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Absorption chiller working principle pdf

Steam absorption cooler Tools are essential for industries that not all chemical reactions take place at ambient temperature or atmospheric temperature. To meet the required temperature of the chemical reaction and for other purposes in the chemical plant tools is necessary. These tools help to achieve high or low temperature for chemical process. In this article we will learn how to work with steam absorption machine / working of Steam absorption cooler in detail. Different types of tools are needed to run industries and common tools are listed below Steam Hot Water Cooling Water Brine Electricity and many more different tools are used according to temperature requirements, and today in this article we will learn to produce chilled water using absorption cooler that is also known as VAM cooling machine. Before we learn and understand the work of vapor absorption machine we need to update the Gas Act that is, Gay-Lussac law which is also known as The Pressure Temperature Law. This law states that the pressure of a given amount of gas held at constant volume is directly proportional to the Kelvin temperature. Press \propto Temperature Explanation- This means that if the pressure in the system increases, the temperature of the system also increases. What is the steam absorption machine? The steam absorption machine (VAM) also known as the steam absorption cooler is to produce chilled water using heat source such as steam hot water and fuel gas. this sounds strange, that is, it produces chilled water using the stem, but yes it is possible. These are the simplest possible words where VAM can be described. In the steam absorption machine there are mainly two rooms and the other four subspaces The main compartment with steam absorption cooler is low pressure side High pressure side These two main components are divided into two parts as below. #1 Low pressure side 1) Evaporator 2) Absorb #2 High pressure side 1) Generator 2) Condenser Working material in steam absorption refrigerant – DM Water (Deminealize water) Absorbent (Salt) – Lithium bromide (LiBr) Refrigerant: – Refrigerant of steam absorption machine is clean (distilled) water. The refrigerant water flows in a closed loop and is recycled. Water boiling changes different pressure and other temperature For example, 1. Sea level Temperature 100 °C Pressure 760 mmHg 2. High altitude Everest peak Temperature 70 °C Pressure 525 mmHg 3. Under vacuum temperature 3.7 °C Pressure 6 mmHg Absorbent absorbent steam absorption machine is lithium bromide (LiBr). LiBr is a highly watery chemical that means it has a great affinity against water. The higher the concentration and the lower the temperature, the stronger the absorption force. LiBr is a non-toxic aqueous solution, but highly corrosive in the presence of oxygen. LiBr - a corrosive effect on metals in the presence of oxygen, but as absorption cooler is a vacuum vessel was almost no oxygen present there thus it will not damage the MOC of the machine. The chemical details of LiBr are as follows Chemical Formula: Li Br Molecular Weight: 86.856 Component: Li = 7.99% / Br = 92.01% Specific Gravity: 3.464 at 25 °C) Melting point: 549°C Boiling point: 1265°C Read more details about LiBr on the Lithium bromide wikipedia page How does the steam absorption machine Description of the main parts of the lithium bromide absorption cooler is given in detail. steam absorption machine flow diagram / lithium bromide absorption cooler Low pressure page 1. Evaporator Evaporator function is to cool the water flowing through a coil. The evaporator is maintained under vacuum of around 6 mmHg which the refrigerant boils at around 4 °C Water when the refrigerant enters the evaporators at a very low pressure and temperature. since very low pressure is maintained inside the evaporator. This water coolant absorbed the heat from the substance to be cooled and completely evaporated, and then enters the absorber. 2. Absorb Absorber The function is to maintain the pressure on the evaporator in the vacuum by absorbing the refrigerant vapor evaporated in the evaporator A concentrated solution of lithium bromide is available in the absorber since water is very soluble in the lithium bromide solution which is then converted into diluted LiBr formed. This solution is pumped to the generator Inmeant time you can high pressure page 1. Generator Generator function is to enrich the LiBr solution to its original concentration. As the lithium bromide solution is emptied, the effect is reduced to absorb the refrigerant vapor. The diluting solution of LiBr absorbent flow to the generator to regain concentration. It is a vessel, where the diluted solution of absorbent is heated by steam hot water or direct gas. The diluted solution releases the refrigerant vapor and becomes concentrated solution The hot concentrated solution, which had now regained its strong affinity to absorb more refrigerant, returns to the absorber. 