Introduction

Mottling is the uneven appearance, mostly in solid areas: small dark and light areas appearing in the surface of paper (board) caused by ink, paper or press work.

As this definition says mottle is influenced by many parameters: type of ink, colour sequence, construction of printing press, speed, rubber blanket, damping fluid and the most important one: the type of paper. Variations in the surface characteristics as absorption, smoothness and cloudiness play an important role in the mottle and are caused by the production process and the components in the paper.

Print mottle is an alternative and easier, but sometimes less accurate method than the back trap mottle. A paper strip is printed 4 times with the same printing disc.

There are some types of mottling. These methods are described in the following W-leaflets:

1. BACK TRAP MOTTLE (W57-AMS)
   In back trap mottle paper is printed and the ink of the printed strip is set off 4 times to 4 clean printing forms with interval times of 10 s or 15 s.
2. PRINT MOTTLE (W58-AMS)
   Print mottle is an alternative and easier, but sometimes less accurate method than the back trap mottle. A paper strip is printed 4 times with the same printing disc.
3. WATER INTERFERENCE MOTTLE (W59-AMS)
   Water interference mottle is the uneven printing result, caused by insufficient and uneven water absorption of the paper, followed by uneven ink absorption.
4. INK TRAP MOTTLE (W92-AMS)
   Ink trap mottle is the uneven printing result caused by a wrong trapping in tack and/or viscosity of the ink in wet-on-wet printing and is also influenced by an uneven absorption of the ink by the paper.

This information leaflet W58-AMS describes:

1. Print mottle index.
   Paper is printed 4 times with the same printing form with interval times of 10 s. After the last print the test result is assessed by the IGT on-line analysing system or visually.
2. Print mottle curve.
   Paper is printed 4 times with the same printing form with interval times of 15 s. After the every print the test result is assessed by the IGT on-line analysing system or visually.

Principle

A paper is printed four times with the same printing form under standard conditions with the IGT printability tester of the type AMSTERDAM 1, 2, 5 or 6.

Print mottle index: After the last print the print result is assessed as a contrast value in the print by the IGT On-line Analysis Software for Mottling. If the on-line analysis software is not used, a visual appraisal can be made in comparison to a self-made scale or in comparison to other papers.

Print mottle curve: After every print the print result is assessed as a contrast value in the print by the IGT On-line Analysis Software for Mottling.

Method of operation

- It is recommended to execute the test in the standard atmosphere; to most standards it is 23,0 ± 1,0 °C and 50 ± 2% rh.
- For the operation of the AMSTERDAM, Inking Unit and ink pipette follow the instructions of manuals, W100 and displays accurately.
- Handle the samples carefully.

Materials and testing conditions		
1	IGT AMSTERDAM 1/2/5/6	
2	IGT High Speed Inking Unit 4	465.000.710
3	Top roller with 4 segments for conventional inks	466.003.003
4	IGT ink pipette	408.000.200
5	Printing disc, covered with rubber blanket, pin, 50 mm wide (1 x)	402.089.720
6	IGT mottle test ink	404.800.010
7	IGT On-line Analysis Software for Mottling	522.100
Strips of paper to be tested, preferable 55*340 mm², 3 strips per sample Lint free rags and cleaning naphtha		

	Print Mottle Index	Print Mottle Curve
Printing force	625 N	625 N
Printing speed	Constant, 0,2 m/s	Constant, 0,2 m/s
Number of prints	4	4
Interval times index / curve	10 s	15 s
Ink film thickness (volume)	2,4 µm (0,10 cm³)	2,4 µm (0,10 cm³)
Checkbox Scan	Activated	Activated

► The numbers 1 thru 7 are available at IGT Testing Systems.

