

Appendix A

Thermal Conversion Factors

Using Thermal Conversion Factors

The thermal conversion factors presented in the following tables can be used to estimate the heat content in British thermal units (Btu) of a given amount of energy measured in physical units, such as barrels or cubic feet. For example, 10 barrels of asphalt has a heat content of approximately 66.36 million Btu (10 barrels x 6.636 million Btu per barrel = 66.36 million Btu).

The heat content rates (i.e., thermal conversion factors) provided in this section represent the gross (or higher or upper) energy content of the fuels. Gross heat content rates are applied in all Btu calculations for the *Annual Energy Review* and are commonly used in energy calculations in the United States; net (or lower) heat content rates are typically used in European energy calculations. The difference between the two rates is the amount of energy that is consumed to vaporize water that is created during the combustion process. Generally, the difference ranges from 2 percent to 10 percent, depending on the specific fuel and its hydrogen content. Some fuels, such as unseasoned wood, can be more than 40 percent different in their gross and net heat content rates. See "Heat Content" and "British thermal unit (Btu)" in the Glossary for more information.

Thermal conversion factors for hydrocarbon mixes (Table A1) are weighted averages of the thermal conversion factors for each hydrocarbon included in the mix. For example, in calculating the thermal conversion factor for a 60-40 butane-propane mixture, the thermal conversion factor for butane is weighted 1.5 times the thermal conversion factor for propane.

In general, the annual thermal conversion factors presented in Tables A2 through A6 are computed from final annual data or from the best available data and are labeled "preliminary." Often, the previous year's factor is used as the preliminary value until data become available to calculate the factor appropriate to the year. The source of each factor is described in the section entitled "Thermal Conversion Factor Source Documentation," which follows Table A6 in this appendix.

Table A1. Approximate Heat Content of Petroleum Products
(Million Btu per Barrel)

| | |
|--|-------|
| Asphalt | 6.636 |
| Aviation Gasoline | 5.048 |
| Butane | 4.326 |
| Butane-Propane Mixture (60 percent-40 percent) | 4.130 |
| Distillate Fuel Oil | 5.825 |
| Ethane | 3.082 |
| Ethane-Propane Mixture (70 percent-30 percent) | 3.308 |
| Isobutane | 3.974 |
| Jet Fuel, Kerosene-Type | 5.670 |
| Jet Fuel, Naphtha-Type | 5.355 |
| Kerosene | 5.670 |
| Lubricants | 6.065 |
| Motor Gasoline | |
| Conventional ¹ | 5.253 |
| Oxygenated ¹ | 5.150 |
| Reformulated ¹ | 5.150 |
| Fuel Ethanol ² | 3.539 |
| Natural Gasoline | 4.620 |
| Pentanes Plus | 4.620 |
| Petrochemical Feedstocks | |
| Naphtha less than 401° F | 5.248 |
| Other Oils equal to or greater than 401° F | 5.825 |
| Still Gas | 6.000 |
| Petroleum Coke | 6.024 |
| Plant Condensate | 5.418 |
| Propane | 3.836 |
| Residual Fuel Oil | 6.287 |
| Road Oil | 6.636 |
| Special Naphthas | 5.248 |
| Still Gas | 6.000 |
| Unfinished Oils | 5.825 |
| Unfractionated Stream | 5.418 |
| Waxes | 5.537 |
| Miscellaneous | 5.796 |

¹See Table A3 for motor gasoline annual weighted averages beginning in 1994.

²Fuel ethanol, which is derived from agricultural feedstocks (primarily corn), is not a petroleum product but is blended into motor gasoline.

Web Page: For related information, see http://www.eia.doe.gov/emeu/aer/append_a.html.

Sources: See "Thermal Conversion Factor Source Documentation," which follows Table A6.