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Survey on Cooling Tower

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Abstract – Cooling towers are one in every of the most necessary industrial utilities used to dissipate the unwanted method heat to the atmosphere through the cooling water within the heat exchangers across the plant site. Cooling system is one in every of the most expensive utility in terms of power consumption and water circulation. Maintaining water quality within the circulation loops is one in every of the main challenges in method improvement for many efficient performance. To identify the key performance parameters with respect to perspective of the operations' team, the water chemistry is the most crucial level and demands proper understanding to maintain complete control over the variations.

Keywords: Cooling Tower, Water Treatment, Performance of Cooling Tower.

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1. INTRODUCTION

In several chemical plants a cooling towers are a very important part. The initial stage of cooling system is to discard heat into the atmosphere. They represent a comparatively inexpensive and dependable means that of removing low-grade heat from cooling water. The make-up water supply is employed to replenish water lost to evaporation. Hot water from heat exchangers is distributed to the cooling system. The water exits the cooling system and is sent back to the exchangers or to different units for more cooling. Cooling towers are able to lower the water temperatures over devices that use only air to reject heat, just like the radiator during a car, and are thus more cost-effective and energy efficient.

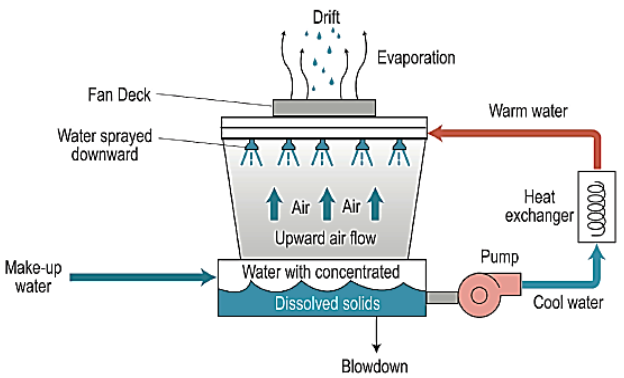

Fig.1 Schematic of an Induced Draft Cooling Tower

2. LITERATURE REVIEW

KENMORTENSEN cooling-loop water maintenance is essential to efficient operation of the process served. Control of biological growth is essential alongside control of scaling and corrosion. Water treatment could be a complicated undertaking with several parameters to consider once properly treating a particular application. Consult a qualified water services company to make the correct program for your system.

M. V. H. Satish Kumar observed that in part load condition liquid to gas ratio is decreased even for same heat removal and same temperature differential as in full load condition. We know that L/G ratio is depends on inlet and outlet air enthalpies at their wet bulb temperatures and differential temperature of cooling water and however as outlet air enthalpy at WBT is decreased obviously the L/G ratio decreased.

J. Smrekar analyzed the water distribution across the plane area of the cooling tower. We have adjusted the number of water to suit the air flow conditions, that can't be influenced with natural draft cooling towers. we have found that it's attainable to determine the optimum water/air mass flow ratio for a cooling system, that has got to be as little and as constant as possible across the whole plane space of the cooling system. During this approach, the optimum moistening of the CT packing is ensured, which ends in a very simpler heat transfer. With a continuing water/air mass flow ratio, a continuing local water outlet temperature is obtained, that decreases the entropy generation and also the energy lost from the cooling system. The result's a lower outlet water temperature from the cooling system and, thus, from the condenser, which ends in greater efficiency of the power plant.

Ramakrishnan RAMKUMAR discuss the appliance of Taguchi technique in assessing most cooling system effectiveness for the counter flow cooling using expanded wire mesh packing. The experiments were planned supported Taguchi's L27 orthogonal array .The path was performed under completely different water conditions of flow of water, air and water temperature. Signal-to noise ratio (S/N) analysis, analysis of variance (ANOVA) and regression were administered so as to see the results of method parameters on cooling effectiveness and to identity optimum issue settings. Finally confirmation tests verified this dependability of Taguchi technique for improvement of counter flow cooling performance with sufficient accuracy.

