Abbreviations

Abbreviation	Term
ID	inside diameter
kg	kilogram
kPa	kilopascal
kPa/m	kilopascal per metre
m	metres
m^3	cubic metre
m^3/m	cubic metres per metre
m^3/min	cubic metres per minute
MD	measured depth
mm	millimetres
kg/m^3	kilogram per cubic metre
OD	outside diameter
P	pressure
SICHP	shut-in casing head pressure
SITHP	shut-in tubing head pressure
TVD	true vertical depth
V	volume

Constant factors	
Constant factor pressure	0.00981
Constant factor capacity (using mm)	0.0000007854

Formulas

1. **Pressure gradient (kPa/m)**

   fluid density (kg/m^3) × 0.00981

2. **Fluid density (kg/m^3)**

   hydrostatic pressure (kPa) ÷ TVD (m) ÷ 0.00981

   or

   $$\frac{\text{hydrostatic pressure (kPa)}}{\text{TVD(m)} \times 0.00981}$$

3. **Hydrostatic pressure (kPa)**

   fluid density (kg/m^3) × 0.00981 × TVD (m) **or** pressure gradient (kPa/m) × TVD (m)

4. **Formation pressure (kPa)**

   SITHP (kPa) + hydrostatic column pressure to the top perforation (kPa)

5. Kill weight gradient (kPa/m)

$$\frac{\text{(well fluid gradient (kPa/m) } \times \text{TVD to point of circulation (m)) + SITHP (kPa) + overbalance* (kPa)}}{\text{TVD to point of circulation (m)}}$$

*Overbalance is variable and will be stated

6. Tubing capacity (m^3/m)

tubing ID^2 (mm) × 0.0000007854

7. Annulus capacity (m^3/m)

(casing ID^2 (mm) - tubing OD^2 (mm)) × 0.0000007854

8. Volume (m^3)

capacity (m^3/m) × MD (m)

9. Time to pump/displace (minutes)

$$\frac{\text{capacity } (m^3/m) \times \text{MD (m)}}{\text{pump rate } (m^3/min)} \quad \textbf{or} \quad \frac{\text{volume } (m^3)}{\text{pump rate } (m^3/min)}$$

10. Area of a circle (mm^2)

0.785 × diameter^2 (mm)

11. Force (kg force)

area (mm^2) × (applied pressure (kPa) ÷ 9807)

12. New pump/circulating pressure (kPa)

$$\text{pump pressure (kPa)} \times \left(\frac{\text{new pump rate } (m^3/min)}{\text{old pump rate } (m^3/min)}\right)^2$$

13. Basic gas law

$$P_1 \times V_1 = P_2 \times V_2$$

$$P_1 = \frac{P_2 \times V_2}{V_1} \qquad V_1 = \frac{P_2 \times V_2}{P_1} \qquad P_2 = \frac{P_1 \times V_1}{V_2} \qquad V_2 = \frac{P_1 \times V_1}{P_2}$$