GEOTHERMAL VAPOUR ABSORPTION REFRIGERATION SYSTEM

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Abstract:- In our paper work we explain on Topic " GEOTHERMAL VAPOUR ABSORPTION REFRIGERATION SYSTEM". Geothermal Is Nothing But Important Source Of Renewable Energy. Geothermal Energy Is Thermal Energy generated and stored in the Earth. Thermal energy is the energy that determines the temperature of matter. The geothermal energy of the Earth's crust originates from the original formation of the planet (20%) and from radioactive decay of minerals (80%). The Earth's geothermal resources are theoretically more than adequate to supply humanity's energy needs, but only a very small fraction may be profitably exploited. Drilling and exploration for deep resources is very expensive. Forecasts for the future of geothermal power depend on assumptions about technology, energy prices, subsidies, and interest rates. Pilot programs like EWEB's customer opt in Green Power Program show that customers would be willing to pay a little more for a renewable energy source like geothermal. But as a result of government assisted research and industry experience, the cost of generating geothermal power has decreased by 25% over the past two decades. The vapour absorption system differs from the compression system in a way that it uses heat energy instead of mechanical energy to make a change in the conditions necessary to complete the refrigeration cycle. The heat energy for this purpose may be obtained from a gas burner, kerosene oil lamp or electric heater. The system uses a minimum number of moving parts. The only moving part used smaller units are valves and controls bat larger units use circulating pumps and fans also. Due to the absence of moving parts such units are quiet in operation and may be used for both commercial and domestic installation.The working of an absorption machine depends upon the use of two substances which have great affinity for each other and which can be easily separated by the application of heat. The principal combination euphoric acid water or ammonia and water the latter deign quite common are use.

1. INTRODUCTION

In vapour absorption refrigeration , system required a heating source (generator) to increase pressure of refrigerant in these case we use a **geothermal energy** as a source which utilise a heat energy from inside the earth. Geothermal power is cost effective, reliable, sustainable, and environmentally friendly. these **Geothermal vapour absorption system** is very useful in industrial as well as domestic application

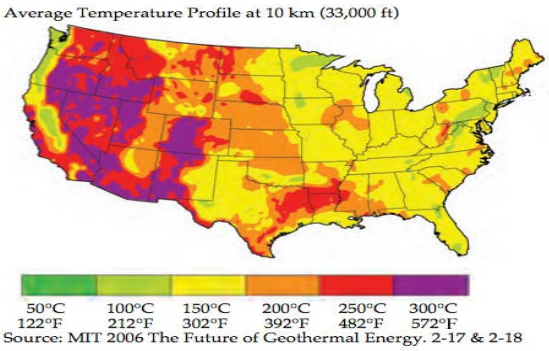
Below the Earth's crust, there is a layer of hot and molten rock called magma. Heat is continually produced there, mostly from the decay of naturally radioactive materials such as uranium and potassium. The amount of heat within 10,000 meters (about 33,000 feet) of Earth's surface contains 50,000 times more energy than all the oil and natural gas resources in the world

"Of all the renewable energy sources , geothermal has the highest capacity factor, is the most reliable, has the least environmental impact, and is the best source for refrigeration."

Concept

The miniscule role of geothermal generation in the overall national power paradigm can be attributed to its dependence on specific geological structures. The characteristics of these geologic structures can be summarized as follows:

1. A subterranean heat source at an accessible depth
2. A litho logy above the heat source that has sufficient porosity and permeability (Figure 3) to allow fluidaccumulation and flow
3. A rock structure with enough volume, pressure and temperature to force the useful fluids to the surface.Below fig. show that within 10 km i.e. (33,000 ft) inside earth temperature gradient up to 300 C which is sufficient for vapour absorption refrigeration system.

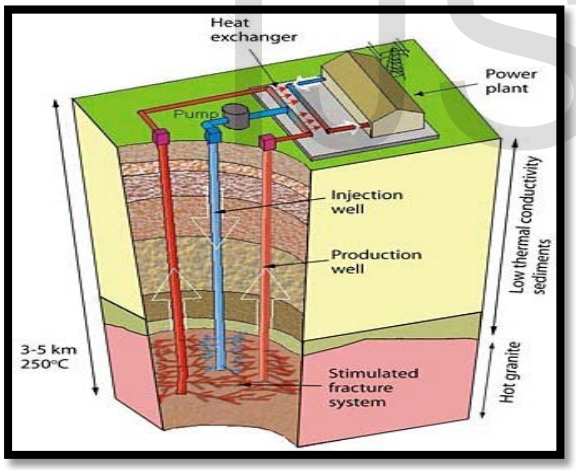


2. WORKING

As general vapour absorption refrigeration system these system also work only that heat gain from hot water vapour from production well from which hot vapour flow up. From injection well we supply cold water to stimulated fracture system which vaporise there and become superheated steam , these superheated steam supply to heat exchanger , where generator of VARS Placed .

