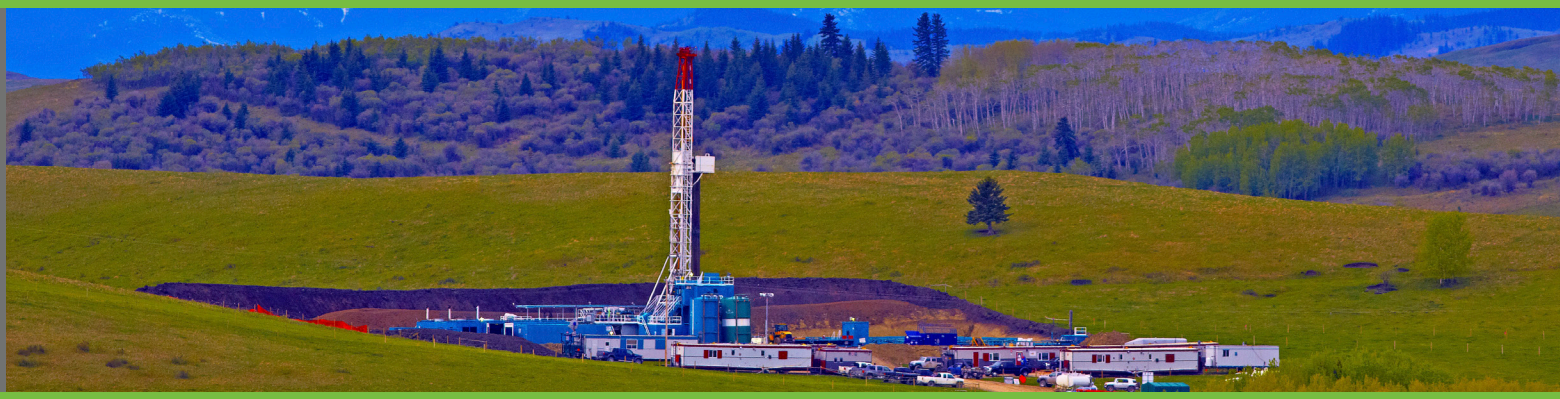

MUD DENSITY

Drilling mud density is required to calculate the hydrostatic pressure that is being exerted by a column of drilling mud at any given depth. Density is also used to provide an indication of the solids content of a drilling mud. When the test is performed using a standard mud balance, care must be taken to ensure that the cup is full and free of entrapped air.

MUD BALANCE CALIBRATION

1. Remove the lid and completely fill the cup with distilled water at room temperature.
2. Replace the lid carefully and wipe the entire balance dry.
3. Place the balance arm on the base with the knife-edge resting on the fulcrum.
4. With the rider placed at 1000 kg/m³ (s.g. = 1.0 or 8.33 lb/gal), the bubble of the level vial should oscillate the same distance to the left and right of the centering mark above the vial. If not, the calibration screw at the end of the balance should be adjusted until the oscillations are equal. (Some balances do not have an adjustment screw and require lead shot to be removed or added through a calibration cap.)

NOTE: A more accurate reading is obtained if the mud balance is permitted to oscillate on its knife-edge rather than allowing it to come to rest with the bubble centered over the centering mark.

TEST PROCEDURE

1. Remove the lid from the cup and completely fill the cup with the mud to be tested, it may be necessary to tap or vibrate the cup lightly to bring entrapped air to the surface for high viscosity muds.
2. Replace the lid and seat it firmly on the cup in a rotating manner and allowing the excess drilling mud to be expelled through the centrally located hole in the lid.
3. Wash the mud from the outside of the cup and dry the balance.
4. Place the balance arm on the base with the knife-edge resting on the fulcrum.
5. Adjust the rider until the bubble oscillates equally to the left and right of the centering mark above the level vial.
6. Read the mud density (mud weight) as shown by the indicator on the rider.
7. Report the result to the nearest scale division in kg/m³ , (specific gravity times 1000).

