******THIS IS A NEW IM. – PLEASE READ CAREFULLY.******

SLURRY TEST FOR DRILL SHAFTS

SCOPE

This test procedure is a method for determining:

1. The weight (mass) of a given volume of slurry.
2. The viscosity of slurry.
3. The sand content (the volume percent of particles larger than 74 µm) of slurry.

SLURRY DENSITY

This test procedure is a method for determining the weight (mass) of a given volume of slurry. Slurry density shall be expressed as pounds per cubic foot (kilograms per cubic meter).

A. Apparatus

1. Any instrument of sufficient accuracy to permit density measurement within ± 0.5 pound per cubic foot (10 kg/m^3) may be used. The mud balance (slurry balance) (See Figure 1.) is the instrument generally used for slurry density determinations. The mud balance (slurry balance) is designed such that the slurry cup at one end of the beam is balanced by a fixed counterweight at the other end, with a sliding-weight rider free to move along a graduated scale. A level-bubble is mounted on the beam to allow for accurate balancing. Attachments for extending the range of the balance may be used when necessary.

2. Thermometer: 32°F to 220°F (0°C to 105°C).

B. The following calibration procedures shall be followed:

1. The instrument shall be calibrated frequently with fresh water. Fresh water should give a reading of 8.3 pounds per gallon or 62.3 pounds per cubic foot (1000 kg/m^3) at 70°F (21°C). If it does not, adjust the balancing screw or the amount of lead shot in the well at the end of the graduated arm as required.

C. The following test procedures shall be followed:

1. Set the instrument base on a flat, level surface.
2. Measure the temperature of the slurry and record it on the Drilling Slurry Report form.
3. Fill the clean, dry cup with slurry to be tested; put the cap on the filled slurry cup and rotate the cap until it is firmly seated. Ensure that some of the slurry is expelled through the hole in the cap in order to free any trapped air.

4. The majority of drilling slurries require no special equipment to remove entrained air or gas prior to testing. Usually, gentle agitation, together with a few drops of an appropriate defoamer, are all that is necessary. Stirring with a spatula or pouring back and forth is sufficient in most cases.

5. Holding the cap firmly on the slurry cup (with the cap hole covered), wash or wipe the outside of the cup clean and dry.

6. Place the beam on the base support and balance it by moving the rider along the graduated scale. Balance is achieved when the bubble is under the centerline.

7. Read the slurry density at the edge of the rider toward the slurry cup. Make appropriate corrections when a range extender is used.

D. Calculations

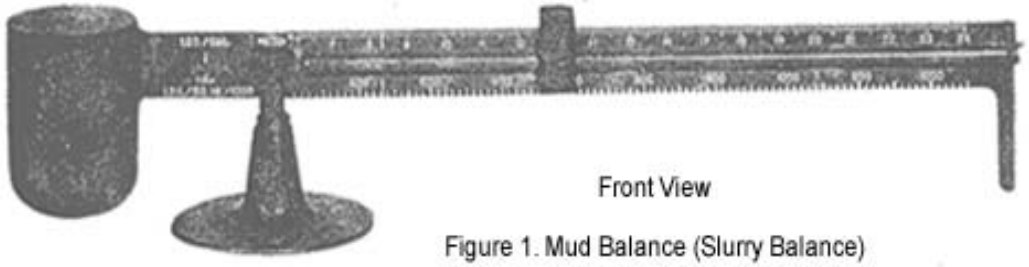
1. Report the slurry density to the nearest 0.5-pound per cubic foot (10 kg/m^3).

