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Cooling Towers – the Industrial Workhorses

By Thomas Yoon

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Industrial Processes usually produces a lot of heat. Air-conditioning also removes heat from the indoor areas through heat exchangers.

Where does all the heat go?

All these heat has to be removed. If you are not near the sea, you have to use cooling towers to cool down your warm water.

Cooling towers make use of air currents to cool warm water. However, a basic rule has to be made when you want to extract heat from any object, including water. Heat has to be taken from a higher temperature source to a lower temperature medium.

If the air is already warm, it will not be able to cool down the warm water. The temperature difference is very important.

Another important point in cooling tower efficiency is how much the water is exposed to the air. If the water is allowed to trickle down, and their contact surface with the air is made large, more heat exchange takes place.

Plastic diffusers designed with wavy patterns are inserted at cooling towers to increase the contact surfaces of the water when it meets with the cooling air stream.

There are several shapes of cooling towers, but they operate on the same principle.

There are basically 2 types airflow patterns in cooling towers:

The cross-flow type of cooling tower makes use of air flowing at right angles to the water dropping down. The fans are positioned so that the air stream flows through the cooling tower from the sides. Water is distributed at the top, and is allowed to drip down to meet with the air.

Cooling Towers – the Industrial Workhorses

The characteristic shape of these cooling towers is usually rectangular shape. Depending on the design, there may be several small fans installed at the top of the cooling tower. However, the fan(s) may also be located at the sides of the cooling tower and the air may be ducted.

The counter–flow type of cooling tower makes use of air flowing in the opposite direction and against the flow of the water. In one design, water flows out through rotating spreader arms to distribute the water and let it drop through the plastic diffusers evenly.

In this design, the shape of the cooling tower is a bottle shape. It is fitted with one single large fan to suck the air to create the airflow. The diameter of the area where the heat exchange takes place is made larger so that more contact surfaces is exposed. The fan is heavy and huge. Its speed is usually

made lower than that of the motor by the use of reduction gears.

There may be a few designs. Some use fans located at the bottom, some have fans at the top, some have large fans, some make use of several small fans.

The materials used in cooling towers have to be selected to be able to withstand ultraviolet ray exposure from the sun, moisture and other outdoor weather effects.

Cooling towers are truly rugged workhorses of industry.

Folks, be cool!

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Vital Chemicals for Cooling Towers

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Cooling towers are used to cool down hot condenser water taken from chillers of air conditioning systems. The cooling effect

of cooling towers are attributed to the evaporation of the water when it is blown through by air from the fans.

After some time of circulating through the cooling towers, the water becomes more and more concentrated with the dissolved salts in the water. The concentrated water has to be drained off and fresh new water added into the system to make it less saline.

However, when fresh water is added, it will not have any passivation chemicals to protect the piping and the component condenser parts from corrosion. So chemicals are added to protect the piping and the machinery.

For cooling tower water, the chemical used serve 2 basic functions – a corrosion inhibitor and a biocide.

The corrosion inhibitor is for preventing corrosion in the piping and the related parts. The biocide is to prevent growth of algae, bacteria and other micro organisms.

Every water treatment chemical company has its own formula and special concoctions. A typical corrosion inhibitor may contain about 1 – 10% Potassium Hydroxide or similar alkali. This is then further diluted when mixed with the water in the cooling tower. Being an alkali, it will neutralize any acids found in the water that can cause corrosion to occur.

The cooling tower is installed outdoors. With the ample warmth from the chiller, fresh air and sunlight, the water it contains is a very ideal medium for the growth of micro organism.

Micro organism growing in cooling tower water causes a lot of problems. Clumps of algae can cause chokages in the pump strainers. Long strands of microscopic plants can act like nets that can cause restrictions to the flow of the water. Some organisms cause diseases and other health related problems to people. A typical biocide contains Sodium hypochlorite with concentrations ranging from 10 – 20%. Again, this is further

diluted when mixed with the cooling water.

Even with the dosing of chemicals, the cooling tower needs to be cleaned every now and then. Dusts from the air still manage to settle down inside the sump of the cooling tower. So does

the remains of dead micro organisms. These can stick to the infills and prevent the proper distribution of the water flow.

Sometimes cooling tower plastic infills get brittle due to the exposure to ultraviolet rays found in sunlight. They often break up into small particles that can choke even coarse filters.

Folks, it's time to clean up!

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