METROPOLITAN NY CHAPTER
Refrigeration Service Engineers Society

Continued Education for the HVAC/R Industry

"Better Service Through Knowledge"

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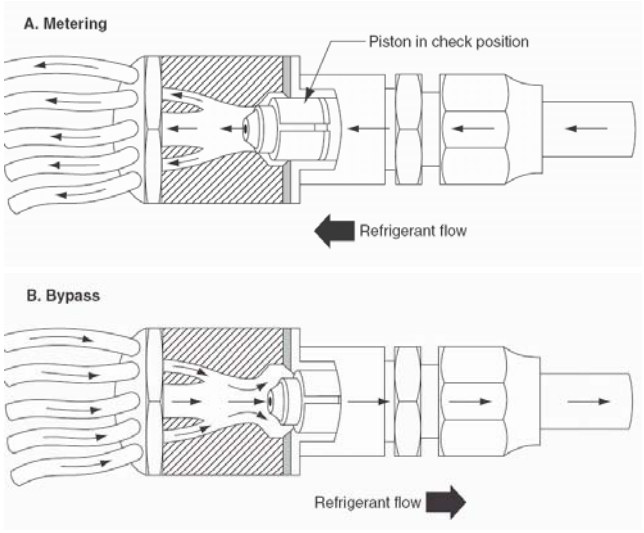
Troubleshooting Heat Pump Check Valves

Heat pump systems need to use some type of check valve to either bypass refrigerant flow around a coil's metering device or force it through the coil's metering device. For example, when in the cooling mode, the check valve for an outdoor coil's metering device will allow the refrigerant to bypass around the metering device, and the check valve for the indoor coil will force the refrigerant to flow through its metering device. In the heating mode, the check valve for indoor coil's metering device will allow the refrigerant to bypass around the metering device, and the check valve for the outdoor coil will force the refrigerant to flow through its metering device.

Sometimes a check valve which is stuck closed can give a technician the impression that the system is operating with a shortage of refrigerant. This can be true when the system is either operating in the cooling mode and the outdoor coil's check valve sticks closed, or when operating in the heating mode and the indoor check valve sticks closed.

If a heat pump is suspected of operating with a shortage of refrigerant, a good field practice is to first try to operate the system in the opposite mode of operation. For example, if the system is suspect of a shortage of refrigerant while operating in the heating mode temporarily switch it to the cooling mode. If the system operates properly when switched to the cooling mode, a shortage of refrigerant is not likely the problem, more likely the indoor coil's check valve is stuck

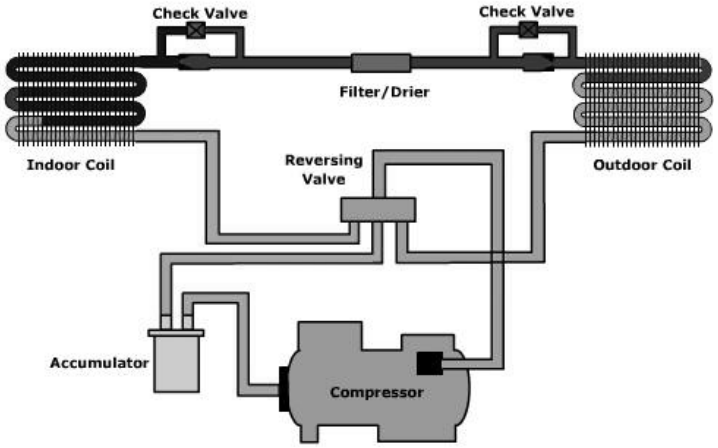


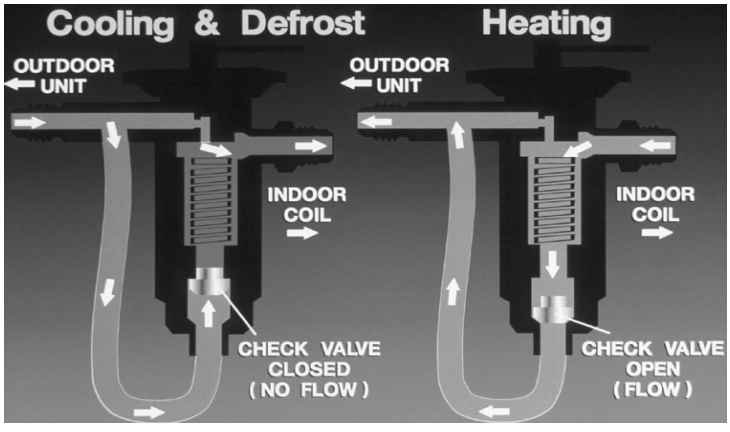
Freeing a Stuck Check Valve

There are two types of check value which can be used on a heat pump system. One which is incorporated into the body of the metering device or one which is installed external to the metering device as shown in the pictures below.

