Calculation task № 1.

Determine the density of washing liquid if the depth of productive formation is 2140 m. Formation pressure in it is 20.6 MPa. Coefficient of safety changes within the range 1.05 – 1.15. Instruction: take the magnitude of coefficient of safety depending on the depth of the well (by the vertical) to the middle of perforation interval.

Data:

H = 2140 m

P_f = 20.6 MPa

Determine : $\rho_{w.l.}$ – ?

Solution

The density of washing liquid is determined by means of the formula:

$$\rho_{w.l.} = k_s \cdot \frac{P_f}{g \cdot H} \qquad (1)$$

where $\rho_{w.l.}$ is the density of washing liquid, kg/m^3; P_f is formation pressure, Pa; H is the depth of productive formation (the depth of the well to the middle of perforation interval), m; k_s is coefficient of safety.

The magnitude of coefficient of safety is taken depending on the well depth.

If $H > 1200$ m coefficient of safety k_s should be taken within the range 1.05 – 1.1.

So finally we take k_s = 1.075.

So

$$\rho_{w.l.} = 1.075 \cdot \frac{20.6 \cdot 10^6}{9.81 \cdot 2140} = \qquad \text{kg/m}^3.$$

Answer : $\rho_{w.l.}$ = kg/m^3.