2. Condenser The condenser function is to refrigerant vapor emitted from the generator cooled and liquid. The hot refrigerant vapor that leaves the regenerator flowing through eliminators or separator to the condenser cooling water from a cooling tower circulates through the condenser to move the heat from the refrigerant vapor. This steam is condensed into liquid refrigerant where it passed thoroughly pressure-reducing valve in the evaporator, which operated under vacuum. This cycle is continuously repeated lithium bromide on the other hand leaving the generator and going into absorbent for absorbent water coolant. Advantages of steam absorption cooler As it is simple heat exchanger working on different it is relatively cheaper and reliable, also it requires very less maintenance and operating costs. It works on environmentally friendly refrigerant on site for CFC which has a negative effect on the ozone layer As there are no moving parts that make it free for noise and vibration. All operations are fully automated, therefore it requires much less human intervention and makes the process easy Get a main grip on industrial safety ... !!! Wrapping Up This was the detailed article on steam absorption cooler working (VAM) and hope you had understood the work of the steam absorption machine which is also known as lithium bromide absorption cooler. If you have any doubts about the steam absorption system, we would like to use the Comments section, we will help you with your confusion. For more such chemical engineering content pay a regular visit. There are many different types of absorption coolers, but they all work on a similar principle. In a low pressure system, an absorber evaporates, removing heat from the chilled water. A heat source such as steam, exhaust or hot water is used to regenerate the absorption solution. The various configurations are explained below Single Effect Hot water-driven absorption cooler One-stage hot water-driven absorption cooler In a single lift Hot water-driven absorption cooler, as the name suggests, the chilled water is once cooled by a refrigerant from a double tray in the evaporator. The evaporated refrigerant is absorbed in a concentrated solution (Normal potassium bromide) This concentrated solution comes from the generator. The concentrated solution is diluted when it absorbs the evaporated refrigerant while the heat is absorbed into the cooling water. The diluted solution in the absorber then flows to the generator through a heat exchanger. The hot 95°C water heats the diluted solution and the refrigerant evaporates. The evaporated refrigerant is condensed and returned to the refrigerant circuit. Diluted absorbent is now regenerated and can be recycled. Double power hot water-driven double-effect hot-water-driven absorption cooler In a 2-Lift hot water-driven absorption cooler there is a main cycle and a auxiliary cycle. The cooled water is cooled twice by the refrigerant from a double tray in the evaporator, and the evaporated refrigerant is absorbed in concentrated solution coming from the second generator. The amount of steam that can be absorbed into absorber is increased by the double tray system. The concentrated solution is diluted solution and the heat is absorbed into the cooling water. The diluted solution in the absorber flows to the first generator through a low temp. heat exchanger and a high temp. heat exchanger, and 95 ° C hot water heats up the diluted solution and the refrigerant evaporates. The absorbent solution becomes a resolution in the first generator and it flows to the second generator through high temp. heat exchanger. The intermediate solution in the second generator is heated by hot water and more refrigerant evaporated in the second generator. The steam is absorbed in absorbent solution in aux. absorb to become aux. diluted solution. The additional diluted solution is delivered to aux. generator through aux. heat exchanger, and the solution is heated by hot water coming from the first generator and becomes aux. concentrated solution. The concentrated aux solution is delivered to aux. absorb through aux. heat exchanger. Refrigerant steam generated in the first generator and aux. generator condenser and then flow into evaporator. The heat in the condenser is absorbed by cooling water. Direct fired absorption cooler Direct fired absorption cooler The directly fired system is similar to the Single Lift Hot Water Series, except that instead of using hot water to regenerate the absorption solution, the solution is heated directly by the gas flame to regenerate the solution and refrigerant. Dual power Exhaust gas driven absorption cooler Double power exhaust gas driven absorption cooler Water boils at low temperature approx. 4.4 °C because it is under vacuum conditions in the evaporator. This means that the cooled water is cooled through the pipes in the evaporator of the evaporating latent heat. This reduces the discharge temperature to about 7oC. A refrigerant pump is used to spray the refrigerant (distilled water) over the evaporator pipes to improve heat transfer. The refrigerant (water) steam flows into the absorber and is absorbed in lithium bromide solution. As this process continues, the lithium bromide becomes a diluted solution and reduces absorption capacity. A solution pump then transfers this diluted solution to the generators where it is reconstructed in two steps (double effect) to boil off the previously absorbed water. The diluted solution is pumped to the high temperature generator where it is heated and concentrated to a medium concentration solution by the extractor heat from the piston engine exhaust gas. The intermediate solution from the high temperature generator flows to the low temperature generator where it is heated to become a concentrated solution at high temperature water vapor released from the solution in the high temperature generator. Since the low temperature generator acts as a condenser for the high temperature generator, the heat energy used in the high temperature generator is used again in the low temperature generator. The reduced heat supply is approximately 45% compared to a single-stage cooler. Vapours released into the shell side of the low temperature generator enter the condenser to cool back to a floating state. The refrigerant water then returns to the evaporator to start a new cycle. To remove the heat from the cooler, cooling water from a cooling tower is circulated first through the pipes in the absorber to remove the evaporation heat. evaporation.

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