Formulas and Conversions

Horse Power		
Mechanical	$HPm = \frac{T \times N}{5252}$	HPm = Motor Mechanical Horsepower (hp) T = Torque (lbs-ft) N = Speed (rpm)
Hydraulic	$HPh = \frac{P \times Q}{1714}$	HPh = Hydraulic Horsepower At Bit P = Pressure Drop (psi) Q = Flow Rate (gpm)

Pressure		
Bit Pressure Drop	$P = \frac{Q^2 \times W}{10{,}858 \times A^2}$	P = Pressure Drop (psi) Q = Flow Rate (gpm) W = Fluid (mud) weight (ppg) A = Total Flow Area (in^2)
Hydrostatic	$P = 0.052 \times D \times W$	D = Vertical Depth (ft)

Velocity		
Jet	$V = \frac{0.32086 \times Q}{A}$	V = Velocity (ft/s) Q = Flow Rate (gpm) A = Jet Flow Area (in^2)
Annular	$V = \frac{0.4085 \times Q}{Dh^2 \times Dp^2}$	Dh = Hole Diameter (in) Dp = Drill string O.D. (in)

Motor Efficiency		
Motor Efficiency	$\% = \frac{32.64 \times T \times N}{Q \times P}$	T = Torque (lbs-ft) N = Speed (rpm) Q = Flow Rate (gpm) P = Pressure Drop (psi)

Quick Reference Conversions

Reference	Units	Multiply By	To Obtain
Acceleration	ft/sec^2	0.3048	m/sec^2
(Acc. Of gravity)	32.2 ft/sec^2	0.3048	9.81 m/sec^2
	m/sec2	3.2808	ft/sec^2
Angel	deg (angle)	60	min
	deg (angle)	0.01745	rad
	deg (angle)	3600	sec
Area	ft^2	144	in^2
	in^2	6.4516	cm^2
	in^2	645.16	mm^2
	ft^2	0.0929	m^2
	ft^2	144	in^2
	cm^2	0.155	in^2
	mm^2	0.00155	in^2
	m^2	10.764	ft^2
Density	lb/gal	119.82	$kg.m^3$
	lb/gal	0.11982	g/cm^3
	lb/gal	7.48	lb/ft^3
	lb/ft^3	5.787×10^{-4}	lbs/in^3
	lb/ft^3	16.02	kg/m^3
	lb/in^3	27679.7	kg/m^3
	lb/in^3	27.6797	g/cm^3
	kg/m^3	8.346×10^{-3}	lb/gal
	g/cm^3	8.346	lb/gal
	kg/m^3	3.61×10^{-5}	lb/in^3
	kg/m^3	0.06243	lb/ft^3
	g/cm^3	0.03613	lb/in^3
Energy	joule	0.737557	lbs-ft
	lbs-ft	1.35583	joule
	lbs-ft	1.286×10^{-3}	Btu
	Btu	777.6	lbs-ft

Quick Reference Conversions

Reference	Units	Multiply By	To Obtain
Flow	bbl/min	42	gpm
	bbl/day	0.02917	gpm
	gpm	0.02381	bbl/min
	gpm	34.286	bbl/day
	gpm	3.785	lpm
	gpm	3.785×10^{-3}	m^3/min
	bbl/min	0.158899	m^3/min
	ft^3/min	4.72×10^{-4}	m^3/sec
	ft^3/min	0.1247	gal/sec
	ft^3/min	0.472	liters/sec
	ft^3/sec	448.83	gpm
	lpm	0.2642	gpm
	m^3/min	264.2	gpm
	m^3/min	6.2933	bbl/min
	m^3/sec	2118.6	ft^3/min
	gal/sec	8.0515	ft^3/min
	liters/sec	2.1186	ft^3/min
	gpm	0.002228	ft^3/sec
Force	lbf	4.448	N
	lbf	4.448×10^{-3}	kN
	lbf	0.4536	kgf
	N	0.22481	lbf
	kN	224.82	lbf
	kgf	2.20459	lbf
Length	in	25.4	mm
	in	2.54	cm
	ft	0.30479	m
	ft	5280	mi
	mi	1.609	km
	mm	0.03937	in
	cm	0.3937	in
	m	3.2808	ft
	km	0.6215	mi

Quick Reference Conversions

Reference	Units	Multiply By	To Obtain
Mass	lb	0.453597	kg
	lb	4.535×10^{-4}	ton (metric)
	kg	2.2046	lb
Nozzles	1/32 in	0.79375	mm
	mm	1.2598	1/32in
Power	hp	0.7457	kw
	ft-lb/min	2.259×10^{-5}	kw
	ft-lb.s	1.3557	w
	kw	1.34102	hp
	kw	44250	ft-lb/min
	w	0.7376	ft-lb/s
Pressure	psi	6.8948	kpa
	psi	0.0068948	Mpa
	psi	0.0680462	atm
	psi	0.068948	bar
	atm	14.6959	psi
	bar	15.50326	psi
	kPa	0.14504	psi
	Mpa	145.03684	psi
Stress	psi	0.0068948	N/mm^2
	psi	0.068948	bar
	psi	0.0068948	N/mm^2
	bar	14.50326	psi
	MPa	145.03684	psi
	N/mm^2	145.03684	psi

Quick Reference Conversions

Reference	Units	Multiply By	To Obtain
Temperature	°F	(°F-32) / 1.8	°C
	°C	(°C x 1.8) + 32	°F
	°F	°F + 459.69	°R
	°C	°C + 273.16	K
Torque	ft-lb	1.35582	Nm
	ft-lb	0.00135582	kNm
	ft-lb	0.1382	kgm
	Nm	0.737561	ft-lb
	kNm	737.561	ft-lb
	kgm	7.23589	ft-lb
Velocity	ft/min	0.508	cm/s
	ft/min	0.01661	ft/sec
	ft/min	0.01829	km/hr
	ft/min	0.3048	m/min
	ft/min	0.01136	mi/hr
	cm/s	1.9685	ft/min
	ft/sec	59.988	ft/min
	km/hr	54.67	ft/min
	m/min	3.281	ft/min
	mi/hr	88.028	ft/min
Volume	gal(US)	3.785	l
	gal(US)	0.003785	m^3
	ft^3	0.02831	m^3
	bbl	0.1589	m^3