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WORKING GROUP
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SUBJECT
CATEGORY _____ Pulp Properties _____
RELATED
METHODS _____ See “Additional Information” _____

CAUTION:
This Test Method may include safety precautions which are believed to be appropriate at the time of publication of the method. The intent of these is to alert the user of the method to safety issues related to such use. The user is responsible for determining that the safety precautions are complete and are appropriate to their use of the method, and for ensuring that suitable safety practices have not changed since publication of the method. This method may require the use, disposal, or both, of chemicals which may present serious health hazards to humans. Procedures for the handling of such substances are set forth on Safety Data Sheets which must be developed by all manufacturers and importers of potentially hazardous chemicals and maintained by all distributors of potentially hazardous chemicals. Prior to the use of this method, the user must determine whether any of the chemicals to be used or disposed of are potentially hazardous and, if so, must follow strictly the procedures specified by both the manufacturer, as well as local, state, and federal authorities for safe use and disposal of these chemicals.

**Sampling and Testing Wood Pulp Shipments for
Moisture**
(Ten-year review of Classical Method T 210 cm-13)
(Changes from Draft 1 Highlighted)

1. Scope

Most woodpulp is shipped sheeted or baled. Some pulp is shipped in rolls or as wet lap. Sampling and testing for moisture content and determination of air-dry weight of pulp shipped in these forms is described. This method is unsuitable for determining moisture content of flash-dried baled pulp.

2. Definitions

Woodpulp is sold on an “air-dry” basis, which is defined as pulp containing 90% oven dry fiber and 10% moisture. Regardless of the moisture content of any pulp shipment, the weight of air-dry pulp is calculated and the shipment invoiced on this air-dry basis.

3. Significance

Approved by the Standard Specific Interest Group for this Test Method
TAPPI

Buyers and sellers of woodpulp require an effective official method of determining the total air-dry weight of pulp shipments. In the event of dispute, an independent analyst would use this official procedure to test the shipment.

4. Apparatus

4.1 *Sampling tool*¹. A boring tool which cuts into a bale or roll to a depth of 75 mm (3 in.), cutting disks about 100 mm (4 in.) in diameter.

4.2 *Template*. For the wedge method, a template is desirable with an apex angle of 24°. This is preferably made of brass and should have a length of about 460 mm (18 in.).

4.3 *Laboratory scale*. The scale used for weighing the pulp sample shall show a sensitivity of 0.1%. For example, if 1 kg (2.2 lb) of pulp is taken, the scale must show a decided deflection by the addition of 1 gram to the load.

4.4 *Mill scale*. The scale for weighing pulp bales will be accepted as accurate: (1) when verified by standard test-weights; or (2) when verified by weighing a measured volume of water.

4.4.1 The scale for weighing bales shall be provided with 0.5-kg divisions, and shall have such accuracy that after having been balanced, it shows a variation of not more than 0.5 kg when a 500 kg reference weight is upon it and the load manually increased and decreased temporarily.

4.4.2 Railroad scale, tested for accuracy.

4.4.3 Truck scale, tested for accuracy.

4.5 *Drying oven*. Any suitable laboratory drying oven with good ventilation may be used for drying the sample to constant weight. A temperature recorder is recommended to measure the temperature throughout the test. The temperature throughout the oven shall not exceed 108°C at any time during the test, and shall be maintained at 105 ± 2°C during the last two hours of drying time.

4.6 *Sample can(s)*. Metal can(s) with tightly fitting cover(s). The tare weight of each can shall be determined if used in weighing the sample, or portion of the sample.

5. Sampling

5.1 No one method of sampling is suitable for all the different forms of pulp. However, select bales or rolls to be sampled at random throughout the shipment being tested. A full description of each sampling method and its application is included under the procedure to which it applies.

5.1.1 *Boring method*. The boring method, while well adapted to the sampling of baled pulp and roll pulp, is not suited to the sampling of wet-lap pulp or pulp below 80% air-dry.

5.1.2 *Wedge method*. The wedge method is particularly suitable for sampling wet lap pulp. However, the wedge method, or any other method which involves the breaking open of bales, is not well suited for referee sampling of pulp at dock, since transportation companies decline to handle broken bales, and re-baling with an ordinary handpress is not practical.

5.2 *Sample size*. Sufficient and representative test specimens must be taken to ensure a fair average of the shipment. Number to be taken is described later under 6.2.1.1, 6.2.2.1, and 6.3.1.1. Representative sampling becomes difficult and more test specimens may have to be taken if bales or rolls from lots of different moisture levels are combined in a shipment. (Pulp shippers typically avoid combining lots of widely different air-dry percentages.)

