Shippensburg Pump Company, Inc.

BOILER FEED • CONDENSATE • DEAERATOR • VACUUM

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Re: Removing Versus Repairing or Replacing a Vacuum Condensate Unit in Steam Heating System?

Vacuum steam heating systems offer numerous advantages that include:

- Fast, positive air removal in the return piping, in the terminal equipment and in the supply piping (i.e., the distribution piping that delivers the steam to the radiators) on cold starts. By removing the existing cold air, the steam can disseminate through the supply piping at just about twice the speed of a gravity system in which the steam must push the cold air out ahead of it.
- The pipe size is usually one size smaller than the piping size in a gravity system because the supply piping has only steam instead of steam and air. Similarly, the return piping has only condensate instead of water and air, so it too is one pipe size smaller than in a gravity system. The smaller pipe sizing offers savings on piping during the original installation. However, it also means the piping is too small for a gravity system. Therefore, if someone installs a non-vacuum condensate unit at a later time, they would need to increase the boiler pressure (i.e., energy input) to force the steam through the piping that would be undersized for a gravity system. Also, the increased pressure would also compress the steam (which is basically a gas) slowing its velocity by about one-third.
- Lower operating costs can be achieved because boilers can operate at a lower pressure (which equates to a lower temperature). This translates into lower BTU input and less run time because of the increased velocity of steam going out into the system.

The cost of running a low-pressure boiler twenty-four hours a day, seven days per week for five or more months a year typically far outweighs the cost of either repairing or replacing an existing condensate vacuum system. Unfortunately in today's world, there is lack of understanding about how vacuum systems work or people are reluctant to spend the time and money to maintain the steam traps.

Steam traps are crucial for two-pipe, vacuum heating systems to work properly. Vacuum steam systems were designed to be very efficient enabling generation of steam even if temperatures dropped as low as 140^{o}F (i.e., this is low-pressure steam where the pressure is less than atmospheric pressure). However, if the steam traps are not maintained, the steam will be allowed to flow through the steam traps into the vacuum returns pressurizing the returns and the vacuum unit. This severely slows down the flow of steam and will damage both the steam traps and the vacuum unit.

Under vacuum, water in the vacuum unit will boil at lower pressures and temperatures causing the condensate pumps to cavitate as the water temperatures approach saturation temperature. Proper trap maintenance helps to prevent this situation by keeping return temperatures below saturation.

Because of their limited knowledge of vacuum systems, many vendors tend to focus on convincing people to remove their vacuum heating systems and replace them with an alternate system in which the boiler is run at higher pressures—causing customers to pay higher energy costs. Replacing the steam system with hot water systems may also result in higher energy costs since steam flows without the cost of circulating pumps.

When the vacuum unit is removed from a steam system, the steam flow rate is slowed down by approximately one-half or more thereby hindering the distribution of heat. The reduced flow rate can cause uneven heating of the building and discomfort for the tenants.

When the boiler is run at a higher pressure to overcome the pressure drops that result from the smaller diameter piping typically used on vacuum steam systems and create sufficient pressure differential for the steam traps to work, energy is wasted – more fuel is required and more BTU's are generated than can be used. A steam heating system radiates 240 BTU's per square foot of heating surface when run at one psig (i.e., that equates to 215^{o}F). A direct result of the higher pressure would be a reduced amount of latent heat per pound of steam and more heat than the radiation could dissipate evenly. Additionally, overheating and greater swings in temperature will occur.

Shipco® offers various models for vacuum condensate units including cast iron vacuum chambers for applications requiring longer life and durability. Our vacuum pumps are efficient, quiet and dependable; the pumps are designed specifically for steam heating applications where others are not or may required mufflers to silence the noise. In addition our pumps are virtually maintenance free when compared to other close-tolerance vacuum producers. Our multi-jet design has proven to be an effective and reliable means of removing air and lifting condensate in return systems.

Sincerely,
Shipco® Marketing and Sales Department

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