Proper Operations of Liquid Cylinders

One of the backbones in our arsenal of gas products is the liquid cylinder. For an industrial, medical, laboratory, beverage, etc. gas users of 5 or more high pressure cylinders of a specific gas type per week, a money saver may be converting to a liquid container. And for those of you that have made that discovery, we would like to review the proper use and operating procedure of liquid cylinders.

Liquid cylinder: What are they? When are they safe in application? How do they work? Where are they used?

What are they? Liquid Cylinders are large, insulated, thermos bottles used to store atmospheric gases in their liquid state. These cylinders have had many different names by distributors and manufacturers: Dewars, VGL 160’s, LS 200’s, Liquid Cans etc. They are delivered in different sizes and configurations and may contain a variety of products including nitrogen, oxygen, argon, carbon dioxide, helium, nitrous oxide and hydrogen. Each Dewar, depending on the size, could store up to the equivalent of 20 high pressure cylinders.

When are they safe in application? These containers are constructed in accordance with DOT regulations insuring the safe shipping and usage at our customer locations.

- The liquid content is very cold, down to -400 degrees F. Therefore, when working with this product, safety glasses, face shields, and gloves are required for skin protection. An understanding of the safe handling of cryogenics is mandatory.
- The containers have externally mounted safety devices that protect them from over-pressurization. Why? When these cold liquids turn to gas they will expand approximately one hundred times in volume.
- Because of the potentially high volume releases of product, understanding the physical properties of the each gas in critical. For example, large quantities of oxygen, an oxidizer, in the presence of hydrocarbons can cause explosions. Nitrogen, carbon dioxide, argon, and helium displace oxygen causing possible asphyxiation. And, of course, you probably know the hallucinatory affects of nitrous oxide.

How do liquid cylinders work? There are four separate piping circuits on a typical Dewar:

- Pressure Building Circuit - The Pressure builder is used when the demand for gas or liquid is greater than the Dewar’s natural productive capacity. This circuit builds gas pressure by removing liquid from the bottom of the tank, and passing it through a coil that is soldered to the outer skin of the tank. The exposure to heat from contact to the tank exterior causes the liquid to convert to a gaseous state as it moves back to the top of the tank. A pressure building regulator controls the gas flow in this circuit.
- **Economizer Circuit**  
  This circuit is activated when the Dewar has been sitting idle for a period of time. Due to inherent heat losses, all Dewars will build a certain amount of pressure when not used. Over a weekend, a tank that at 150 psi on Friday, may be at 220 psi on Monday. This circuit affords the use of the excessive pressure before resuming the building of pressure.

- **Gas Use Circuit**  
  Similar to the pressure building circuit, liquid is taken from the bottom of the inner vessel and run through multiple coils that are soldered to the outer vessel, to produce gas. This gas is available for low or high pressure applications.

- **Liquid Withdrawal Circuit**  
  This circuit takes liquid from the bottom of the tank and delivers it directly to the liquid valve for customer use.

  In addition to these four circuits, there is also a vent valve on the top of the tank that gives the end user or supplier the ability to vent the head pressure off of the tank for service or filling.

All tanks are supplied with a pressure relief valve for maintaining safe tank pressure for specific applications. Typically, these are shipped to the customer at 22 psi for liquid withdrawal, and up to 350 psi for higher pressure requirements. When the pressure in the tank reaches its release point, this valve will evacuate the excessive pressure. When the pressure falls back below these levels, the valve closes again.

Finally, there is also a contents gauge indicating the liquid level.

Where are they used? The gas or liquid inside is used for many different cryogenic applications such as freezing and/or storing of specimens, radical temperature cyclic testing, cold machinery, shrinking metals in the fabrication process, etc. Gas vapor blanket environments are applied for protect from the atmospheric conditions in electronic, medical, and laboratory applications. Gas conversion for cryogenic liquid storage is required for high volume, automated oxy-fuel, plasma, and laser cutting.

Liquid oxygen, nitrogen, argon, and CO2 cylinders are filled and delivered from our plant at 6330 Colorado Boulevard, Denver.

Upon request, a General Air representative will conduct an on-site customer training and safety program. In addition, if at any time you have questions regarding the operation of one of our liquid cylinders, call or email our closest store. Our customer service, store, or outside sales representatives are trained to answer your questions.

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**Did you know?** General Air can save you money by implementing fabrication solutions that increase output and reduce labor costs. Contact our Productivity Enhancement Team at 303.892.7003 for more information.