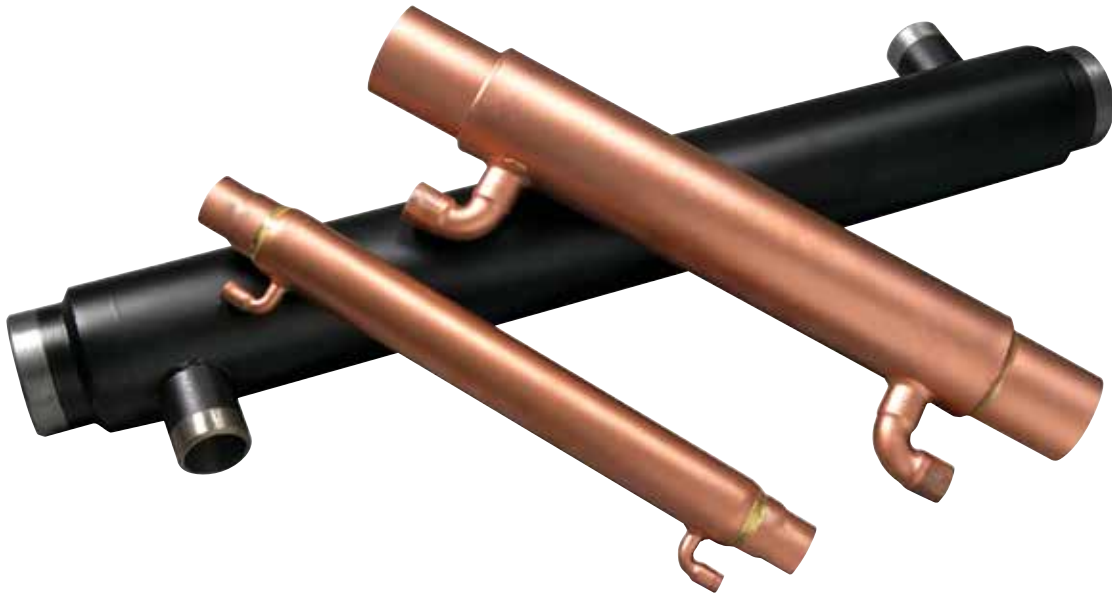




## Suction Line Heat Exchangers

**Enhances Evaporator Capacity and Provides System Protection for Minimal Cost.**



**R**efrigeration compressors are precision components designed to compress hot refrigerant vapor before passing it through to the condenser. In a properly working system, the compressor's piston pulls low pressure suction vapor from the evaporator through the suction reed valve as it travels down the cylinder.

When the piston continues through its cycle, it travels back up the cylinder compressing this low pressure suction vapor and raising its pressure and temperature. The compressed vapor is then pumped out through the discharge valves as a high pressure gas, which then passes to the condenser.

If liquid refrigerant in the form of droplets returns to the compressor, and gets drawn into the suction gallery, it then passes through the suction valve where it can cause problems. This liquid being a solid mass can make the suction valve bend and sometimes break. Liquid will then enter into the piston cylinder, washing away its lubricant and eventually causing scoring to the cylinder walls and pistons.

In any event, when a piston receives a solid mass, it is unable to compress the liquid and the refrigerant is driven up against the suction valve and into the discharge valve causing severe damage. In extreme cases, the piston will be damaged as well as the connecting rod and/or crankshaft.

## TECHNICAL EXCHANGE: Suction Line Heat Exchangers

One solution to prevent the introduction of liquid refrigerant to the compressor is the installation of a Suction Line Heat Exchanger (SLHE). A SLHE protects the compressor by reducing the risk of flooding by vaporizing droplets which can occur within the suction line. It improves refrigeration system performance and is a proven refrigeration system component for greater efficiency. A SLHE protects the compressor and is highly recommended by equipment manufacturers of medium and low temperature refrigeration systems.

By subcooling the hot refrigerant liquid, evaporator coil capacity is increased and overall refrigeration system reliability improved. As a rule, 1°F refrigerant subcooling results in 0.5% capacity improvement. A nominal SLHE selection will provide 4% to 10% coil capacity improvement along with improved system

pull-down time. Nominal SLHE selections should be based on system horsepower, which will provide a nominal 10°F subcooling and a nominal 20°F suction superheat for most refrigerants including R-22, R-502, R-404A, R-507, R-407A, R-134A, R-407C and R-410A at 110°F condensing and 25°F suction. It is important to not select undersized models to avoid high suction pressure drops and gas whistling.

A suction line heat exchanger improves expansion valve operation. Fluctuating operating conditions such as low ambient and low-load can cause a refrigeration system to experience expansion valve “hunting” and liquid line bubbles. A SLHE helps eliminate this problem and provide improved expansion valve operation and proper capillary performance.

