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.

Open drum washer mat sampling technique
(Five-year review of Standard Practice T 281 sp-18)

1. Scope

This practice provides a means to collect pulp mat and liquor samples from open drum washers.

2. Significance

Samples collected according to this practice are used to determine drum washer operating parameters, such as, the consistency of the pulp mat (I), and the dissolved solids or chemical oxygen demand (COD) content of the liquor.
3. **Definitions**

3.1 Consistency is the amount of oven dry fiber, expressed as a percent of total sample weight. Consistency is determined by TAPPI T 240 “Consistency (Concentration) of Pulp Suspensions.”

3.2 Dissolved solids are the washable, or soluble solids contained in the liquor portion of the sample. This does not include bound or fixed sodium adsorbed by the pulp. Dissolved solids are determined by TAPPI T 650 “Solids Content of Black Liquor” (2).

3.3 COD is determined by a recognized industry standard (e.g., ASTM D1252 - 06 “Standard Test Methods for Chemical Oxygen Demand (Dichromate Oxygen Demand) of Water” or PAPTAC Standard H.3 (2006) "Chemical Oxygen Demand" (3,4).

3.4 The term “liquor” refers to the water plus soluble solids.

4. **Apparatus**

4.1 A wooden paddle or scraper, approximately 125-150 mm (5-6 in.) wide with a tapered lip, (see Figure 1 for a paddle 1 meter long), used to lift/scrape the pulp mat off the drum face.

4.2 Containers for liquor samples.

4.2.1 Sealable plastic bags or wide mouth containers 1 liter or larger with air tight lids for the mat samples.

4.2.2 Plastic screw-cap containers, 50–200–mL minimum, for the liquor and low consistency stock samples.

4.2.3 A short handled dipper to collect low consistency vat samples away from the edge of the vat.

5. **Safety precautions**

**CAUTION.** Collecting samples from brown stock washers involves handling hot, caustic pulp and liquor. Appropriate protective clothing and safety equipment should be used. There is a potential for severe burns. Use a longer sampling paddle, if necessary to avoid collecting samples in such a fashion that would place body parts (hands, arms) inside the hood of the brownstock washer. Breaking the plane of an opening into a confined space with any part of your body may be considered to be a violation of OSHA Confined Space Entry standards.
Fig. 1. Suggested paddle design (dimensions are in millimeters). If a longer paddle is required, increase the width of the handle so the head will not “snap off” under load.

6. **Sampling**

6.1 Take multiple samples at 3 to 4 locations along the length of the drum at intervals no greater than 1.2 m. This sampling procedure should be repeated over time (hrs. – days – weeks).

6.2 Avoid samples from the very ends and center of the washer drum. These are likely to vary significantly from the machine average.
6.3 Collect samples in air tight containers or plastic bags and label them appropriately to identify the sample.

6.4 Samples should be processed as soon as possible for best results. If not possible, be consistent in storage time.

6.5 Samples may be evaluated individually, to give a cross machine profile, or combined into a single composite sample for an average result.

7. Procedure

7.1 Low Consistency Stock Samples:
7.1.1 Collect samples in a scoop, dipper, or sample bottles described in 4.2.2, 4.2.3 from the washer inlet. The sample should be collected with a smooth dipping action avoiding areas of stagnation or high turbulence. If transferring samples between containers, mix (by stirring or shaking) to insure uniformity of the sample.

7.2 Pulp Mat Samples:
7.2.1 Using the paddle described in 4.1, obtain a pulp mat sample from the discharge side of the washer drum being careful to avoid repulper. Collect the sample with a scraping/lifting motion taking care not to damage the drum face but ensuring that the sample is the full thickness of the pulp mat. This procedure should yield a rough mat sample approximately 125-150 mm (5-6 in.) square.
7.2.2 Break off the outer edges of the rough sample to obtain a final sample approximately 75 mm (3 in.) square. Place this final sample in a labeled plastic bag or wide mouth container as described in 4.2.1, seal the bag or container and set aside for laboratory testing.
7.2.3 Collect an additional sample (or samples) in accordance to 7.2.1 and prepare a 75-mm (3-in.) square (as described in 7.2.2.). Take the 75-mm (3-in.) sample and immediately squeeze the liquor from it, using a gloved hand or a mechanical press, into a sample bottle as described in 4.2.2 to obtain a 25-50 mL liquor sample. Tightly cap the labeled sample bottle and set aside for laboratory testing. If squeezing the liquor at time of sampling is not practical, seal the 3-in samples inside plastic bags or wide mouth containers, label, and take to the laboratory to perform the squeezing. Place the samples into a refrigerator if they cannot be squeezed within an hour.

7.3 Liquor Samples:
7.3.1 Using a bucket, labeled sample bottles, or dipper described in 4.2.2, 4.2.3 to obtain samples from the appropriate liquor lines. Allow the sample stream to flow freely prior to sample collection until the line and sample tap are well flushed.

8. Calculations

None required.
9. Report

None required; however, the following information will be helpful in evaluating the washer’s performance:

<table>
<thead>
<tr>
<th>Drum speed</th>
<th>RPM</th>
</tr>
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<tbody>
<tr>
<td>Vacuum</td>
<td>kPa</td>
</tr>
<tr>
<td>Vat temperature</td>
<td>°C</td>
</tr>
<tr>
<td>Production rate</td>
<td>air-dried or oven-dried tons (or metric tones) per day</td>
</tr>
<tr>
<td>Washing shower flow</td>
<td>LPM</td>
</tr>
<tr>
<td>Drum diameter</td>
<td>m</td>
</tr>
<tr>
<td>Drum width</td>
<td>m</td>
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</tbody>
</table>

10. Precision

Since this is a Standard Practice, a precision statement is not required. However, it is imperative that all samples be collected and handled in a uniform and consistent manner to ensure statistical accuracy.

11. Keywords

Consistency, Dissolved solids, Drums, Washer, COD

12. Additional information

12.1 Effective date of issue: To be assigned.

12.2 Revisions in this 2012 edition include: (1) clarification of the definition of pulp consistency in Section 3; (2) addition of standard test methods for measuring chemical oxygen demand (COD) in Section 3; (3) Inclusion of Figure 1 in Section 4, which was missing; and (4) addition of safety caution statement in Section 5 regarding OSHA Confined Space Entry Standards to a brownstock washer hood.
Literature cited

1. TAPPI T 240 “Consistency (Concentration of Pulp Suspensions).”
2. TAPPI T 650 “Solids Content of Bleach Liquor.”
3. ASTM D1252 - 06 “Standard Test Methods for Chemical Oxygen Demand (Dichromate Oxygen Demand) of Water”

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