IGT information leaflet

Determination of the abrasion resistance and ink transfer to unprinted areas

W30

This test may be carried out with the IGT printability testers
A1, A2, A1-3, A2-3, AC2, AIC2 and AIC2-5.

INTRODUCTION

Packaged goods may loose an essential part of their appeal through wear. Modern production methods require printing that will not be damaged at high production speeds. Also during transport of the packaged product from manufacturer to customer the packaging is not to be damaged. Therefore there are high requirements with regard to abrasion resistance. For this reason the IGT abrasion tester has been developed. This accessory can be used on the IGT printability testers A1, A2, A1-3, A2-3, AC2, AIC2 and AIC2-5 and is determining the abrasion resistance of the printed matter in a certain ink/substrate combination. With this test it is also possible to determine the ink transfer to unprinted areas. The test conditions are prescribed by the requirements that have to be met in practice by the materials to be tested.

PRINCIPLE

In the IGT abrasion tester a strip of material to be tested and a strip of abrasive material are rubbed against each other in opposite directions and under a controlable load. The rubbing always takes place against a fresh stretch of the abrasive strip, so that possible ink particles transferred to the abrasive strip are not allowed to play a part in the rubbing. A standard baryta-paper is used as abrasive material for the testing of overprinted paper or cardboard. A standard emery paper is used as abrasive material for the testing of overprinted tin-plate packaging material. It is also possible to rub a strip of printed matter a number of times against a similar printed strip, so that any present waxes are contributing to the abrasion resistance. The load during the rubbing and the number of rubs have to be determined emperically.
The testresults are to be checked against a scale, which is custom made for the purpose of testing the material concerned, indicating different levels e.g. from 1 to 5. Level 1 is very good and level 5 is very bad. Another possible method to determine the level of abrasion is by means of densitometry.

For the assessment of the ink transfer to non printed areas the same methods as for the abrasion resistance are used; as abrasive material the unprinted production paper is used.

IGT/Reprotest

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APPARATUS AND MATERIALS

(While ordering materials be sure to state the type and serial number of the printability tester on which the test is to be carried out).

1 * IGT printability tester A1, A2, A1-3, A2-3, AC2, AIC2 or AIC2-5.
2 * IGT abrasion tester.
3 * IGT rubber packing.
4 * Strips of baryta paper or emery paper for abrasion resistance
5 Strips of unprinted production paper for ink transfer to non printed areas
  - size for single tests : 15 x 380 mm
  - size for multiple tests : 15 x 1,000 mm
6 Soft brush.

The with * marked articles can be obtained through IGT/Reprotest

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PROCEDURE

It is recommended to execute the test under standard conditions, because of the influence of temperature and/or relative humidity on the properties of the paper.
The standard atmosphere according to many standards is:
23.0?C ? 1.0?C (73.4?F ? 1.8?F) and 50.0% + 2.0% RH.

1 PREPARATIONS

1.1 Cut teststrips of the materials to be tested and mark them with a felt-tip marker to distinguish the type of material.
The sizes of the test strips are preferably:
* for A1 and A2 : 25 x 270 mm
* for A1-3 and A2-3 : 35 x 270 mm
* for AC2 and AIC2 : 35 x 340 mm
* for AIC2-5 : 55 x 340 mm

1.2 Mount the rubber packing on the sector and stretch the packing with the help of the stretching screw(s).

1.3 For A1, A2, A1-3 and A2-3 only (see figure 1):
a) Remove the brush from the brushhole.
b) Put the pin in the brushhole.
c) Move the upper shaft of the printability tester out of printing position.
d) Push the bottom disc of the abrasion tester on the upper shaft of the printability tester till it snaps. The pin in the brushhole is falling in the slot at the back of the abrasion tester. At this point the abrasion tester should be able to move about a little.

1.4 For AC2, AIC2 and AIC2-5 only (see figure 2):
a) Move both shafts of the printability tester out of printing position.
b) Push the bottom disc of the abrasion tester on the bottom shaft of the printability tester till it snaps. The top disc is positioned over the upper shaft. At this point the abrasion tester should be able to move about a little.

1.5 Mount a teststrip on the sector.

1.6 Move the sector into starting position.

1.7 Adjust the printing force on the bottom disc of the abrasion tester to 350 N.

1.8 Remove the teststrip from the sector.

1.9 Adjust the printing speed: 0.2 m/s, constant speed.

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2 EXECUTION

2.1. FOR ABRASION RESISTANCE ONLY

2.1.1 Place the lever with the weight in the vertical position.

2.1.2 Turn the top disc of the abrasion tester till the slot is above.

2.1.3 Slide the abrasive strip (baryta paper or emery paper) from the left into this slot. The baryta coating or the emery side must be pointing outwards (see note 1).

2.1.4 Wind the abrasive strip around the top disc by turning it clockwise.

2.1.5 Guide the loose end of the abrasive strip to the right over the bottom disc of the abrasion tester.

2.1.6 Slide the loose end of the strip into the slot of the bottom disc.

2.1.7 Turn the bottom disc clockwise till the strip is tight and the slot has passed the point of contact between disc and sector.

2.1.8 Mount a teststrip on the sector.

2.1.9 Move the sector into starting position.

2.1.10 Move the bottom disc of the abrasion tester into printing position against the teststrip.

2.1.11 Place the lever with the weight in the horizontal position.

2.1.12 Adjust the required rubbing force between 3 and 10 N by moving the weight on the lever into the required position.

2.1.13 Start the sector so that the test strip is rubbed.

2.1.14 In case the teststrip has to be rubbed one time only:

a) Remove the rubbed teststrip from the sector.
b) Evaluate the result of the rubbing as described in paragraph 3.1.
c) Repeat points 2.1.1 thru 2.1.14.b for every teststrip.
The test has to be carried out at least three times.