External check valves will be made with a brass body and an internal steel ball or disc. Sometimes a check valve will stick in one position, causing the system to malfunction. When this occurs a large magnetic can be used to be try to free the valve's ball or disc. Simply place the magnetic on the valve body and move is back and forth. Sometimes these will free up the check valve.

Even if this does free up the check valve it may not be a permanent fix, the check valve may stick again. At that





COMING EVENTS

The Latest Technology in Vacuum Specifics and Evacuation Procedures

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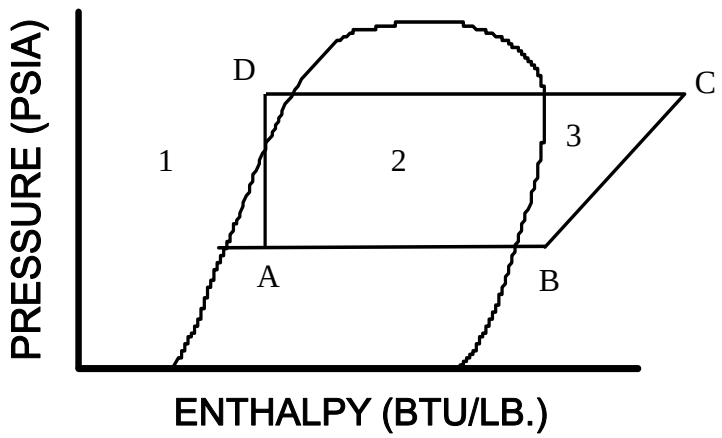
If you have any suggestions or requests for future programs, please let us know!

The Pressure Enthalpy Diagram



The pressure enthalpy diagram is a useful tool to predict system operation in a typical vapor compression refrigeration cycle. Every refrigerant has its own pressure enthalpy diagram. The lines of the diagram above represent the processes by which the refrigerant goes through a theoretical refrigeration cycle. This diagram assumes no process drop in either the suction or liquid lines.

Line A-B represents the process through the evaporator. Line B-C represents the process through the compressor. Line C-D represents the process through the condenser. Line D-A represents the process through the metering device. Area 1 represents the refrigerant in its liquid state. Area 2 represents the refrigerant in its saturated state. Area 3 represents the refrigerant in its vapor state.

If the values at points A, B, C, D are known we can calculate several equations which can tell us the system's refrigeration effect, its heat of rejection, its heat of compression, its mass flow rate, its theoretical compressor power and its theoretical compressor displacement.

EXAMPLE

If A = 10 Btu/lb. B = 80 Btu/lb. C = 100 Btu/lb. D = 10 Btu/lb. v = .09 cu. ft/lb.
Calculate the system's refrigeration effect, heat of compression, heat of rejection, mass flow rate, theoretical compressor displacement and theoretical compressor power.

Refrigeration Effect

$R.E. = h_b - h_a$
R.E. = 80 Btu/lb. - 10 Btu/lb.
R.E. = 70 Btu/lb.

Heat of Compression

$H.C. = h_c - h_b$
H.C. = 100 Btu/lb. - 80 Btu/lb.
H.C. = 20 Btu/lb.

Heat of Rejection

$H.R. = h_c - h_d$
H.R. = 100 Btu/lb. - 10 Btu/lb.
H.R. = 90 Btu/lb.

Mass Flow Rate Per Ton

m = 200 Btu/min / R.E.
m = 200 Btu/min / 70 Btu/lb.
m = 2.86 lb./min

Theoretical Compressor Displacement

Vt = m X v
Vt = 2.86 lb./min X .09 cu. ft/lb.
Vt = .26 cu. ft. /lb.

Theoretical Compressor Power

P = H.C. X m
P = 20 Btu/lb. X 2.86 lb./min.
P = 57.2 Btu/min

Questions to Ponder . . .

* *Whose cruel idea was it for the word "lisp" to have an "s" in it?*
* *If, instead of talking to your plants, you yelled at them, would they still grow, only be troubled and insecure?*

METROPOLITAN NEW YORK CHAPTER, RSES

For Information Call: Stan Hollander, CMS (718) 232-6679

Things you didn't need to know . . .

- No president of the United States was an only child.
- The Eisenhower interstate system requires that one-mile in every five must be straight. These straight sections are usable as airstrips in times of war or other emergencies.
- Many years ago in England, pub frequenters had a whistle baked into the rim or handle of their ceramic cups. When they needed a refill, they used the whistle to get some service. "Wet your whistle," is the phrase inspired by this practice.

Wednesday January 12th, 2011 at 7:30pm

at

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500 microns— getting there quickly

Rich Aughey—JB Industries

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EDUCATIONAL PROGRAM
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