Unit Conversion Factors

The conversion factors shown below are approximate and were taken from a variety of sources. When dealing with liquid or gaseous hydrocarbons, the actual volume, weight, mass, or heat content may depend upon a range of factors such as the specific gravity of the fluid, the amount (if any) of water entrained in the mixture, the temperature and pressure at which the measurements are taken, and other factors. Consequently, in many cases there is no single factor that can be used for conversion. The factors below may be used as rules of thumb and will work for general comparison purposes or calculations.

Thermal conversion factors measure the equivalent heating content of various fuels in British Thermal Units (Btus). In the U.S., common practice is to use the gross or upper end of the range of heat content values for a specific product. In Europe, net or lower end heat content rates are typically used. The difference is the amount of energy that is consumed to vaporize the water created during the combustion process. This difference is typically 2 to 10%, depending on the specific fuel and its hydrogen content. Some fuels, such as unseasoned wood, can be more than 40% different in their gross and net heat content rates. [Source: U.S. Department of Energy, Energy Information Administration]

Conversion tables included:

Volume

Mass/Weight

Length

Area

Energy

Approximate Heat Content of Petroleum Products
Million Btu (MMBtu) per Barrel

Volume

Unit	multiplied by	Approximate Conversion Factor	equals	Unit
barrels of oil (bbl)	X	42	=	US gallons (gal)
barrels of oil (bbl)	X	34.97	=	Imperial gallons (UK gal)
barrels of oil (bbl)	X	0.136	=	tonnes of oil equivalent (toe)
barrels of oil (bbl)	X	0.1589873	=	cubic metres (m3)
barrels of oil equivalent (boe)	X	5,658.53	=	cubic feet (f3) of natural gas
tonnes of oil equivalent (toe)	X	7.33 [1]	=	barrels of oil equivalent (boe)
cubic yards (y3)	X	0.764555	=	cubic metres (m3)
cubic feet (f3)	X	0.02831685	=	cubic metres (m3)
cubic feet (f3) of natural gas	X	0.0001767	=	barrels of oil equivalent (boe)
US gallons (gal)	X	0.0238095	=	barrels (bbl)
US gallons (gal)	X	3.785412	=	liters (l)
US gallons (gal)	X	0.8326394	=	Imperial gallons (UK gal)
Imperial gallons (UK gal)	X	1.201	=	US gallon (gal)
Imperial gallons (UK gal)	X	4.545	=	liters (l)
[1] This conversion can range from 6.5 to 7.9 depending on the type of crude oil. This factor is intended to provide an approximation that can be used when the exact factor is unknown.				

Mass/Weight

Unit	multiplied by	Approximate Conversion Factor	equals	Unit
short tons	X	2,000	=	pounds (lb)
short tons	X	0.9071847	=	metric tonnes (t)
long tons	X	1.016047	=	metric tonnes (t)
long tons	X	2,240	=	pounds (lb)
metric tonnes (t)	X	1,000	=	kilograms (kg)
metric tonnes (t)	X	0.9842	=	long tons
metric tonnes (t)	X	1.102	=	short tons
pounds (lb)	X	0.45359237	=	kilograms (kg)
kilograms (kg)	X	2.2046	=	pounds (lb)

Length

Unit	multiplied by	Approximate Conversion Factor	equals	Unit
miles (mi)	X	1.609344	=	kilometers (km)
yards (yd)	X	0.9144	=	meters (m)
feet (ft)	X	0.3048	=	meters (m)
inches (in)	X	2.54	=	centimeters (cm)
kilometer (km)	X	0.62137	=	miles (mi)

Area

Unit	multiplied by	Approximate Conversion Factor	equals	Unit
acres	X	0.40469	=	hectares (ha)
square miles (mi2)	X	2.589988	=	square kilometers (km2)
square yards (yd2)	X	0.8361274	=	square meters (m2)
square feet (ft2)	X	0.09290304	=	square meters (m2)
square inches (in2)	X	6.4516	=	square centimeters (cm2)

Energy

Unit	multiplied by	Approximate Conversion Factor	equals	Unit
British Thermal Units (Btus)	X	1,055.05585262	=	joules (J)
calories (cal)	X	4.1868	=	joules (J)
kilowatt hours (kWh)	X	3.6	=	megajoules (MJ)
therms	X	100,000	=	British thermal units (Btus)
tonnes of oil equivalent	X	10,000,000	=	kilocalories (kcal)
tonnes of oil equivalent	X	396.83	=	therms
tonnes of oil equivalent	X	41.868	=	gigajoules (GJ)
tonnes of oil equivalent	X	11,630	=	kilowatt hours (kWh)
cubic feet (f3) of natural gas	X	1,025	=	British Thermal Units (Btus)

Approximate Heat Content of Petroleum Products
Million Btu (MMBtu) per Barrel

Energy Source	MMBtu/bbl	Energy Source	MMBtu/bbl
Crude Oil	5.800	Natural Gasoline	4.620
Natural Gas Plant Liquids	3.735	Pentanes Plus	4.620
Asphalt	6.636	Petrochemical Feedstocks:	
Aviation Gasoline	5.048	Naphtha < 401° F	5.248
Butane	4.326	Other oils >= 401° F	5.825
Butane-Propane (60/40) Mixture	4.130	Still Gas	6.000
Distillate Fuel Oil	5.825	Petroleum Coke	6.024
Ethane	3.082	Plant Condensate	5.418
Ethane-Propane (70/30) Mixture	3.308	Propane	3.836
Isobutane	3.974	Residual Fuel Oil	6.287
Jet Fuel, Kerosene-type	5.670	Road Oil	6.636
Jet Fuel, Naphtha-type	5.355	Special Naphthas	5.248
Kerosene	5.670	Still Gas	6.000
Lubricants	6.065	Unfinshed Oils	5.825
Motor Gasoline - Conventional	5.253	Unfractionated Stream	5.418
Motor Gasoline - Oxygenated or Reformulated	5.150	Waxes	5.537
Motor Gasoline - Fuel Ethanol	3.539	Miscellaneous	5.796
Source: U.S. Department of Energy, Energy Information Administration (2001)			