2.1.15 In case the teststrip has to be rubbed several times:

a) Place the lever with the weight in the vertical position.
b) Move the bottom disc of the abrasion tester out of printing position.
c) Move the sector into starting position.
d) Remove any dust from the teststrip with a soft brush.
e) Move the bottom disc of the abrasion tester into printing position again.
f) Place the lever with the weight in the horizontal position.
g) Start the sector so that the teststrip is rubbed.
h) Repeat points 2.1.15.a thru 2.1.15.g as often as required and if needed mount a new abrasive strip according to points 2.1.1 thru 2.1.7 (see note 2).
i) Remove the rubbed teststrip from the sector.
j) Evaluate the result of the rubbing as described in paragraph 3.1.
k) Repeat points 2.1.1 thru 2.1.13 and 2.1.15. for every teststrip.
The test has to be carried out at least three times.

2.1.16 Make an accurate record of the conditions of the test.

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2.2. FOR INK TRANSFER TO NON PRINTED AREAS ONLY

2.2.1 Place the lever with the weight in the vertical position.

2.2.2 Turn the top disc of the abrasion tester till the slot is above.

2.2.3 Slide the abrasive strip (unprinted production paper) from the left into this slot. The side to be tested must be pointing outwards.

2.2.4 Wind the abrasive strip around the top disc by turning it clockwise.

2.2.5 Guide the loose end of the abrasive strip to the right over the bottom disc of the abrasion tester.

2.2.6 Slide the loose end of the strip into the slot of the bottom disc.

2.2.7 Turn the bottom disc clockwise till the strip is tight and the slot has passed the point of contact between disc and sector.

2.2.8 Mount a teststrip on the sector.

2.2.9 Move the sector into starting position.

2.2.10 Move the bottom disc of the abrasion tester into printing position against the teststrip.

2.2.11 Place the lever with the weight in the horizontal position.

2.2.12 Adjust the required rubbing force between 3 and 10 N by moving the weight on the lever into the required position.

2.2.13 Start the sector so that the test strip is rubbed.

2.2.14 In case the teststrip has to be rubbed one time only:

a) Remove the strip on which the ink is transferred from the abrasion tester.

b) Evaluate the result as described in paragraph 3.2.

c) Repeat points 2.2.1 thru 2.2.14.b for every teststrip. The test has to be carried out at least three times.

2.2.15 In case the teststrip has to be rubbed several times:

a) Place the lever with the weight in the vertical position.

b) Move the bottom disc of the abrasion tester out of printing position.

c) Move the sector into starting position.

d) Remove any dust from the teststrip with a soft brush.

e) Turn the upper disc of the abrasion tester clockwise till the abrasive strip is positioned into the starting position.

f) Move the bottom disc of the abrasion tester into printing position again.

g) Place the lever with the weight in the horizontal position.

h) Start the sector so that the teststrip is rubbed.

i) Repeat points 2.2.15.a thru 2.2.15.h as often as required.

j) Remove the strip on which the ink is transferred from the abrasion tester.

k) Evaluate the result as described in paragraph 3.2.

l) Repeat points 2.2.1 thru 2.2.13 and 2.2.15 for every teststrip. The test has to be carried out at least three times.

2.16 Make an accurate record of the conditions of the test.

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3 EVALUATION

3.1 FOR ABRASION RESISTANCE ONLY

a) Visually
Compare the result of the rubbing of the teststrip visually with the self-made abrasion scale (see note 3).

$$\frac{D_0 - D_g}{D_0} * 100\%$$

b) Density measurement
   1) Measure the density of the unrubbed printing (= Do).
   2) Measure the density of the rubbed printing (= Dg).
   3) Calculate the decrease in density according to the formula:

c) Repeat the observation for every test strip.
d) Calculate the average and if required the spreading and/or standard deviation. In some cases it may be useful to mention the highest and lowest value as well.

3.2 FOR INK TRANSFER TO NON PRINTED AREAS ONLY

a) Visually
Compare the result of the ink transfer with a self-made reference.
b) Density measurement
Measure the density of the ink which is transferred to the blank paper.
c) Repeat the observation for every test strip.
d) Calculate the average and if required the spreading and/or standard deviation. In some cases it may be useful to mention the highest and lowest value as well.

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NOTES

1 When using baryta paper the side with the baryta coating is used. This side may be found by rubbing with a gold or silver ring: on the coated side a black mark will develop.

2 In most cases a repeated rubbing against fresh abrasive material of five times is sufficient.

3 To make an abrasion scale proceed as follows.
Execute the abrasion test according to this instruction, with a varying number of rubbings, e.g. 1x, 5x, 20x and 40x, and a constant rubbing force. On the contrary it is possible to vary the rubbing force as well, if necessary in combination with the variation of the number of rubbings. The teststrips, rubbed in this way, are validated, e.g. 1 = very good and 5 = very bad.

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SUMMARY OF TESTING CONDITIONS ABRASION RESISTANCE AND INK TRANSFER TO NON PRINTED AREAS

Printability tester	A1, A2, A1-3, A2-3, AC2, AIC2, AIC2-5
Packing	rubber
Printing force	350 N
Rubbing force	3 to 10 N at choice
Speed	0.2 m/s
Number of repeats	as required
Abrasive material	
a. abrasion resistance	baryta paper or emery paper
b. ink transfer to non printed areas	production paper

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fig.1 abrasion tester on A1-3 (A2-3)

fig.2 abrasion tester on AIC2-5

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