

T 200 sp-10

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Laboratory beating of pulp (Valley beater method)

1. Scope

1.1 This procedure is used to define the papermaking quality of pulp, by subjecting it to a controlled mechanical treatment in a laboratory beater; see also TAPPI T 248 "Laboratory Beating of Pulp (PFI Mill Method)."

1.2 The beating procedure may be used with any pulp, suitably modifying the withdrawal schedule to provide the number of samples required for a satisfactory beater curve. The method may not give satisfactory results with certain extremely long-fibered pulps, such as cotton fibers or jute since the fibers entangle and tend to rope in the beater.

2. Applicable documents

- 2.1 TAPPI T 205 "Forming Handsheets for Physical Tests of Pulp."
- 2.2 TAPPI T 220 "Physical Testing of Pulp Handsheets."
- 2.3 TAPPI T 227 "Freeness of Pulp."

3. Summary

A measured amount of pulp of specified stock concentration is beaten between the roll bars and bedplate of a laboratory beater. Samples are withdrawn at regular intervals during treatment to determine their beating degree and to be made into laboratory handsheets for evaluation.

Approved by the Standard Specific Interest Group for this Test Method



Documents

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4. Significance

The term beating denotes a specific type of refining, but is now commonly used to describe refining in a laboratory. This procedure is used by market pulp mills as a basis for product quality claims, in research studies, to evaluate new pulps, and to provide a basis for process control when using variable pulp sources.

5. Apparatus

5.1 *Disintegrator*¹, as described in TAPPI T 205.

5.1.1 *Large container for standard pulp disintegrator*, the container shall be 300 mm ID, have a height of 200 mm and 12.70 mm radius at the bottom. It shall have a disintegrating capacity of 11 liters and shall have smooth interior walls. The container shall be made of 316 stainless steel. The container must have a suitable cover.

5.2 *Beater*¹, with controlled bedplate.

5.2.1 A dimensioned drawing of the 0.7-kg (1.5-lb) beater is shown in Fig. 1. The bedplate and roll shall be made of Type 410 heat-treatable stainless steel (chromium content, 11.5 to 13%) or its equivalent. The diameter of the roll with flybars inserted (32 in number) shall be 193.8 mm (7 5/8 in.). The thickness of each flybar shall be 4.8 mm (3/16 in.) and the width of the roll shall be 152.4 mm (6 in.). The Brinell hardness of the flybars shall be 350 to 400 and bedplate bars 325 to 375.

5.2.2 The bedplate assembly shall consist of 7 bars, each 3.2 mm (1/8 in.) thick, 15.9 mm (5/8 in.) high, and spaced 2.4 mm (3/32 in.) apart. These shall be bent into a V-shaped form, having an angle of 5° with the roll axis, with the apex of the V pointing in the direction of movement of stock over the plate. The grooves between the bedplate bars shall be filled with strips of kiln-dried white oak. The projected length of the bedplate assembly shall be 158.7 mm (6 1/4 in.) and its projected width 42.8 mm (1 11/16 in.) and shall be ground in to conform to the bars in the roll. The bedplate bar assembly shall be securely mounted in the bedplate with a low-melting-point bismuth alloy, to prevent heat damage to the wooden spacers.

5.2.3 The lever arm of the controlled bedplate shall have a ratio of 17.5 to 9, as indicated in Fig. 1. When the standard weight of 5500 g is positioned at the end of the bedplate lever arm, a force of 104.9 ± 1 N (10,700 g) is applied upwards against the roll.

5.2.4 The bedplate-lever arm assembly shall be sealed to the body of the beater through a diaphragm of 1.6 mm (1/16 in.) live rubber, installed in such a way that there is no tension in the diaphragm when the bedplate and beater roll are in contact.

5.2.5 The beater roll shall be driven at 500 ± 10 rpm. A 1-hp, 1200-rpm motor with belt drive is recommended (see also Additional Information).

5.2.6 The beater may be equipped with a water-level marker to facilitate adjustment of the volume to 23.0 L. A threaded screw may be permanently attached to the beater body and adjusted to indicate the water level at 23.0 L.

5.3 *Lever-arm clamp*, designed to adjust and maintain the position of the bedplate relative to the beater roll.

5.4 *Carborundum hone*, No. 149 or equivalent.

5.5 *Precision straightedge*.

5.6 *Silicon carbide powder*, 80 mesh (180 µm), 120 mesh (125 µm), and 325 (45 µm).

5.7 *Reference pulp*, a large quantity of air-dried, randomized pulp of the type being regularly evaluated should be set aside and maintained for use as a reference material. An unbleached softwood kraft pulp that has been stored for at least two years can be expected to remain relatively stable for long periods, if kept protected from heat, light, and severe cycles of humidity.

NOTE 1: As a periodic check on the performance and calibration of the beater, it is essential to routinely process a reference pulp. If the reference pulp is purchased from a commercial source, care should be taken to closely follow the exact referenced procedures provided with the sample. Failure to follow the referenced procedures, calculation method, and withdrawal schedule will change the test results.