A SLHE also eliminates undesirable moisture collection by reducing pipe sweating and frost through raising the suction temperature in the suction line piping. By eliminating condensate formation, messy water puddles are eliminated as well as reducing water damage to other equipment.





## Proper Installation is Important

A properly installed SLHE fully wets the evaporator coil increasing heat transfer coefficient and coil performance. Additionally, it wets most of the inner SLHE surface with liquid refrigerant that hugs the wall in a thin film fully covering the heat transfer surface. If improperly installed the liquid refrigerant falls to the bottom of the heat exchanger through gravity and wets only up to a third of the surface. The result is maximized subcooling and improved system efficiency.

The SLHE acts as a miniature liquid separator with gas separating at the top and liquid the bottom. Gas re-condenses and is then subcooled assuring only liquid flows to the expansion device. With liquid connections mounted on top, gas can become entrained with liquid to the expansion device defeating the purpose.

Electronic expansion valves allow lower superheat setting assuring full wetting of coil. It also assists in wetting a large portion of the SLHE heat transfer surface when superheat sensor is attached to the gas outlet of the SLHE versus coil gas outlet.

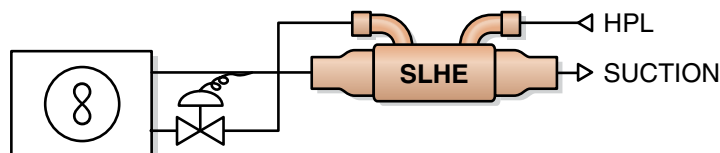
Improved system efficiency resulting from a properly installed SLHE may permit a smaller coil size reducing capital expenses. Other savings can be realized through smaller or fewer fans reducing the system load and compressor operation for additional energy savings. SLHE units should also be properly supported reducing unnecessary stress on connecting liquid lines.

Selection of oversized models will provide additional liquid subcooling and suction superheat. However, oversized models are acceptable only if the suction gas temperature to the compressor is not raised above 65°F for proper compressor performance.

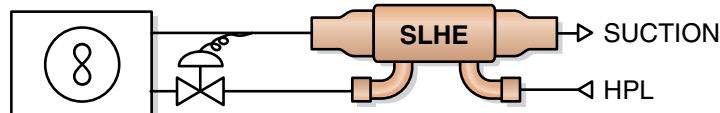
Suction line heat exchangers increase performance and provide system protection for minimal cost. Smart operators are reconsidering their installation, and standard models are available for use with every brand of refrigeration system.

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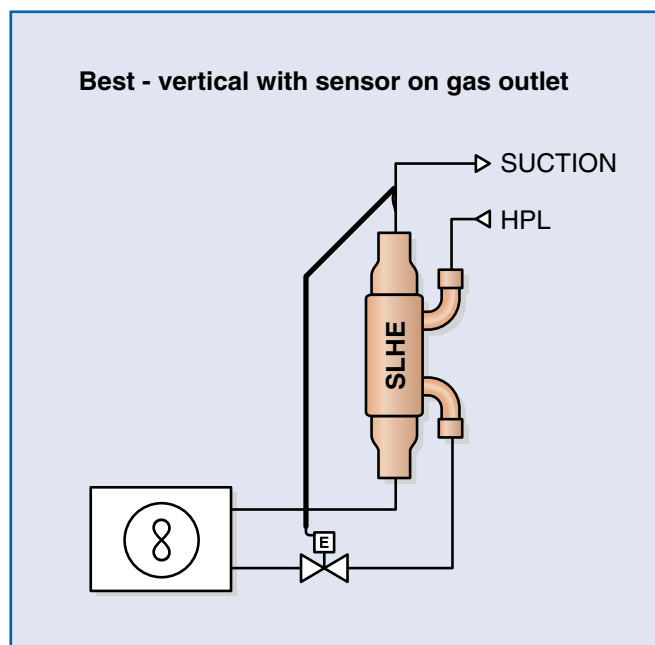
### Not so good - horizontal wrong side up



### Better - horizontal right side up



### Best - vertical with sensor on gas outlet



# TECHNICAL EXCHANGE: Suction Line Heat Exchangers

## Applications

The SLHE units are suitable and cost effective for a wide variety of refrigeration and specialty applications. This includes DX Subcooler Applications, Marine/Military and miniature shell/tube heat exchangers to name a few.

Doucette Industries is a leading supplier of heat exchangers, vibration absorbers and OEM parts to the HVAC/R industry since 1975. Our products improve system efficiency and reliability resulting in lower operating costs and longer life.



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