BULK DENSITY

PRINCIPLE

A graduated cylinder is loosely filled and then packed with sample using standard techniques. Loose and packed bulk densities are calculated from the sample weight and volumes.

SCOPE

This method can be applied to starches of all types, feedstuffs and all other solid products obtained from the wet milling of corn (Note 1).

SPECIAL APPARATUS

1. Cylinder Funnel Assembly: Select a 250 mL graduated cylinder having a graduated section (0 to 250 mL mark) not less than 24 cm and not more than 26 cm in length. Use a 75 mm, 60 degree powder funnel having a stem 30 mm in length and 17 mm inside diameter; the stem end should be square cut.

2. Vibrator: The SYNTRON Paper Jogger, Type J-1 is recommended; available from FMC Corporation, Material Handling Equipment Division, Homer City, PA 15748.

PROCEDURE

Tare the 250 mL graduated cylinder to the nearest 1 g and place on the base of a ring stand. With a 3 inch metal ring attached to the ring stand, support the powder funnel in a vertical position with the stem inside the cylinder 6 cm above the 250 mL graduation mark.

With the aid of a spoon or large spatula, carefully add sample to the powder funnel until the cylinder is filled (level) to the 250 mL mark. Weigh sample also to the nearest 1 g.

Place cylinder with loosely-packed sample on wooden deck of vibrator. Attach 3 inch metal support ring to ring stand and position ring around cylinder at about the 200 mL graduation mark to support the cylinder in center of the deck during

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vibration. Start vibrator and increase vibration amplitude by means of rheostat to the point at which cylinder begins to bounce up from the deck rather vigorously, usually indicated by a break in the vibrating rhythm between the cylinder and deck. Vibrate cylinder and sample for 10 mins. Record volume of packed sample to the nearest mL.

CALCULATION (Note 2)

$$\text{Density (Loose) g/mL} = \frac{\text{Loose - Filled Sample Wt., g}}{250\ \text{mL}}$$

$$\text{Density (Packed) g/mL} = \frac{\text{Loose - Filled Sample Wt., g}}{\text{Packed Sample Volume, mL}}$$

NOTES AND PRECAUTIONS

1. Bulk density values must be interpreted with caution. Results on starch and other samples are affected by processing methods and by the method of analysis which is empirical. Bulk densities of granular samples are affected significantly by the geometry (surface area : volume ratio) of the calibrated vessel.

2. The preferred density units are grams per milliliter (g/mL) or grams per cubic centimeter (g/cc), which can be considered equivalent by this test procedure. Conversion factors for alternate units are:

   $lbs/ft^3 = (g/mL) \times 62.4$
   lbs/gallon (U.S.) = (g/mL) x 8.35
   lbs/bushel (U.S.) = (g/mL) x 77.7

METHOD HISTORY

Combined the Bulk Density methods for Corn Starch (Unmodified) (B-16) and Feedstuffs (G-8) on 4-15-2010.

Corn Starch (Unmodified), Bulk Density(B-16), Date of Acceptance 4-14-1978, Revised 4-09-1998.

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Feedstuffs, Bulk Density (G-8), Date of Acceptance 3-26-1976, Revised 4-09-1998.