Evaluation of printing capabilities of a flexo printing machine.
Banding evaluation test forme.
Uniformity evaluation test forme.

Foreword

When the machine's status is unknown, it is necessary to use a verification method to determine the machine's ability to achieve the print production target.

At this stage, the machine is to be considered uncalibrated.

Printing acceptability is the ability to print on a surface uniformly for several metres at a defined speed while satisfying specific parameters. This test verifies the ability of the machine to be subsequently characterised and profiled.

To check the status of a machine, the following parameters need to be checked on a single colour forme:
- Mechanical aspects
  - Management of the support according to the substrate (film, paper, cardboard, aluminium, etc.).
  - Substrate elongation
  - Substrate distortion
  - Material advancement (dragging parallelism)
  - Printing constancy
- Print management
  - Inking uniformity
  - Streaks / Bouncing
  - Minimum % printable dot
  - Slur
  - Ghosting

1. Objectives

Banding/bouncing and uniformity are problems that may affect flexo printing quality.

Identifying a methodology to quickly evaluate the banding and have a numeric measure of quality.

Identifying a methodology to quickly evaluate the uniformity and have an index related to quality.

Having measurement numbers allows us to better understand the problem and take corrective measures to limit it if necessary.

2. What is "banding"?

Banding is a specific printing defect that creates a variation in the print density in the direction of printing.

It can affect both web and sheet printing presses.
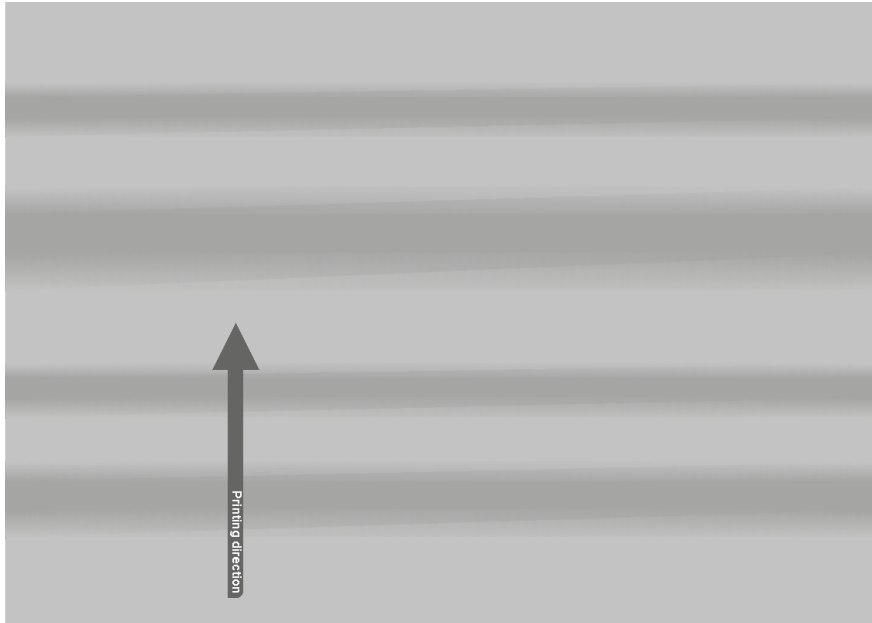
This is generally caused by the plate cylinder not rolling smoothly against the press cylinder.

3. What is uniformity?

Printing uniformly, i.e when the overall quantity of ink released is uniform all over the printing area, is quite important, especially if printing a multiple-track job.
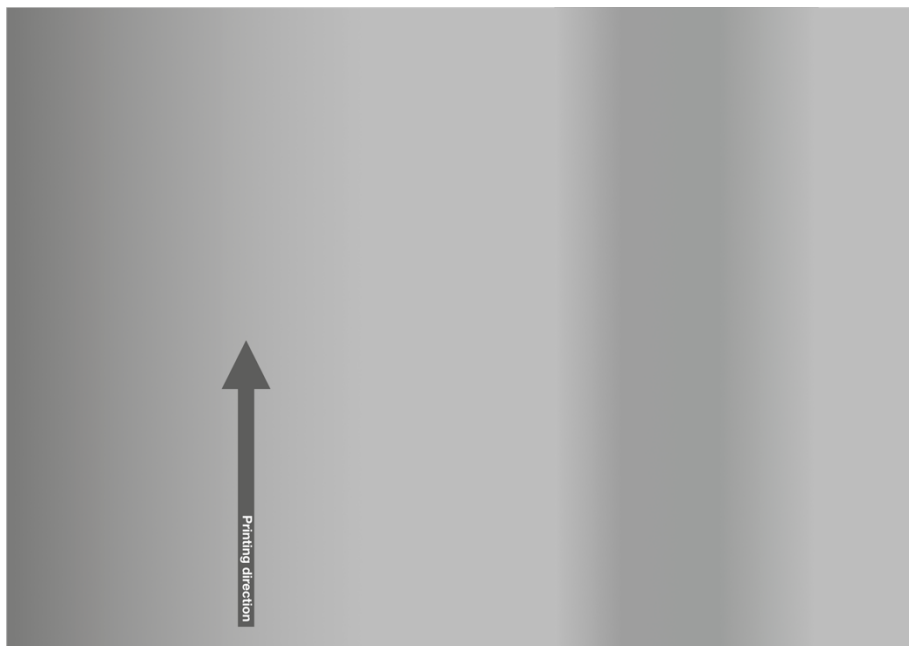

