

Water-Lithium Bromide Vapor Absorption Refrigeration System

In water-lithium bromide vapor absorption refrigeration system, water is used as the refrigerant while lithium bromide (Li Br) is used as the absorbent. Thus in the absorber the lithium bromide absorbent absorbs the water refrigerant and solution of water and lithium bromide is formed. This solution is pumped by the pump to the generator where the solution is heated. The water refrigerant gets vaporized and moves to the condenser where it is heated while lithium bromide flows back to the absorber where it further absorbs water coming from the evaporator. The water-lithium bromide vapor absorption system is used in a number of air conditioning applications. This system is useful for the applications where the temperature required is more than 32 degree F.

Special Features of Water-Lithium Bromide Solution

Here are some special features of the water and lithium bromide in absorption refrigeration system:

1) As such lithium bromide has great affinity for water vapor, however, when the water-lithium bromide solution is formed, they are not completely soluble with each other under all the operating conditions of the absorption refrigeration system. Hence, when the water-lithium bromide absorption refrigeration system is being designed, the designer must take care that such conditions would not be created where the crystallization and precipitation of lithium bromide would occur.

2) The water used as the refrigerant in the absorption refrigeration system means the operating pressures in the condenser and the evaporator would be very low. Even the difference of pressure between the condenser and the evaporator are very low, and this can be achieved even without installing the expansion valve in the system, since the drop in pressure occurs due to friction in the refrigeration piping and also in the spray nozzles.

3) The capacity of any absorption refrigeration system depends on the ability of the absorbent to absorb the refrigerant, which in turn depends on the concentration of the absorbent. To increase the capacity of the system, the concentration of absorbent should be increased, which would enable absorption of more refrigerant. Some of the most common methods used to change the concentration of the absorbent are: controlling the flow of the steam or hot water to the generator, controlling the flow of water used for condensing in the condenser, and re-concentrating the absorbent leaving the generator and entering the absorber.

Lithium Bromide Absorption Refrigeration Chiller and Air Conditioner

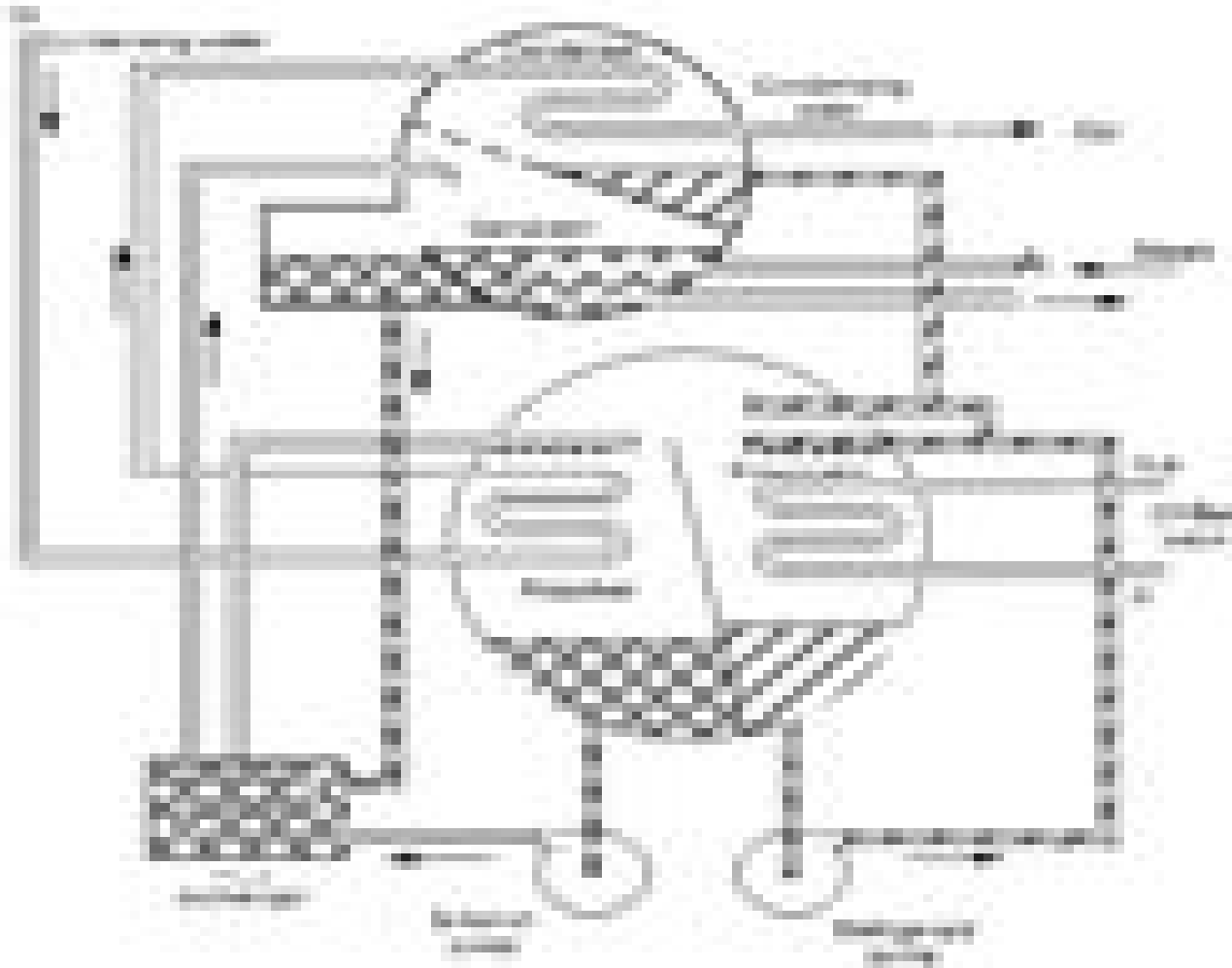


Figure 13.1 Diagram of two-shell lithium bromide cycle water chiller (ASHRAE, 1983).

Parts of the Water-Lithium Bromide Absorption Refrigeration and their Working

Let us see various parts of the water-lithium bromide absorption refrigeration and their working (please refer the figure above):

1) Evaporator: Water as the refrigerant enters the evaporator at very low pressure and temperature. Since very low pressure is maintained inside the evaporator the water exists in the partial liquid state and partial vapor state. This water refrigerant absorbs the heat from the substance to be chilled and gets fully evaporated. It then enters the absorber.

Absorber: In the absorber
concentrated solution of lithium
bromide is already available. Since
water is highly soluble in lithium
bromide, solution of water-lithium
bromide is formed. This solution is
pumped by the pump to the generator

Generator: The heat is supplied to the refrigerant water and absorbent lithium bromide solution in the generator from the steam or hot water. Due to heating water gets vaporized and it moves to the condenser, where it gets cooled. As water refrigerant moves further in the refrigeration piping and through nozzles, its pressure reduces and so also the temperature. This water refrigerant then enters the evaporator where it produces the cooling effect. This cycle is repeated continuously. Lithium bromide on the other hand, leaves the generator and reenters the absorber for absorbing water refrigerant.

As seen in the image above, the condenser water is used to cool the water refrigerant in the condenser and the water-Li Br solution in the absorber. Steam is used for heating water-Li Br solution in the generator. To change the capacity of this water-Li Br absorption refrigeration system the concentration of Li Br can be changed.