3. TYPES OF COOLING TOWER

Natural draft cooling tower

The natural draft or hyperbolic cooling makes use of the difference in temperature between the close air and also the hotter air within the tower. As hot air moves upwards through the tower (because hot air rises), recent cool air is drawn into the tower through an air inlet at the bottom. Because of the layout of the tower, no fan is needed and there's virtually no circulation of hot air that might have an effect on the performance. Concrete is employed for the tower shell with a height of up to 200 m. These cooling towers are principally just for giant heat duties because giant concrete structures are expensive. There are 2 main sorts of natural draft towers:

- **Cross flow tower:** air is drawn crosswise the falling water and the fill is located outside the tower
- **Counter flow tower:** air is involved through the falling water thus and also the fill is therefore placed within the tower, though style depends on specific site conditions.

MECHANICAL DRAFT COOLING TOWER

Mechanical draft towers have giant fans to force or draw air through circulated water. The water falls downwards over fill surfaces, that facilitate increase the contact time between the water and therefore the air - this helps maximize heat transfer between the 2. Cooling rates of mechanical draft towers depend on varied parameters like fan diameter and speed of operation, fills for system resistance etc.

OPEN VS. CLOSED-CIRCUIT TOWERS

One of the first differentiations between cooling towers is whether it's AN open or closed- circuit tower. In open towers, the cooling water is pumped through the instrumentality wherever it picks up thermal energy so flows on to the cooling system wherever it's dispersed through spray nozzles over the fill, wherever heat transfer happens. Then, this same water is collected within the tower sump and is sent back to the instrumentality to begin the method once more. In an open tower any contaminants within the water are circulated through the equipment being cooled.

In a closed-circuit tower, generally observed as a fluid cooler, the cooling water flows through the equipment as within the open tower. The difference is once the water is pumped to the cooling system, it's pumped through a closed loop device that's internal to the cooling system, then came to the equipment. During this application, water within the closed-loop system isn't in direct contact with the evaporative water within the tower, which implies contaminants aren't circulated through the equipment. in a very circuit tower, a small pump, called a "spray pump" circulates a separate body of evaporative water from the tower sump, through the spray nozzles and over the inner device piping. This "open" evaporative body of water is contained among the tower and wishes to be regularly created up to fill again evaporative and alternative losses. However, once water treatment within the closed cooling loop is stabilized, the only time it must be created up or adjusted is that if there's a leak.

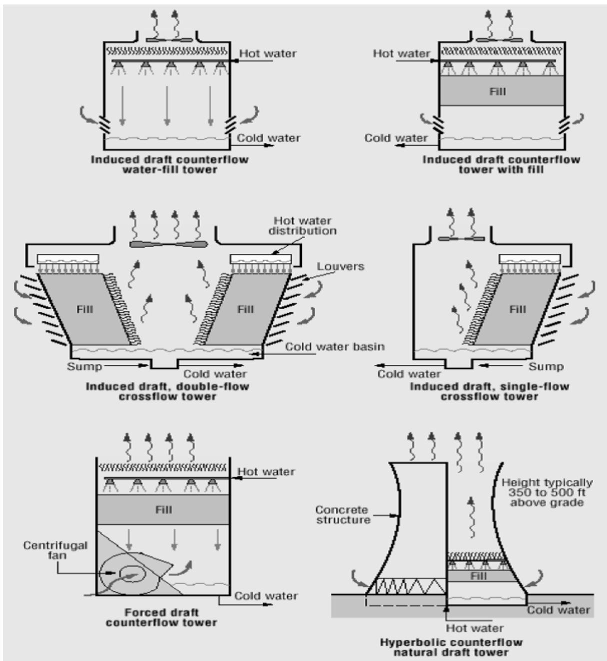

Fig.2 Cooling Tower Types

Hybrid Towers

Hybrid towers are closed towers which might operate either within the smart heat transfer mode only (without evaporation) or a mixture of smart and latent heat transfer (with evaporation). in periods of low load and/or low close temperature, the spray of water is stopped and heat is sensibly transferred to the flow of air across the fins of the coils containing the cooling fluid. In periods once this can be not enough, a latent heat transfer system is activated by change on an evaporative cooler or water is sprayed across the dry coils to permit for increased heat transfer through evaporation. These processes provide substantial savings in water.

4. CONCLUSION

Based on the study on the assigned project, it's suggested to reduce the water leakages within the tower by overcoming the development flaws of the project. More it additionally suggested pursuing the choices for water and chemical conservation opportunities in cooling operation. The field can unleash the wide spectrum of value effective and environmental friendly in operation practices which might be next to the international eco-efficiency standards.

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