This is generally caused by the non-uniform printing pressure or non-uniform ink supply.

4. Printing machines that may be checked

- Web press
- Corrugated carton board press

5. How to evaluate and measure uniformity

The aim of this test forme is to enable the ink delivery to be evaluated over the entire printing surface.
The printing area is subdivided into 9 areas to be measured.

Uniformity Forme
ver. 1A

FORME dimension 800x500 mm
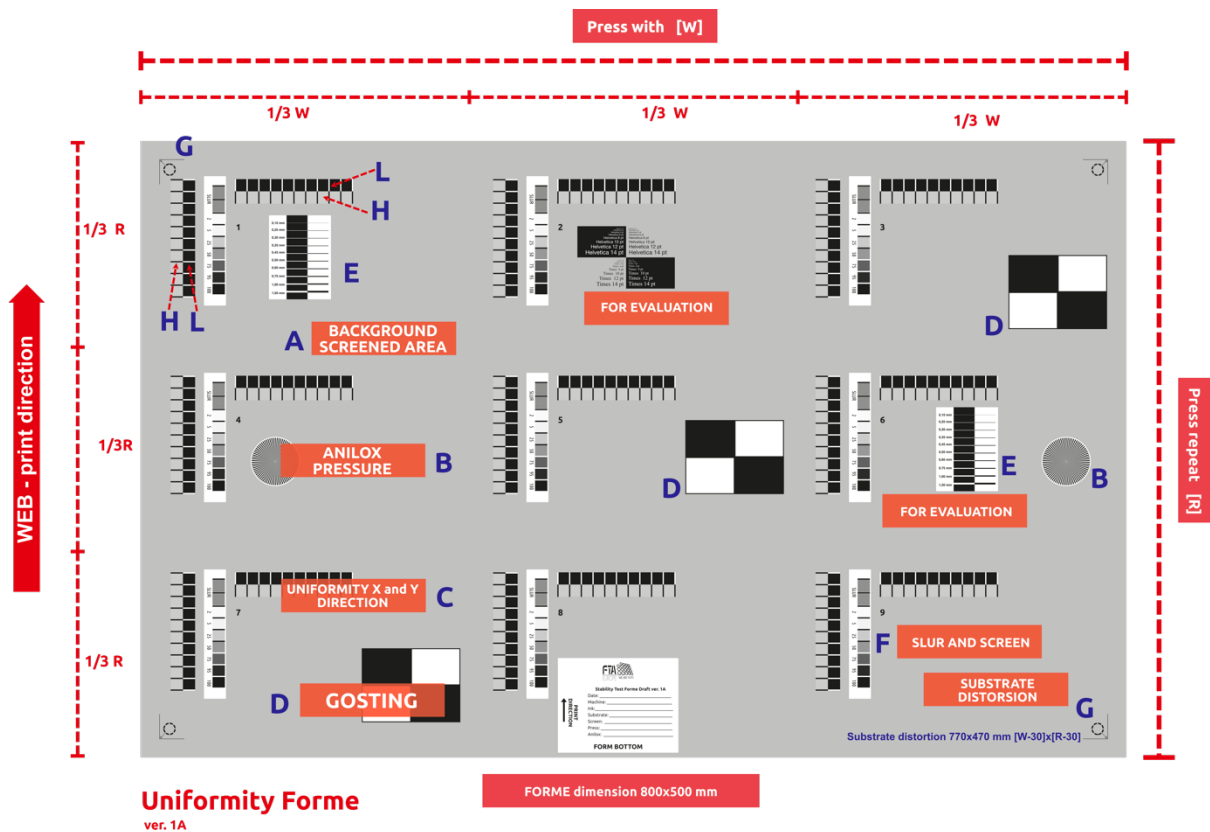
Graphic elements legend:
- A. Background screened area, to evaluate visually the uniformity
- B. Anilox pressure target, to evaluate the correct anilox pressure
- C. Uniformity scale (L,H) in the X and Y printing direction, measuring this scale to obtain the uniformity index
- D. Ghosting target, to evaluate the ink fountain capacity
- E. For evaluation only
- F. Scale to measure slur and dot gain
- G. Distortion of the printed area

