SCANDINAVIAN PULP, PAPER AND BOARD
TESTING COMMITTEE

SCAN-P 70:09
Accepted 2008

Papers and boards

Ink-absorbency value

0 Introduction

This SCAN-test Method replaces SCAN-P 70:95 from which it differs in the following ways:

- the choice of ink to be used is left open to the user to decide upon, but the ink used and the batch number must be reported;
- the apparatus for automatic removal of excess ink has been deleted, since there is no longer any producer of that equipment;
- the manual method has been improved.

1 Scope

This SCAN-test Method specifies a procedure for determining and calculating an ink-absorbency value. The procedure may be applied to different kinds of inks. The producer of the ink and the batch number are to be reported together with the results.

This Method is applicable to printing papers in general and especially to coated papers and boards.

2 References

ISO 187	Paper, board and pulps – Standard atmosphere for conditioning and testing and procedure for monitoring the atmosphere and conditioning of samples (EN 20187)
ISO 2469	Paper, board and pulps – Measurement of diffuse radiance factor
ISO 2471	Paper and board – Determination of opacity (paper backing) – Diffuse reflectance method
ISO 5636-3	Paper and board – Determination of air permeance (medium range) – Part 3: Bendtsen method

Note – SCAN-test has withdrawn a number of test methods and refers instead to the corresponding ISO and/or EN Standards.

3 Definition

For the purpose of this Method the following definition applies:

3.1 Ink-absorbency value – The percentage change in the luminance factor of the paper as a result of the absorption of a test ink under the conditions prescribed.

4 Principle

The ink-absorption characteristics of the sample are assessed by measuring the loss in reflectance of the paper or board due to the absorption, during a given time, of a pigmented non-drying ink of standard shade.

5 Apparatus

5.1 Reflectometer as specified in ISO 2469 providing a means of determining the CIE tristimulus Y-value evaluated for the CIE 1931 standard observer and the CIE illuminant C.

5.2 Template, or suitable device, for application of an ink film, consisting of a flat plate approx. 80 x 60 mm in size with a thickness of approx. 0,1 mm, and an opening to enable the ink to be applied to a region of the test piece having a diameter of at least 35 mm.

5.3 *Test ink*, supplied in a jar or a tube.

Note 1 – K&N ink may be used, but other inks may also be used.

Note 2 – Properties of inks manufactured by different suppliers and from different batches may vary, especially the shade and viscosity. In interlaboratory comparison tests, ink from the same producer and from the same jar should be used.

Note 3 – Consider the paper grades to be used, since different inks are suitable for different paper grades.

5.4 Stopwatch.

5.5 Wipe-off paper, cellulose wadding, soft cotton or an uncoated, calendered paper grade, having a grammage of 50 – 60 g/m^2 and an air permeance of 0,25 – 0,50 µm/Pas, according to ISO 5636-3. The type of wipe-off paper does not appear to be critical for the results.

6 Preparation of test pieces

Condition the samples as described in ISO 187 and keep them in the conditioning atmosphere throughout the test. Avoiding dirt and obvious defects, cut test pieces of a suitable size.

Assemble a number of pieces of the same paper or board into an opaque pad to place beneath each test piece during the reflectance factor determination. The number shall be such that doubling the number of pieces does not alter the reflectance factor of the pad. Avoid contamination and unnecessary exposure to light or heat.

Prepare at least four test pieces.

7 Procedure

7.1 Application of ink

If the ink is delivered in a jar, stir the ink thoroughly in its jar.

Place a suitable quantity of ink (5.3) in a strip on the application template (5.2) beside the opening. The quantity of ink should be sufficient to ensure that the ink on the paper remains glossy throughout the absorption period of 120 s. Place a test piece under the template so that the test area is visible through the opening. Spread the ink over the test area with a rigid blade or rod and start the stopwatch (5.4). Remove the template and leave the test piece undisturbed on a flat horizontal surface.

Note – If no template is available, the ink may be applied with a spatula or roller. Care must be taken to ensure that sufficient ink is applied as indicated over an area which is sufficiently large (a diameter of at least 35 mm) for the necessary measurements to be made.

If it is suspected that the normal time of 120 s is too long to give a meaningful result, a shorter time may be used. If measurements are made at shorter times, this must be stated clearly in the report.

7.2 Removal of excess ink

After 120 s have elapsed, wipe the test piece to remove the excess ink using the wipe-off paper (5.5). Sufficient pressure should be applied to remove the excess ink without damaging the surface of the paper. Complete the wiping operation as soon as possible, but use the same wiping time for the four test pieces.

7.3 Measurement of reflectance factors

Allow the test pieces to stabilize, taking care to avoid contamination. The time is not critical, but start the measurements within the time interval between 15 min and 120 min. To avoid the risk of errors due to fading, measurements must be completed on the same day on which the stains are prepared.

