AYVAZ

HEAT PUMP HOSES

SUSTAINABLE ENERGY SOLUTIONS

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A solar-assisted heat pump (SAHP) is a machine that represents the integration of a heat pump and thermal solar panels in a single integrated system. Typically these two technologies are used separately to produce hot water. In this system the solar thermal panel performs the function of the low temperature heat source and the heat produced is used to feed the heat pump's evaporator.The goal of this system is to get high COP and then produce energy in a more efficient and less expensive way.

It is possible to use any type of solar thermal panel (sheet and tubes, roll-bond, heat pipe, thermal plates) or hybrid (mono/polycrystalline, thin film) in combination with the heat pump. The use of a hybrid panel is preferable because it allows covering a part of the electricity demand of the heat pump and reduce the power consumption and consequently the variable costs of the system.

The operating conditions' optimization of this system is the main problem, because there are two opposing trends of the performance of the two sub-systems: by way of example, decreasing the evaporation temperature of the working fluidincreases the thermal efficiency of the solar panel but decreases the performance of the heat pump, and consequently the COP. The target for the optimization is normally the minimization of the electrical consumption of the heat pump, or primary energy required by an auxiliary boiler which supplies the load not covered by renewable source.

Configurations

There are two possible configurations of this system, which are distinguished by the presence or not of an intermediate fluid that transports the heat from the panel to the heat pump. Machines called indirect- expansion mainly use water as a heat transfer fluid, mixed with an antifreeze fluid to avoid ice formation phenomena during winter period. The machines called direct-expansion place the refrigerant fluid directly inside the hydraulic circuit of the thermal panel, where the phase transition takes place.This second configuration, even though it is more complex from a technical point of view, has several advantages

Separated production systems

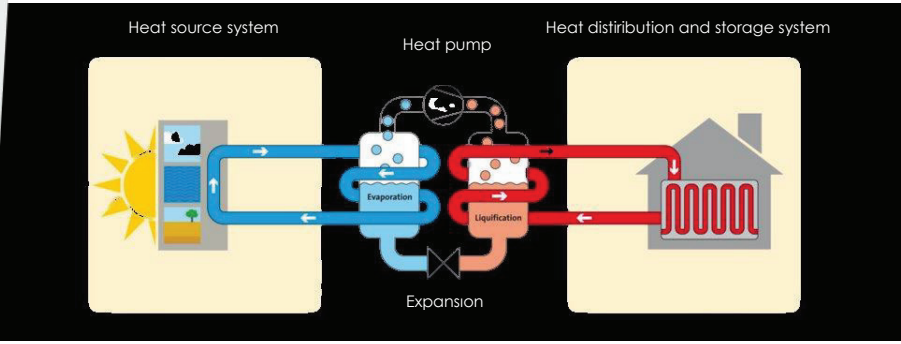
In comparison with only heat pump utilization, it is possible to reduce the amount of electrical energy consumed by the machine during the weather evolution from winter season to the spring, and then finally only use thermal solar panels to produce all the heat demand required , thus saving on variable costs.

In comparison with a system with only thermal panels, it is possible to provide a greater part of the required winter heating using a non-fossil energy source.

