

Geothermal Glossary

Commonly Used Terminology in Geothermal Heating & Cooling

A--A--A--A--A--A

Aquifer - A large body of underground water.

Active Cooling - Compressor driven air-conditioning.

B--B--B--B--B--B

BTU - British Thermal Unit - The amount of heat required to raise the temperature of one pound of water, one degree Fahrenheit.

C--C--C--C--C--C

Coefficient of Performance (COP) - Heating capacity divided by electrical energy consumed. (e.g. 15 kW output / 4.5 kW input = COP of 3.3) The coefficient of performance of a heating system is the electrical ratio of the heat we get out divided by the heat we put in.

Condenser - The heat rejecting mechanism in a heat pump usually in the form of a refrigerant-to-air coil or a refrigerant-to-water coil. Refrigeration heat exchanger where the refrigerant gives up its heat during condensation from a vapor to a liquid.

Compressor - Refrigeration component which increases the density, temperature and pressure of entering refrigerant through compression and discharges a hot dense gas.

Closed Loop - An underground heat exchanger piping system usually of polyethylene or polybutylene designed to allow the extraction or rejection of heat to the earth by the circulation of fluid within the tubing.

Check Valve - A check valve is a mechanical device normally applied to a piping system which allows fluid to flow in only one direction.

CFM - Cubic feet per minute of air flow.

Cupro-nickel - 90% copper / 10% nickel alloy which has high corrosion resistance to water containing salt, sulphur, chlorides and other dissolved minerals.

D--D--D--D--D--D

Degree Day - The number of degrees that the mean temperature for that day is below 65° F. (e.g. mean temp. of 40°F for the day--65-40=25 degree days)

Desuperheater - A heat exchanger and pump system which removes a small portion of heat from the compressor discharge gas and typically transfers it to a domestic hot water tank.

Direct Expansion Heat Pump - A geothermal heat pump system whereby the liquid refrigerant is sent directly out into copper coils buried in the ground where it is vaporized or condensed by contact with the earth.

Dual Condenser - A heat pump system which has the capability to switch, usually automatically, between an air and a water heat exchanger. Full capacity hot air or hot water output is available.

E--E--E--E--E--E--E

Energy Efficiency Ratio (EER) - Cooling capacity in BTU/hr divided by electrical energy consumed in watts.

EWT - Entering water or fluid temperature.

Evaporator - The heat absorbing mechanism or heat exchanger in a heat pump. Refrigerant changes phase from a liquid to a gas in this exchanger, absorbing heat energy from the surrounding media in the process.

F--F--F--F--F--F--F

Freon - Trade name for a series of man made chemicals or **refrigerants** used in refrigeration systems. Each refrigerant is designed to change phase at specific temperatures and pressures which will produce the desired cooling effect required for a specific job. The refrigerant absorbs energy as it evaporates and releases energy during condensation.

Full Package - Self contained heat pump which has blower and compressor section integrated into one unit.

Full-Condensing Heat Exchanger - A heat exchanger with enough surface area to condense all the hot refrigerant gas produced by a heat pump to its liquid state thereby transferring all the heat produced by the unit.

G--G--G--G--G--G

Geothermal Energy - Heat energy stored in the earth's crust by the absorption of solar energy and by conduction with the earth's hot interior.

Ground Loop - A series of heat exchange pipes containing an antifreeze solution which are buried either vertically or horizontally in the earth.

Ground Source - A heat pump which utilizes the earth as its source of energy.

H--H--H--H--H--H

Heat Exchanger - A component which transfers heat energy from one medium to another. For example heat could be transferred, in a geothermal heat pump system, **from** water-**to**-air or **from** water-**to**-water etc. and vice versa.

HEAT SOURCE - The area or media from which heat is removed. (water, air, etc.)

HEAT SINK - The area or media where heat is deposited. (Inside a home, etc.)

I--I--I--I--I--I

J--J--J--J--J--J

K--K--K--K--K

KWH - Kilowatt hours - Electrical term - 1 Kwh equals the use of 1000 watts for one hour.

