August 2022

RegO® Field Topics

Determining Propane Vapor Capacity

Field Topics are intended to provide useful information to the network of authorized LP-Gas and Anhydrous Ammonia distributors regarding the proper use of RegO® products. **Warning Bulletins** covering many of the hazards involved are available from RegO for more detailed information. These bulletins can be found in our **L-500, L-102 and NH3-102** catalogs. Neither the Field Topic or the Warning Bulletins are intended to conflict with federal, state, or local ordinances and/or regulations, which should be observed at all times. This information also is not intended to be a substitute for or to supplement any training in the safe handling and use of propane and related equipment, as required by any applicable law. By providing this material, ECI assumes no responsibility for providing any such training. Only individuals properly trained in the safe handling and use of propane and related equipment should be permitted to do so, and by providing this information, ECI does not assume responsibility for providing such training.

For more information on LP Gas system requirements, refer to Liquefied Petroleum Gas Code (NFPA 58), National Fuel Gas Code (NFPA 54), National Propane Gas Association Safety Handbook, the RegO LP-Gas Serviceman's Manual L-545, RegO catalogs L-500/L-102/NH3-102, ANSI K61.1 Safety Requirements for Storage and Handling of Anhydrous Ammonia, as well as any applicable local codes and ordinances.

Determining Propane Vapor Capacity

The withdrawal of propane vapor from a vessel lowers the contained pressure. This causes the liquid to "boil" in an effort to restore the pressure by generating vapor to replace that which was withdrawn. The required "latent heat of vaporization" is surrendered by the liquid and causes the temperature of the liquid to drop as a result of the heat so expended.

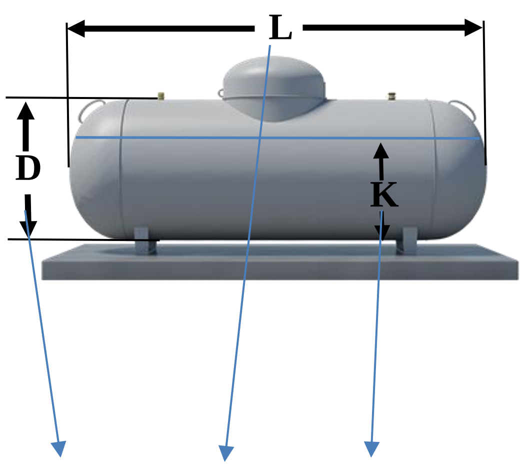
The heat lost due to the vaporization of the liquid is replaced by the heat in the air surrounding the container. This heat is transferred from the air through the metal surface of the vessel into the liquid. The area of the vessel in contact with vapor is not considered because the heat absorbed by the vapor is negligible. The surface area of the vessel that is bathed in liquid is known as the "wetted surface." The greater this wetted surface, or in other words the greater the amount of liquid in the vessel, the greater the vaporization capacity of the system. A larger container would have a larger wetted surface area and therefore would have greater vaporizing capacity. If the liquid in the vessel receives heat for vaporization from the outside air, the higher the outside air temperature, the higher the vaporization rate of the system.

There are three factor that are important to properly size the LP-Gas storage container:

1. The total BTU load must be determined. The total load is the sum of all gas usage in the installation. Future appliances which may be installed should also be considered when planning the initial installation to eliminate the need for a later revision of piping and storage facilities.
2. The lowest percentage where refilling is best. Please follow up with your company policy and delivery manager to determine your best refill rate.
3. The coldest temperature the system will experience. Sizing to the lowest temperature condition will ensure proper operation of appliance in peak demands
4. After gathering these factors refer to the calculation in your Rego L-545 Serviceman's manual.

Use the below calculations to determine your propane vapor capacity according to your volume best at refill at 0°F in BTU/Hr:

Percentage in Container when refilled	"K" Factor	Calculation
60	100	D X L X 100
50	90	D X L X 90
40	80	D X L X 80
30	70	D X L X 70
20	60	D X L X 60
10	45	D X L X 45



D Overall diameter in inches X **L** Overall length in inches X **K** Constant for percent volume of liquid = **BTU/Hr @ 0°F**

Examples of sizing at 30% refill @ 0°F							
Container Size	**D***	**X**	**L***	**X**	**"K"**	**=**	**BTU/hr Capacity of container**
120 gals	24"		68"				114,240
250 gals	30"		94"				197,400
320 gals	30"		115"				241,500
500 gals	37 ½"	**X**	120"	**X**	70	=	315,000
1000 gals	41"		192"				551,000

Try it!

*These dimensions are only for guidance, as tank sizes and dimensions vary by manufacturer

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Vaporization rates at various temperatures

Reference the multiplier in the below table and multiply from results at 0°F

Prevailing Air Temperature	Multiplier
-15°F	0.25
-10°F	0.50
-5°F	0.75
-0°F	1.00
5°F	1.25
10°F	1.50
15°F	1.75
20°F	2.00

Examples of sizing using the temperature multiplier

Container Size	Prevailing Air Temperature	Calculation	BTU/hr Capacity of container
320 gals	-15°F	241,500 X 0.25	60,250
	10°F	241,000 X 1.50	361,500
	20°F	241,000 X 2.00	482,000
500 gals	-15°F	315,000 X 0.25	88,200
	10°F	315,000 X 1.50	472,500
	20°F	315,000 X 2.00	630,000
1000 gals	-15°F	551,000 X 0.25	137.750
	10°F	551,000 X 1.50	826,500
	20°F	551,000 X 2.00	1,102,000

Try it! →

Mounded & Underground containers

Sizing underground ASME containers are slightly different than sizing aboveground ASME tanks. There are two deciding factors to effectively size underground tanks: demand of all existing and future appliances and maximum anticipated frost penetration depth. Please refer to PERC CETP training 4.1 module 2 for underground ASME container sizing.

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Should you have any questions or concern, please contact me.

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