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Ink rub test of container board and corrugated board

1. Scope and summary

Ink rub testers are designed to evaluate the scuffing or rubbing resistance of an ink film or fiber surface on container board and corrugated board. A variety of tests may be made, including: dry rub; wet rub; wet bleed or transfer; wet smear; and functional rub.

2. Significance

This method evaluates resistance of inks to either dry or wet rubbing or scuffing. It can also be used to evaluate dry or wet surface strength of coated containerboard, unprinted container board, and other similar surfaces as well as the smearing or bleeding of inks. Some use this test to differentiate between strong and weak ink films and their adhesion to container board. This test examines rub resistance under different conditions than some other types of scuffing or rubbing tests (c.f. BS-3110) and should not be expected to produce results identical to other methods.

3. Apparatus

3.1 Ink rub testers are motor driven devices for moving a weighted test specimen over a printed or unprinted sample. The weighted specimen should travel (using any appropriate mechanical means) through an arc of $8.5^\circ \pm 0.5^\circ$, or along a linear or almost linear path of approximately 3.9 cm (1.54 in.), for a predetermined number of strokes.

3.1.1 A stroke comprises one complete to-and-fro motion of the test weight.

3.2 Test speeds can be selected from fixed speeds of 21, 42, 85 and on some models 100 cycles per min. Test speeds should be accurate to within 2%.

3.3 The typical apparatus comes with one or more weighted sleds in order to apply different contact pressures to the surface being rubbed. Higher test speeds and contact pressures are used to increase the severity of the test without increasing the time or the number of strokes required.

3.3.1 Customary weights include $908 \text{ g} \pm 45 \text{ g}$ (2-lb $\pm 0.1 \text{ lb}$) and $1816 \text{ g} \pm 90 \text{ g}$ (4-lb $\pm 0.2 \text{ lb}$) each having 51.6 cm^2 (8 in.²) of contact area. Thus, a 908 gr. (2-lb) sled has a contact pressure of 1.7 kPa (0.25 psi), and a 1814 gr. (4-lb) sled has a contact pressure of 3.4 kPa (0.50 psi).

3.3.2 The test sleds shall be fitted with an open cell Neoprene rubber pad 0.32 cm (0.13 in.) thick with a compressibility such that $172 \pm 34 \text{ kPa}$ (25 psi $\pm 5 \text{ psi}$) shall compress the pad to half of its original thickness.

NOTE 1: Some users have increased contact pressure by reducing the size of the rubber pads on the bottom of the sleds.

3.4 Some instruments have pins on the bottom plate to secure the sample. The pins will hold corrugated board in place during testing. Some instruments provide a hold-down bracket to secure the bottom sample. Some instruments may not have protruding pins or a hold-down bracket; if not, samples can be secured with double sided tape. Foam tapes, which may provide cushioning, should not be used.

3.4.1 Some instruments have a Neoprene rubber pad (similar to 3.3.2 above) on the surface of the bottom plate. The friction between the pad and the bottom sample can, in addition to pins, clamps, and tape, help keep the bottom sample piece from shifting during the test.

4. Sampling

4.1 Select specimens of container board for testing from undamaged areas. Avoid wrinkled or folded areas which may affect the test results. Corrugated test specimens should not include scores or slots.

4.2 Cut 5 top specimens 51 mm (2 in.) wide and of sufficient length to be secured under the spring clips of the desired top block in each of the two principal directions. Allow 25 mm (1 in.) on each end of the top block to fit into the metal clamps. Cut 5 bottom specimens at least 152mm × 76mm (6 × 3 in.).

4.2.1 Unless otherwise noted or required by specific customer testing specifications, container board samples should be cut so that the MD direction runs the width of each sample.

4.2.2 Unless otherwise noted or required by specific customer testing specifications, corrugated samples should be cut so that the MD paper direction runs the width of each sample. This will typically result in the flute peaks rubbing across each other during the test.

4.2.3 In some cases, the top or bottom specimen may come from unprinted stock or from copy paper or other white substrates upon which ink transfer can more easily be observed. Ink transfer from the specimen should be observed against the unprinted stock.

5. Conditioning

Precondition and condition the specimens in accordance with TAPPI T 402 “Standard Conditioning and Testing Atmospheres for Paper, Board, Pulp Handsheets and Related Products” prior to testing.

6. Procedure

6.1 The test procedure is typically performed until failure is observed on the sample. Failure is defined by customer specifications and requirements, and may include visible ink transfer to unprinted stock or to copy paper, surface abrasion, or smearing of the printed image. The test procedure may be performed under a variety of test conditions, with different possible test speeds and contact pressures, as required by the customer.

6.2 Samples are usually evaluated by visually comparing them to internally maintained standards. The result is usually a pass or fail designation. It is also possible to evaluate samples using a densitometer or spectrophotometer. The initial reading before the rub test is designated as zero and the change in density or delta E after the rub test is reported.

6.3 *Dry rub.*

6.3.1 Clip a 152 × 51 mm (6 × 2 in.) unprinted specimen to the test block. Place the printed sample, print side up, on the base plate. Place the weight over the sample, and make sure that both surfaces are free of dirt. Preset the tester for a series of ten strokes, or as otherwise indicated by the customer.

NOTE 2: Higher presets can be used if experience indicates a high number of strokes will be needed to initiate transfer.

6.3.1.1 If identification of ink transfer is required, the material on the sled is typically unprinted, while the printed specimen is placed print side up on the base plate.

6.3.2 When the first series of strokes have been completed, examine both the inked surface and the plain surface on the test block for signs of transfer. Repeat the stroke sequence until transfer occurs or a predetermined limit is reached. The two test strips should be stapled together and used for visual reference and interpretation. They should be marked plainly with the number of strokes at which transfer or abrasion was observed, as well as with the test speed, test block weight, and conditions.