L--L--L--L--L--L

Liquid-to-Air Heat Pump - A heat pump which absorbs heat from a liquid and distributes the energy in the form of hot forced air.

Liquid-to-Liquid heat pump - A heat pump which absorbs heat from a liquid and distributes the energy in the form of hot water.

M--M--M--M--M--M

Mechanical Cooling - Conventional cooling provided by a compressor operated refrigeration device. Term can be interchanged with "active cooling".

N--N--N--N--N--N

O--O--O--O--O--O

Open Loop - A system where water is pumped from a water well, pond, lake or other surface source for use in a heat pump.

Oversized Evaporator - A technique of employing a larger than normal evaporator (heat absorption device) in a geothermal heat pump in order to obtain greater heat exchange and thus better performance from the unit.

P--P--P--P--P--P

Passive Cooling - A process whereby cold well water (less than 50° F.) is pumped directly to a finned air coil (much like the radiator of a car) so that when the heat pump fan is operated, cooling and dehumidification are provided **without** the operation of a compressor driven refrigeration system.

Package Heat Pump - A heat pump which has all components (compressor, blower and heat exchangers etc.) in one cabinet.

Q--Q--Q--Q--Q--Q

R--R--R--R--R--R

Refrigerant - A naturally occurring or man made liquid which absorbs and releases heat energy in a refrigeration device by changing phase from a liquid to a gas and vice versa in response to the influence of a refrigeration compressor.

Reversing Heat Pump - A heat pump in which the condenser and evaporator coils of the unit reverse roles in response to a reverse in the direction of the flow of refrigerant in the machine

Radiant Floor Heating - Process of embedding tubing (cross-linked polyethylene, polybutylene etc.) directly in a concrete floor so that hot water can be pumped through the tubing for the purpose of heating the floor and thus the building.

S--S--S--S--S--S--S

Seasonal Coefficient of Performance (SCOP) - Is the average COP over the entire heating season.

Seasonal Energy Efficiency Ratio (SEER) -The average cooling efficiency over an entire cooling season.

Simple Payback Factor (heating) - Subtract the installation cost of the least expensive (less efficient) system from the installation cost of the more expensive (more efficient) heating system. This value is the increased cost of installing the more efficient system. Calculate the yearly energy savings in dollars by installing the more efficient system. Take the increased cost to install divided by the yearly energy savings and your result is the number of years required for the more efficient system to pay for itself.

Sink Temperature - This is the temperature of the media (water or air) into which the heat pump must reject it's heat.

Source Temperature - This is the temperature of the media (water or air) from which the heat pump extracts its heat.

Split System - Split heat pumps are two **(2) part** refrigeration systems which have separate **evaporator / air handler** and **compressor / condenser** sections. Commonly employed in air-to-air systems where the condenser section is located outside the home while the evaporator / air handler is located inside the conditioned structure.

T--T--T--T--T--T--T

TX Valve - A temperature and pressure controlled device for metering refrigerant in a heat pump or other refrigeration device.

Ton (of refrigeration) - The amount of energy it takes to convert 2000 lbs. of water at 32° F. to ice at 32° F. during a 24 hour period. Calculation: $2000 \text{ lbs. H}_2\text{O} \times 144 \text{ Btu/lb.} = 288,000 \text{ Btu's in 24 Hrs. Divide by 24 hrs} = 12,000 \text{ Btu/hr. Therefore a "ton" of cooling is a measure of heat energy which is roughly equivalent to 12,000 BTU's.}$

Turbotec® - Tradename for a high efficiency expanded surface style coaxial tube-in-tube heat exchanger.

U--U--U—U—U

V--V--V--V--V--V

W--W--W--W--W

Water Well - A vertical bore hole into the earth's crust usually to a depth of less than 300 ft. for the purpose of accessing an underground water supply (aquifer). A pumping system generally of the submersible type is normally installed to bring the water to the surface under sufficient pressure to be used in a home.

Water-to-Water - A heat pump which extracts heat from water in one area and transfers the heat usually at a higher temperature to another body of water. ex. extracting heat from a 50°F. well and using it to heat domestic hot water at 120° F.

XYZ -- XYZ -- XYZ