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Purge units for centrifugal chillers

A look at the past and the high-efficiency present of purge units – a guide for contractors.

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The words “purge unit” have been a part of the refrigeration equipment lexicon for about as long as there has been mechanical refrigeration.

Although purge units can be used with both high- and low-pressure refrigerant systems, they are most commonly found on low-pressure refrigerant (R-11, -113, and -123) centrifugal chillers.

BRIEF HISTORY

The basic function of the purge system is to maintain the refrigerating system free of non-condensable gases (air) and moisture. Accumulation of non-condensable gases within the system causes an increase in condensing pressure, which in turn results in the loss of operating efficiency.

Moisture is also a major enemy of the refrigeration system. It causes the formation of acids that can attack the machine's internal components and ultimately lead to premature failure. Therefore, it is critical to maintain the machine free of non-condensable gases and moisture at all times.

In the old days, when refrigerants were cheap and there was little or no concern about the potential harm they may have upon the environment, the primary concern was to get the machine purged down as rapidly as possible.

As a consequence, there was no reason to be particularly concerned about purge unit “refrigerant-to-air” separation efficiency, so long as the unit wasn't overly wasteful. It was not uncommon for oem purge units to release as much as 5 to 10 lb of refrigerant for every 1 lb of air purged.

Of course, with the ever-increasing price of refrigerants, as well as ever-increasing emphasis on the environment, such a large discharge of refrigerant can no longer be tolerated.

Redi Controls recognized this emerging problem back in the late 1980s, before the concern over ozone depletion even became an issue. The first step in the evolution towards the current breed of high-efficiency purge systems was the introduction of the patented PE-2000 purge-assist unit.

By retrofitting existing oem purge systems with the purge-assist device, purging efficiency could be increased from 5 to 10 lb of refrigerant to less than 0.1 lb of refrigerant/1 lb of air purged. This represented a dramatic improvement in purge unit efficiency — and, as it turned out, a timely one at that.



High-efficiency purge unit with optional carbon collection canister installed on an R-11 chiller in a hospital.

However, because many of the original purge units were aging and wearing out, it simply made better economical sense to replace the entire purge system with a completely new, high-efficiency purge system.

Many centrifugal chiller owners have already replaced their old, inefficient purge systems with a high-efficiency purge. But far too many chiller owners still have not done so. If you are one of those owners who are still holding out, the question is, why?

Every time your chiller's purge system operates, it's costing you money. Besides, you are also allowing harmful CFCs to escape into the atmosphere needlessly. If you are considering upgrading your chillers with a high-efficiency purge system, the following guidelines will help you select the right purge unit.

WHAT TO LOOK FOR IN A PURGE UNIT

The most important aspect of any high-efficiency purge unit is obviously efficiency. The only assurance you have that a particular manufacturer's purge unit will perform to its published efficiency rating is to make absolutely sure the unit is ARI certified to Standard 580.

The ARI-certified and -tested refrigerant-to-air emission ratio should be at or below 0.6 lb of refrigerant/1 lb of air purged. Be sure this is the certified efficiency of the purge unit alone, without

the aid of secondary absorption media.

Adding secondary absorption media, such as activated carbon, can further reduce purge unit emissions down to as low as 0.0049 lb of refrigerant/1 lb of air purged. However, the additional refrigerant absorbed in the process is, for all practical purposes, non-recoverable and lost to the machine.

Secondary emission-collection systems, such as carbon canisters, do reduce CFC emissions to the atmosphere. This may be important (or even necessary) in certain environments, such as in the food-processing industry, where exposure to CFCs can accelerate ripening of fruits and vegetables.

The use of special absorbents, such as the new Cryo-Line molecular-sieve emission-collection canister, can reduce purge unit emission levels down to 0.0004 lb of refrigerant/1 lb of air, which is, for all practical purposes, zero emissions.

More importantly, the refrigerant can be reclaimed and returned to the chiller owner via a refrigerant credit program offered by Blue Sky Technologies in the United States, and Cryo-Line Supply in Canada.

As with the purge unit, the secondary emission-collection system's performance rating should also be ARI certified.

Another important consideration is to be certain the purge unit is UL listed.

The purge unit should be easy to install, requiring minimal modification to the chiller. When possible, select a purge unit that can be installed without having to remove the chiller's refrigerant charge, which unnecessarily increases the risk of accidental refrigerant loss, and increases installation cost.

Most currently available high-efficiency purge units come with a full complement of microprocessor-based datalogging and diagnostic capabilities, as well as on-off duty cycling.

Duty cycling allows the purge unit to operate based on actual purging require-



Model PE-2000 purge-assist unit from Redi Controls.



Microprocessor-controlled, high-efficiency purge unit.

When possible, select a purge unit that can be installed without having to remove the chiller's refrigerant charge, which unnecessarily increases the risk of accidental refrigerant loss, and increases installation cost.

ments, thereby reducing wear on the unit. Duty cycling also reduces power consumption by 80% to 90% over older-style, oem purge units.

Most of these features are standard, with slight variations between manufacturers and models.

One of the most important considerations when selecting a high-efficiency purge unit is the availability of technical support. These purge units tend to be complex to troubleshoot. Should a problem arise, you don't want to spend all day

fixing the purge unit.

So, before you buy any high-efficiency purge unit, call the manufacturer's technical support department and verify to your satisfaction that the support you need will be there when needed — immediately!

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