FUEL DATA

Fuel	Density sp. gr. @ 60°F	Weight lb/gal @ 60°F	Heating Value Btu/lb - **	Air/Fuel Ratio for complete combustion	Latent heat of evaporation Btu/lb - **	Mixture temp. drop due to latent heat, °F - **
Gasoline	.690 aviation .751 most pump [avg of (6) major brands] .690 - .740 typical race	6.17 for .740 sp. gr.	20,000	14.7	148	40
Methanol	.792 with no water present (anhydrous)	6.60	8,600	6.5	474	300
Nitromethane (100%)	1.139	9.50	4,500	1.8	135	7
Ethanol	0.795 (anhydrous)	6.62	11,600	8.5	361	153

** — These are approximate values, especially the latent heat and mixture temperature drop.

Note: water is 8.3 pounds per gallon.

Example of use: A popularly accepted rule of thumb is that of the total heating value of gasoline, only about 1/3 goes down the drive shaft as work, as about 1/3 goes out of the radiator as heat and about 1/3 goes out of the exhaust pipes as heat and blow-down pressure.

Lets look at a 331 cubic inch small block professional road race engine:
648 hp @ 7800 rpm with .46 BSFC (Brake Specific Fuel Consumption)
470 ft-lb @ 6750 rpm with .42 BSFC
Looking at our conversion chart, we know that one horsepower = 42.44 Btu

Torque From the conversion chart*,

$$hp = \frac{\text{torque (ft-lb) x rpm}}{5252} = \frac{470 \times 6750}{5252} = 604 \text{ hp}$$

***Kinsler's "Handy Conversion" Wallet Card**

604 hp x 42.44 Btu/min per hp = 25,634 Btu/min work done by the engine

From the conversion chart, BSFC = $\frac{\text{lb/hr fuel}}{\text{observed hp}}$ so lb/hr = BSFC x obs hp = .42 x 604 = 254 lb/hr

254 lb/hr = 4.233 lb/min gasoline 4.233 lb/min gas x 18,400 Btu/lb gas = 77,887 Btu/min heat value in the gasoline burned

Efficiency = $\frac{25,634}{77,887}$ = **33%**

Horsepower 648 hp x .46 BSFC = 298 lb/hr gas = 4.968 lb/min 4.968 lb/min x 18,400 Btu/lb = 91,411 Btu/min heat value
648 hp x .4244 Btu/min per hp = 27,501 Btu/min work done by engine

Efficiency = $\frac{27,501}{91,411}$ = **30%**

NOTE It makes sense that the engine is less efficient at the horsepower peak than the torque peak, as the air pumping losses through the intake ports are higher at the horsepower peak.

AIR FUEL RATIO METER:

Oxygen (O_2)/Exhaust Gas Sensors & Bungs on Page 65-M

11070	Meter ONLY, Halmeter, 30 LED air-fuel ratio indicator, wiring harness, for #11070 meter, single oxygen sensor. 3.920" length x 1.970" width x .830" depth
11065	Meter ONLY, BZ, 16 LED air-fuel ratio indicator. 4.025" length x 2.4" width x 1.0" depth
11071	Air-Fuel Ratio Kit, includes #11070 meter, #10671 oxygen sensor, weld-in bung, wiring harness, and instructions.
11072	Air-Fuel Ratio Kit-Dual, includes #11070 meter, (2) - #10671 oxygen sensor, (2) - weld-in bungs, dual sensor wiring harness, toggle switch, and instructions.
11073	Air-Fuel Ratio Kit, includes #11065 meter, #10671 oxygen sensor, weld-in bung, wiring harness, and instructions.
11066	Wiring harness, for #11070 meter, single oxygen sensor.
11068	Wiring harness, for #11070 meter, dual oxygen sensors.

#11070

#11065

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