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Laboratory processing of pulp (plate refiner)

Scope

This method concerns the processing of pulp by means of a laboratory plate refiner prior to forming handsheets, for the purpose of determining its behavior when subjected to a definite schedule. [See also TAPPI T 200 "Laboratory Processing of Pulp (Beater Method)," TAPPI T 248 "Laboratory Beating of Pulp (PFI Mill Method)," UM 253 "Laboratory Processing of Pulp (Ball or Pebble-Mill Method)," and UM 258 "Laboratory Processing of Pulp (Kollergang Method)."] Only the furnishing and processing of the stock and the withdrawal and dilution of samples are described.

Safety precautions

For safe use of this refiner consult the manufacturer's instructions.

Apparatus

1. *Disintegrator*, able to handle at least 80 or 400 g of dry pulp. The TAPPI pulp disintegrator (described in Appendix A of TAPPI T 205) may be used for the smaller quantity. A disintegrator having a vertical shaft, driven at about 1750 rpm with an 89-mm (3.5-in.) diameter slotted disk or propeller at its lower end and a suitable container for holding the stock may be used for the larger quantity.
2. *Plate refiner*, with controlled loading. The refiner consists of a stationary plate with elevated radial refining ribs, and a revolving ribbed plate which can be brought into contact at moderate pressure with the stationary plate by means of a weighted lever assembly. The plates are cast from brass composed of 85% copper, 5% tin, 5% lead, and 5% zinc. The revolving plate rotates at 450 rpm, driven by a sprocket and chain.
3. *Stopwatch*, or electric timer.

Approved by a Working Group of TAPPI in accordance with the Useful Method Guidelines

Care of the refiner

Upon receipt of a new refiner, or when re-sharpening an older refiner, it is necessary to go through a “breaking-in” process.

1. For new refiners, first ensure a water-tight seal between the plate and case by filling the flow box with water and stopping any leaks noticed while running with the plates disengaged, then lap the stationary plate against the stationary case with paste of 280 grit of silicon carbide in petroleum grease. This is typical of engine valve grinding/lapping compound.

2.1. To recondition a refiner remove the stationary plate. Ensure that all surfaces that are in contact between the stationary plate and the housing are clean and without burrs. Apply a light coating of grinding compound consisting of 280 grit silicon carbide in petroleum grease to the surfaces of the stationary plate. Then bolt the plate on the housing and tighten the bolts evenly. Run the refiner with the plates in contact for 1 minute. Remove the stationary plate and wipe off the grinding compound. Note if the newly trimmed surfaces are uniform over the surface of the rotor and the plate. If so, then completely clean off the grinding compound from the rotor and the stationary plate with kerosene. If not, then a courser grit (180) grinding paste can be used to remove metal followed by a treatment with the 280 grit paste. Between each treatment remove all grinding paste to prevent the abrasive from getting into and damaging the seals and bearings.

2.2. The burrs on the edges of the bars can be removed using a flat fine grit stone held flat against the vertical surfaces of the bars so as to not round the bar edges.

2.3. Reassemble the refiner taking care to evenly tighten the mounting bolts.

2.4. Fill the flow box with hot water containing a low foam detergent, run the refiner with the plates apart for one minute, and drain. Refill the flow box with water, run for one minute with the plates apart, and drain. Repeat the water flushing procedure twice.

3. At this point the refiner is usually ready for breaking in with a pulp suspension. If there is any reason to suspect that the plates are not in perfect contact, remove the stationary plate and apply Prussian Blue to the face of the bars and reassemble the refiner. With the plates in contact, rotate the revolving disk for a few seconds. Remove the stationary plate and examine for contact. If less than three-fourths of the faces of the refining bars are in contact, repeat steps 2.1 and 2.2. In most cases of re-sharpening, it is not necessary to perform the Prussian Blue test.

4. Condition the refiner by refining ten batches of unbleached sulfite, or other hard beating pulp, each for 3 min, discarding each batch after it has been refined. After 10 refinings of the unbleached pulp, refine a bleached sulfite slurry for 30 s and determine the freeness in duplicate. The breaking-in process is considered completed when the freeness checks following three successive series of 10 refinings each fall within the experimental limits of freeness testing. At first the refiner will cut excessively, but after about 50 batches, or so, there will be no further drift in the freeness and the refiner will be ready for use.

It is advisable to set aside a quantity of bleached, dry-lap sulfite pulp to be used for making periodic checks on the condition of the refiner. Thus, a refining check is made following the breaking-in period, and at three-month intervals thereafter. When the refiner is subjected to continuous heavy use, the refining times required to reach given freeness increase, even though the strength factors developed at these freenesses do not vary. When the refining times become excessive, it is necessary to repeat the breaking-in procedure.

Sampling

When dealing with mill consignments, a sample of pulp of about 25.8 cm² (4 in.²) in area shall be drawn from the interior of every bale included in the official test for moisture (disks bored for the moisture test but not dried may be