Fluid Resistivity

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Subject Name: Formation evaluation lab **Subject Code: PEP-318**

1. Aim/Overview of the practical:

To adjust the fluid resistivities at given temperatures.

2. Task to be done:

To calculate Resistivity of a given drilling fluid at Formation temperature.

3. Apparatus:

- Logging data
- Code editor or IDE

4. Algorithm/Flowchart:

- Develop a script, with relevant inputs, for designing the relevant formulation.
- Execute the program and display in the console.

5. Theme/Interests definition:

Resistivity: Is the ability of a material to resist electrical conduction. It is the inverse of conductivity and is measured in ohm-m.

6. Steps for experiment/practical:

- Locate the resistivity value, 1.2 ohm-m, on the scale at the left of the chart.
- Move to the right horizontally along the 1.2 ohm-m line until the vertical line representing a temperature of 75°F (from the bottom of the chart) is encountered (point A on the chart).
- Move parallel to the (diagonal) constant salinity line to where it intersects the vertical line representing a temperature value of 160°F (point B on the chart).
- From point B, follow the horizontal line to the left to determine the resistivity of the fluid at the desired temperature (0.58 ohm-m at 160°F).

Each diagonal line on the chart shows the resistivity of a solution of fixed concentration over a range of temperatures. The diagonal lines at the bottom of the chart indicate that an NaCl solution can hold no more than 250,000 to 300,000 ppm NaCl depending on temperature (i.e., the solution is completely salt saturated).

7. Observations/Discussions:

Resistivity of the mud at 75 °F (R1) = 1.2 ohm-m

Formation temperature (Tf) = 160 °F

8. Percentage error (if any or applicable**):**

NA

9. <u>Calculations/ Chemical Reactions / Theorems /Formulas used etc</u>:

$R2 = R1(T1 + 6.77)/(T2 + 6.77)$ (when temperatures in °F)

or

$R2 = R1(T1 + 21.5)/(T2 + 21.5)$ (when temperatures in °C)

- <u>Calculations</u>

T1 = 75 °F = 23.88 °C

T2 = 160 °F = 71.11 °C

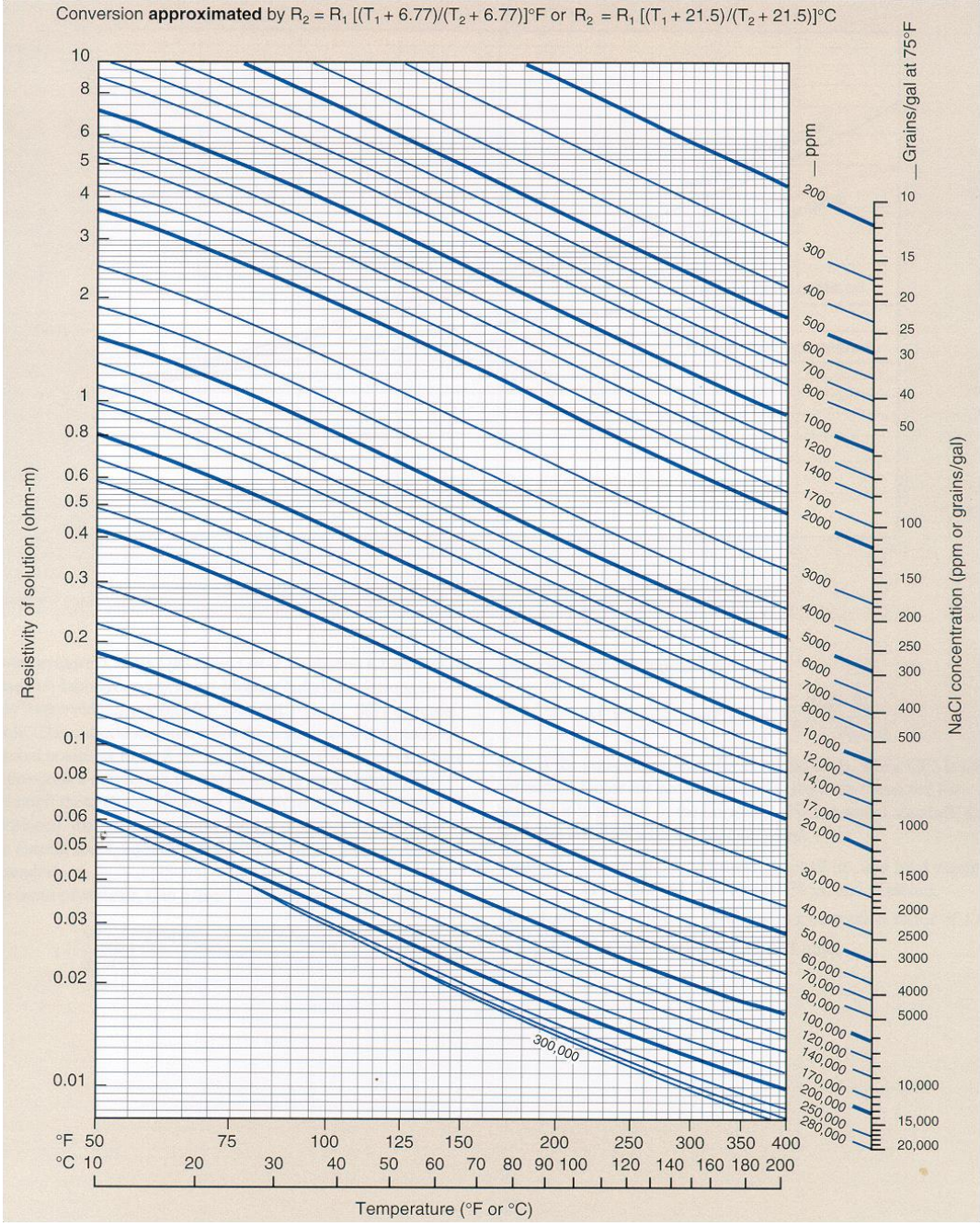
$$R2 = \frac{1.2(75 + 6.77)}{160 + 6.77} = \mathbf{0.5884}$$

$$R2 = \frac{1.2(23.88 + 21.5)}{71.11 + 21.5} = \mathbf{0.5881}$$

10. <u>Result/Output/Writing Summary</u>:

The resistivity of the given drilling mud at Formation temperature is **0.58 ohm-m**.

11. Graphs (If Any):



12. <u>Learning outcomes</u> (What I have learned**):**

- The fluid resistivity can be determined using the temperature vs resistivity plot.
- The fluid resistivity can be calculated using the appropriate equation.
- Parameters may vary in the formula used to calculate the fluid resistivity, depending on if the temperatures are in degree Celsius or degree Fahrenheit.
- The resistivity of the drilling fluid at formation temperature is dependent of the temperatures the drilling fluid and the resistivity at current conditions.
- Learned how to perform the experiment.