Abbreviations

Abbreviation	Term
bbl	barrels (US)
bbl/ft	barrels (US) per foot
bbl/min	barrels (US) per minute
ft	feet
ID	inside diameter
in	inches
lbs	pounds
MD	measured depth
OD	outside diameter
P	pressure
ppg	pounds per gallon
psi	pounds per square inch
psi/ft	pounds per square inch per foot
SICHP	shut-in casing head pressure
SITHP	shut-in tubing head pressure
TVD	true vertical depth
V	volume

Constant factors	
Constant factor pressure	0.052
Constant factor capacity	1029.4

Formulas

1. Pressure gradient (psi/ft)

fluid density (ppg) × 0.052

2. Fluid density (ppg)

hydrostatic pressure (psi) ÷ TVD (ft) ÷ 0.052

or

$$\frac{\text{hydrostatic pressure (psi)}}{\text{TVD (ft)} \times 0.052}$$

3. Hydrostatic pressure (psi)

fluid density (ppg) × 0.052 × TVD (ft) **or** pressure gradient (psi/ft) × TVD (ft)

4. Formation pressure (psi)

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

5. Kill weight gradient (psi/ft)

$$\frac{\left(\text{well fluid gradient (psi/ft)} \times \text{TVD to point of circulation (ft)}\right) + \text{SITHP (psi)} + \text{overbalance* (psi)}}{\text{TVD to point of circulation (ft)}}$$

*Overbalance is variable and will be stated

6. Tubing capacity (bbl/ft)

$$\frac{\text{tubing ID}^2\ \text{(in)}}{1029.4}$$

7. Annulus capacity (bbl/ft)

$$\frac{\text{casing ID}^2\ \text{(in)} - \text{tubing OD}^2\ \text{(in)}}{1029.4}$$

8. Volume (bbl)

$$\text{capacity (bbl/ft)} \times \text{MD (ft)}$$

9. Time to pump/displace (minutes)

$$\frac{\text{capacity (bb/ft)} \times \text{MD (ft)}}{\text{pump rate (bbl/min)}}$$

or

$$\frac{\text{volume (bbl)}}{\text{pump rate (bbl/min)}}$$

10. Area of a circle (in^2)

$$0.785 \times \text{diameter}^2\ \text{(in)}$$

11. Force (lbs force)

$$\text{area}\ (\text{in}^2) \times \text{applied pressure (psi)}$$

12. New pump/circulating pressure (psi)

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

13. Basic gas law

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

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