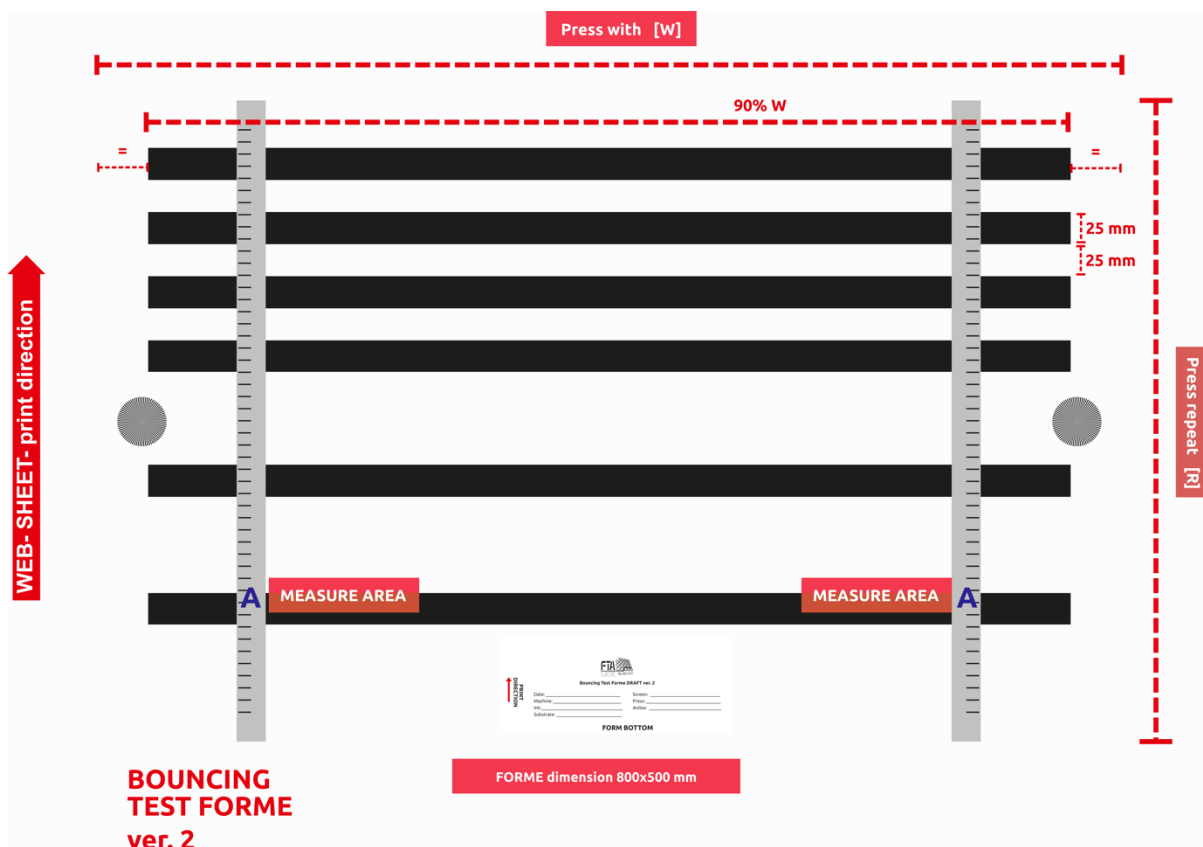## 6. How to evaluate and measure banding uniformity

What a printing press operator may have on their printing machine is a spectrophotometer. The measurement of a printed sheet is within the printer's competence and possibilities.

The L*, luminance, variation along the printing area is used to calculate an index, which represents the level of uniformity in that printed area.

Lower value, toward zero, less variation is present in the printed area.

