WHY USE A VAPORIZER?

Vaporization Basics:

Your LP-Gas cylinder or tank is filled with liquid propane, while your equipment burns vapor. How does this all work?

Overview

LP-Gas (propane, butane, LPG) is transported and stored as a liquid under pressure. In order for your equipment to be able to use the propane[1] in your storage vessel (cylinder or tank) it must undergo a phase change (vaporization) from liquid to vapor within the cylinder, before being combusted by your consuming equipment (BBQ, radiant heater, boiler, process burner, etc.). The rate of natural vaporization in your tank is essentially a function of two factors: 1) ambient temperature; 2) tank size and fill level ("wetted" tank surface area). Each piece of propane consuming equipment has its own requirements as to the amount of vapor that it needs to run properly.

Vaporization Requires Energy (Heat)

Propane, like water, is a "compound" with its own set of chemical properties. At atmospheric pressure, water, a substance that we are all very familiar with, boils -- that is to say goes through a phase change from liquid to vapor -- at 212 degrees Fahrenheit (100 degrees Celsius). Propane, on the other hand, as a result of its particular set of chemical properties, boils at -44 degrees Fahrenheit (-42 degrees Celsius). Therefore, as long as your propane tank is stored in an area that is at least -44 degrees F. (at sea level), the propane in your tank is undergoing phase change, and the pressure will be great enough to give off at least some vapor pressure.

Now, to complicate things, the phase change of propane, just like that of water, involves the transfer of energy. You cannot boil water without an outside source of heat from, say, the burner on your stove. Further, the more energy applied (the hotter the burner), the faster your water is boiled, and the faster it is expelled into the atmosphere as vapor. Similarly, with propane, a warmer ambient temperature (above -44 F) results in a higher rate of vaporization and greater vapor pressure, allowing you to draw more vapor off the top of your cylinder. Based upon this discussion, it should be fairly evident that ambient temperature has a direct effect on the ability to run your equipment. If your equipment is asking for more vapor pressure than can be provided naturally by ambient heat, it may shut down (or merely provide less heat than you require).

Properties of Hydrocarbons

Saturation Curves

Tank Size and Fill Level--the "Wetted" Surface of the Tank

Now that we have briefly discussed the direct effect of temperature (energy) on

vaporization, lets now turn to the effects of tank size and fill level. Let's continue with the water analogy. Say you have two pots of boiling water, one 2 quarts and another 2 gallons. The 2 gallon pot is going to give off more vapor than the 2 quart pot, so long as the heat being applied is held constant. The same is true for propane--the larger and fuller a tank is (the more "wetted" surface it has), the more heat transfer surface area, and the more vapor it is going to give off.
These two factors, heat and heat transfer area (tank size and fill level), directly affect the natural vaporization rate of the propane in your tank. It should be fairly easy to see that if you are relying purely on natural vaporization in order to run your equipment, you are at the mercy of these two factors.

LPG vaporization rates from storage tanks

Warning Signs

If you've ever seen a layer of frost form on your propane tank or bottle, you have seen first hand the limits of natural vaporization. Seeing frost on your tank means that the rate of heat being transferred into the tank to the liquid propane is less than the energy being used to actually convert the liquid to vapor, which results in a pressure reduction thus creating a refrigeration effect. This refrigeration effect continually reduces the rate of vaporization by forming an insulating frost layer on the tank, further causing a loss of vapor pressure. This can have a devastating effect on your ability to run your equipment.
If you notice that your propane consuming equipment isn't giving off quite as much heat as it should, you should also suspect insufficient natural vaporization—quite simply, the pressure of the vapor reaching the burner has decreased below that which is required for optimal heat output.

Increasing Vaporization

If the rate of natural vaporization is a function of two factors--ambient temperature and wetted tank surface--as discussed above, the question becomes: how do you increase your rate of natural vaporization. Unfortunately, you can't control the outside temperature, so what does that leave you with? Wetted surface area. Simply put, in order to increase your wetted surface area you can either 1) increase your tank size (or add more tanks) or 2) ensure that your tank is always "full." There are unfortunately, numerous problems associated with these solutions:
At temperatures near the saturation point corresponding to zero pressure, no additional amount of wetted surface area will help. Only a vaporizer will help.
They high cost of additional storage tanks to achieve larger vaporization capacities.
Higher costs associated with more frequent refills in order to maintain sufficient wetted surface in tank.

The cost of land necessary to install additional storage tanks.
Codes or laws may limit storage capacity in given areas.
In essence, while natural vaporization is often adequate for domestic and light commercial applications, it is typically inadequate for commercial and industrial needs. Larger LPG consuming equipment often requires more vapor than natural vaporization can provide.

An Alternate Solution

An alternate solution to natural vaporization is the addition of artificial heat by using a vaporizer.

What is a Vaporizer?

A Vaporizer is essentially a boiler that does not build pressure.
LPG enters the vaporizer as a liquid and exits as a gas.
Vaporizers are an integral component in a variety of LPG and propane systems, and are suitable for any number of applications.
Vaporizers do not build additional pressure, but provide protection against the refrigeration affect that causes frosting and loss of pressure.
Based upon the above information, there are several key benefits associated with using a vaporizer:
Propane retailers benefit from being able to make less frequent, larger volume fills.
Using a vaporizer eliminates re-condensation of vapor in the supply lines that can create a hazardous situation.
Eliminates tank "freeze-ups" that result in production losses or delays.
Vaporizers allow you to utilize 100% of the LP-Gas in your tank/cylinder, decreasing delivery frequency and overall costs.
Eliminates heavy ends accumulations in tanks.
Provides a constant supply of vapor at temperatures down to -40 degrees Celsius.
Eliminates distillation of LPG when vaporizing Propane/Butane mixes.
Allows you to significantly increase the capacity of your system without adding additional tanks.