Experimental and investigation of induce draught cooling tower

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ABSTRACT

Cooling tower is one of the important utility in chemical industries. Normally they are used to dissipate heat from heat sources to heat sink. The cooling of hot effluent and process water is required from reuse and environmental point of view. The water cooling happens because of humidification of air. The heat lost by water is heat gained by air. Water loss is due to evaporation. Our aim is to develop such system, which reduce water evaporation.

KEYWORD : *fills, fans, motor, liquid to gas ratio, drift eliminator*

Introduction:

A cooling tower is a heat rejection device that reject waste heat to the atmosphere through the cooling of water stream to a lower temperature.cooling tower may either use the evaporation of water to remove process heat and cool the working fluid to near the wet bulb air temperature orin the case of close circuit dry cooling tower, rely solely on air to cool the working fluid to near the dry bulb air temperature.

(1.1) . The fill performance of Natural Draft Cooling Tower (NDCT) using CFD has been analyze to measure the heat transfer rate and flow mechanics of fill characteristics. analyzing the thermal performance of CT, non uniform water flow pattern generated with the help of circular spray nozzle fitted in square manifold with cellular packing. He found out radial spray pattern of individual nozzle give best thermal performance by optimization. In Cooling Tower (CT) mainly three zones was present to reject heat namely spray, rain and packing zone if rain and spray zone neglect and calculated error was 6.5% and solved by Engineering Equation Solver (EES) software has been use to calculate the normalized fill performance index of CT, which is the function of weight gain by fouling. A relationship has been between packing mass transfer coefficient and pressure drop through experimental test. presented a fouling model using data available in the literature and found that effectiveness of CT significantly degrade with time. produced an empirical equation for fill loss coefficient and they concluded that it is more efficient than common available methods in the literature. The experimental investigation was carried out on CT and they found that mass transfer phenomenon in packing of CT as function of liquid and gas flow rate.

(1.2) Most towers employ fills (made of plastic or wood) to facilitate heat transfer by maximizing water and air contact. Fill can either be splash or film type.

With splash fill, water falls over successive layers of horizontal splash bars, continuously breaking into smaller droplets, while also wetting the fill surface. Plastic splash fill promotes better heat transfer than the wood splash fill.

Film fill consists of thin, closely spaced plastic surfaces over which the water spreads, forming a thin film in contact with the air. These surfaces may be flat, corrugated, honeycombed, or other patterns. The film type of fill is the more efficient and provides same heat transfer in a smaller volume than the splash fill.

(1.3). The major factors in deciding the number of fan blades are as below:

Blade Strength:

Fig -1 Design of blade

There is a limit of blade strength in bearing the torque or horsepower. In case of Hudson Products Corp. the maximum and Trouble Free BHP/Blade by the fan diameter Is as a general rule, do not select the fans near to the limit of BHP/Blade specified like above. The high BHP/Blade will cause a fatigue in a short period due to the high blade air loading, and will make a trouble for the vibration noise. Author's experience is the less number of fan blades causes the severe vibration (called Throat Flutter) in the fan stack, unless a special attention in making the fan stack is paid. Any fan that is effectively moving air at the tips of the blades will develop a reduced pressure area (or suction) on the fan throat at the tip of the blade. This suction tends to draw the throat toward the tip of each blade, which means that a four blade fan would tend to draw the throat into something approaching a square while a six blade fan would draw it into something resembling a hexagon, etc. Since the fan is rotating, the effect on the throat is that of continually drawing it into a rotating polygon. The resulting throat flutter is frequently mistaken for fan unbalance. A substantial throat will be sufficiently rigid that flutter will not exist. A weak or flexible throat, particularly when used with a fan of a low number of blades, will be greatly affected by this type of vibration. Throat flutter is easily detected due to the fact that it is invariably of a frequency of the fan RPM times the number of blades on the fan. If in doubt that throat flatteries the cause of vibration, reduce the angle of the blades until the fan is doing little or no work. If the vibration ceases under this condition, it is certain that throat flutter is present when the blades are loaded. Throat flutter will cause no damage to the fan so long as the throat does not disintegrate and fall into the fan blades. It may be eliminated by stiffening or bracing the throat.