Traditional heat pumps

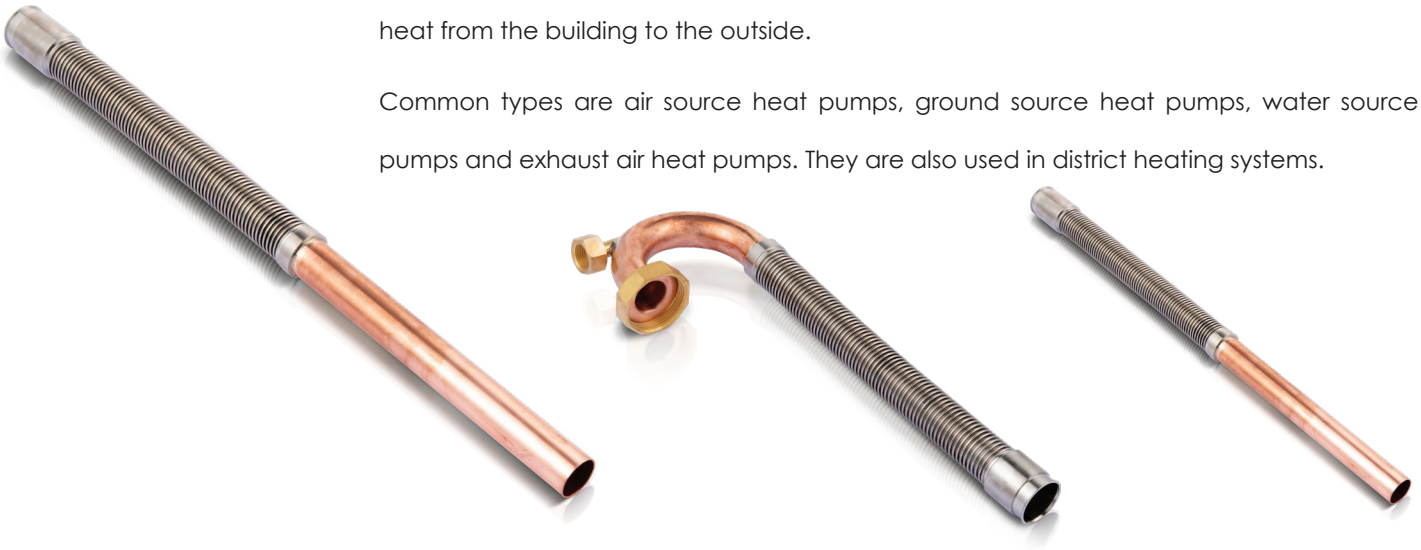
Compared to geothermal heat pumps, the main advantage is that the installation of a piping field in the soil is not required, which results in a lower cost of investment and in more flexibility of machine installation, even in areas in which there is limited available space. Furthermore, there are no risks related to possible thermal soil impoverishment.

Similarly to air source heat pumps, solar-assisted heat pump performance is affected by atmospheric conditions, although this effect is less significant. Solar-assisted heat pump performance is generally affected by varying solar radiation intensity rather than air temperature oscillation. This produces a greater SCOP. Additionally, evaporation temperature of the working fluid is higher than in air source heat pumps, so in general the coefficient of performance is significantly higher.



A heat pump is a device that transfers thermal energy between spaces, usually between an enclosed space and the outdoors. When used to heat a building, the energy is transferred from the outside into the building. A heat pump can also work as an air conditioner by transferring heat from the building to the outside.

Common types are air source heat pumps, ground source heat pumps, water source heat pumps and exhaust air heat pumps. They are also used in district heating systems.



Ayvaz's heat pump hoses are assembled using annularly corrugated stainless steel hoses and high strength stainless steel braiding. They are designed for optimum performance in applications and to reduce vibration.

Advantages of Using Flexible Metal Hose in Heat Pumps

- Assembly Flexibility
- Fast and Easy installation
- High resistance against heat and temperature

Two types of refrigerant are used in heat pumps, R134A and R410A. The boiling point of R134A is -26.3 C and for R410A -48.5 C. Since copper pipe has the highest thermal conductivity as a material, these are used in applied to the lines in the heat exchanger. All connections between the expansion tank and the heat exchanger should be made of stainless steel pipe or stainless steel corrugated pipe even with icing.

Heat loss calculation:

1 meter copper pipe (when the room temperature is 20 degrees and the refrigerant is R134A)

U=390 x (26.3+20) = 18000W.

Loss of 432 Kw/h based on a calculation of 24 hours of operation.

But if stainless steel pipe or stainless steel corrugated pipe is used, the loss is 700 W.

This also means a loss of 16.8 Kw/h based on a calculation of 24 operating hours.

In comparison, we achieve a yield of 415 Kw/h*.

Material	Thermal Conductivity (W/m*K)
Steel Stainless 316	13.53
Steel Stainless 321 and 347	13.807
Steel Stainless 430 430f and 431	16.736
Steel Stainless 304	14.644
Copper Alloy (110)	390

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