Introduction

W24 Print penetration/varnishability/oil absorption

At the moment of printing a quantity of ink or varnish is absorbed by the surface of the paper. This amount is determined by the absorption of liquid in the surface recesses (roughness) and the absorption into the paper pores at the surface. With the in this leaflet described test method the sum of the two phenomena is determined: the oil absorption or varnishability. The reciprocal value of this is called print penetration.

It is quite safe to assume that, when various batches of paper of the same type are supplied by the same manufacturer and the oil absorption test renders the same result, both the roughness and the absorption have remained the same. It is most unlikely that, for instance, the effect of the roughness has increased in exactly the same ratio as that of the absorption has decreased.

Due to its simplicity the test method is very suitable to be used in quality control systems.

The test is suitable to evaluate the following properties:

Varnishability/oil absorption: In the case of varnishability low oil absorption and thus a long stain is essential. For that reason the varnishability is expressed directly as the stain length in mm.

Print penetration: A large stain indicates a low roughness/absorption of the paper. It seems to be logical to use the reciprocal value of the stain length multiplied by 1,000 as an identifier of this property (i.e. 1,000/stain length in mm). This is then called the print penetration.

The method has been standardized in the Dutch standard NEN 1836.

W60 Felt and wire site

It can be very important to know what side of the paper is the felt or wire side: there can be big differences in properties between both sides. There are several methods available and sometimes it can be very difficult to see the difference. With the help of the accessory for the printing it is very easy to find the difference between the two sides of the paper.

Fig. 1: Print penetration set AIC2-5T2000

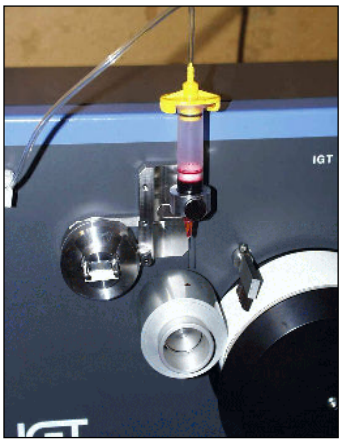

Fig. 2: Print penetration set

Principle

W24 Print penetration/oil absorption/varnishability

Between the printing disc and a paper strip on the sector of an IGT-printability tester a drop of oil with a volume of 5,8 ± 0,3 mg is spread to a stain. The length of the stain is measured. The stain length is increasing when the roughness and/or absorption of the paper is decreasing.

W60 Felt and wire site

The principle of measuring is the same as for W24. In general the stain at the felt side is longer than the stain at the wire side. Besides the penetration from the wire side to the felt side is more than from the felt side to the wire side.

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 AIC2-5T2000 and Global Standard Tester follow the instructions of the manuals, IGT information leaflet W100 and the displays accurately.
- Handle the samples carefully.

Materials / Testing conditions		
1	IGT AIC2-5T2000 or IGT Global Standard Tester 1 or IGT Global Standard Tester 1W ********** For AIC2-5T2000 only:	710.000.000 410.000.000 415.000.000
2	Holder for syringe	409.002.710
3	Syringe Fortuna	409.013
4	Printing disc, aluminum, 50 mm	402.331
5	Testing liquid for print penetration, red	409.003.000
6	Packing, rubber, 55 mm **********	404.001.006
	For GST 1/1W only:	
7	Cartridge empty	160.250
8	Hose and coupling	160.300
9	Printing disc, aluminum, 50 mm	402.331
10	Testing liquid for print penetration, red	409.003.000
11	Packing, rubber, 55 mm	404.001.006
Strips of paper to be tested, preferable 55*340 mm^2, 5 strips per sample Ruler Lint free rags and ethanol or cleaning naphtha		
Printing force	1000 N	
Printing speed	Increasing, end speed 1,25 m/s	
Quantity of test liquid	1 drop, 5,8 mg ± 0,3 mg	
► The numbers 1 thru 11 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. Mount the packing on the sector. See W100.
4. For AIC2-5T2000 only:
   - 4.1. Adjust the printing force of the top printing disc shaft to 1000 N and pay attention for the right backlash. See W100.
   - 4.2. Adjust the printing speed to 1,2 m/s in the increasing speed mode (◢).
   - 4.3. Place the syringe holder with the thick shaft into the top accessory holder of the tester in such a way that the flat side in this shaft is pointing to the left.
   - 4.4. Fasten the device with the screw at the left hand side of the tester.
   - 4.5. Fill the syringe with the red coloured testing liquid:
     - 4.5.1. Place the needle on the syringe and the plunger into the syringe.
     - 4.5.2. Press the plunger downward and insert the needle into the red coloured testing liquid.
     - 4.5.3. Reduce the force on the plunger slowly so the plunger will move upwards slowly and the fluid comes into the syringe.
     - 4.5.4. When the plunger does not move any longer, pull the plunger upwards until it is above the hole in the glass.
     - 4.5.5. Take the syringe with the needle out of the fluid.
     - 4.5.6. Dry the needle from the testing liquid red solution with a cleaning towel.
     - 4.5.7. Mount the loaded syringe into the holder and move the drop catcher under the needle at the same time. With regular intervals a drop is falling from the syringe.
5. For GST 1/1W only:
   - 5.1. Select the menu “Print penetration” in the display.
   - 5.2. Move the mounting ring with the ring opening horizontal on the pin of the mounting plate.
   - 5.3. Fill a cartridge with the testing fluid. See W100.
   - 5.4. Mount the cartridge with testing fluid. See W100.

