Method 4.5 – Filter feed: bagacillo to mud solids ratio

1. ...

T... ...licable to filter feed and determines the ratio of bagacillo to mud solids in...

2. Principle

The filter feed is screened to remove the bagacillo. The residue is dried and the percentage bagacillo in the filter feed is determined gravimetrically. The filtrate from the screening is filtered through a filter paper to determine the percentage of mud in the filter feed. The ratio of the percentage of bagacillo to the percentage of mud in the filter feed is calculated. This value is referred to as the bagacillo ratio.

3. Apparatus

3.1   **Top pan balance** readable to 0.01 g

3.2   **Heavy duty balance** readable to 1 g

3.3   **Drying oven** operating at 130°C

3.4   **Stainless steel container**: 5 litres

3.5   **Beakers**: 250 and 500 cm^3

3.6   **Conical flask** with stopper: 1 000 cm^3

3.7   **Screen**: 200 mm ϕ, 0.075 mm pore opening

3.8   **Buchner funnel**: 110 mm ϕ

3.9   **Buchner flask**: 500 cm^3

3.10 **Glass rod**

3.11 **Desiccator** containing self-indicating silica gel

3.12 **Filter paper**: Whatman No. 1 or equivalent, 150 mm ϕ

4. Reagents

4.1   **Celite 577 filter aid**

Celite is an inert powder and inhalation may cause asbestosis of the lungs. Wear a dust mask during use.

5. Procedure

5.1   Bagacillo in filter feed

Dry the screen in the oven at 130°C for 1 hour. Cool in the desiccator for 1 hour and weigh. Weigh the 5 litre container on the heavy duty balance and record the mass.

Stir the sample of feed vigorously to ensure that insoluble matter is uniformly dispersed throughout. Quickly weigh out 100.00 g of the agitated sample into the 250 cm^3 beaker. Transfer the sample to the screen and wash with distilled water until there is no trace of mud left in the bagacillo. Collect the filtrate and all washings in the 5 litre container.

Dry the sieve and its contents in the oven at 130°C for 4 hours. Cool in the desiccator for 1 hour and weigh.

5.2   Mud solids in filter feed

Dry the filter paper (Whatman No. 1 or equivalent) at 130°C in the oven for 2 hours. Store in a desiccator until needed. Place the 5 litre container on the heavy duty balance and add distilled water until the mass of the contents is 2 000 g.

Weigh the filter paper on the top pan balance within 30 seconds after removing the paper from the desiccator. Wet the filter paper in a Buchner funnel with distilled water so that the paper fits tightly around the sides of the funnel. Mix 2 g of Celite 577 with 20 cm^3 of water and pour down a glass rod onto the filter paper while low vacuum is applied to precoat the filter paper with a thin layer of Celite. Use a 15 kPa differential pressure.

Stir the contents of the 5 litre container and quickly weigh 250 g while stirring into the 500 cm^3 beaker. Pour this aliquot slowly down a glass rod onto the precoated filter paper at a rate slower than the drainage rate of the filter so as not to flood the filter aid surface. This will ensure quick filtration. Stir the contents of the beaker occasionally while filtering. Visually inspect the filtrate for clarity to ensure that no filter aid or suspended solids are passing through the filter. Use a 15 kPa differential pressure.

Rinse the beaker with 10 × 30 cm^3 distilled water and pour each rinse through the filter paper, allowing the filter to drain between washings. Release the vacuum and transfer the filter paper and contents to a preweighed 250 cm^3 beaker. Dry the beaker and contents in the oven at 130°C for 4 hours. Cool in a desiccator for 1 hour and weigh.

6. Calculations

6.1   Bagacillo in filter feed

Mass of bagacillo (g)   = $M_2 - M_1$

where M_1 ≡   mass of screen (g)
          M_2 ≡   mass of screen and bagacillo after drying (g)

Bagacillo in feed   = $\dfrac{\text{mass of bagacillo (g)}}{\text{mass of filterfeed (g)}} \times 100$

6.2   Mud solids in filter feed

Mass of filter feed   = $\dfrac{\text{mass of sample (g)}}{\text{total mass of dilution (g)}} \times \text{aliquot (g)}$

Mass of mud solids (g)   = $M_2 - M_1$

where M_1 ≡   mass of beaker, filter paper and filter aid (g)
       M_2 ≡   mass of beaker, filter paper, filter aid and mud solids after drying (g)

Mud solids in feed   = $\dfrac{\text{mass of mud solids (g)}}{\text{mass of filter feed (g)}} \times 100$

6.3   Ratio of bagacillo to mud solids

Bagacillo ratio   = $\dfrac{\text{Bagacillo in feed (\%)}}{\text{Mud solids in feed (\%)}} \times 100$

Express as bagacillo as a percentage of mud solids to the nearest unit.

7. Example

7.1   Bagacillo in filter feed

Mass of filter feed   =   100.00 g
Mass of screen   =   264.80 g
Mass of screen and sample   =   268.91 g

Mass of bagacillo   =   268.91 - 264.80 g
                                =   4.11 g
Bagacillo in feed   = $\dfrac{4.11\text{ g}}{100.00\text{ g}} \times 100$
                                =   4.11%

7.2   Mud solids in filter feed

Mass of filter feed   = $\dfrac{100.00\text{ g}}{2000\text{ g}} \times 250\text{ g}$
                        =   12.5 g

Mass of beaker, filter paper and filter aid   =   352.11 g
Mass of beaker, filter paper, filter aid and sample   =   352.53 g

Mass of mud solids   =   352.53 - 352.11 g
                        =   0.42 g

Mud solids in feed   = $\dfrac{0.42\text{ g}}{12.50\text{ g}} \times 100$
                        =   3.36%

7.3   Percentage ratio of bagacillo to mud solids

Bagacillo ratio   = $\dfrac{4.11\%}{3.36\%} \times 100$

                        =   122.32%
Report as 122%

8. References

SASTA (1985). *Laboratory Manual for South African Sugar Factories.* 3rd Edition: 266 - 268.

SMRI (1997). Determination of ash in cane. *SMRI Test Methods,* TM063.