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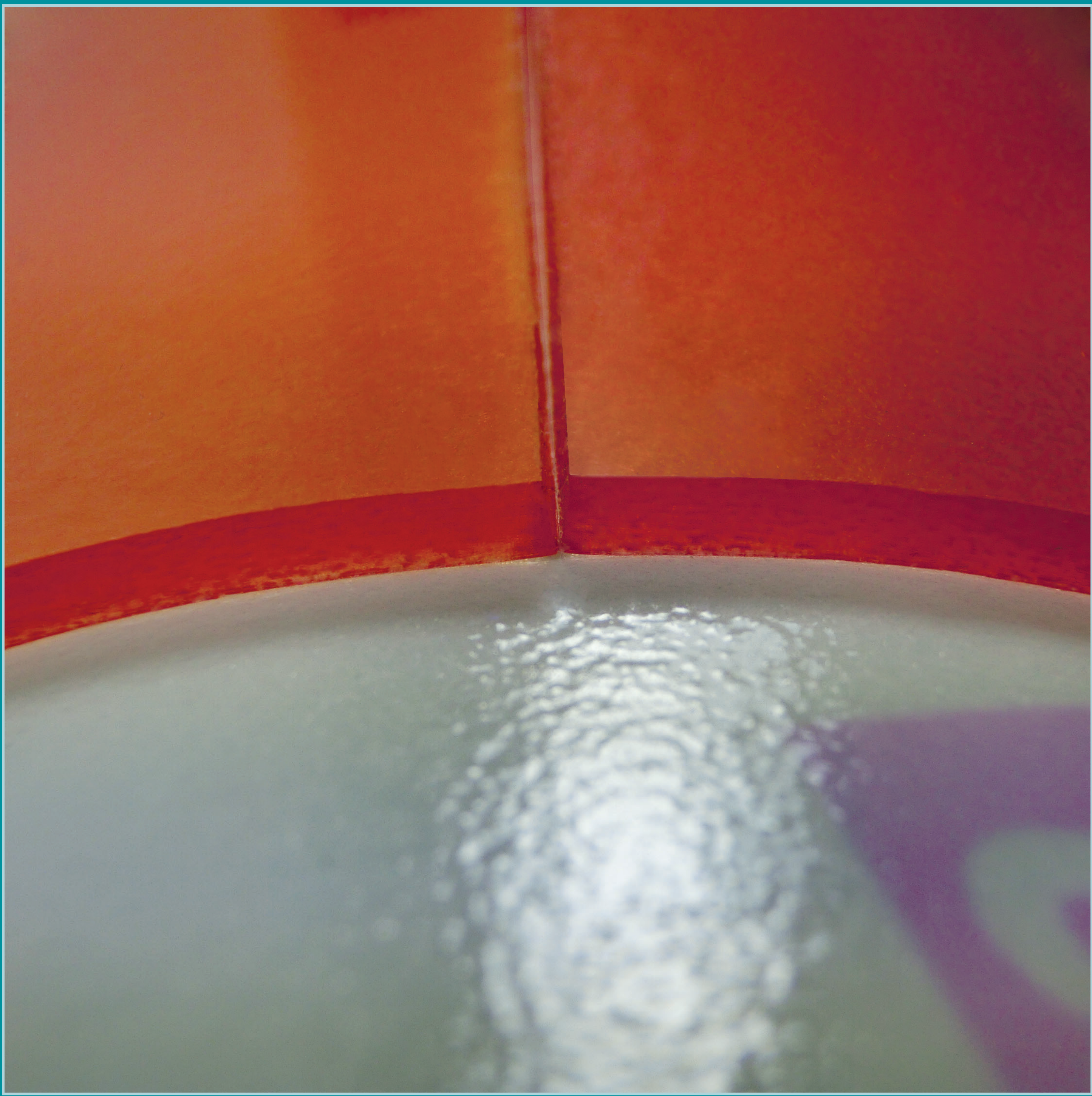

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Unambiguous conclusions of extended cell shape performance

WILBERT STREEFLAND

In 2012 Pamarco contacted Technology Coaching for comparable testing of the EFlo's extended cell shape. They wanted the tests carried out by an independent observer in unambiguous terms. WILBERT STREEFLAND's first comment to Pamarco was that they have to realise that tests will show what they need to know and that this often significantly deviates from what they want to hear about their product. They accepted this objective testing and the project was started. When doing comparable testing the level differences from properties that are important for the print process are measured.

What are the key anilox roller properties that have an impact on the print process?

- Its ability to release ink;
- Its ability to transfer a uniform and constant ink film to the printing plate;
- Cleaning intervals needed for maintaining the ink transfer level.

What is EFlo's extended cell shape?

Let's first look at the extended cell shape relative to the hexagonal cell shape. *Figure 1* and *2* shows side by side the *EFlo* and hexagonal cell shapes. Comparable testing of the anilox rollers can, in this case, be done based on line count and/or on the number of cells/area – both were done.

