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Water absorption of corrugating medium: float curl method

1. Scope and summary

1.1 The water absorptivity of corrugating medium is measured by floating a specimen on the surface of a vessel of water and determining the time for the specimen to become saturated.

1.2 This method is applicable to corrugating medium as it is commercially produced by all processes. It is generally applicable to relatively unsized (water leaf) paperboards. It may not be applicable for more highly sized boards or to grades produced in different grammage (basis weight) from those normally used in corrugating medium.

1.3 TAPPI T 432 “Water Absorbency of Bibulous Papers” and TAPPI UM 596 “Water Absorbency of Non-Bibulous Paperboard” have been used to measure the water absorptivity of corrugating medium, but the study which led up to the development of this method indicates that they lack the repeatability of this method and most certainly take more time to conduct, especially on the more resistant samples.

2. Significance

The absorptivity of corrugating medium must be controlled to some extent in order that it has the proper receptivity to the corrugating adhesive, which is an aqueous suspension of starch, for proper adhesion in the corrugating process. A test for absorptivity is necessary for control. The absorptivity may relate to the way the medium can be steamed by the showers on the singlefacer and by the preconditioner.

3. Apparatus and materials

3.1 *Open dish or vessel*, to contain the water and float the specimen. A 145 cm³ (8.85 in³) or larger evaporating dish has been found satisfactory, but any similarly sized vessel is adequate.

3.2 *Distilled water or deionized water*, pH 6.5 to 7.5, 23.0 ± 1.0°C (73.4 ± 1.8°F).

3.3 *Stopwatch or timer*.

Approved by the Standard Specific Interest Group for this Test Method



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4. Sampling and test specimens

- 4.1 Select sample according to TAPPI T 400 "Sampling and Accepting a Single Lot of Paper, Paperboard, Containerboard, or Related Product."
- 4.2 Condition according to TAPPI T 402 "Standard Conditioning and Testing Atmospheres for Paper, Board, Pulp Handsheets, and Related Products." Conduct test in atmosphere corresponding to TAPPI T 402.
- 4.3 From each test unit of the sample, select at least ten specimens, and cut each of them to approximately 50 × 50 mm (2 × 2 in.). Alternatively, cut ten such specimens from a single composite test unit.
- 4.4 Determine the felt (top) and wire (bottom) side (T 455) of each specimen. Make a small mark identifying the wire (bottom) side.

5. Procedure

- 5.1 Gently place the test specimen, top or felt side down, on the surface of the distilled water in the vessel or dish and, at the same instant, start the stopwatch or timer.
- 5.2 The specimen will first curl upward due to the absorption of water by the surface in contact with the water. Then as it becomes saturated, the strains will be equalized, the stiffness is relaxed, and the specimen will flatten out again to almost its original shape.
- 5.3 Record the time in seconds required for the specimen to curl upward and return to its flat position on the surface of the water.

NOTE 1: When making this water absorptivity test, check the pH of the water periodically to assure it does not drift outside the acceptable range. Varying pH can have an affect on the test results.

6. Report

For each test unit, report as the test result the average total elapsed time for ten test specimens. Also report the elapsed time for each test specimen.

7. Precision

- 7.1 The precision of this method was determined by a round-robin evaluation (1991) of this and several other methods by eight laboratories on samples of corrugating medium from eight different mills made by a variety of processes with a wide range of absorptivity levels. Tests were made both before and after aging.
- 7.2 The following estimates of precision are based on these results:
- 7.2.1 Repeatability = 12% of average according to definitions of TAPPI T 1200 "Interlaboratory Evaluation of Test Methods to Determine TAPPI Repeatability and Reproducibility."
- 7.2.2 Reproducibility = 61% of average, computed from the Coefficient of Variation, as described in TAPPI T 1200.

8. Keywords

Corrugating medium, Absorptivity, Water absorption, Float curl method, Adhesion

9. Additional information

- 9.1 Effective date of issue: April 24, 2012.
- 9.2 Two alternate methods may be performed in the same general time period with roughly similar repeatability are also described below. They do not give the same numerical results, but, in general, will rank the materials in the same order as the preferred method.
- 9.2.1 An alternate procedure which is particularly useful in a corrugating plant for measuring the water absorptivity of corrugating medium as it is being used is TAPPI T 831 "Water Absorption of Corrugating Medium: Water Drop Penetration Test."
- 9.2.2 Another alternate procedure, for measuring the water absorptivity of corrugating medium is TAPPI T 835 "Water Absorption of Corrugating Medium: Water Drop Absorption Test."
- 9.3 Wet curl is one factor that can affect starch bonding. However, it is not the only factor as even sized liner when used as medium can bond. Therefore, this test is useful as a control test, but one has to be careful in assessing