Working Component of Geothermal Plant

1) Pump
2) Injection well
3) Production well
4) Heat exchanger



WORKING :-

1) Pump **:-** pump is a device which is used to circulate the pressurise water through the pipe .

2) Injection well **:-** through injection well the pressurise cold water are flow inside the earth hot region

3) Production well **:-** Production well is transfer the superheated steam from hot well to heat exchanger from inside the earth .

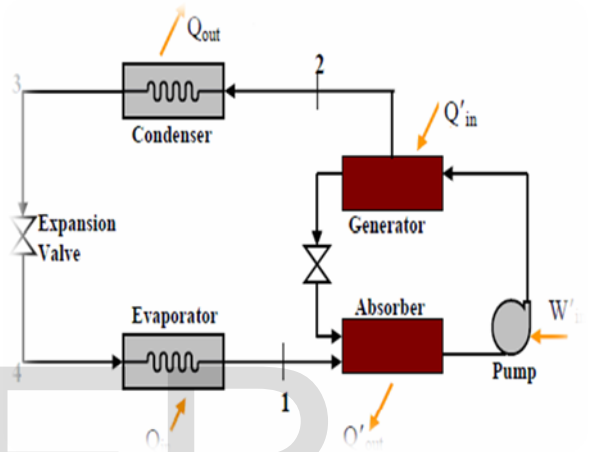
4) Heat exchanger **:-** heat exchanger are loss there heat with generator of refrigeration system .

What is Absorption?

Comparing the absorption refrigeration cycle with the more familiar vapour compression refrigeration cycle is often an easy way to introduce it. The standard vapour compression refrigeration system is a condenser, evaporator, throttling valve, and a compressor. Figure below is a schematic of the components and flow arrangements for the vapour compression cycle.

Working Component of Vapour Absorption Refrigeration Unit

1. Generator
2. Condenser
3. Evaporator
4. Absorber



Generator:-

The purpose of the generator is to deliver the refrigerant vapour to the rest of the system. It accomplishes this by separating the water (refrigerant) from the lithium bromide-and-water solution. In the generator, a high-temperature energy source, typically steam or hot water, flows through tubes that are immersed in a dilute solution of refrigerant and absorbent. The solution absorbs heat from the warmer steam or water, causing the refrigerant to boil (vaporize) and separate from the absorbent solution. As the refrigerant is boiled away, the absorbent solution becomes more concentrated. The concentrated absorbent solution returns to the absorber and the refrigerant vapour migrates to the condenser.

Condenser:-

The purpose of condenser is to condense the refrigerant vapours. Inside the condenser, cooling water flows through tubes and the hot refrigerant vapour fills the surrounding space. As heat transfers from the refrigerant vapour to the water, refrigerant condenses on the tube surfaces. The condensed liquid refrigerant collects in the bottom of the condenser before travelling to the expansion

device. The cooling water system is typically connected to a cooling tower. Generally, the generator and condenser are contained inside of the same shell.

Expansion Device:
From the condenser, the liquid refrigerant flows through an expansion device into the evaporator. The expansion device is used to maintain the pressure difference between the high-pressure (condenser) and low-pressure (evaporator) sides of the refrigeration system by creating a liquid seal that separates the high-pressure and low pressure sides of the cycle. As the high-pressure liquid refrigerant flows through the expansion device, it causes a pressure drop that reduces the refrigerant pressure to that of the evaporator. This pressure reduction causes a small portion of the liquid refrigerant to boil off, cooling the remaining refrigerant to the desired evaporator temperature. The cooled mixture of liquid and vapour refrigerant then flows into the evaporator
.

Evaporator:
The purpose of evaporator is to cool the circulating water. The evaporator contains a bundle of tubes that carry the system water to be cooled/chilled. High pressure liquid condensate (refrigerant) is throttled down to the evaporator pressure (typically around 6.5 mm Hg absolute). At this low pressure, the refrigerant absorbs heat from the circulating water and evaporates. The refrigerant vapours thus formed tend to increase the pressure in the vessel. This will in turn increase the boiling temperature and the desired cooling effect will not be obtained. So, it is necessary to remove the refrigerant vapours from the vessel into the lower pressure absorber. Physically, the evaporator and absorber are contained inside the same shell, allowing refrigerant vapours generated in the evaporator to migrate continuously to
the absorber.

Absorber:
Inside the absorber, the refrigerant vapour is absorbed by the lithium bromide solution. As the refrigerant vapour is absorbed, it condenses from a vapour to a liquid, **releasing the heat** it acquired in the evaporator. The absorption process creates a lower pressure within the absorber. This lower pressure, along with the absorbent's affinity for water, induces a continuous flow of refrigerant vapour from the evaporator. In addition, the absorption process condenses the refrigerant vapours and releases the heat removed from the evaporator by the refrigerant. The heat released from the condensation of refrigerant vapours and their absorption in the solution is removed to the cooling water that is circulated through the absorber tube bundle. As the concentrated solution absorbs more and more refrigerant; its absorption ability decreases. The weak absorbent solution is then pumped to the generator where heat is used to drive off the refrigerant. The hot refrigerant vapours created in the generator migrate to the condenser. The cooling tower water circulating through the condenser turns the refrigerant vapours to a liquid state and picks up the heat of condensation, which it rejects to the cooling tower. The liquid refrigerant returns to the evaporator and completes the cycle.

