**Oil Based Mud Calculations**

Density of oil/water mixture being used

(V1) (D1) + (V2) (D2) = (V1 + V2) DF

Sample Case : If the oil/water (o/w) ratio is 75/25 (75% oil, V1 and 25%

water V2), the following material balance is set up :

NOTE : The weight of diesel oil (D1) = 7.O ppg  
 The weight of water D2 = 8.33 ppg

(075) (7.0) + (0.25 x 8.33) = (0.75 + 0.25) DF  
 5.25 + 2.0825 = 1.0 DF  
 7.33 = DF

Therefore : The density of the oil/water mixture = 7.33 ppg

**Starting volume of liquid (oil plus water) required to prepare a desired volume of mud**

Where ;

SV = starting volume (bbl)  
W1 = initial density of oil/water mixture (ppg)  
W2 = desired density (ppg)  
DV = desired volume (bbl)

Sample Case : W1 = 7.33 ppg (o/w ratio – 75/25)  
 W2 = 16.0 ppg  
 DV = 100 bbl

Solution :

**Oil/water ratio from retort data**

Obtain the percent by volume oil and percent by volume water from retort analysis or mud still analysis. From the data obtained, the oil/water ratio calculated as follows :

c. Result : The oil/water ratio is reported as the percent oil and the

percent water

Sample Case : Retort analysis : % by volume oil = 51  
 % by volume water = 17  
 % by volume solids = 32

Solution :

c. Result : Therefore, the oil/water ratio is reported as 75/25 : 75%

oil and 25% water

**Changing oil/water ratio**

NOTE : If the oil/water ratio is to be increased, add oil ; if it is to be

decreased, add water

Retort analysis : % by volume oil = 51  
 % by volume water = 17  
 % by volume solids = 32

The oil/water ratio is 75/25

Sample Case 1 : Increase the oil/water ratio to 80/20 :

In 100 bbl of this mud, there are 68 bbl of liquid (oil plus water). To increase the oil/water ratio, add oil. The total liquid volume will be increased by the volume of the oil added, but the water volume will not change. The 17 bbl of water now in the mud represents 25% of the liquid volume, but it will represent only 20% of the new liquid volume.

Therefore : let x = final liquid volume

then, O.20 x = 17

x = 17 ÷ 0.20

= 85 bbl

The new liquid volume = 85 bbl

Barrels of oil to be added :

Oil (bbl) = new liquid vol — original liquid vol

= 85 — 68

= 17 bbl oil per 100 bbl of mud

Check the calculations. 1f the calculated amount of liquid is added, what will be the resulting oil/water ratio?

% water would then be : 100 — 80 = 20

Therefore : The new oil/water ratio would be 80/20

Sample Case 2 : Change the oil/water ratio to 70/30 :

As in Example 1 there are 68 bbl of liquid in 100 bbl of this mud. In this case, however, water will be added and the volume of oil will remain constant. The 51 bbl of oil represents 75% of the original liquid volume and 70% of the final volume :

Therefore : let x = final liquid volume

then, O.7Ox = 51

x = 51 ÷ 0.70

= 73 bbl

The new liquid volume = 73 bbl

Barrels of water to be added :

Water (bbl) = new liquid vol — original liquid vol  
 = 73 — 68  
 = 5 bbl of water per 100 bbl of mud

Check the calculations. 1f the calculated amount of water is added, what will be the resulting oil/water ratio?

% oil in liquid phase = 100 – 30

= 70

Therefore, the new oil/water ratio would be 70/30