1. Scope and summary

1.1 The water absorptivity of corrugating medium is measured by dropping a drop of water on the surface of a specimen and determining the time in seconds for the drop to be completely absorbed as evidenced by the loss of sheen.

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) containerboards. It may not be applicable to more highly sized boards or to grades produced in different grammage (basis weight) than those normally used in corrugating medium.
1.3 The precision and repeatability of test results are dependent on the grade and manufacturing process. Use caution when making comparisons between samples that differ significantly in basis weights or manufacturing process.

1.4 Due in part to the uniqueness of medium, various alternate methods are available for evaluating water absorption. These alternate methods are cited in Section 10 Additional Information.

2. Significance

Some producers test absorptivity of corrugating medium to know that it has the proper receptivity to the corrugating adhesive, which is an aqueous suspension of starch, for proper adhesion in the corrugating process. The absorptivity may also relate to the way the medium can be steamed by the showers on the singlefacer and by the preconditioner.

3. Safety precautions

3.1 Care should be taken with cutting instruments when preparing any specimen for testing. Use of appropriate PPE is recommended.

4. Apparatus and materials

4.1 Burette, syringe or dropper, which will deliver 20 ± 1 drops/cm³ of distilled or deionized water.
4.2 Rack or ring stand, to support test specimen.
4.3 Distilled water or deionized water, pH 6.5 to 7.5, 23.0 ± 1.0°C (73.4 ± 1.8°F).
4.4 Stopwatch or timer.

5. Sampling and test specimens

5.1 Select sample according to TAPPI T 400 “Sampling and Accepting a Single Lot of Paper, Paperboard, Containerboard, or Related Product.”
5.2 Precondition and 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.
5.3 From each test unit of the sample, select at least four specimens. Cut test specimens into a square large enough to perform 5 replicates per specimen without absorbed drops touching when they are applied on each corner and in the center of the specimen. This may require some trial drops to determine the size of the absorbed drop.
5.4 Determine the felt and wire side of each specimen. If desirable, make a small mark identifying the wire side.

6. **Procedure**

6.1 Place the flat specimen on a rack or ring so that its testing area is not in contact with a solid surface.
6.2 Position the burette or dropper 25 mm (approximately 1 inch.) above the top surface of the specimen.
6.3 Fill the burette, syringe or dropper with distilled or deionized water.
6.4 Place a drop of water on the surface of the specimen and immediately start the timer. Observe the drop on the specimen and record the time when the gloss disappears from the surface. Record the time in seconds.
6.5 Repeat this process five times on each specimen, once in the center and then on each corner.
6.6 Repeat the test process with half (2) the specimens tested felt side up and half (2) tested wire side up.

7. **Report**

For each test unit, report as the test result the average time for complete absorption of the drop into the surface for the ten felt-side tests and for the ten wire-side tests.

8. **Precision**

8.1 The precision of this method was determined in 1991 by a round-robin evaluation 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.
8.2 The following estimates of precision are based on these results.
8.2.1 Repeatability = 13% of average according to definitions of TAPPI T 1200 “Interlaboratory Evaluation of Test Methods to Determine TAPPI Repeatability and Reproducibility.”
8.2.2 Reproducibility = 75% of average, computed from the Coefficient of Variation, as described in TAPPI T 1200 “Interlaboratory Evaluation of Test Methods to Determine TAPPI Repeatability and Reproducibility.”

9. **Keywords**

Corrugating medium, Absorptivity, Water absorption, Water drop tests
10. Additional information

10.1 Effective date of issue: To be assigned.
10.2 The 2019 revision includes editorial changes to clarify the test process and removal of some redundant information in the procedure. A Safety section was added.
10.3 Three alternate methods which can be performed in the same general time period with equal repeatability are described below. They do not give the same numerical results, but, in general, will rank the materials in the same order as this method.

10.3.1 TAPPI T 831 “Water Absorption of Corrugating Medium: Water Drop Penetration Test.”
10.3.2 TAPPI T 819 “Water Absorption of Corrugating Medium: Boat Method,” which is now a Classical Method.
10.3.3 TAPPI T 832 “Water Absorption of Corrugating Medium: Float Curl Method.”

A. Appendix

The information contained in this Appendix is historical in nature and was contained in the test method when it was first defined in 1994. References to support the statements below have not been found in published studies or cited. This information is anecdotal and should be viewed with caution.

Artificial aging

A.1 The absorptivity of corrugating medium made of virgin fibers has been known to change markedly, usually decreasing (an increase in absorption time) with aging. Often this change will be greatest during the first day or days after manufacture. Therefore, to compensate for those expected changes, many mills induce artificial aging as part of their off-machine control testing of absorptivity. Usually, exposure to some form of elevated temperature constitutes the artificial aging process.

A.2 Some possible conditions are: 1/2, 2, or 7 h at 105°C (221°F); 15 min at 190°C (374°F) (this is designed strictly for an off-machine test at the time of manufacture).

A.3 One laboratory found that 2-8 h at 105°C (221°F) gave aging equivalent to one month under natural conditions.

A.4 There is good indication that the aging effect is due to oxidation. One laboratory reported that samples from the outside layers of a roll had increased in absorption time 25-fold, while the inner layers were unchanged in a 10-month storage.

A.5 One laboratory found a close relationship of aging with the amount of alcohol benzene extractives in the medium. If these materials are as described in TAPPI T 204 “Solvent Extractives of Wood and Pulp,” aging could indeed be an oxidation, a chemical reaction. Using the general rule of thumb for acceleration of a chemical reaction, the aging time could be halved by increasing the temperature by 10°C (50°F).
A.6 A 1991 study by the Institute of Paper Science and Technology on complete absorption water drop aging, found an average aging increase of 600% (from 15 to 90 seconds) when 7 different mediums were retested after 2 months of aging, in roll form. The retests were made from samples taken 2 in. down inside the roll. The same study showed an average increase of 1200% (180 seconds) when after 4 months, the rolls were cut down another 2 in., and retested. The seven different mediums were selected to represent the wide variety of mediums commercially available, including recycled.

A.7 Other water absorptivity tests also showed increases in water resistance with aging; however, they were not as sensitive to aging as the complete absorption water drop test. For example, using the same seven mediums, the study showed that the percentage increases for the boat float method were 475% after 2 months and 1025% after 4 months. The float curl was even less sensitive, with increases of 333% and 933% after 2 and 4 months of aging. The water strike through test was the least sensitive of all, with increases of 400% and 600% after 2 and 4 months of aging.

Your comments and suggestions on this procedure are earnestly requested and should be sent to the TAPPI Standards Department.