Execution

1. Place the printing disc on the top printing disc shaft of the tester.
2. Attach a test strip into the front clamp of the sector.
3. For AIC2-5T2000 only:
   - 3.1. Turn the sector into starting position.
   - 3.2. Move the printing disc into printing position against the test strip.
   - 3.3. Turn the drop catcher away until one single drop of the testing liquid has fallen on the printing disc and thereafter replace the drop catcher in the catching position.
4. Make a “print”: the drop is spread into a stain.

►►

5. For GST 1/1W only:
   5.1. Select "Make print" in the display.
   5.2. Press the side buttons to move the sector into the starting position and the printing disc into the printing position.
   5.3. Release the side buttons to move the cartridge downward and to apply a drop of test liquid to the printing disc.
   5.4. As soon as the drop has fallen, make a "print": the drop is spread into a stain.
6. Remove the test strip from the sector and mark the top and the bottom of the spot directly.
7. Take off the printing disc from the shaft and clean it with rags and cleaning naphtha or ethanol and let it dry.
8. For felt and wire side: Repeat the points 2 thru 7 for the other side of the paper.
9. Measure the test result as explained in the chapter "Assessment".
10. Repeat the points 1 thru 9 for every test strip.
    10.1. For print penetration: it is recommended to perform the test at least 5 times per sample.
    10.2. For felt and wire side: it is recommended to perform the test at least 2 times at each side of the sample.
11. After having finished the test, clean and store all parts as described in the manual.
12. Make an accurate record of the conditions and the results of the test and refer to:
    W24: print penetration/varnishability/oil absorption.
    W60: felt and wire side.

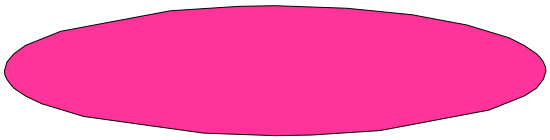

Fig. 3: Test result

Assessment

1. W24 Stainlength/Varnishability:
   Measure the length of the stain to the nearest mm. Thus the stain length or varnishability is determined.

2. W24 Print penetration or Oil absorption:
   2.1. Measure the length of the stain to the nearest mm.
   2.2. Calculate the print penetration/oil absorption with the formula:

   1000 / stain length in mm.

   The higher the value, the better the print penetration and oil absorption.

3. W60 Felt and wire side.
   3.1. Measure the length of the stain to the nearest mm. The felt side shows a longer stain than the wire side.
   3.2. Observe the penetration speed of the testing liquid from the one side to the other side: the penetration from the wire side into the felt side is quicker than from the felt side into the wire side.

4. Repeat point 1, 2 or 3 for each test strip.
5. 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 values as well.

Notes:

1. For GST 1/1W only: To prevent leakage of the test liquid from the cartridge for the GST, store the cartridge closed with the caps at both sides and in the upright position.

► *2006: In comparison to older IGT leaflets, this leaflet is valid for the AIC2-5T2000 and Global Standard Testers as mentioned.*
► *2012: The leaflet contains some small text corrections.*
► *2012 April: New types/article numbers for syringe, syringe holder and needles*
►*2017: W24 and W60 are combined in this leaflet. This leaflet contains some small text corrections.*

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