IGT Testing Systems

Research, development and production of testing equipment for the printing and allied industries

IGT Information leaflet W24
PRINT PENETRATION (oil absorption)
IGT AIC2-5T2000, Global Standard Tester 1/1-W

Version: July 2006

Introduction:

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 three paper properties:

- Varnish ability: 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.
- Felt and wire side: see W60

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

Principle:

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 (see figure 2). The length of the stain is measured. The stain length is increasing when the roughness and/or absorption of the paper is decreasing.

Fig. 1: Print penetration set AIC2-5T2000

Fig. 2: Print penetration set GST1

Method of operation:

- It is recommended to execute the test in the standard atmosphere; to most standards it is 23.0 ± 1.0 °C (73.4 ± 1.8 °F) 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.

Preparation

1. Condition the papers, the test liquid and the equipment during >6 hours in the standard atmosphere.
2. Cut the paper strips (preferable 55 x 340 mm, 5 strips per sample) and mark them with top and/or bottom side, machine and/or cross direction and a code for the type of material.

Materials / testing conditions

1	IGT AIC2-5T2000 or IGT Global Standard Tester 1 or IGT Global Standard Tester 1W **********	710.000.000 410.000.000 415.000.000
	For AIC2-5T2000 only:	
2	Holder for syringe	409.002.414
3	Syringe PE14 with 2 needles	409.013
4	Printing disc, aluminium, 50 mm, ø 65 mm	402.331
5	Dibutylphtalate with 1% sudan 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, aluminium, 50 mm, ø 65 mm	402.331
10	Dibutylphtalate with 1% sudan red	409.003.000
11	Packing, rubber, 55 mm **********	404.001.006
12	Strips of paper to be tested, preferable 55 x 340 mm, 5 strips per sample	
13	Ruler	
14	Lint free rags	
15	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.
► The numbers 2 thru 6 can be obtained as Print Penetration Set for AIC2-5T2000, article number 409.000.710
► The numbers 7 thru 11 can be obtained as Print Penetration Set for Global Standard Tester 1/1W, article number 409.000.410.

•*This leaflet contains article numbers per January 1st, 2006*•.

3. Mount the packing on the sector. See W100.
4. For AIC2-5T2000 only:
   - 4.1. Adjust the printing force of the upper 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 coloured dibutyl phthalate:
     - 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 Sudan red solution.
     - 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 Sudan red solution with a cleaning towel
   - 4.6. 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 out of the syringe.
5. For GST 1/1W only:
   - 5.1. Select the menu “Print penetration” in the display.

►

IGT Testing Systems, P.O.Box 12688, 1100 AR Amsterdam, The Netherlands / Keienbergweg 25, 1101 EX Amsterdam, The Netherlands
Phone +31 (0)20 409 9300, Fax +31 (0)20 697 4842, E-mail: info@igt.nl Internet: www.igt.nl

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.

6. Check the functioning of the tester with the print penetration set as described in the chapter “Execution".

Execution

1. Place the printing disc on the (upper) printing disc shaft.
2. Attach a test strip in the front clamp of the sector.
3. For AIC2-5T2000 only:
   3.1. Turn the sector into starting position.
   3.2. Press one of the side buttons to start the motor.
   3.3. Move the printing disc into printing position against the test strip.
   3.4. Turn the drop catcher away until one single drop has fallen on the printing disc and replace the drop catcher in the caching position.
   3.5. Press the other side button as well to make a “print”: the drop is spread into a stain.
4. For GST 1/1W only:
   4.1. Select “Make print” in the display.
   4.2. Press the side buttons to move the sector into the starting position and the printing disc into the printing position.
   4.3. Release the side buttons to move the cartridge downwards and to apply a drop of test liquid to the printing disc.
   4.4. As soon as the drop has fallen, press both side buttons to make a “print”: the drop is spread into a stain.
5. Remove the test strip from the sector.
6. Measure the stain length as explained in the chapter “Assessment” immediately after the test. In case the stain length is not measured right after the test, the stain length has to be marked with marking dots.
7. Take off the printing disc from the shaft.
8. Clean the disc with rags and cleaning solvent and let it dry.
9. Repeat the points 1 thru 8 for every test strip. It is recommended to perform the test at least 5 times per sample.
10. After having finished the test, clean and store all parts as described in the manual. NOTE 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.

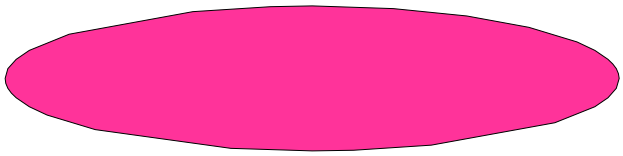

Fig. 2: test result

11. Make an accurate record of the conditions and the results of the test.

Assessment

1. Measure the length of the stain to the nearest mm. Thus the stain length or varnishability is determined.
2. If required determine the print penetration with the formula:

Printing penetration = 1000: stain length in mm

3. Repeat point 1 and 2 for each test strip.
4. 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. The test results of the AIC2-5T2000, AIC2-5 and Global Standard Tester 1 and 1-W compare well with one another, on the condition that they have been carried out under the same conditions.

► *In comparison to older IGT leaflets, this leaflet is valid for the AIC2-5T2000 and Global Standard Testers as mentioned*

This information leaflet has been compiled with the utmost care. However, may you find any inadequacies or if there are any comments, we kindly request you to send these to IGT Testing Systems, Sales Department.

IGT Testing Systems, P.O.Box 12688, 1100 AR Amsterdam, The Netherlands / Keienbergweg 25, 1101 EX Amsterdam, The Netherlands
Phone +31 (0)20 409 9300, Fax +31 (0)20 697 4842, E-mail: info@igt.nl Internet: www.igt.nl