Comparable testing

To do the comparable testing two identical banded anilox rollers were produced. Why use two anilox rollers for the test? The testing should be comparable to day-to-day printing which means also investigating wet-on-wet printing. A single-colour banded anilox roller test will never provide any information about ink trapping.

Test variables:

- 2 identical banded anilox rollers;
- 3 substrates;
- 1 ink type (colours: Cyan, Magenta and Black);
- 2 printing speeds.

Table 1 shows the configuration of the two identical rollers. In total each anilox roller had 14 bands. Bands A and B were engraved on the operator-side and drive-side of the roller. This was done for measuring machine alignment. You can't judge the results of a banded anilox roller test if the alignment of the machine is not monitored and equal on both sides. Thus on each side the results of the A and B bands were measured and compared.

The test forme used was specially designed and contained:

- Large fulltone areas including a large fulltone trapping area;
- Barcodes with bars in print direction and cross print direction;
- Halftone areas with line counts up to 64 l/cm (163 lpi);
- Halftone areas with angles of 30°, 45 ° and 60° to investigate moiré between print plate and anilox roller;
- A special dot size area to investigate the minimum printable dot size where the target dot size on the print plate ranged from 20 to 150 micron for a coverage between 1 and 20%;
- Standard pressure marks.

Conducting the test on a corrugated post printer allows testing a large variety of substrates in respect of ink absorbance. In this case coated White top liner, uncoated kraft liner and Brown kraft liner were used.

The machine used for the test was the *Bobst Masterflex HD* installed at *Ghelfi Ondulati* in Italy. It is important that a test is carried out according to the preset protocol. Deviations from the test protocol are not allowed. This kind of testing can only be done when operators know what they are doing and the machine is in perfect working condition.

For this kind of testing the time used ratio for preparing the test : the actual test : the data collection and reporting is 4:1:12. The actual testing on the press was about 6 hours. Ten test runs were completed.

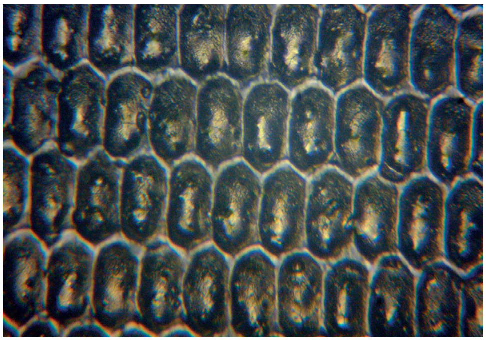
What was part of the evaluation?

- Anilox roller IFT (ink film thickness on the anilox roller surface);
- Anilox roller cell wall thickness;
- Anilox roller line count;
- Colour variation;
- Colour change during start-up;
- Ink transfer;
- Moiré between anilox roller and printing plate;
- Dot size;
- Filling of halftone area;
- Trapping;
- Barcode bar width gain variation.

Overview of the amount of data collected:

- 7600 spectral readings;
- 1600 barcode scans;
- 540 microscope images;
- 84 image scans.

Let us now look briefly at the results of the tests. First the engraved rollers were measured and



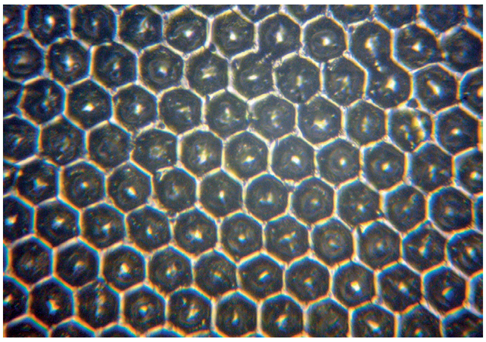


Figure 1 (left): EFlo extended cell.

Figure 2 (right): Conventional 60° hexagonal cell.

Technology Coaching bvba, Heverlee/B.

the target compared with actual readings. This was done by allocating each band to three groups:

- *EFlo* standard line count;
- Conventional 60° hexagonal;
- *EFlo* high line count.

Figure 3 and *4* show the relation between line count and ink film thickness (IFT) on the roller surface.

The actual measured results for IFT and line count are in line with the target. This allows comparable testing. There are only minor differences between the two banded anilox rollers, within normal tolerance.

Evaluation of moiré patterns between anilox roller and print plate was also included in the tests. This showed that there was no difference in moiré appearance between using *EFlo* and hexagonal 60°.

Let us now look at the result when printing Cyan on coated liner. *Figure 5* shows the relation between the L value of the L*a*b* values measured using a spectrophotometer and the IFT on the anilox roller. The L represents a value for the colour strength. A higher L value means a lighter colour. Remember, the colour will be lighter when the IFT reduces on the roller surface but also when less ink is transferred from the roller to the substrate.