Preparation

1. Condition the papers, the ink and the equipment during >6 hours in the standard atmosphere.
2. Cut the paper strips and mark them with top and/or bottom side, machine and/or cross direction and a code for the type of paper.
3. For print mottle index:
   3.1. Select method **Mottle: Print Index**.
   3.2. If desired, touch the checkbox **Scan** to scan and save the test strip.
4. For print mottle curve:
   4.1. Select method **Mottle: Print Curve**
   4.2. Touch the checkbox **Scan** to scan and save the test strip.
5. Remove the brush from the tester.
6. Fill the ink pipette with the mottle test ink.
7. Adjust the High Speed Inking Unit 4 with the following settings:
   - Water bath: 23,0 °C
   - Top roller: 4-segmented, rubber for conventional inks
   - Mode: 2
   - Startup time: 10 s
   - Distribution time: 20 s
   - Distribution speed: 0,5 m/s
   - Inking time printing discs: 15 s

Execution

1. Touch the button **PRINT** to rotate the (1st) shaft into the starting position.
2. Mount a test strip on the sector by attaching the beginning of the test strip into the front clamp and fixing the end of the test strip on the sector with a piece of tape.
3. Apply 0,10 cm³ of ink to a segment of the top roller of the inking unit, distribute the ink during the preset or desired time.
   NOTE: Due to drying of the ink it is not advised to add some ink after a test.
4. Place a printing disc on the printing disc shaft of the inking unit and ink the disc during the preset or desired time.
5. Take the printing disc from the inking unit and place it on the 1st printing disc shaft of the tester.
6. For Print Mottle Index
   6.1. Press both side buttons to make a print and to come into the waiting position for the 2nd print. At this moment release both side buttons.
   6.2. Before the waiting time has elapsed, press both side buttons to make a 2nd print with the same disc and to come into the waiting position for the 3rd print. At this moment release both side buttons.
   6.3. Repeat the point 6.3 for the next two prints. After the last print, keep pressed both side buttons if activated, to move the camera downward, to scan the test result and to come into the end position; then release both buttons.

►►

7. For Print Mottle Curve
   7.1. Press both side buttons to make a print, to move the camera downward, to scan the printing result and to come into the waiting position for the 2nd print. At this moment release both side buttons.
   7.2. Before the waiting time has elapsed, press both side buttons to make a 2nd print with the same disc, to scan the printing result and to come into the waiting position for the 3rd print. At this moment release both side buttons.
   7.3. Repeat point 7.2 for the next two prints and scans. After the last print, keep pressed both side buttons to scan the test result and to rotate the sector into the end position; then release both buttons.
8. If the camera is activated:
   8.1. The test strip is assessed; if finished the camera moves upward.
   8.2. Save or discard the results.
9. Take the disc from the shaft and clean with rags and naphtha and let it dry.
10. Take the sample from the tester.
11. For a next test start with point 2 or touch **BACK** and start with point 1. It is recommended to perform the test at least three times per sample.
12. After having finished the tests, touch **BAC**K and clean and store all parts as described in the manuals.
13. Make an accurate record of the conditions and the results of the test and refer to method:
    W58-AMS, Print Mottle Index
    W58-AMS, Print Mottle Curve

Assessment

1. Print mottle index:
   1.1. Image analyzing
   The IGT On-line Analysis Software for Mottling has scanned and analyzed the printed strip after 4 prints. The results are shown in the display as a contrast. The higher this value the more mottling is present.
   1.2. Visually
   If the IGT On-line Analysis Software for Mottling is not used, compare the printing results with a self-made scale or compare with the results of other papers and give a number or description of the result.
2. Print mottle curve:
   2.1. Image analyzing
   The IGT On-line Analysis Software for Mottling has scanned and analyzed the printed strip after every print. The results are shown in the display as a contrast. The higher this value the more mottling is present.

Notes

1. Due to the quick altering of the rubber blanket of the printing disc and the sensitivity of the test, the maximum life time of the rubber blanket for this test is 1 month or even shorter after the first use.
2. The maximum storage life of the Mottle test ink in the original, closed packing is 1 year; in an opened packing 3 months.