MR STREEFLAND HAS WORKED IN THE CORRUGATED INDUSTRY SINCE 1992. DURING THIS TIME, HE HAS BEEN TECHNOLOGY DEVELOPMENT MANAGER FOR SCA PACKAGING AS WELL AS TECHNICAL MANAGER AT STORK SCREENS. HE STARTED TECHNOLOGY COACHING BVBA IN FEBRUARY 2005.

PERFORMANCE CONCLUSIONS OF THE EFlo EXTENDED CELL SHAPE FROM PAMARCO

IN THE FOLLOWING ARTICLE, WILBERT STREEFLAND LOOKS AT THE PERFORMANCE CONCLUSIONS OF THE EFlo ANILOX ROLL EXTENDED CELL SHAPE FROM PAMARCO.

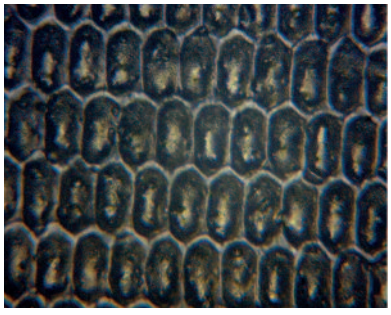
Pamarco contacted Technology Coaching (Wilbert Streefland) in 2012 to undertake comparable testing of the EFlo anilox roll extended cell shape. They wanted the tests carried out by an independent observer in unambiguous terms. My first comment to them was that they have to realise that tests will show what they need to know and that this is often significantly different from what they want to hear! They accepted this objective testing and we started the project.

When doing comparable testing, we measure the level difference from properties that are important for the print process. We start by asking what are the key properties of the screen roll that have an impact on the print process.

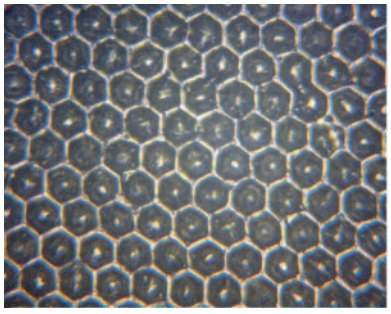
- Its ability to release ink;
- Its ability to transfer a uniform and constant ink film to the printing plate;
- Cleaning intervals need to maintain the ink transfer level.

What is the EFlo extended cell shape?

Let's first look at the EFlo anilox roll extended cell shape relative to the hexagonal cell shape. The following two images show, side by side, the EFlo and hexagonal cell shapes.



EFlo extended cell



Conventional 60° hexagonal cell

Notice the stretching of the EFlo cells. Comparable testing of the screen rolls can in this case be done based on line count and/or on the number of cells/area. We did both.

Comparable testing

To do the comparable testing, two identical banded screen rolls were produced. Why use two screen rolls for the test? The testing should be comparable to day to day printing, which means also investigating wet in wet printing. A single colour banded screen roll test will never provide any information about ink trapping.

Test variables: Two identical banded screen rolls; Three substrates; One ink (colours: Cyan, Magenta and Black) and two printing speeds. The following table shows the configuration of the two identical rolls:

	A	B	1	2	3	4	5	6	7	8	9	10
IFT in µm	10.0	5.0	3.0	3.0	3.0	5.0	5.0	8.0	8.0	8.0	10.0	10.0
L/cm	100	200	320	320	510	320	200	140	140	220	100	160
Range	Hex	Hex	EFlo std	Hex	EFlo high	EFlo high	EFlo std	EFlo std	Hex	EFlo high	EFlo std	EFlo high

In total, each screen roll had 14 bands. Bands A and B were engraved on the operator side and drive side of the roll. This was done for measuring machine alignment. You can't judge the results of a banded screen roll test if the alignment of the machine is not monitored and equal on both sides. Consequently, the results of the A and B bands were measured and compared on each side.

The plate used for the test was specially designed and contained:

- Large, full tone areas including a large full tone trapping area;
- Barcodes in print direction and cross print direction;
- Halftone areas with line counts up to 64 L/cm;
- Half tone areas with angles of 30°, 45 ° and 60° to investigate Moiré between print plate and screen roll;
- A special dot size area to investigate the minimum printable dot size where the target dot size on the plate ranged from 20 to 150 µm for a coverage between 1 and 20 per cent;
- 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 we used coated whitetop liner, uncoated kraftliner and brown kraftliner.

