HOW REIHL EFFICIENT COILS SAVE ENERGY

THE REIHL COIL ALLOWS THE SAME VOLUME OF REFRIGERANT TO HOLD UP TO

300%

MORE HEAT.

The only way you can increase the efficiency of the vapor compression cycle, with a constant heat load, is to remove more heat per volume of refrigerant. This will allow the compressor to run less.

To understand how The Reihl Coil saves energy, a brief explanation of what happens as refrigerant passes through the thermal expansion valve of a conventional vapor compression refrigeration system is needed.

The Problem

When high pressure refrigerant is forced through an expansion valve, it creates heat. As the refrigerant exits the expansion valve, it drastically drops in pressure and changes state from a liquid into a vapor, absorbing the heat created in the process.

The inefficiency here is that approximately 80%, or more, of this liquid changes to a vapor. This leaves roughly 20%, or less, liquid refrigerant to actually remove heat in the evaporator coildrastically reducing the cooling capability of the original volume of refrigerant.

The Solution

The Reihl Coil fixes this problem by absorbing the heat and condensing the refrigerant back to a liquid after it leaves the expansion valve, before it enters the evaporator coil. This allows the same volume of refrigerant to absorb up to 300% more heat. The Reihl Coil accomplishes this by circulating the refrigerant mixture through a chamber filled with PCM (Phase Change Material) that is in direct contact with both the refrigerant line coming from the thermal expansion valve and the finned evaporator coil.

Having increased the surface area of the finned coils allows The Reihl Coil to maintain cabinet temperature for longer periods of time between compressor cycles. A special control is incorporated to cycle the evaporator fans on and off, independently from the compressor, allowing the PCM to absorb heat from the cabinet during the compressors off cycle.

The Answer to Everyone's Question

How can this reduce energy consumption when you are increasing the heat load on the refrigeration system by adding PCM to the coil?

The answer: Yes, we are, but only once. As soon as the PCM temperature drops below the temperature of the cooled space, it is already condensing the refrigerant. This increases the amount of usable refrigerant to remove heat from the cold space. The PCM does not completely go through the phase change in one compressor run cy[illegible]t does it over a period of hours. Once the PCM goes through phase change, our custom control maintains the PCM at phase change temperature.

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REFRIGERATION INNOVATION

Example

The example below compares a conventional evaporator coil with The Reihl Coil. Conventional coils utilize a conservative estimate of approximately 33% of their refrigerant as a liquid for use within the evaporator coil itself. This typically leaves the remaining refrigerant to cycle through the system as a vapor. The vapor is above the temperature to remove heat from the cabinet (room) so has very little impact on cooling.

The Reihl Coil introduces a patented PCM (Phase Change Material) that considerably lowers the refrigerant temperature after exiting the TXV (Thermal Exchange Valve). In lowering this temperature, up to three times the refrigerant remains in a liquid state greatly increasing the ability to remove heat from the cabinet.

With the introduction of the PCM, a refrigeration system can become substantially more efficient than its conventional counterpart. This increased efficiency allows for a reduction in the number of fan motors, and less compressor run time, to achieve the same cooling effect. Consequently, less electricity is consumed to maintain cabinet temperature, resulting in a redcution in the overall cost of operation.

Part 1

Conventional Refrigeration System Capacity:	**30,000 Btu/h with 30% liquid refrigerant at the evaporator coil**
Average Cooler Heat Load	**10,000 Btu/h**
Compressor Duty Cycle to Maintain Cooler Temperature	**33.33%**

Part 2

Introduce the PCM (Phase Change Material) into the system. This adds an additional 7,380 Btu/h of heat load while increasing the usable liquid refrigerant to 90%. Add in the increased surface area of the new fin design to accomodate the additional liquid refrigerant.