5.8 *Sampling cups* to remove the required amount of stock for making sheets of standard area and grammage.

¹ Names of suppliers of testing equipment and materials for this method may be found on the Test Equipment Suppliers list, available as part of the CD or printed set of Standards, or on the TAPPI website general Standards page.

5.9 *ASTM Type II Water*, is preferred to run the beater curve and associated freeness determinations; however, water quality with a conductance of less than 4 $\mu\text{S}/\text{cm}$ has been found acceptable for accurate and repeatable test results.

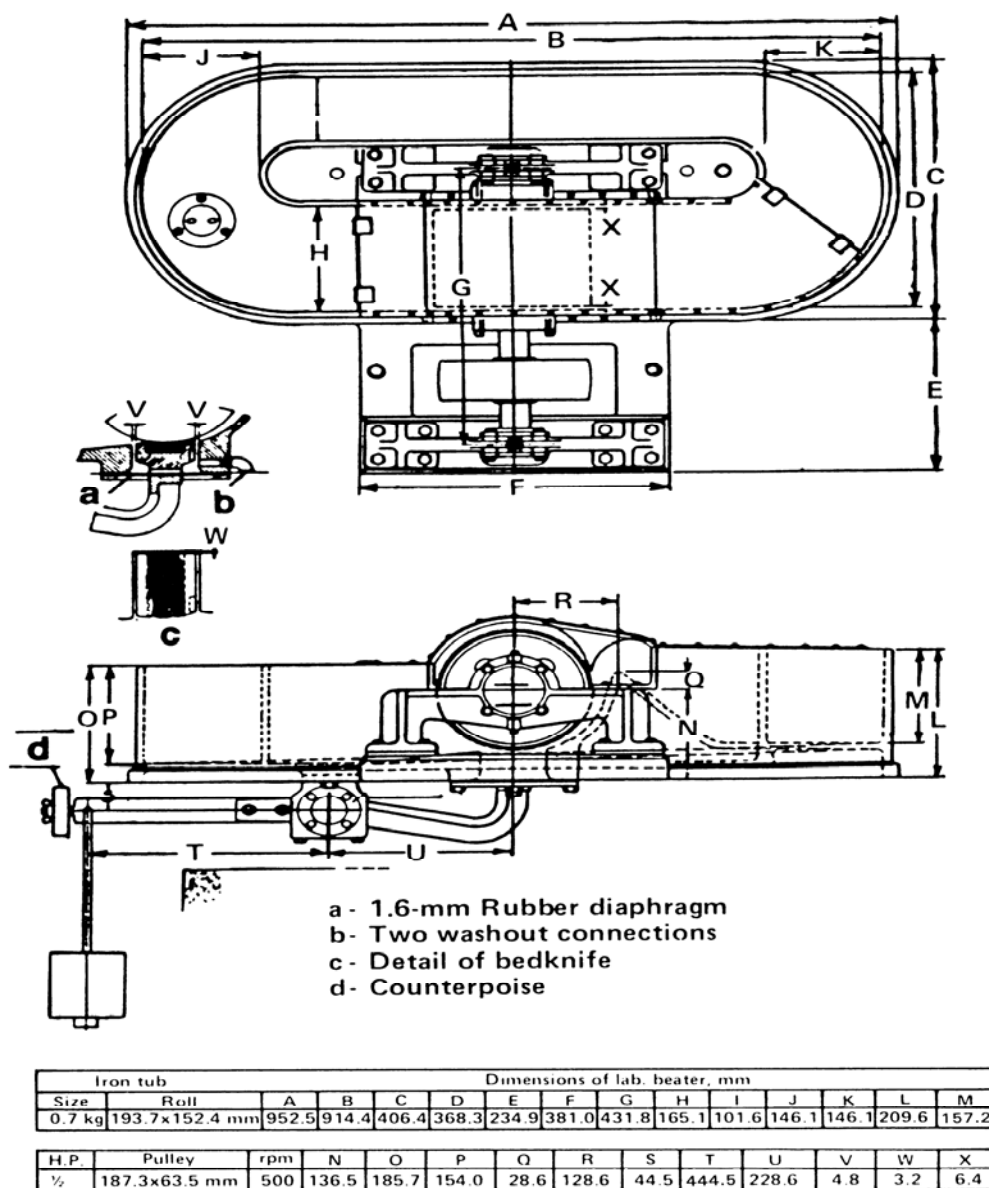


Fig. 1. Beater with controlled bedplate.

6. Calibration

6.1 The following calibration procedure is designed to bring the beater to a condition which will remain stable during repeated use, and will maintain reproducible handsheet properties at a given beating degree (freeness), within a narrow range of beating times.

NOTE 2: Caution is required when working on electrically operated equipment. Disconnect the power to the beater using a lock out/tag out procedure prior to working on the beater.