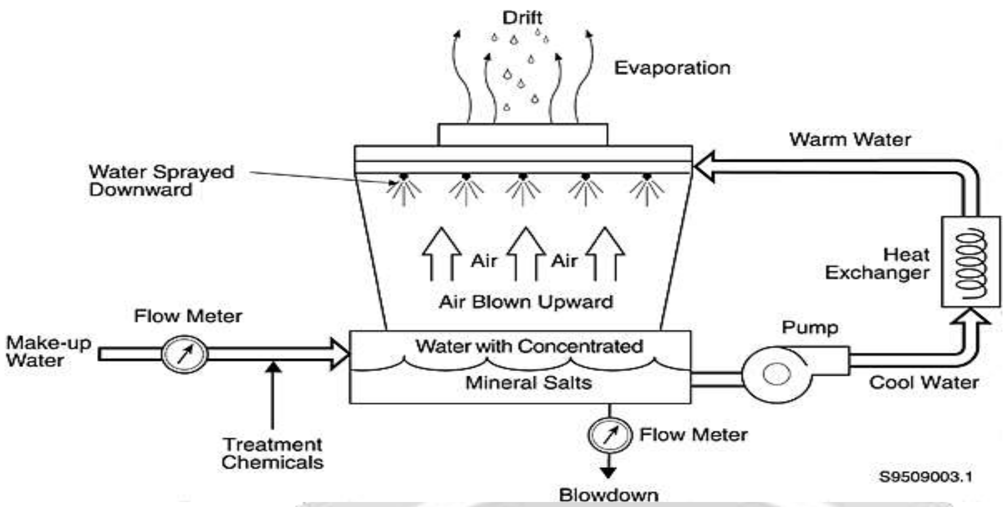

Fig -1 working of tower

(1.4). Cooling tower is utilizing very important role in chemical industries. in mainly use of chemical industries to hot water convert in to cool water. main purpose is to reuse the water. now days use two type of cooling tower natural draught and mechanical draught. Further classification in mechanical draught are induced draught and forced draught. According to requirement use. in natural draught require large land space compare to mechanical draught. In natural draught affected to atmosphere air or air velocity. mechanical draught generally known as a used a fan. In this fan is used to circulating of air in tower.

In cooling tower air circulating in two ways(1) cross flow (2) counter flow. In counter flow is the optimum result given . in counter flow not a contact between air and water. Heat transfer by convection. Not mixing of water and air. And cooling tower efficiency mainly affected a liquid to air ratio.

Also in filling the material is very important and It was observed that vertical preference of packing improve performance. Closure strategy and water dispersion are important for optimization of cooling towers.

(1.5). In mechanical draught other classified(1) Forced Draught Counter Flow Cooling Tower (2)Induced Draught Counter Flow Cooling Tower (3)Induced Draught Cross Flow Cooling Tower

In induced draught hot waters enters at top of the tower and passing through fills. air moves vertically upward through the fill counter to the downward fall of water. Because of the need for extended intake and discharge plenums; the use of high pressure spray systems; and the typically higher air pressure losses, some of the smaller counter flow towers are physically higher; require more pump head; and utilize more fan power than their cross flow counterparts. In larger counter flow towers, however, the use of low pressure, gravity related distribution systems, plus the availability of generous intake areas and plenum spaces for air management, is tending to equalize, or even reverse, this situation. The enclosed nature of a counter flow tower also restricts exposure of the water to direct sunlight, thereby retarding the growth of algae.

In counter flow air flow directly opposite side to the flow of water. Air flow enter from the free side and passing move vertically and water is sprayed by pressurized nozzle and opposite to air flow. Fills material honeycomb and PVC that help to heat decapitation .in square type of cooling tower less noise and use for high efficiency and high performance.

As the metallic fans are manufactured by adopting either extrusion or casting process it is always difficult to generate the ideal aerodynamic profiles. The FRP blades are normally hand moulded which facilitates the generation of optimum aerodynamic profile to meet specific duty condition more efficiently. Cases reported where replacement of metallic or Glass fiber reinforced plastic fan blades have been replaced by efficient hollow FRP blades, with resultant fan energy savings of the order of 20–30% and with simple pay back period of 6 to 7 months. Also, due to lightweight, FRP fans need low starting torque resulting in use of lower HP motors. The lightweight of the fans also increases the life of the gear box, motor and bearing is and allows for easy handling and maintenance.

Square type of induce draught cooling tower is compact in size and silent. these features facilitate low speed around air inlet and its turnery fair distribution of air flow and cooling tower made from FRP is many advantages firstly low cost , secondly light weight , thirdly outside cooling tower is covered with UV protector film. The best thing for us is require less power of fan so reduced the cost. So we conclude that our induced draught cooling tower made in square and material used is FRP.

Conclusion:

The described study allows site specification scenario for the possible development of water temperatures and related impact on the power plant cooling system. These are e.g. cooling water temperature , requirement of power to circulating air, rpm of fan, using different – different material of fan, using in different material of fills. therefore, the model will be provide a basis for site-specification. Keep the height of cooling tower as long as possible. Exhaust fan rpm should be high.

we justify our project title as far as possible . according to these thing in two way (1) changing material of fills for e.g. used honeycomb, v-bar, polythining, etc…(2) changing material of fan , we used FRP, plastic ,metallic, etc…. and put them in different angle check which will give a optimum result to achieve our object successfully.

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