Refrigeration System Capacity increases to:	**30,000 Btu/h with 90% liquid refrigerant at the evaporator coil**
Average Cooler Load increases to	**17,380 Btu/h**
Compressor Duty Cycle decreases to	**19.31%**

Part 3

In actual operation, the PCM maintains 80% of its cooling properties through each cycle. This means an effective heat loss of only 20% This reduces the additional heat load of 7,380 Btu/h to 1,476 which needs to be added to the baseline average heat load.

Refrigeration System Capacity increases to:	**30,000 Btu/h with 90% liquid refrigerant at the evaporator coil**
Average Cooler Load increases to	**11,476 Btu/h**
Compressor Duty Cycle decreases to	**12.75%**

If you have a correctly sized and functioning refrigeration system, you can replace the existing coils with the same size Reihl Coils and you will see a dramatic reduction in energy consumption and an increase in cooling performance.

Conclusion

By increasing the usable amount of liquid reaching the evaporator coil, our technology has been able to dramatically increase the efficiency and cooling performance.

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THE COMPETITION

EVAPORATOR COIL

Removes heat from a confined space to be released in an unconfined space by the condenser coil.

The refrigerant enters the evaporator with the entire refrigerant line full of 100% liquid that has been super cooled below saturation (more liquid volume = more heat removal capacity = less compressor run time). This equates to less money spent running your refrigeration system each month.

When the refrigerant exits the evaporator coil it is 100% vapor with enough superheat in it to protect the compressor from liquid flood back.

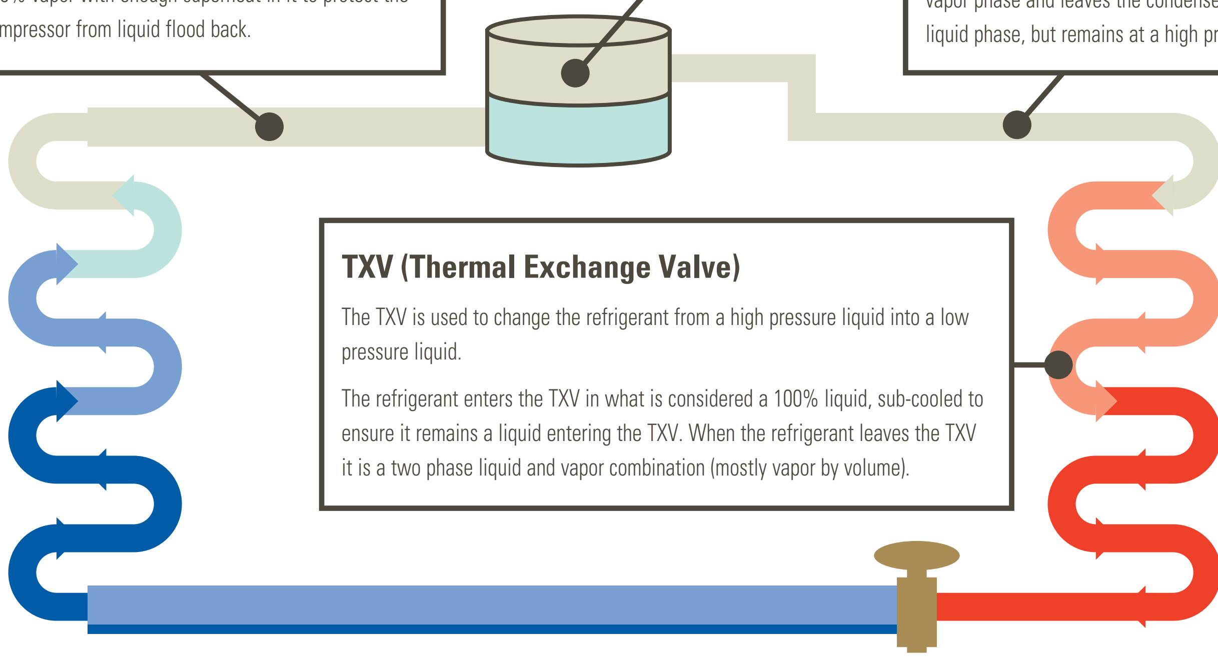
COMPRESSOR

Converts a low pressure vapor into a high pressure vapor.

