Air Source Heat Pumps

Air source heat pumps have traditionally been used in warmer climates than Alaska for both heating and air conditioning. However, recent models of ASHPs are able to provide space heating at lower temperatures, even below 32°F.

Fuel

ASHPs use electricity, however the main "fuel" is the heat contained in the outside air. The heat pump takes heat from the ambient air and uses electricity to "step up" the heat to a temperature usable for space heating.

Distribution system

Air-to-air heat pumps provide heat to a space through forced air distribution. In a traditional ducted ASHP system, heat is distributed to individual rooms by ducts. Mini-split ductless ASHPs have indoor wall-mounted units that deliver heat directly to a room. Air-to-water heat pumps provide heated water for a hydronic distribution system or for domestic hot water uses.

How it works

An ASHP acts like a refrigerator running in reverse, using a refrigeration cycle to gather heat from the outdoor air and transfer it to a home's interior. In an air-to-air heat pump, fluid (liquid refrigerant) travels through coils of pipe in the outside unit, heats up and evaporates into a gas. Then the gas is compressed (in a compressor) until it is hot enough for space heating. The heated gas passes through a set of indoor coils, where it transfers heat to the indoor air and condenses back into a liquid. A fan is used to move the heat into a room or through ducts, and the fluid moves through the cycle again. In an air-to-water heat pump, the heat from the refrigerant is transferred to water instead of air.

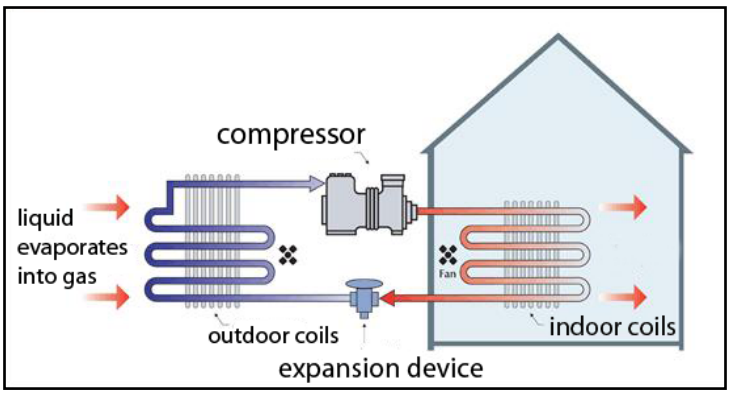

Photo Courtesy Craig Moore. An air source heat pump in Juneau takes heat from the outside air, raises the temperature with electricity, and distributes it inside.

Maintenance

ASHPs should be check yearly by a heating professional, preferrably before the heating season. The heating contractor will check the condition of the heat pump and the electrical connections, and will adjust the controls so that the heat pump operates efficiently. Additionally, air-to-air heat pumps generally have filters that should be cleaned every few months.

You can also inspect the heat pump by following recommendations provided by the manufacturer. Look in the appliance manual for tips on what to check and how often to check it.

Efficiency Range

The heating efficiency of ASHPs is measured by the coefficient of performance, or COP. A higher COP indicates a more efficient appliance. ASHPs in warmer parts of Alaska might have a COP of 2-3, which corresponds to an efficiency of 200-300%. ASHPs can have efficiencies over 100% because unlike other appliances that convert fuel to heat, heat pumps instead use electricity to intensify naturally occurring heat. This means that occupants receive more heat than is contained in the electricity used to run the heat pump.

The COP of a heat pump depends on the outdoor temperature, and thus will fluctuate throughout a winter. Lower outdoor temperatures result in less efficient heat pumps, because there is less heat available in the atmosphere. Thus, it is important to select a model of ASHP that can work efficiently even at the coldest temperatures of the winter.

Advantages	Disadvantages
• ASHPs have the potential to be an inexpensive method of residential heating in regions where electricity is fairly low-cost. • ASHPs are a partially renewable heating appliance, because the heat they take from the air is replaced by the sun. They are entirely renewable if the electricity comes from a renewable source. • No combustion products results in clean and safe operation. • ASHPs can provide both heating and cooling, an advantage for buildings that require cooling because only one appliances needs to be installed and maintained. • ASHPs require relatively little maintenance in comparison to combustion heating appliances.	• ASHPs have declining efficiency at lower temperatures. • In cold climates, ASHPs require a back-up heat source for the coldest days of winter. • Because ASHPs require electricity to run, they cannot be used during a power outage.

If you're interested in learning more about heat pumps, visit our website:
http://cchrc.org/publications-catalog

For more information on heating systems see the Consumer Guide to Home Heating:
http://cchrc.org/docs/reports/Consumer_Guide_Home_Heating.pdf

For questions or comments please contact CCHRC at (907) 457-3454 or info@cchrc.org.