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| **Propane & Natural Gas Consumption Rates** |
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Propane only has about 10% less BTU content than gasoline gallon-to-gallon, so the estimate used by manufacturers for gasoline consumption will be very close for propane.  When figuring power output of any fuel, the size of the engine has to be a significant factor of the total equation.  For instance, comparing a vehicle with a V8 engine to a generator with an 11 HP generator attached can not be calculated the same way. The characteristics of the fuels and how they mix with air, how far the piston is in relation the gasoline float bowl effects the power derived from the fuel among many other things.  To presume that just  because the BTU content is less, it is less powerful, is wrong.  We now offer some basic factors, round numbers and some good estimates to see how run time values of propane cylinders can be worked out:  **BASIC FACTORS**   * It requires 2 horsepower to produce 1000 watts of energy per hour under load * Under load, each horsepower consumes 10,000 BTU per hour * Propane contains 92,000 BTU per gallon * Propane weighs 4.2 pounds per gallon * Bulk tanks are rated by gallon   **Cylinder Capacities in Gallons and BTU's**   |  |  |  | | --- | --- | --- | | **Size** | **Gallon Capacity** | **Total BTU Capacity** | | **20 Lb.** | 4.8 | 441,600 | | **30 Lb.** | 7.1 | 653,200 | | **40 Lb.** | 9.5 | 874,000 | | **60 Lb.** | 14.3 | 1,315,600 | | **100 Lb.** | 23.8 | 2,189,600 | | **200 Lb.** | 47.2 | 4,342,400 | | **420 Lb.** | 99.1 | 9,117,200 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Using these factors we can arrive at run times based on average load for any generator.   For instance:  How long would a 5000 Watt Generator with a 10 HP engine at 50% load run on a 20# propane cylinder?  10 HP at 50% load would be using 5 horse power to generate 2500 watts of energy.  5hp x 10,000 BTU would consume 50,000 BTU per hour.  Using a 20# cylinder that produces 441,600 total BTU, the engine consuming 50,000 BTU per hour would run for about 8.8 hours.  **BTU consumption chart based on generator/engine size and load**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Generator Wattage** | **Engine Horsepower** | **Full Load** | **75% Load** | **50% Load** | | **1850** | 3.5 | 35,000 | 26,250 | 17,500 | | **4000** | 8 | 80,000 | 60,000 | 40,000 | | **5000** | 10 | 100,000 | 75,000 | 50,000 | | **7500** | 15.5 | 155,000 | 116,250 | 77,500 | | **8000** | 16 | 160,000 | 120,000 | 80,000 | | **10,000** | 20 | 200,000 | 150,000 | 100,000 | | **12,000** | 24 | 240,000 | 180,000 | 120,000 |   Many people want to know what size cylinders they need based on their engine size.  Here are some real conservative estimates of the vaporization rate of various size cylinders based on the outside temperature.  Vaporization Rates of Cylinders  Output in BTU's per hour - Vertical Cylinder 25% full - Minimum Cylinder Pressure 10 PSI    **Cylinder Size**     |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **Outside Temperature** | **20 Lb.** | **30 Lb.** | **40 Lb.** | **100 Lb.** | **200 Lb.** | **400 Lb.** | | **+60 F** | 24,000 | 32,000 | 40,100 | 79,700 | 125,900 | 185,500 | | **+50 F** | 21,200 | 28,300 | 35,500 | 70,600 | 111,500 | 164,300 | | **+40 F** | 18,450 | 24,700 | 31,000 | 61,500 | 97,200 | 143,100 | | **+30 F** | 15,700 | 21,000 | 26,400 | 52,400 | 82,800 | 122,000 | | **+20 F** | 13,000 | 17,300 | 21,800 | 43,300 | 68,400 | 100,700 | | **+10 F** | 10,250 | 13,700 | 17,200 | 34,200 | 54,000 | 79,500 | | **0** | 7,500 | 10,000 | 12,600 | 25,000 | 39,500 | 58,300 | | **-10 F** | 4,780 | 6,400 | 8,000 | 16,000 | 25,300 | 37,100 | | **-20 F** | 2,050 | 2,700 | 3,400 | 6,800 | 10,700 | 15,900 |   For the physical properties of each cylinder, click on the **"Cylinder Size"**above.  **What does all this mean?**    Well, i you went exactly by the chart, you would need a 420 Lb. cylinder to run a 14 HP engine if it was 25% full and 40 degrees outside and keep a minimum of 10 psi in the cylinder.  This is a worse case scenario.  For instance, when a 20 Lb. cylinder is full it can run a 16 HP engine for quite some time in 40 degree weather before there will be any freezing problem. But if you wanted to use up all the gas in a cylinder, it would have to be sized according to the chart.    Here is why.   Propane is stored as a liquid under pressure and boils to produce a vapor that is drawn off at the top for the engine to use as the fuel.  Because propane boils at -44° (below zero), the gas will freeze if it can not absorb enough ambient heat to compensate for the boiling process.  The bigger the cylinder is compared to the amount of load, the warmer it is outside, the warmer the cylinder is kept, all are a determining factor in the likelihood of a cylinder freezing up.  If a sweat or frost line forms around the cylinder at the level of the fuel, this is a telltale sign that the cylinder over worked and is in the process of freeze up.  If the gas does freeze, it will stop producing vapor and the pressure inside the cylinder will drop to as low as zero psi which will cause the engine to stop running.    To compensate for an undersize cylinder, two cylinders can be tied together using a tee check and pigtails.  Some customers set the cylinder near the exhaust of the engine to help keep the cylinder warm and have no problem using smaller tanks on bigger engines. This practice needs to be carefully monitored so that the cylinder does not overheat and cause the relief valve to check off.  **NATURAL GAS**   * Natural gas is billed in THERMS. * This represents a unit or block of 100,000 BTU of fuel. * The average price per Therm is around $0.80 (varies widely) * A generator engine running at 3600 rpm under full load consumes on average about 10,000 btu per horsepower per hour. | | | | |