CONDENSER COIL

This releases the heat absorbed from the evaporator coil into an unconfined space.

The refrigerant enters the condenser coil in a nearly 100% vapor phase and leaves the condenser coil in a nearly 100% liquid phase, but remains at a high pressure the entire time.



TXV (Thermal Exchange Valve)

The TXV is used to change the refrigerant from a high pressure liquid into a low pressure liquid.

The refrigerant enters the TXV in what is considered a 100% liquid, sub-cooled to ensure it remains a liquid entering the TXV. When the refrigerant leaves the TXV it is a two phase liquid and vapor combination (mostly vapor by volume).

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THE REIHL COIL

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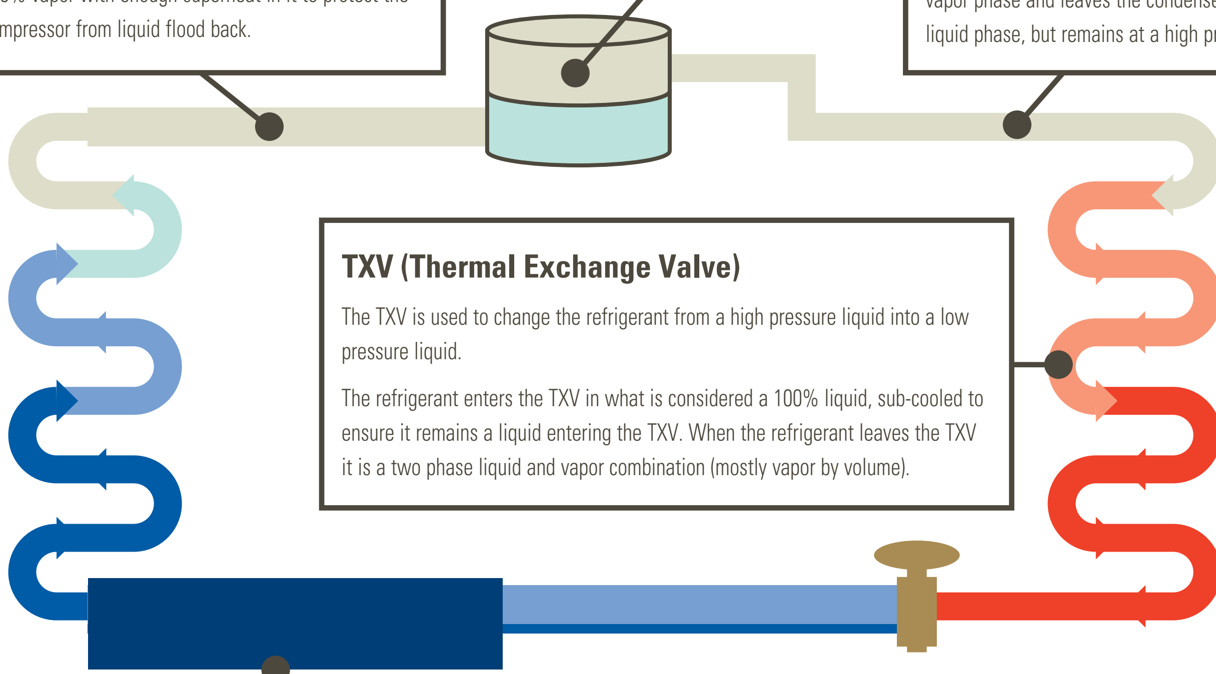

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PCM (PHASE CHANGE MATERIAL) CHAMBER

The PCM chamber absorbs heat from the two phase refrigerant (that is mostly vapor by volume) traveling from the TXV, heading to the evaporator coil. By removing heat from the two phase refrigerant, the PCM chamber condenses the two phase refrigerant back into a liquid and also reduces the liquid temperature enough to ensure it remains in what is considered 100% liquid until it enters the evaporator coil. The new term coined for this process is “Super Cooling”.