5.3 *Bale or roll condition*. Do not make tests on pulp which has been unduly exposed to the weather or other unusual conditions of moisture or heat, except by special agreement between shipper and consignee. In all cases of dispute, keep the shipment intact if possible and in no case present less than 50% of the shipment for test.

6. Procedure

6.1 *Determination of gross weight of pulp*.

6.1.1 Rules for determination of the total gross weight of pulp shipments are just as important as the rules for sampling and testing to determine average moisture content. Determine the gross weight by one of the following methods:

¹Names of suppliers of testing equipment and materials for this method may be found on the Test Equipment Suppliers list in the bound set of TAPPI Test Methods, or may be available from the TAPPI Quality and Standards Department.

Deleted: insure

6.1.1.1 *Railroad weight.* Determine railroad weight of an entire car by uncoupling it and weighing it separately. Similarly determine the tare of the empty car. Do not use the routine bill of lading railroad weight, but an actual weighing upon a railroad scale properly supervised. (Weight of an entire car lot as certified by official weighmaster's certificate of weight is acceptable.) If railroad weight is used for determination of total shipment weight, sample the shipment for moisture determination within 48 hours of the weighing.

6.1.1.2 *Weighing by truck and tested scale.* Determine the weight of pulp by truckload by passing the truck over a scale (tested for accuracy) prior to unloading. Subtract the tare of the truck. If truck weight is used for determination of air-dry shipment weight, sample the shipment for moisture determination within 48 hours of the weighing.

6.1.1.3 *By calculation from average weight of bales.* Determine the weight of the shipment by multiplying the actual number of bales in the shipment by the average weight of those bales weighed and sampled. Weigh and record the weight of each bale to be sampled; sample all bales weighed and no others. Whenever the bales are numbered, list their numbers in addition to their weights. Sample only normal bales. Reject as abnormal those bales obviously damaged or wetted by rain or by dripping condensate in a railcar. In the case of roll pulp or of widely varying weights of pulp bales, weigh the entire shipment.

6.2 *Sampling by the boring method.* This method is suitable for sampling baled pulp in sheets and for sampling roll pulp.

6.2.1 *Baled pulp in sheets.*

6.2.1.1 Number of bales to be sampled:

<u>Bales in Shipment</u>	<u>Number of Sample Bales</u>
0-350	10 percent
351-500	35 bales
501-750	45 bales
751-1000	55 bales
1001-2000	70 bales
2001-3000	90 bales
3001-4000	110 bales
4001-5000	130 bales

If more than 5000 bales, sample 1% of the bales in excess of 5000 bales.

6.2.1.2 Take test specimens from each bale to be sampled by boring into the bottom of each bale a depth of 75 mm (3 in.) with a special tool which cuts disks about 100 mm (4 in.) in diameter.

NOTE 1: Pulp producers routinely add make-up sheets to the top of bales during production in order to bring bales to the proper bale weight. To avoid taking the test unit from the make-up sheets, bore the bale from the bottom.

6.2.1.3 Remove the disks and select ten of them as test specimens, as follows:

One disk from second sheet from the wrapper.

Two disks 2.5 cm (1 in.) deep.

Three disks 5 cm (2 in.) deep.

Four disks 7.5 cm (3 in.) deep.

Locate the holes to be bored so that in each series of five successive bales, they will represent a portion extending diagonally across the bale. Bore each bale once, the first bale at the corner with the edges of the cut at a distance of 2.5 cm from the edge of the bale. Make the second cut half-way between the corner and the center of the bale; cut the third bale at the center; the fourth bale half-way between the center and the corner; and the fifth bale in the opposite corner in a position corresponding to the first. In case binding wires or straps interfere with the exact location of cuts, make the borings as near the prescribed location as possible.

6.2.2 *Roll pulp*

6.2.2.1 Number of rolls to be sampled:

<u>Rolls in Shipment</u>	<u>Number of Sample Rolls</u>
0-350	10 percent
351-500	35 rolls
501-750	45 rolls
751-1000	55 rolls
1001-2000	70 rolls
2001-3000	90 rolls
3001-4000	110 rolls
4001-5000	130 rolls

If more than 5000 rolls, sample 1% of the rolls in excess of 5000 rolls.

6.2.2.2 Bore the first hole 50 mm (2 in.) from the end of the roll. Space the holes in succeeding rolls successively one-fifth of the distance across the width of the roll, traveling toward the opposite end of the roll. Select disks at depths as described in 6.2.1.3 above.