The graph in figure 5 shows an overlap for the hexagonal bands and the *EFlo* high line count. It can be concluded that the *EFlo* bands, having the same IFT and line count as the hexagonal bands, transfer more ink. Ink transfer between *EFlo* and hexagonal are equal when we have the same number of cells per area. The difference is smaller at low IFT on the surface of the anilox roller.

Let us compare the bar width gain of the barcodes that were printed using Black ink in function of the IFT of the anilox roller bands (*figure 6*).

Also here we see how the »EFlo standard« separates by having a higher bar width gain. This is logical because the »EFlo standard« transfers more ink from the surface of the anilox roller.

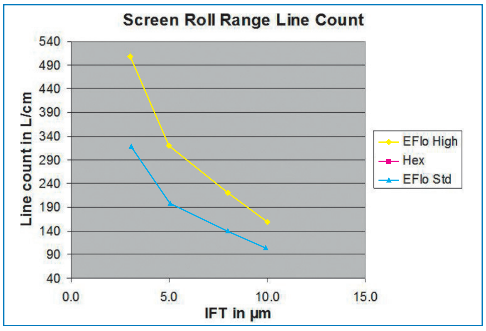


Figure 3: Target.

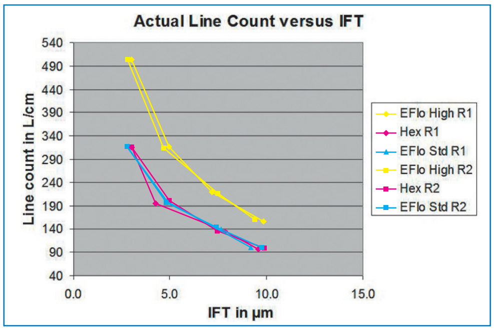


Figure 4: Actual.

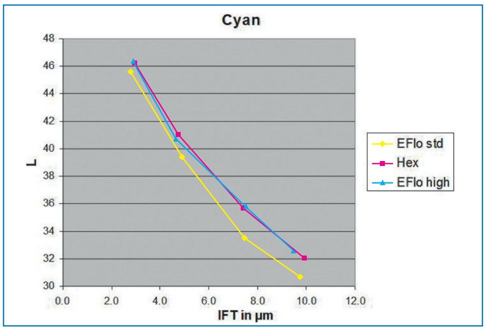


Figure 5.

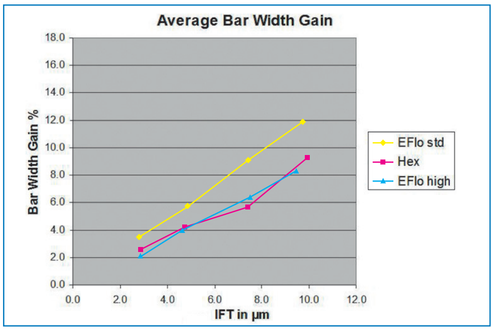


Figure 6.

	A	B	1	2	3	4	5	6	7	8	9	10
IFT in micron	10	5	3	3	3	5	5	8	8	8	10	10
L/cm	100	200	320	320	510	320	200	140	140	220	100	160
lpi	254	508	813	813	1296	813	508	356	356	559	254	406
Range	Hex	Hex	EFlo std	Hex	EFlo high	EFlo high	EFlo std	EFlo std	Hex	EFlo high	EFlo std	EFlo high

Table 1.

Conclusions

The banded anilox roller tests show:

- A *Pamarco EFlo* extended cell anilox roller with the same line count compared to a hexagonal anilox roller transfers more ink from the cells when both rollers have the same ink film thickness on the surface of the roller.
- A *Pamarco EFlo* extended cell anilox roller that has about 1.55 times the line count of a hexagonal roller transfers about the same amount of ink when both rollers have the same ink film thickness on the surface of the roller.
- Increasing line count with the same IFT on the surface of an anilox roller results in a lower ink transfer: this results in the risk of the anilox roller getting dirty more easily.
- The dominating factor for dot gain is the amount of ink transferred. Thus when ink transfer reduces e.g. due to the anilox roller getting dirty, not only does the colour shade get lighter but also the printed dots get smaller.
- Using the *Pamarco EFlo* extended cell shape provides an opportunity in having a more stable ink transfer at equal line count compared to a conventional 60° hexagonal cell shape.

> The specification and selection of an *EFlo* extended cell shape anilox roll and its behaviour is predictable relative to a 60° hexagonal cell shape screen roll.
>
> Thus potential customers can reliably change from the conventional hexagonal anilox roll to an *EFlo* extended cell anilox roll.

Recommendations

Use three general anilox roller specifications:

- Uncoated paper: IFT 10–12 micron, 100 l/cm (254 lpi) or *EFlo* 160 l/cm (406 lpi);
- Coated paper: IFT 4–5 micron, <200 l/cm or (508 lpi) *EFlo* 320 l/cm 813 lpi);
- Process colours on coated liner: IFT 3 micron, <320 l/cm or (813 lpi) *EFlo* 510 l/cm (1295 lpi). ■