

METHYLENE BLUE CAPACITY

OFI Series 168-00

The Methylene Blue capacity of a drilling fluid is an indication of the amount of reactive clays (Bentonite or drilled solids) present as determined by the Methylene Blue Test (MBT). The Methylene Blue capacity gives an estimate of the total cation exchange capacity (CEC) of the solids in the drilling fluid. The Methylene Blue capacity and the cation exchange capacity are not necessarily equivalent, with the Methylene Blue capacity normally being somewhat less than the actual cation exchange capacity. Methylene Blue solution is added to a sample of drilling fluid which has been treated with hydrogen peroxide and acidified until saturation is noted by the formation of a "dye halo" around a drop of solids placed on filter paper. Drilling fluids frequently contain substances in addition to reactive clays that also absorb Methylene Blue dye. Pretreatment with Hydrogen Peroxide removes these effects from organic materials such as lignosulfonates, lignites, cellulosic polymers and polyacrylates, etc.

Equipment:

- #140-55 Filter Paper, 3 1/2 inch, 100/pkg
- #153-14 Cylinder, Graduated, 50 ml x 1 ml, glass
- #153-29 Syringe, 2 ml, glass
- #153-40 Pipette, 10 ml x 1/10 ml, glass
- #153-50 Flask, Erlenmeyer, 250 ml
- #168-01 Hot Plate, with Thermostat, 115 Volt, 325 Watt
or:
- #168-01-1 Hot Plate, with Thermostat, 230 Volt, 325 Watt
- #168-04 Stirring Rod, glass

Reagents:

- #200-01 Methylene Blue sol'n, 8 oz
- #200-11 Hydrogen Peroxide, 3% sol'n, 8 oz
- #206-01 Distilled Water, 8 oz
- #230-13 *Sulfuric Acid, 5N, 8 oz (UN2796)

Case:

- #144-35 Case, Multi-Kit Diagonal Design, Stainless Steel

Procedure:

1. With the syringe add 2.0 mLs of drilling fluid to the Erlenmeyer Flask. Air or gas entrained in the drilling fluid must be removed prior to injection. Vigorously stir the drilling fluid to break the gel and quickly draw the mud into the syringe. Then slowly discharge the syringe back into the drilling fluid keeping the tip submerged. Again draw the fluid into the syringe and deliver exactly 2.0 mLs of fluid to the flask.
2. Add 10 mLs of distilled water to the Erlenmeyer Flask.
3. Add 15 mLs of 3% Hydrogen Peroxide to the Flask.
4. Add 0.5 mLs of 5N Sulfuric Acid to the mixture.
5. Using the hot plate, boil gently for 10 minutes, but do not allow to boil to dryness.
6. Dilute the mixture to about 50 mLs using Distilled Water.
7. Add Methylene Blue solution to the flask in increments of 0.5 mLs. If the approximate amount of Methylene Blue dye is known from previous testing, then larger increments may be used at the beginning of the procedure. After each addition of Methylene Blue solution swirl the contents of the flask for about 30 seconds.
8. While the solids are still suspended, remove one drop of liquid with the stirring rod and place the drop on the filter paper. The *initial* end point of the titration is reached when the dye appears as a blue turquoise ring surrounding the dyed solids.
9. When the blue tint halo spreading from the spot is detected, shake the flask an additional 2 minutes and place another drop on the filter paper. If the blue ring is again evident, the final endpoint has been reached. If the blue ring does not appear, then continue as before until a drop taken after 2 minutes shows the blue tint halo.

Calculation:

$$\text{Methylene Blue Capacity} = \frac{\text{Methylene Blue, ml}}{\text{Drilling Fluid, ml}}$$

The Methylene Blue capacity may also be reported as pounds per barrel of equivalent Bentonite, based on Bentonite with a cation exchange capacity of 70 meq/100 grams.

$$\text{Bentonite equivalent, lb/bbl} = \frac{5 (\text{Methylene Blue, ml})}{\text{Drilling Fluid, ml}}$$

$$\text{Bentonite equivalent, kg/m}^3\text{g} = 2.85 (\text{Bentonite equivalent, lb/bbl})$$

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