

General Information

Vaporizers and Heat Transfer

Vaporizers are Large Heat Exchangers

Industrial gases can be delivered and stored as cryogenic liquids or gases. For applications requiring larger, consistent gas supply, Air Products installs cryogenic storage systems. Vaporizers are used to convert the liquid product from the storage tank into gas. Ambient air vaporizers are most common. They take heat from the surrounding air and transfer it to liquid product flowing through its coils. Other vaporizer types are available for processes that require more product flow than an ambient vaporizers can provide. Alternatives include fan ambient, electric, steam and water vaporizers.

Heat Transfer

The purpose of vaporizers is to change the cryogenic liquid to a gas. This process always requires energy. Energy is transferred in the form of heat. The criteria used to determine how much and how fast heat is transferred are:

1. Surface Area – the area over which the heat transfer is occurring. For ambient vaporizers, this is over the entire fin area.
2. Temperature Difference – the average difference in cold fluid temperature and the heat source temperature. In the case of ambient vaporizers, the cold temperature is the average cryogenic temperature in the vaporizer and the warm temperature is the outside temperature.
3. Heat Transfer Coefficient – the heat transfer coefficient is a complex factor derived from experimental data and other calculations. Considerations include the mode of heat transfer (i.e. conduction, convection, or radiation), velocity of either the hot fluid or the cold fluid, as well as geometry and type of materials used.

The total energy required is a function of how much gas is required, how fast it is needed, and the energy available.

Heat Transfer through Ambient Vaporizers

Energy to vaporize liquid oxygen, nitrogen, argon, or hydrogen by ambient vaporizers is obtained from the surroundings. The air outside the vaporizer wall is much warmer than the cryogenic fluid (-280 to -420 °F.). Heat is transferred or “pushed” across the wall or fin of the vaporizer into the cryogenic liquid. As the ice forms on the vaporizer fins, the area through which this heat transfer takes place is lessened. Excessive ice build up may severely limit the vaporizer efficiency.

Learn more about normal and excessive ice build up on vaporizers at:
<http://www.airproducts.com/vaps>.



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