

Formula Sheet- Field Units for Well Control Drilling Operations



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Measurement	Units	Decimals
Depth	ft	x
Pressure	psi	x
Pressure Gradient	psi/ft	x . x x x x
Mud Weight	ppg	x . x
Volume	bbls	x . x
Capacity & Displacement	bbls/ft	x . x x x x
Pump speed in strokes per minute	SPM	x
Strokes	stk <i>or</i> stks	x
Speed in feet per hour	ft/hr	x
Area	in ²	x . x x x x
Force	lbs	x
ICP to FCP = DP pressure reduction surf to bit	psi/10 steps <i>or</i> psi/100 stks	x

DRILLING
IADC Rounding Rules

Kill mud round up 10.11 = 10.2 & 11.03 = 11.1
Leak off mud round down 10.16 = 10.1

x = Whole numbers
x . x = Number with 1 decimal
x . x x x x = Number with 4 decimals

PEMDAS order of mathematical operations = Parenthesis then Exponents then Multiplication/Division then Addition/Subtraction

Pressures - PSI

Pressure psi =	Force lbs ÷ Area ²
Pressure Drop per 100 Strokes =	(ICP - FCP) ÷ Strokes to Bit x 100
Pressure Required to Test Shoe =	(EMW test - Mud Weight) x 0.052 x TVD shoe
Hydrostatic Pressure Gradient psi/ft =	Mud Weight ppg × 0.052
Hydrostatic Pressure psi =	Mud Weight ppg × 0.052 × TVD ft
Formation Pressure psi <i>or</i> Bottom Hole Pressure at Shut in =	Hydrostatic pressure in drill string psi + SIDPP psi
Initial Circulating Pressure psi =	Slow Circulating Rate Pressure psi + SIDPP psi
Final Circulating Pressure psi =	Slow Circulating Rate Pressure psi x (Kill Mud Weight ppg ÷ Original Mud Weight ppg)
MAASP or MACP psi =	(Maximum Allowable Mud Weight ppg - Current Mud Weight ppg) × 0.052 × Shoe TVD ft
New MAASP after Kill psi =	(Maximum Allowable Mud Weight ppg - Kill Mud Weight ppg) × 0.052 × Shoe TVD ft
New Pump Pressure with New SPM psi =	Current Pressure psi × (New SPM ÷ Old SPM) ² (only approximate)
New Pump Pressure with New Mud Weight psi =	Current Pressure psi × (New Mud Weight ppg ÷ Old Mud Weight ppg) (only approximate)

Pounds per Gallon - PPG

Mud Weight ppg =	Pressure psi ÷ TVD ft ÷ 0.052
Mud Weight =	Gradient ÷ 0.052
Equivalent Mud Weight ppg =	Pressure psi ÷ 0.052 ÷ TVD ft <i>or</i> (Surface Pressure psi ÷ TVD ft ÷ 0.052) + Mud Weight ppg
Equivalent Circulating Density ppg =	(Annular Pressure Loss psi ÷ 0.052 ÷ TVD ft) + Original Mud Weight ppg
Kill Mud Weight ppg =	(SIDPP psi ÷ 0.052 ÷ TVD ft) + Original Mud Weight ppg
Maximum Allowable Mud Weight <i>or</i> Fracture Mud ppg =	(Surface Leak Off psi ÷ 0.052 ÷ Shoe TVD ft) + Test Mud Weight ppg
Buoyancy Factor on String Weight =	(65.4 - Mud Weight) ÷ 65.4

Barrels per foot - bbls/ft *or* Barrels - bbls

Tubular Capacity bbls/ft =	ID ² ÷ 1029.4 (ID = Inside Diameter of Tubular)
Annular Capacity bbls/ft =	(ID of Casing ² <i>or</i> Hole Size ² - OD of Tubing ²) ÷ 1029.4 (OD = outside diameter of Tubular)
Volume to Bleed due to Gas Migration bbls =	(Working Pressure to Bleed psi ÷ Mud Gradient psi/ft) × Annular Cap bbls/ft at Top of Well
Additional Mud Return by Slug bbls =	[(Slug Weight ppg ÷ Mud Weight ppg) - 1] × Slug Volume bbls
Total Mud Returned by Slug bbls =	(Slug Weight ppg ÷ Mud Weight ppg) × Slug Volume bbls
Rectangular Tank bbls/ft =	(Length ft × Width ft) ÷ 5.61 (To convert to Inches) ÷ by 12 = bbls/inch

Feet - FT

Level Drop after Pumping a Slug ft =	[(Slug Weight ppg ÷ Mud Weight ppg) - 1] × Slug Vol bbls ÷ Drill Pipe Cap bbls/ft
Gas Migration Rate ft/hr =	Shut in Pressure Increase psi/hr ÷ Mud Gradient psi/ft (can use SIDPP or SICP)
Height of Fluid in a Pipe <i>or</i> Annulus ft =	Kick Volume bbls ÷ Annular Capacity bbls/ft <i>or</i> Pipe Capacity bbls/ft

Miscellaneous

Boyle's Law Formulae =	P1 × V1 = P2 × V2 <i>or</i> P2 = (P1 × V1) ÷ V2 <i>or</i> V2 = (P1 × V1) ÷ P2 P = pressure V = volume Atmospheric Pressure = 14.7 psi
Density Formulas approx.	Typical Fluid Densities = Gas 2 ppg Oil 7 ppg Water 9 ppg
Height Of Kick =	Pit Gain ÷ Annular Capacity bbls/ft
Density of kick Fluids =	Mud Weight - [(SICP - SIDPP) ÷ Height of Kick ÷ 0.052]
Force lbs =	Pressure psi x Area ²