Operate the reflectometer as described in ISO 2469 and ISO 2471.

Determine the luminance factor, R_y, of the stained area on each of the four test pieces using the prepared pad of paper as background and following the procedure described in ISO 2471.

Determine the intrinsic luminance factor, R_∞, on the unstained area of the four test pieces using the same pad as background and following the procedure described in ISO 2471.

If possible, measure on the area intended to be inked, and then, after inking, measure on the same area again. Use the same procedure for all four test pieces.

8 Calculation and subjective impression

8.1 Calculation

Calculate the ink-absorbency value, *A*, for each test piece according to the equation:

$$A = \frac{100 \cdot (R_\infty - R_y)}{R_\infty} \qquad [1]$$

where

R_y is the luminance factor of the stained area measured over an opaque pad of the paper (ISO 2471);

R_∞ is the intrinsic luminance factor of the paper (ISO 2471).

Calculate and report the mean ink-absorbency value to the nearest whole number. If requested, calculate the standard deviation.

8.2 Visual observations

The stained areas contain more information than the ink-absorbency value alone can convey. The evenness of the stain, the occurrence of streaks or mottling etc can with advantage be noted.

9 Report

The test report shall include a reference to this SCAN-test Method and the following particulars:

a) date and place of testing;
b) precise identification of the material tested;
c) grade, producer and batch number of the test ink used;
d) absorption time, if not 120 s as stated;
e) the test results, expressed as stated in 8.1;
f) any visual observations;
g) any deviation from the procedure described in this SCAN-test Method or any other circumstance that may have affected the test results.

10 Precision

10.1 Repeatability

Since this Method allows the use of different inks, depending on the purpose of the test and on the paper grade to be tested, it is not probable to use the tests for comparison. It is therefore not relevant here to report any repeatability data.

Annex A has been inserted as a guide to show that different papers combined with different inks give very different results.

10.2 Reproducibility

Since this Method allows the use of different inks, depending on the purpose of the test and on the paper grade to be tested, it is not probable to use the tests for comparison. It is therefore not relevant here to report any reproducibility data.

11 Bibliography

Bristow J.A., Bergenblad H., Adv. Print. Sc. Tech. Vol. 16 (Ed: W.H. Baulls). Pentect 1982.

Annex A

(informative)

Ink-absorbency values using different papers and inks

A1 Tested inks

One laboratory made tests, under normal laboratory conditions, using different test inks and different paper grades. The following inks were tested:

- K&N ink
- NP (Noir Porometrique) ink batch A
- NP (Noir Porometrique) ink batch B
- MC (Micro Contour) blue ink
- Red mottle ink
- MC (Micro Contour) red ink

These inks are commonly used in laboratories and mills. The papers that were used are indicated in Table A1.

The results (mean value and coefficient of variation) for these inks are reported in table A2.

Table A1 Paper grades used

Paper grade	Number
Coated paper of MWC type	1
Envelope paper	2
Laser paper	3
Copy paper	4

Note 1 – The NP ink batch A and NP ink batch B are from the same ink supplier, but from different batches. Note that this method may give large differences for different batches of the same ink.

Note 2 – The results of MC (Micro Contour) blue ink may not be interpreted simply as absorbency values since it is intended as a measure of surface roughness.

Table A2 Repeatability data for all inks tested

Paper grade	Ink grade	Mean	Variation within test %
1	K&N ink	9,5	1,80
2	K&N ink	31,9	1,44
3	K&N ink	30,2	3,21
4	K&N ink	30,3	1,58
1	NP ink batch A	64,6	0,80
2	NP ink batch A	92,4	0,15
3	NP ink batch A	86,8	0,28
4	NP ink batch A	91,2	0,16
1	NP ink batch B	70,3	0,44
2	NP ink batch B	92,9	0,09
3	NP ink batch B	88,5	0,37
4	NP ink batch B	91,9	0,20
1	MC blue ink	5,2	3,43
2	MC blue ink	65,6	1,45
3	MC blue ink	67,1	1,25
4	MC blue ink	65,0	0,85
1	Red mottle ink	17,7	3,05
2	Red mottle ink	42,1	1,95
3	Red mottle ink	36,7	1,22
4	Red mottle ink	39,9	1,05
1	MC red ink	36,9	0,65
2	MC red ink	57,5	0,56
3	MC red ink	54,7	0,55
4	MC red ink	55,5	0,50

SCAN-test Methods are issued and recommended by KCL, PFI and STFI-Packforsk for the pulp, paper and board industries in Finland, Norway and Sweden.
Distribution: Secretariat, Scandinavian Pulp, Paper and Board Testing Committee, Box 5604,
SE-114 86 Stockholm, Sweden.