The forme has been drawn with 2 graphic elements:
- Horizontal bars, parallel the rotation axes of the plate cylinder, at different distances from each other and different heights to create a non-uniform printing surface
- A screened area perpendicular to the rotation axes of the plate cylinder, where the luminosity variation is measured.

BOUNCING TEST FORME ver. 2

Press with [W]

90% W

25 mm
25 mm

WEB- SHEET - print direction

Press repeat [R]

MEASURE AREA

MEASURE AREA

FORM BOTTOM

FORME dimension 800x500 mm

The forme needs to be adapted to the printing machine dimension.

7. Instruments to be used

A spectrophotometer capable of scanning the patches.

8. How to calculate the score

A free Excel sheet to make the calculation is available.

9. Plate preparation

The plate must be prepared as usual, though specific attention needs to be paid to ensure:
- The plate is not distorted
- Image stretching in the printing direction must be applied, to compensate for the circumferential distortion
- No dot gain compensation
- The plate must be compensated to give the screen file value (i.e. 50% on file must be 50% on the plate)
- No micro screen pattern must be applied
- Plate thickness, as currently used, normally for web 1,14 mm
- Plate screen at least 48 l/cm or 120 l/inch
- Use a standard tape or plate mounting layer
- External surface print on film

10. How to print the test form
- Print on each deck with a high contrast ink, black is best
- Use a clean anilox, with a volume suitable to obtain at least a D of 1.30 or a L* of 30
- Anilox standard 60° hexagonal cell with a line ruling sufficient to avoid dot dipping (400 l/cm)
- Print at the following speeds
    - 90 % of max machine speed

- o 50 % of max machine speed
- o 20 % of max machine speed

11. Measure methodology:

The methodology proposed and adopted to get an indication of the stability of the print is essentially a statistical measurement.

We use the L* value read from the patch and calculate an Index of uniformity, to give a reference value to evaluate the banding, where a lower value indicates that there is no or low variability.

Any measurement related to the hue is not appropriate since a single colour tone is being measured.

Using a spectrophotometer: scan all the A patches, and submit the values into the Excel spreadsheet provided to calculate the result.

Repeat the measurement at least for 3-5-9 different sheet pickups, not in sequence, for each speed

The best result is a perfect uniform area, i.e. 0 for the Index of uniformity value.

Repeat for sufficient test sheets, not collected sequentially through a run of 50/100 m or 50/100 sheets.

Bouncing measurement score:

Index of uniformity		
0 to 2,59	Optimum result	No Banding
2,6 to 5,0	Acceptable result	Minimum acceptable banding
5,1 to 10	Non acceptable result	Not Acceptable banding

Density Change over Distance
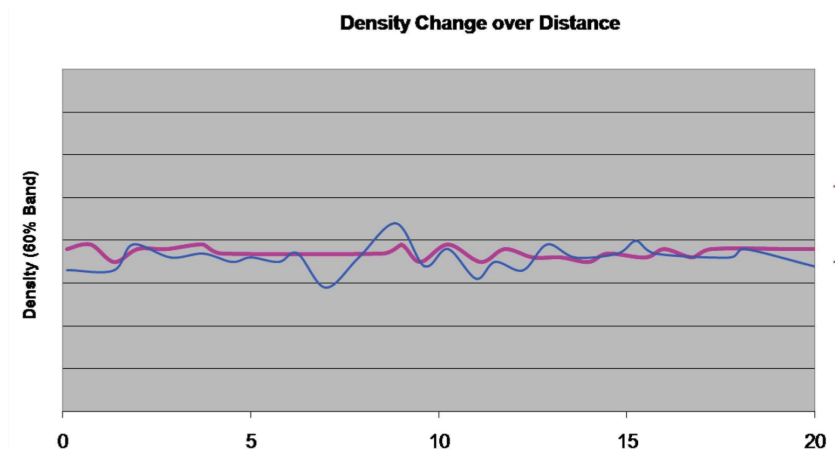
Uniformity measurement score:

On this test form, there are different results to be evaluated

- ● Ghosting
  - o The D elements do not appear repeated along the printing direction
- ● Slur
  - o Slur is quite an important measure, is measured as an L* difference between to patch a value.

0	Optimal
< 0,2	Good
> 0,2	Worst

- ● Distortion
  - o The G rectangle must be not distorted
    - ■ How to measure distortion:
      All the opposite rectangle sides must have the same length, together with the 2 diagonals
- ● Printing curve
  - o The F scale measurements need to be uniform all over the area, i.e., the halftone gain curve should be the same