Analyzer: The analyzer is a direct contact heat exchanger consisting of series of tray mounted above the generator. Its function is to remove partly some of the unwanted water particle associated with ammonia vapour going to the condenser. The water vapour if allowed to enter to condenser may enter the expansion valve where they will freeze and choke the pipe line.

Rectifier: The final reduction of the percentage of water vapour occurs in the rectifier, water cooled heat exchanger which condenses water vapour and returns it to the generator. The net refrigerating effect of such a machine is the heat extracted in the evaporator. The total energy supplied for operating the machine is the sum of the work done by the liquid pump and the heat supplied in the generator.

3. **Working performance**

Efficiency of Vapour Absorption Machine (VAM)
Efficiencies of absorption chillers is described in terms of Coefficient of Performance
(COP), and is defined as the refrigeration effect, in Btu, divided by the net heat input,
in Btu.

$$COP = \frac{\text{cooling capacity obtain at evaporator}}{\text{heat input for the generator}}$$

The COP can be thought of as a sort of index of the efficiency of the machine. The absorption systems with a COP of 1.0 will burn 12,000 BTUs of heat energy for each ton-hour of cooling. For example, a 500-ton absorption chiller operating at a COP of 0.70 would require: (500 x 12,000 Btu/h) divided by 0.70 = 8,571,429 Btu/h heat input. as the capacity to remove heat at a rate of 12,000 Btu/hr at the evaporator. Cooling caoecity is measured in tons of refreigeration is defined.

4. APPLICATION

1. For facilities that use lot of thermal energy for their processes, a large chunk of heat is usually discarded to the surrounding as waste. This waste heat can be converted to useful refrigeration by using a VAM.

2. For facilities that have a simultaneous need for heat and power (cogeneration system), absorption chillers can utilize the thermal energy to produce chilled water.

3. For facilities that have high electrical demand charges. Absorption chillers minimize or flatten the sharp spikes in a building's electric load profile can be used as part of a peak shaving strategy.

4. For facilities where the electrical supply is not robust, expensive, unreliable, or unavailable, it is easier to achieve heat input with a flame than with electricity. Absorption chillers uses very little electricity compared to an electric motor driven compression cycle chiller.

7. For facilities implementing clean development mechanism (CDM) and
accumulating carbon credits, the absorption use coupled to waste heat

5. ADVANTAGE

1) Geothermal is a renewable source of energy.

2) It does not created any kind of pollution , i.e. clean source of energy.

3) Moving parts are only in the pump, which is a small element of the system. Hence operation is smooth.

4) The system can work on lower evaporator pressures also without affecting the COP.

5) No effect of reducing the load on performance.

6) Liquid traces of refrigerant present in piping at the exit of evaporator

6. DISADVANTAGE

1) Initial cost is high

2) Long drilling of hole in earth causes earthquake

3 These kind of plant are place away from city

5. For facilities, where the cost of electricity verses fuel oil/gas tips the scale in favor of fuel/gas. Various studies indicate that the absorption chillers provide economic benefit in most geographical areas, due to the differential in the cost between gas and electric energy.

6. For facilities wanting to use a "natural refrigerant and aspiring for LEED certification (Leadership in Energy and Environmental Design) absorption chillers are a good choice. Absorption chillers do not use CFCs or HCFCs - the compounds known for causing Ozone depletion

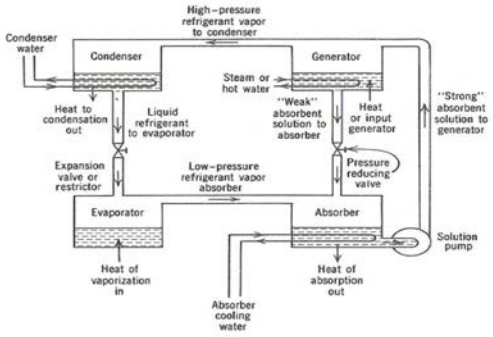


Fig. 20-21 Basic absorption refrigeration cycle.

recovery and cogeneration system help reduce problems related to
greenhouse effect from CO emission.

7. CONCLUSION :-

This paper describes a number of research options of absorption refrigeration technology; generally three approaches have been followed.

1) geothermal is a source of renewable energy and very much useful to vapour absorption refrigeration system

8. REFERENCE :-

[1] Google & Wikipedia ,

[2] Refrigeration and Air-conditioning by R.K. Rajput ,