3 and 4.

Notice that in test 1, for station 1, blue bar, the bar width gain in positions AD is greater then in position CF; the same is the case for stations 2 and 3. For station 4 the average gain is greater in position AD than in CF.

Look now at the graph for test 2. The gain values are more or less at the same level between -15 and -20.

Modifications were made to the machine between test 1 and test 2.

Conclusion and recommendation

From the two tests it was possible to detect a misalignment of the cylinders in the printing machine and show what effect the corrective action had.

If a problem is noticed in the bar width gain for barcodes printed across the printing machine the next step is to check the alignment of the machine using feeler gauges to confirm the misalignment. Use the barcode print test as a detection method to find out if there is something wrong.

Misalignment of the cylinder can affect the colour to colour register, the board 'skews' in the print station. It also can result in colour variation difference across the printing machine, resulting in no print on one side and print with halos on the other side.

It is wise to check the alignment of the printing equipment regularly to see if there are problems. ■