Petroleum Units Systems

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Petroleum Industry maintains two primary measurement unit systems: Oil Metric (based on SI units) and Oil Field (base d on Imperial units).

Both Oil Metric and Oil Field unit systems have deviations from their original base systems.

Some companies historically maintain customised unit systems at corporate level which are usually a slight variation of one of the two primary systems.

See Units Conversion for on-line converters between various units.

	Symbol	Dimension	SI	Oil Metric	Oil Field	Additional
Dimensionless quantity	–	–	frac	frac	frac	
Time	t	T	s	d = 86,400 s	d = 86,400 s	hr = 3,600 s
Length	L	L	m	m = 3.281 ft	' = ft = 0.3048 m	km = 10^3 m, cm = 10^{-2} m, mm = 10^{-3} m
Area	A	L^2	m^2	m^2	ft^2 = 0.0929030 4 m^2	ac = 4,047 m^2 = 43,560 ft^2 ha = 10,000 m^2 = 2.471 ac
Volume	V	L^3	m^3	m^3 = 6.289811 bbl	bbl = 5.61458 ft^3 = 0.1589869389 44 m^3 Mbbl = 10^3 bbl , MMbbl = 10^6 bbl 1 ft^3 = 0.1781077124 20163 bbl	scf = ft^3 = 0.0283168 m^3 cc = cm^3 = 1 · 10^{-6} m^3 tonne = 7.28 bbl (Urals) ÷ 7.59 bbl (Brent) with average 7.33 bbl (WTI)
Mass / Weight	M, m	M	kg	kg	lb = 0.4535923 7 kg	g = 10^{-3} kg
Amount of chemical substance		1	mol	mol	mol	
Molar mass			kg / mol			
Pipe Diameter	d, ø	L	m	m = 39.37 in	" = in = 0.0254 m	mm = 0.001 m= 0.0393701 in

Temperature	T		K	°C = K - 273	°F = 9/5 T [°C] + 32	K = 273 °C
Pressure (absolute)	P	M L^{-1} T^{-2}	Pa	kPa = 10^3 Pa = 0.145038 psi MPa = 10^3 Pa = 145.038 psi GPa = 10^6 Pa = 145,038 psi	psi = 6894.76 Pa = 6.89476 kPa	bar = 10^5 Pa = 100 kPa = 14.5038 psi atm = 101,325 Pa = 101.325 kPa = 14.6959 psi
Pressure (gauge)	P_{gauge}	M L^{-1} T^{-2}	Pa	kPa(g) = kPa(abs) - 101,325 kPa	psi(g) = psi(abs) - 14.6959 psi	
Volumetric flow rate (oil & water)	q, Q	L^3 T^{-1}	m^3/s	cmd = m^3/d = $1.16 \cdot 10^{-5}$ m^3/s	bpd = $0.184 \cdot 10^{-5}$ m^3/s = 0.159 cmd	
Volumetric flow rate (gas)	q_g, Q_g	L^3 T^{-1}	m^3/s	cmd = m^3/d = 35.3147 scf/d	scf/d = ft^3/d = 0.0283168 cmd	
GOR	GOR, R_s, Y_g	–	m^3/m^3	m^3/m^3 = 5.615 scf/bbl	scf/bbl = 0.1781 m^3/m^3	
Density (solids)		M L^{-3}	kg/m^3	g/cc = 10^3 kg/m^3	lb/ft^3 = 16.0185 kg/m^3	
Density (oil)	o	M L^{-3}	kg/m^3	g/cc = 10^3 kg/m^3	°API = (141.5/SG) - 131.5	
Specific gravity (oil)		–	–	1 = 10^3 kg/m^3	1 = g/cc	= / w
Compressibility	c	L T^2 M^{-1}	Pa^{-1}	kPa^{-1} = 10^{-3} Pa^{-1}	psi^{-1} = $0.145 \cdot 10^{-3}$ Pa^{-1} = 0.145 kPa^{-1}	
Permeability	k	L^2	m^2	md = $9.869233 \cdot 10^{16}$ m^2	md = $9.869233 \cdot 10^{16}$ m^2	D = $9.869233 \cdot 10^{13}$ m^2
Porosity		–	frac	frac	frac	p.u. = % = 100 frac
Dynamic Viscosity		M L^{-1} T^{-1}	Pas	cp = 10^3 Pas	cp = 10^3 Pas	1 P = 100 cp
Productivity	J	L^4 T M^{-1}	$m^3/(Pa \cdot s)$	cmd /kPa = $0.11574 \cdot 10^{-7}$ $m^3/(Pa \cdot s)$ 1 $m^3/(Pa \cdot s)$ = $8.64 \cdot 10^9$ cmd / bar	bpd/psi = 0.0231 cmd /kPa	cmd /atm = 101.325 cmd /kPa = $4.394 \cdot 10^3$ bpd/psi

Transmissibility		$L^4\ T\ M^{-1}$	m^3/(Pa·s)	(md·m)/cp = 9.87 · 10^{-13} m^3/(Pa·s)	(md·ft)/cp = 0.3048 (md·m)/cp	(md·m)/cp = 8.527 · 10^{-5} cmd/kPa = 8.64 · 10^{-3} cmd/atm cmd/atm = 115.741 (md·m)/cp
Pressure diffusivity		$L^2\ T^{-1}$	m^2/s	(md·kPa)/cp = 9.869233 · 10^{10} m^2/s	(md·psi)/cp = 6.89476 (md·kPa)/cp	(md·atm)/cp = 101.325 (md·kPa)/cp
Wellbore storage	WBS, C_S	$L^4\ T^2\ M^{-1}$	m^3/Pa	m^3/kPa = 0.001 m^3/Pa	bbl/psi = 0.0231 m^3/kPa	
Thermal conductivity		$M\ L\ T^{-3\ -1}$	W/(m·°K)	W/(m·°C) = W/(m·°K)	BTU/(hrft°F) = 1.7295772 W/(m·°C)	
Specific heat capacity	c_p	$M\ L^2\ T^{-2\ -1}$	J/(kg°K)	J/(kg°C) = J/(kg°K)	BTU/(lbm°F)= 4186.798188 J/(kg°C)	
Thermal diffusivity	a	$L^2\ T^{-1}$	m^2/s	m^2/s = 0.0929 ft^2/s	ft^2/s = 10.764 m^2/s	

See also

Natural Science / Engineering / Measurement / Unit / Units Systems

[Units Conversion] [Volume units used in petroleum engineering]

[Petroleum Industry (Oil & Gas Industry)]

[Petroleum Metric Unit System] [Petroleum British Unit System][Petroleum Russian Unit System]

Reference

http://www.petroleumoffice.com/unitconverter