6.3 *Sampling by the strip method.* This method is suitable for sampling wet lap pulp and roll pulp. Cut all sample strips the same width.

6.3.1 *Wetlap pulp.*

6.3.1.1 *Amount to be sampled.* Take test units throughout the entire lot with at least one test unit for each 1000 kg of wet pulp.

6.3.1.2 To sample a lap, cut a 60 or 70 mm strip through the center of the lap across the machine direction to a depth halfway through.

6.3.2 *Roll pulp.* Take a test strip about 75 mm (3 in.) in width across the face of the roll from the third layer. Then take four strips to a depth of 50 mm (2 in.) or deeper from the outside layer.

6.4 *Sampling by the wedge method.* This method is suitable for sampling wet-lap pulp.

6.4.1 *Wet-lap pulp.* Cut a wedge (test specimen) from every 1000 kg wet weight, with the center of the wedge at the center of the lap. Cut the wedge half through the lap. Start at the middle of the closed edge of the lap as the first position. Cut successive laps by moving around counter-clockwise as shown in Figure 1.

6.4.2 *Hydraulically pressed wet lap.* For hydraulically pressed bales, it is convenient to weigh and sample a total number of bales which is a multiple of 20. Weigh and sample a total number of bales of at least 2½% of large shipments or 5% of small shipments (less than 1000 bales). Select at random 20% of the bales sampled and withdraw the middle lap. Similarly, from 40% of the bales sampled, withdraw the lap halfway between the outside and the center. From 35% of the bales sampled, withdraw the lap next to the outside. From 5% of the bales sampled, withdraw the outside lap. Sample folded laps withdrawn from the outside of the bales on that side which formed the surface of the bale.



Fig. 1. Wedges from wet laps.

6.5 *Handling of test specimens.* Immediately deposit moisture specimens taken by the boring, strip or wedge procedure in clean, dry, tared metal cans with tightly fitting covers. Obtain the net weight as soon as practical. In the boring method, bales are sampled in groups of five (6.2.1.3). Specimens for each 5 bales may be collected in a single can.

6.6 *Weighing and drying of specimens.* Obtain both moist weight and dry weight on the same scales using the same weights. After weighing the moist specimens, place the specimens in an oven and dry to constant weight at a temperature of $105 \pm 2^\circ\text{C}$. After an initial 3 hours drying, weigh the hot specimens in the oven or in closed containers immediately after withdrawing from the oven, taking care to avoid convection currents while weighing. Then return the specimens to the oven for another three hours drying. If weighing after the second oven drying does not show a variation greater than 0.1% of the original moist weight, then take this second weighing as the final moisture-free

weight. If variation is greater than 0.1% then carry out additional three-hour drying periods until variation in dry weight is less than 0.1% of the moist weight.

7. Calculations and report

$$\text{Air-dry percent} = \frac{D \times 100}{W \times 0.9}$$

where D = weight of moisture-free pulp specimens
 W = weight of moist pulp specimens

Total air-dry weight of shipment = $(B \times A \times \text{total bales in shipment}) / 100$

where B = average gross bale weight
 A = average air-dry percent

8. Precision

The precision of the test procedure is dependent on the variability of bale weights, the variability in pulp moisture content throughout the shipment, the randomness of bale selection, and the number of bales sampled.

9. Keywords

Pulp, Sampling, Moisture, Moisture content, Baled pulp

10. Additional information

10.1 Effective date of issue: To be Assigned

10.2 Although the 2003 version of this method carried a cm-86 designation, it was the same version as published in 1958. The 2003 revision made the following changes from that version:

10.2.1 Eliminates procedure for moisture testing of pulp at the producing pulp mill which is described in another test method now in preparation.

10.2.2 Eliminates the procedure for testing of baled shredded pulp which is no longer manufactured for the marketplace.

10.2.3 Provides a scope and significance statement.

10.2.4 Changes the amount of sampling required in various sized shipments of bales or rolls.

10.2.5 Requires that pulp in bales be sampled from the bottom of bales. This is to avoid "make-up sheets" frequently added to the top of bales at the pulp mill to bring bales to a standard gross weight.

10.3 Related Methods: ISO 801/1-1979 (E), PAPTAC A.2, A.9.

Reference

1. Sinibaldi, F. J., and Wenner, S. R., "Can the TAPPI Bore Test Measure Moisture Accurately?" *Tappi* **65** (3): 103 (1982).

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