MUD DENSITY

METHOD TWO, GARRETT GAS TRAIN

EQUIPMENT AND CHEMICALS

Equipment		Product Code
1.	Garrett Gas with H_2S Dräger tubes & floating ball flow meter	EX1360
2.	Hydrogen sulfide (Hach), paper disks as alternative to Dräger tubes (for more qualitative test)	EX1080
3.	Sulfuric acid (5N)	EY1210
4.	Dropper bottle with octanol defoamer or equivalent	EY1050
5.	Hypodermic syringe (10 mL with 21 gauge needle)	EN3334

1. Be sure the gas train is clean, dry and on a level surface. **NOTE:** Moisture in the flow metre can cause the ball to float erratically.
2. With the regulator T- handle backed off, install and puncture a CO_2 gas cartridge.
3. Add 20 mL distilled water to chamber No. 1. (The chambers are numbered beginning at the regulator).
4. Add 5 drops of octanol defoamer to chamber No. 1.
5. Measure the sample into chamber No. 1 according to the following table:

Dräger Tube Identification			
Sulfide Range mg/L	**Sample Volume cm^3**	**Dräger Tube Identification**	**Tube Factor**
1.2 - 24	10.0	H_2S 100/a	0.12*
2.4 - 48	5.0		
4.8 - 96	2.5		
30 - 1050	10.0	H_2S 0.2% o/a	1500**
60 - 2100	5.0		
120 - 4200	2.5		
*Tube factor applies to new tubes, H_2S 100/a with scale 100 to 2000. Old tubes use the tube factor 12.			
**Tube factor applies to new tubes, H_2S 0.2% o/a with scale 0.2 to 7.0. Old tube use tube factor 600 times ration: "batch factor"/0.40.			

6. Select the proper Dräger tube in accordance with the table above. Break the tips from each end of the tube and apply Lubriseal to each end.
7. Install the tube with the arrow pointing downward into the bored receptacle. Likewise, install the flow meter with the word "TOP" upward. (Be sure O-rings seal around the body of each tube)
8. Install the top on the gas train and evenly hand tighten to seal all O-rings.
9. Attach the flexible tubing from the regulator onto the dispersion tube of chamber No. 1 and from the outlet tube of chamber No. 3 to the Dräger tube.
10. Adjust the dispersion tube of chamber No. 1 to within 5 mm from the bottom.

11. Flow CO_2 gas gently through train form 10 seconds to purge system of air. Stop gas flow.
12. Slowly inject 10 mL sulfuric acid solution into chamber No. 1 through the septum using the syringe and needle.
13. Immediately restart CO_2 flow. Using the regulator, adjust the flow so that the ball remains between the two lines on the flow meter tube. NOTE: One CO_2 cartridge should provide 15-20 minutes flow at this rate.
14. Observe a color change on the Dräger tube if H_2S is present. In the units marked on the tube, note and record the maximum darkened length before the front starts to smear. Continue flow for 15 minutes although the front may attain a diffuse, feathery colouration. On the high range tube an orange color may appear ahead of the black front if sulfites are present. The orange region should be ignored when recording the darkened length.

CALCULATION

mg/L sulfides = tube factor x tube stain length / mL sample volume

CARE AND CLEANING

To clean the gas train, remove the flexible tubing and gas train top. Take the Dräger tube and flow meter out of the receptacles and plug the holes with stoppers to keep them dry. Wash out the chambers using a brush with warm water and mild detergent. Use a pipe cleaner to clean the passages between the chambers. Wash, rinse and then blow out the dispersion tube with air or CO_2 gas. Rinse the unit with distilled water and allow to drain dry.

NOTE: A lead acetate paper disc (Hach) fitted below the O-ring of chamber No. 3 can be substituted for the Dräger tube in the gas train. The lead acetate paper, although not preferred for quantitative work, will show the presence of sulfides.

WARNING: The reagents in this kit may be hazardous to the health and safety of the user if inappropriately handled. Please read all warnings before performing the test and use appropriate safety equipment.