



Working and Functioning of Industrial Air Cooled Heat Exchangers

Lily William *

Department of Chemical Engineering, The University of Adelaide, Adelaide, Australia

DESCRIPTION

An industrial cooling tower is a device that acts as a heat-dissipating device. It removes the residual heat of the water and thus lowers the temperature of the water. It is used in industries to reduce water temperature and thus provide process cooling water.

Naturally aspirated cooling towers operate by natural convection to circulate air completely through the tower. Hot water that comes from the facility and needs to be cooled is pumped by a pump to the top of the cooling tower, which is considered the cooling tower inlet or hot water inlet.

Types of cooling towers

Utilities are neither a reactants nor a catalyst but its absence can affect a chemical reaction. Utilities are equivalent to the core of any industrial process as they play an important role in maintaining the complete requirements of the product process.

There are different types of utilities used in the chemical industry; the widespread use of cooling water can be seen in manufacturing industries such as reactor housings, heat exchangers, furnace shells and many others.

Cooling tower operation

Cooling tower works on the principle of water evaporation. Hot water is sprayed from the top of the cooling tower, exchanging heat with atmospheric air and reducing the temperature of the hot water. Convection heat transfer mode is used in cooling towers, where heat is transferred between air and water. Coolant is a utility used as cold side and hot side fluid in heat exchangers depending on temperature requirements. Coolant is pumped from the reservoir at the plant, where it is used in the reactor shell, in the heat exchangers, in the reactor shell. After the heat exchange of these devices, its temperature has increased, so it is sent to the cooling tower. Cooling towers reduce water temperature. The water is pumped back to the plant again and used as a utility for the plants.

Cooling tower industrial application

This is the basic cooling water flow, where the cooling water is taken from the tank and pumped to the plant, and then the cooling tower reduces the temperature to be cooled by the cooling tower and pump back to the factory again. Therefore, to use water again, people use cooling towers.

The hot water inlet is connected to a series of nozzles also known as dispensers that use this nozzle to be sprayed evenly over the filling material. The purpose of the filler material is to provide a larger contact surface for heat transfer. Cool air is generated at the bottom of the tower and then flows to the top where heat transfer takes place between the hot water coming from the top and the cool air from the bottom. Hot water removes heat after exposure to the air and in the process some of the water evaporates.

The cooled water after heat transfer is collected into the tub or the bottom of the tower, and the warm/hot and humid air exits from the top of the tower to the atmosphere. Air movement takes place because of difference in density between the air that enters inside and the one that is already inside within the tower. The warm and moist air is denser as compared to the cool air and therefore, it rises through the tower. The dry and cool air from outside the tower will fall in, creating a constant cycle of air flow.

Mechanical draft

Working principle of mechanical cooling tower is similar as natural cooling tower which is principle of evaporation but the only difference is here the air is circulated into the cooling tower is through mechanical means here fans/propellers are used to create air.

Mechanical draft cooling tower are of two types:

Forced draft cooling tower: In the Forced draft system, an exhaust fan placed at the base which forced the air to flow from the bottom to top of the tower. A drift eliminator is installed

Correspondence to: Lily William, Department of Chemical Engineering, The University of Adelaide, Adelaide, Australia, E-mail: wilily@uae.au

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inside the tower to prevent the loss of water droplets along with the forced air.

Induced draft cooling tower: In an induced draft cooling tower a fan is installed centrally at the top, which creates suction in the cooling tower and discharges it to the atmosphere. This creates a flow of air from bottom to top with a force and results in a reduction in the temperature of hot water. The only difference between the induced draft cooling tower and forced draft cooling tower is that the fan is located at the top in the induced draft cooling tower. Induced draft cooling tower chemical weak.

Another types of cooling tower are categorized is based on air flow pattern. There are two types:

Cross flow cooling tower: In a cross-flow cooling tower, hot water sprayed from the top which is perpendicular to air which

enters from the sidewalls of the tower horizontally and then rises upward from the center of the cooling tower. In cross-flow cooling towers air enters at 90 degrees in the direction of the water. Because the water and air flows intersect, these types of cooling towers are called cross-flow cooling towers.

Upstream cooling tower: In an upstream cooling tower, water is sprayed through pressurized nozzles near the top of the tower and flows through the fill material and the air enters below the fill and moves upward in the opposite direction of the flow of the water stream. Because the air and water flows in the cooling tower are opposite, these cooling towers are called countercurrent cooling towers.