

Selected Conversion Factors

Metric/English conversions used in Combustion System Design

Air Heating Calculations

kg/hr \div 1.2 = m³/hr at 20°C (68°F)
 m³/hr \times 0.5883 = ft³/min at 20°C (68°F)
 kg/hr \times 0.489 = ft³/min at 20°C (68°F)

Nm³/hr \times 0.31 \times Δ T°C = kcal/hr
 kg/hr \times 0.24 \times Δ T°C = kcal/hr

kcal/hr \times 4 = Btu/hr
 Btu/hr \times 0.25 = kcal/hr

ft/min \times 0.005 = m/sec
 m/sec \times 200 = ft/min

Δ T°C \times 1.8 = Δ T°F
 Δ T°F \times 0.555 = Δ T°C

(°C \times 1.8) + 32° = °F
 (°F - 32°) \times 0.555 = °C

Gas Heating Values

(Note that EEC countries always rate their gases at Lower Heating Value.)
 kcal/Nm³ \times 0.113 = Btu/ft³ (at 0°C or 32°F)

Pressures

1" wc = 25.4 mm w.s.
 1 psig = approx. 700 mm (16 oz/in²)
 1 Bar = 1 Atm = 1 Atu = 1 kg/cm² = approx. 14.22 psi

Linear Measurements

1" = 25.4 mm
 mm \div 25.4 = inches
 meters \times 3.28 = feet

Area Measurements

cm² \times 0.155 = in²
 m² \times 10.76 = ft²

Cubic Measurement

m³ \times 35.3 = ft³

Liquid Volume Measurement

liters \times 0.264 = U. S. Gallons
 U. S. Gallons \times 3.79 = liters
 U. S. gph \times 3.79 = liters/hr

Weight Measurements

kilograms \times 2.2 = lbs
 lbs \times 0.454 = kgs
 1 lb = 454 grams

Oil Specifications

40 SSU at 100°F = 1.56° Engler at 20°C
 kcal/kg \times 1.82 = Btu/lb
 Btu/lb \times 0.552 = kcal/kg

Energy Unit Conversion Chart^①

Cubic Feet Natural Gas ^② (CF)	Barrels Oil (bbl)	Short Tons Bituminous Coal (T)	British Thermal Units (Btu)	Kilowatt Hours Electricity (kWhr)
---	---	---	1	0.000293
1	0.00018	0.00004	1000	0.293
3.41	0.00061	0.00014	3413	1
1000 (1 MCF)	0.18	0.04	1 Million	293
3413	0.61	0.14	3.41 Million	1000 (1 MWhr)
5600	1	0.22	5.6 Million	1640
25,000	4.46	1	25 Million	7325
1 Million (1 MMCF)	180	40	1 Billion	293,000
3.41 Million	610	140	3.41 Billion	1 Million (1 GWhr)
1 Billion (1 BCF)	180,000	40,000	1 Trillion	293 Million
1 Trillion (1 TCF)	180 Million	40 Million	1 Quadrillion (Quad) (Q)	293 Billion

① Based on the following nominal fuel heating values:
 1 Cubic Foot Natural Gas = 1,000 Btu
 1 Barrel Crude Oil = 5.6 Million Btu
 1 Pound Bituminous Coal = 12,500 Btu

② Substitute Natural Gas (SNG) and Liquefied Natural Gas (LNG) will have approximately the same heating value.

Further information

Energy

The basic energy unit is the *joule* (J), but the traditional units *calorie* (cal) and *watt-hour* (Wh) are still in frequent use. In many English-speaking countries, energy is often expressed in *British Thermal Units* (Btu).

Power Output

Power is energy per unit of time, i.e. energy = power × time. The term *output* is usually used in reference to the power produced by a given system. The output of a boiler or heating plant is currently expressed in Watts (usually kW or MW).

In industrial applications, power is sometimes specified in metric tonnes of steam per hour. One ton of steam per hour is equivalent to 0.7–0.9 MW.

Energy units

		GJ	MWh	toe	tce	Gcal	MMBtu
1 GJ	(Giga-Joule)	1	0.28	0.024	0.034	0.24	0.948
1 MWh	(Megawatt-hour)	3.6	1	0.086	0.122	0.86	3.36
1 toe	(ton of oil equivalent)	41.9	11.6	1	1.422	10	40
1 tce	(ton of coal equivalent)	29.3	8.20	0.703	1	7.03	27.7
1 Gcal	(Gigacalorie)	4.19	1.16	0.1	0.142	1	4
1 MMBtu	(million British thermal units)	1.06	0.297	0.025	0.036	0.25	1

Approximate comparison ratios

1 kWh	Roughly the energy consumed by an electric hot plate in one hour.
1 MWh	Roughly the energy needed to drive a car 1,000 kilometres.
1 GWh	Roughly the consumption of a medium sized town in south Sweden every 24 hours.
403 TWh	Sweden's total energy consumption during 1983.
1 kW	Heat output of an electric hot plate.
10 kW	Heat output of the heating system in a single-family house.
100 MW	Output of a district-heating plant serving about 10,000 single-family houses.

SI prefixes for multiples

k kilo	1,000
M mega	1,000,000
G giga	1,000,000,000
T tera	1,000,000,000,000
P peta	1,000,000,000,000,000

Wood measurement units

m ³ w,	Cubic metre solid wood, actual wood content.
m ³ lv,	Cubic metre loose volume. Chips measurement; chips must not be compacted.
m ³ tv,	Cubic metre, total volume over bark, from stump to tip.
tDM,	Metric ton of dry matter, water not included. Fresh wood contains about 50% water.

National Energy Administration

On 1st July 1983, the National Energy Administration was founded in Sweden. The Administration's responsibility comprises government support for research into new sources of energy, new methods for energy production and measures to replace oil.

The National Energy Administration budget for research into energy production amounts to about SEK 250 million. The Administration also provides support in the form of loans and grants totalling SEK 400 million for projects dealing with the replacement of oil in industrial applications.

It also provides grants for the education of staff at energy production plants.

The Energy Administration also conducts numerous studies. The studies deal with subjects such as the international oil trade and forecasts of energy needs in the future.

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Energy content of various fuels

1 ton (metric)	Coal	27 GJ
1 ton (metric)	Coke	28 GJ
1 m ³	Petrol	34 GJ
1 m ³	Diesel fuel	36 GJ
1 m ³	Heavy oil	39 GJ
1 ton (metric)	Liquefied fuel gas	46 GJ
1 m ³	Natural gas	0.03 GJ
1 m ³	LNG (Liquefied Natural Gas)	20 GJ
1 ton (metric)	Peat (50% moisture content)	9 GJ
1 ton (metric)	Peat (35% moisture content)	12 GJ
1 ton (metric)	Wood (fresh)	8 GJ
1 ton (metric)	Wood (stored)	14 GJ
1 ton (metric)	Pellets, briquettes	18 GJ