# Process technology

## Introduction

 The cooling towers actually serve the prime role in any chemical plant, vividly. However, various companies often encounter problems that are related to scaling, fouling, and corrosion of the same. Hence, a huge cost has to be borne pertaining to the efficiency degradation and material replacement. At times, the extent of problem even reaches the level of production loss. With the passing time, the technologies have improved to a large extent and the cooling tower programs and water treatment technologies have evolved. It has ever become possible because of the water supply choice and more stringent regulations pertaining to the discharge. Most of the plants follow a stipulated procedure for combatting issues related to corrosion, scaling, and fouling. In this paper, it will be elucidated how cooling tower-oriented problems are solved in process technology, via harmonization of the effects and causes.

Research question: What are the core problems associated with the cooling tower used for water treatment and how such problems can be solved?

## Discussion

### Problem

 The mechanism of cooling tower is quite transparent. After all, the cooling towers actually remove the heat through the process of nothing but evaporation. Therefore, a lot of water is used up in this process so as to cool down. However, at times, a large quantity of solids remains as a residue after the completion of evaporation process. On the other hand, it largely depends on the quantity of water added to the tower and the unit’s operation efficiency (Rubio-Castro et al. 959). Therefore, most of the times, the plants undergo the need for removing solid wastes and increase the necessity to blowdown. Most importantly, the dissolved solids’ build up can actually corrode equipment or at the least, scale down the same. It is crucial to remember that those solids are extracted from the circulating water.

 Another problem is related to the low cycle pertaining to concentration. A facility must encounter at least 3 to 6 concentration cycles. On one hand, over 5 cycles are ideal; on the other hand, the higher cycles lead to less blowdown and making up of water thereby saving the chemicals, water, and cost.

### Causes and effects

When the blowdown takes place, treatment chemicals and circulation water also corrode along with those wastes that are available in the solid form. Thus, there is a need for monitoring this process proximately. On the contrary, if the cooling tower needs more amount of blowdown then chances are high that the same is not as efficient as before. Therefore, an effective tower will mostly need the appropriate amount of water and correct chemistry of circulation. It will then help in avoiding the problematic disposition, effective running, and maintain an adequate amount of blowdown. As a result, in return, the same will assist in conserving the chemicals needed and water amount collected.

In the next instance, when the systems operate at a much lower cycle both the chemical usage and water consumption can greatly increase to a large extent thereby causing excess cost addition. Some tower operators can run at a low cycle intentionally. However, others actually aim to maintain a higher concentration cycle.

### Solutions

 There is only a handful amount of solutions available for decreasing the cooling tower’s blowdown amount. For instance, the feed water filtration can be improved. Secondly, the side-stream filtration should be in higher quality. On the other hand, the cycle of concentration can be largely surged. Next, the cooling tower feed may be closely managed or changed all together. Last but not the least, the plants can maintain better water chemistry makeup by simply removing the corrosion causing and scale forming impurities.

 The cooling tower expert is definitely the best judge in this regard. He can provide the best of solutions for a plant. However, there are only few solutions that can be implemented to resolve the problems associated with the cycles of concentration. For example, better controlling of cooling tower can be achieved by minimizing the blowdown (Altman et al. 181). On the other hand, the alkalinity and pH control can also be done for minimizing the formation of scale. Apart from these, the microbial growth management also be done along with the decrease in silica, iron, and hardness feed. Moreover, biocide is also required for treating the water in cooling tower. The main intention of using biocide is to eliminate any harmful organism or bacteria. Therefore, the biological growth is prevented in this manner as well.

 Lastly, recovery and reuse of those cooling towers’ water is extremely important for conservative of the natural resources. The wastewater reclamation is done via an economically and viable option such as the membrane technology (Yu et al. 140). As a result, this should be used for further water recovery. Moreover, the blowdown’s waste stream water always contains a large amount of salt.

## Conclusion

 The process technology chosen for this study is cooling tower. It can be observed from the above-paper how cooling tower faces problems in regards to the high blowdown amount and low concentration cycle. Their reasons have also been elucidated elaborately in this paper along with the solutions. Lastly, along with the solutions a step to preserve water has been suggested here itself. For instance, water can be recycled by using the membrane technology.

## Works Cited

Altman, Susan J., et al. "Membrane treatment of side-stream cooling tower water for reduction of water usage." *Desalination,* vol. 285, no.1, 2012, pp.177-183.

Rubio-Castro, Eusiel, et al. "Synthesis of cooling water systems with multiple cooling towers." *Applied Thermal Engineering,* vol.50, no.1, 2013, pp. 957-974.

Yu, Xianguo, et al. "Experimental evaluation on concentrating cooling tower blowdown water by direct contact membrane distillation." *Desalination,* vol.323, no.1, 2013, pp.134-141.