

# CHART BULK TANKS



The heart of any cryogenic system is the bulk liquid storage device, yet it often gets the least amount of attention because it is outside, out of sight and out of mind. However, using the correct bulk tank is critical in ensuring the most efficient operation of the total system. Failure to address bulk tank issues can cost thousands of dollars per year in losses. The following are some items that should be looked for and their affect on the total system performance:

**Insulation System** - Bulk storage cryogenic tanks are made with two main styles of insulation systems, perlite and multi-layer:

- Perlite insulated tanks have been around for many years. The perlite powder is poured into the tanks annular space and then the air is evacuated from the space. Over time the perlite tends to shift and settle in the annular space which causes voids in some areas. These voids have higher in heat leak.
- A multi-layer insulation system involves wrapping the inner vessel with many layers of radiation shield and low-conductivity paper, followed by evacuating the air from the insulation space. Multi-layer insulation doesn't settle over time, and the many radiation shields very effectively reflect the radiation heat transfer. The following figure shows the difference between perlite and multi-layered insulation heat transfer rates.

**Withdrawal Line** - It is important that the tank have a liquid withdrawal line that is vacuum insulated with a vacuum insulated shut-off valve. Many older tanks do not have a vacuum insulated liquid withdrawal line because the tank was initially intended for gas service. Considering the fact that any heat picked up by liquid at the beginning of the system (at the withdrawal) will be carried all the way through the system, the importance of vacuum insulation is understood.

Think ahead to the future and plan for reasonable growth. The withdrawal line size should be large enough to handle the demand of your initial chamber installations, as well as provide a little extra for future chambers.

**Tank Size** - Selecting the proper size tank has many advantages. Bigger isn't always better. The tank should be sized to comfortably supply the immediate demand, as well as any future chamber additions. To get a good estimate of the tank size needed, determine an estimate of the liquid nitrogen needed to run the chamber(s), then size the tank such that it will be filled once every 2 weeks on average. A tank that is too small will require many filling stops, it will increase the odds of running out of liquid, and increase occurrence of getting partial trailer loads of liquid. On the other hand, if the tank is far too large, the liquid in the tank has a longer time to absorb heat. This heat will make the system less efficient and result in higher nitrogen bills.

**Plumbing** - Stainless steel plumbing will last longer and be more durable than copper plumbing on a tank. The nitrogen delivery trucks aren't always the kindest thing to the plumbing system of a tank. Having the plumbing system made of stainless steel piping will help ensure many years of reliable performance.

**Orientation** - Bulk storage tanks are either vertical or horizontal. The majority of tanks installed are vertical as they take up less space to mount than a horizontal tank. However, local zoning may have requirements that prohibit taller vertical tanks for aesthetic reasons. If no such requirements exist, a vertical tank will be much more readily available and will take up less space.

**Gas Withdrawal Line** - Even though a gas withdrawal line isn't always needed for operating chambers, it can be useful for other requirements within the facility. It is often possible to run both the liquid application (the chamber) and the gaseous application (purging, etc) from the same bulk nitrogen storage tank.