2. To convert the reading to other units, use the following:

$$Density = g/cm^3 = \frac{lb/ft^3}{62.3} = \frac{lb/gal}{8.345}$$

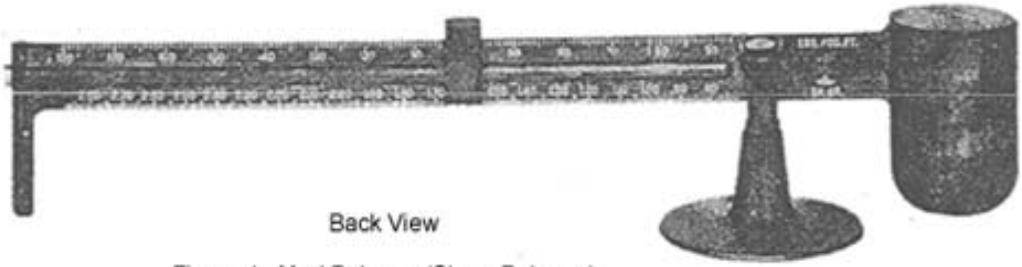
$$kg/m^3 = (lb/ft^3)(16) = (lb/gal)(120)$$

$$Mudgradient, psi/ft = \frac{lb/ft^3}{144}, \frac{lb/gal}{19.24}, or \frac{kg/m^3}{2309}$$



Front View

Figure 1. Mud Balance (Slurry Balance)



Back View

Figure 1. Mud Balance (Slurry Balance)

MARSH FUNNEL

The Marsh Funnel is a simple device used to determine viscosity on a routine basis. Viscosity is a measurement that relates to the flow properties of the slurry.

A. Apparatus

1. Marsh funnel: a marsh funnel (see Figure 2) is calibrated to out-flow 1 quart (0.95 L) of fresh water at a temperature of 70°F ± 5°F (21°C ± 3°C) in 26 seconds ± 0.5 seconds. A graduated cup is used as a receiver.

   a. Funnel Cone:
   Length: 12.0 inches (305 mm).
   Diameter: 6.0 inches (152 mm).
   Capacity to the bottom of the screen: 1500 cm^3.

   b. Orifice:
   Length: 2.0 inches (50.8 mm).
   Inside Diameter: 3/16 inch (4.7 mm).

   c. Screen: No. 12 mesh.
   The screen has 1/16 inch (1.6 mm) openings and fixed at a level 3/4 inch (19.0 mm) below the top of the funnel.

2. Graduated cup: 1 quart (0.95 L).

3. Stopwatch

4. Thermometer: 32°F to 220°F (0°C to 105°C).

B. The following test procedures shall be followed:

1. Cover the funnel orifice with a finger and pour freshly sampled drilling fluid through the screen into the clean, upright funnel. Fill the funnel until the fluid reaches the bottom of the screen.

2. Remove finger and start the stopwatch. Measure the time for the slurry to fill to the 1-quart (0.95 L) mark of the cup.

3. Measure the temperature of fluid in °F (°C).

4. Report the time to the nearest second as marsh funnel viscosity. Report the temperature of the fluid to the nearest °F (°C).

Figure. 2 Marsh Funnel and Cup

SAND CONTENT

This test procedure is a method for determining the sand content of slurry, which is the volume percent of particles larger than #600 sieve (75 µm). It is measured by a sand-content set (See Figure 3).

A. Apparatus

1. No. 200 sieve, 2.5 inches (63.5 mm) in diameter.

2. Funnel to fit sieve.

3. Glass measuring tube marked for the volume of slurry to be added. The tube is graduated from 0% to 20% in order to read the percentage of sand directly.

B. The following test procedures to measure the sand content of slurry shall be followed:

1. Fill the glass measuring tube with slurry to the "mud" mark. Add water to the next mark. Close the mouth of the tube and shake it vigorously.

2. Pour the mixture onto the clean, wet screen. Discard the liquid passing through the screen. Add more water to the tube. Then shake, and again pour it onto the screen. Repeat this process until the tube is clean. Wash the sand retained on the screen to free it of any remaining slurry.

3. Put the funnel upside down over the top of the sieve. Slowly invert the assembly and insert the tip of the funnel into the mouth of the glass tube. Wash the sand into the tube by playing a fine spray of water through the screen. Allow the sand to settle. From the graduations on the tube, read the volume percent of the sand.

4. Report the sand content of the slurry in volume percent. Report the source of the slurry sample, in other words, above the shaker, suction pit, and so forth. Coarse solids other than sand will be retained on the screen (for example, lost circulation material), and the presence of such solids should be noted.

Figure 3. Sand Content Set