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Graphic technology — Laboratory test method for chemical ghosting in lithography

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TECHNICAL REPORT

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Technologie graphique — Méthode d'essai en laboratoire pour impression fantôme chimique en lithographie

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Foreword

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ISO/TR 12705 was prepared by Technical Committee ISO/TC 130, *Graphic technology*.

Introduction

This Technical Report describes a test method to evaluate the susceptibility of a particular ink, substrate and printing procedure to produce chemical ghosting in sheet-fed offset lithographic printing. Chemical ghosting occurs only in sheet-fed offset lithographic printing and appears mostly in dark areas of a print. A related phenomenon, mechanical ghosting, can appear in both sheet-fed and web offset. This is due to the ink supply limitations of some inking unit designs for sheet-fed offset presses; its origin is unknown in web-offset presses.

Chemical ghosting occurs during storage of freshly printed sheets in the output stack. Inks formulated from natural fatty acids liberate volatile chemicals during oxidative drying. These might cause either

— image-wise yellowing of the back side of the adjacent sheet in the stack (in either single side or perfecting printing), or

— variation in the drying speed of ink layers that are subsequently over-printed, which results in an image-wise variation in gloss.

In both cases “ghost image artefacts” might be visible. Complete suppression of these artefacts can be achieved by strictly separating the sheets. The effect of chemical ghosting depends on the nature and film thickness of the printing inks, the substrate, climatic conditions, the time intervals between face and reverse printing, and printing and converting.

The severity of chemical ghosting that manifests itself by differences in gloss may be reduced by:

a) measures that result in faster ink drying;

b) lower ink film thicknesses;

c) moderate temperatures;

d) medium relative humidity;

e) very short or very long intervals between face and reverse printing;

f) short converting intervals[3].

If prints are surface-finished by dispersion, UV lacquers, and sometimes oil lacquers, this tends to achieve a homogeneous gloss level and therefore to suppress chemical ghosting[3].

Optical measurements like densitometry, colorimetry and gloss measurement at constant and variable angles of illumination and detection have proven unsatisfactory in the evaluation of the severity of image-wise gloss artefacts. These effects are better evaluated visually.

The reliability of the test method described in this Technical Report was validated by printing trials on a sheet-fed offset printing press[3][4].

TECHNICAL REPORT ISO/TR 12705:2011(E)

Graphic technology — Laboratory test method for chemical ghosting in lithography

1 Scope

This Technical Report describes a laboratory method, using a printability tester, for the preparation of specimens in order to evaluate the tendency of a particular ink, substrate and printing procedure to produce chemical ghosting in sheet-fed offset lithography on coated papers or foils.

A test procedure to induce ghosting using these specimens is also included.

The presence of chemical ghosting is determined by visual evaluation of test images. Chemical ghosting can appear either as reverse-side yellowing on single-side and perfect printing, or as image-wise gloss variations in perfect printing. This method applies only to oxidative drying inks on coated papers or foils and it evaluates a particular ink and substrate combination.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
chemical ghosting
reverse-side and image-wise yellowing and/or gloss variations in face and reverse printing, typically in the form of a mirror image

2.2
face and reverse printing
perfect printing
printing on both sides of a print substrate, either in the same run or in two subsequent runs

3 Test method

3.1 Principle

Two test prints are prepared, according to the procedures defined in ISO 2834-1, using the ink and substrate combination to be evaluated. One of the test prints should have a large area of uniform coverage. The second test print should have a smaller area of uniform coverage that will lie within the area (or width) of coverage of the larger area test print when the two printed areas are placed facing each other.

These test prints are then placed with the printed areas facing each other, for a defined time interval, in a condition that simulates the pressure and environment associated with storage of freshly printed sheets in the output stack of a production press.

3.2 Apparatus

3.2.1 Printability tester

A printability tester meeting the requirements of ISO 2834-1 should be used. All of its settings should be recorded as defined in ISO 2834-1.

3.2.2 Printing forme

Two different printing formes are required. The inkable area of the first printing forme should represent a significantly smaller area than the second printing forme.

For easy visual detection, the printing forme with the smaller area should have more than just one contrast edge. This can be achieved by printing two symmetrically located stripes spaced by the width of the stripes (typically about 10 mm).

Figure 1 shows an example of a pair of printing formes for a typical printability tester meeting the criteria defined.