The machine used for the test was the Bobst Masterflex HD installed at Ghelfi Ondulati in Italy, giving us a quality, technically advanced machine for testing. It is important that the test is carried out according to 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 type of testing, the time ratio for preparing the test, the actual test, the data collection and reporting was 4 : 1 : 12. The actual testing on the machine was about six hours. We did 10 test runs.

What was included in the evaluation?

- Screen roll IFT (Ink Film Thickness on the screen roll surface);
- Screen roll cell wall thickness;
- Screen roll line count;
- Colour variation;
- Colour change during start-up;
- Ink transfer;
- Moiré between screen roll and print plate;
- Dot size;
- Filling of halftone area;
- Trapping;
- Barcode bar width gain variation.

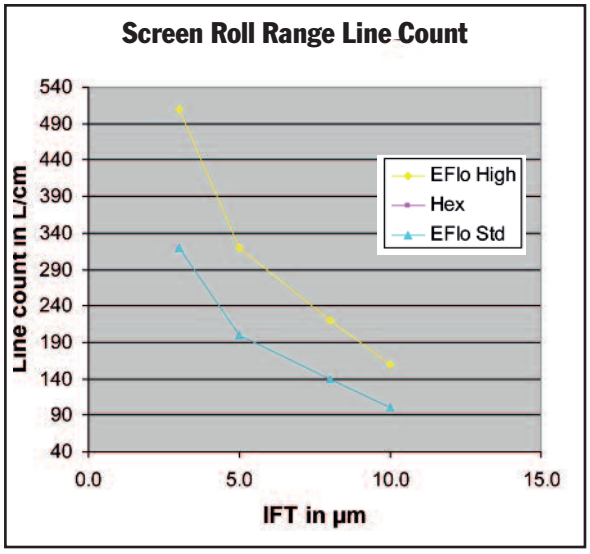
An overview of the amount of data collected included: 7,600 spectral readings; 1,600 barcode scans; 540 microscope images and 84 image scans.

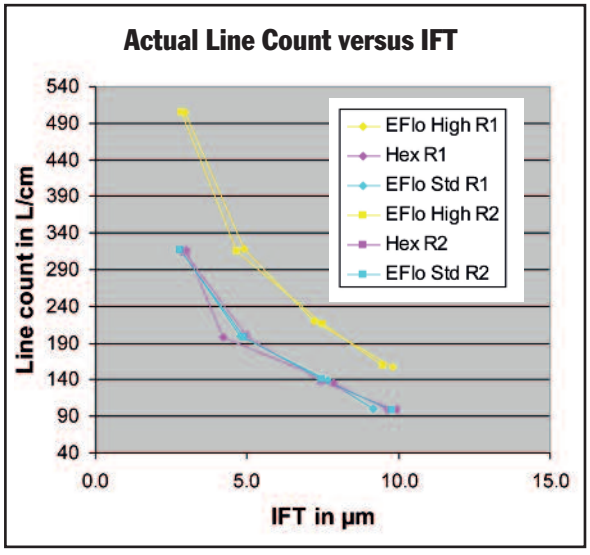
Results

Let's now look at brief results of the tests. First, the engraved rolls were measured and the target compared with the actual. This was done by allocating each band to three groups: EFlo standard line count; Conventional 60° Hexagonal and EFlo high line count.

The image on the following page shows the relation

between Line Count and Ink Film Thickness (IFT) on the roll surface:

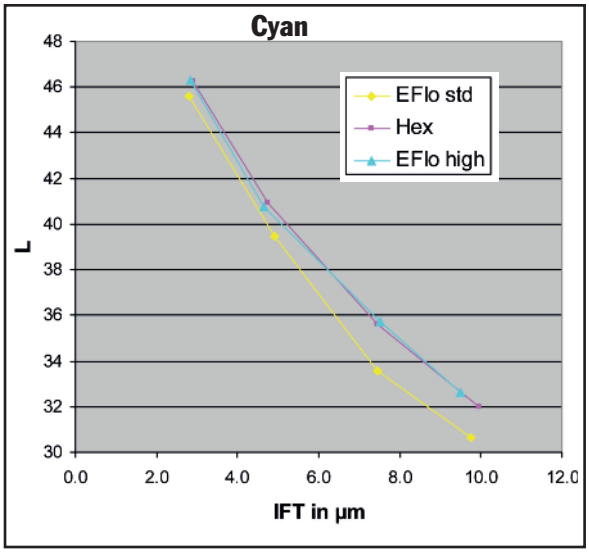




The actual measured results for IFT (Ink Film Thickness) and line count are in line with the target. This allows comparable testing. There are only minor differences between the two banded screen rolls, within normal tolerance.

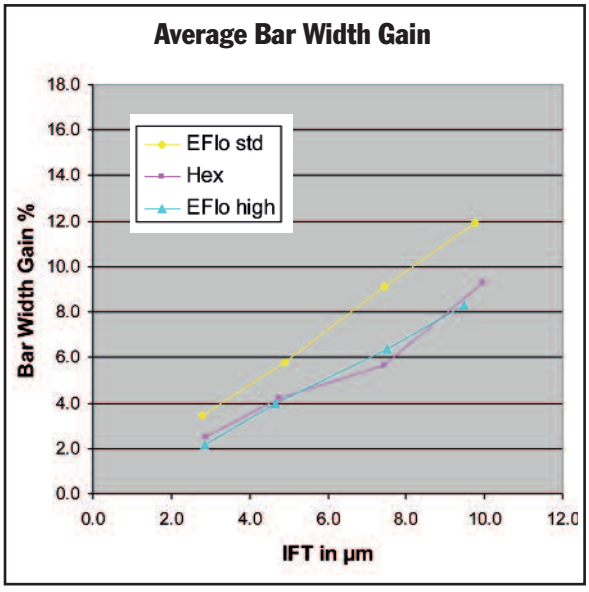
Included in the test was an evaluation of Moiré patterns between screen roll and print plate. The tests showed that there was no difference in Moiré appearance between using EFlo and Hexagonal 60°.

Let's now look at the result when printing cyan on coated liner. The graph top right shows the relation between the 'L' value of the L, a, b values measured using a spectrophotometer and the IFT on the screen roll. 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 (Ink Film Thickness) reduces on the roll surface but also when less ink is transferred from the roll to the substrate.



The graph above also shows an overlap for the Hexagonal bands and the EFlo high line count. We can conclude 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 screen roll.

Let's compare bar width gain of the barcodes that were printed using black ink in function of the IFT of the screen roll bands:



Here we see how the 'EFlo standard' has a higher bar width gain. This is logical, because the 'EFlo standard' transfers more ink from the surface of the screen roll.

Conclusions

The banded screen roll tests show:

- A Pamarco EFlo Extended Cell screen roll with the same line count compared to a Hexagonal screen roll transfers more ink from the cells when both rolls have the same Ink Film Thickness on the surface of the roll;
- A Pamarco EFlo Extended Cell screen roll that has about 1.55 times the line count of an Hexagonal roll transfers about the same amount of ink when both rolls have the same Ink Film Thickness on the surface of the roll;
- Increasing line count with the same IFT on the surface of a screen roll results in a lower ink transfer — this results in the risk of the screen roll getting dirty more easily;
- The main cause of dot gain is the amount of ink transferred — when ink transfer reduces (eg. due to the screen roll 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 to have a more stable ink transfer at equal line count compared to a conventional 60° Hexagonal cell shape, resulting in less stops during production.

The specification and selection of an EFlo Extended Cell shape screen roll as well as its behaviour is predictable relative to a 60° Hexagonal cell shape screen roll.
Thus potential customers can reliably change from the conventional Hexagonal screen roll to an EFlo Extended Cell screen roll.

Recommendations

Use three general screen roll specifications:

- Uncoated paper: IFT 10-12m, 100 L/cm (EFlo 160 L/cm)
- Coated paper: IFT 4-5m, <200 L/cm (EFlo 320 L/cm)
- Process colours on coated liner: IFT 3m, <320 L/cm (EFlo 510 L/cm) ■

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