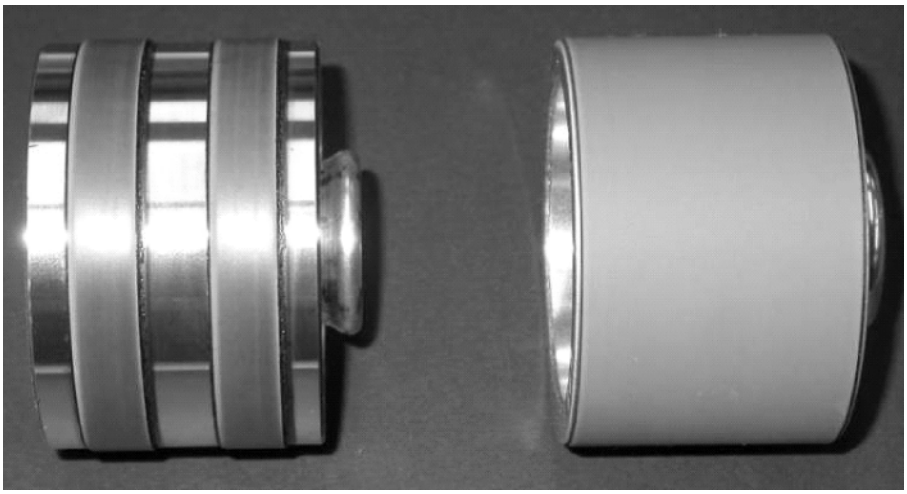

Figure 1 — Example of a pair of printing forms meeting the criteria of 4.2.2

3.3 Materials

3.3.1 Printing ink

This test is appropriate for use with all oxidative drying printing inks intended for sheet-fed offset printing. Since the drying speed of the ink plays an important role, any drying inhibitors that may have been applied to the ink surface while in the can should be completely removed prior to the test.

3.3.2 Print substrate

This test is appropriate for use with all coated papers or foils compatible with sheet-fed offset printing. Each test requires two pieces of substrate.

3.3.3 Output stack simulation

Prints should be stored in way that simulates the pressure and environment associated with storage of freshly printed sheets in the output stack of a production press. The use of the test substrate as the material for the stack is not necessary. Common office copy paper with a grammage of 80 g/m^2 may be used. The stack height above each pair of test images in contact with each other should be at least 5 cm.

3.4 Test conditions

3.4.1 Climatic conditions

Samples should be conditioned, and tests should be conducted, under the standard conditions of ISO 187.

3.4.2 Settings for the printability tester

The printability tester should be used with a printing pressure of 200N/cm and a printing speed of 1 m/s.

4 Procedure

The steps in the testing procedure are as follows.

a) Condition the printability tester, the ink and the printing substrate for a sufficient period of time (e.g. 2 h) so that temperature and humidity will come to equilibrium.

b) Create a test print using the test form with the smaller area at an ink film thickness specified for the intended printing condition to be simulated.

NOTE 1 A unified ink film thickness of 2,5 g/m^2 is suggested.

c) Allow the first test print to set for an initial time period that is long enough that set-off from the printed sheet to the second sheet does not occur. Limit the ink setting time to 15 min at the maximum.

NOTE 2 An ink setting test according to the manuals or instructions of the manufacturer of the printability tester can be used to determine the appropriate time interval to be used.

d) Place a second sample of the substrate in contact with the first test print with the intended printing side facing the first test print.

e) Place these sheets within a simulated output stack of paper for a time interval that compares well to the expected time between face and reverse printing.

f) Remove the sample sheets from the simulated output stack of paper and separate the unprinted test sheet from the printed test sheet.

g) Examine the unprinted test sheet for any evidence of yellowing in the areas that were in contact with the printed area of the first test sheet.

h) Using the unprinted test sheet and the test form with the larger area prepare a second test print. Be sure hat the printing is performed on the side designated as the intended printing side when the unprinted sheet was placed in contact with the first test print.

i) Allow the second test print to set for an initial time period that is long enough that set-off from the printed sheet to the second sheet does not occur. Limit the ink setting time to 15 min at the maximum.

j) Place this second test print in contact with the first test print in the same position and orientation that was initially used.

k) Place these sheets within a simulated output stack of paper for a time interval that compares well to the expected time between face and reverse printing.

l) Remove the sample sheets from the simulated output stack of paper and separate the second test sheet from the first test sheet.

m) Visually evaluate the second test print for variations in gloss.

5 Test report

The report should contain:

a) a reference to this Technical Report, i.e. ISO/TR 12705:2011;

b) any deviation from this Technical Report;

c) type of printability tester used and all its settings;

d) climatic conditions during the test;

e) designations and brands of both paper and ink;

f) design and ink film thickness of the first test print;

g) time interval between first and second test print;

h) ink film thickness of the second test print;

i) time interval between second test print and evaluation;

j) result of visual inspection;

k) any operations not specified in this Technical Report which might have influenced the result.

Bibliography

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