# DEVELOPMENT OF AN INTEGRATED OPTIMIZATION FRAMEWORK FOR A COOLING WATER NETWORK

## Introduction

Integrated optimization of a cooling water network can result in large energy savings. A cooling tower is a primary component of a cooling water network. There are different types of cooling towers: induced draft, forced draft, natural draft and hybrid-draft. The thermal performance and modes of operation of these towers differ from each other. Although large scale chemical plants occupy quite an assortment of cooling towers, distribution of cooling water streams and their temperatures among these cooling towers and heat exchanger networks is not optimal. In addition to energy efficiency, new measures taken by companies to improve cycles of concentration (CoC) should also be considered when implementing integrated optimization of the cooling water network. Improving the CoC results in the increase of scaling and corrosion potential of water.

## Methodology

Steps involved in developing an integrated optimization framework for a cooling water network are:

1. Familiarize with the cooling water network through literature review. Build a case study through discussions with industrial partners and content from literature review.
2. Identify factors affecting the optimization problem. For example: scaling potential, corrosion potential, energy requirements of pumps and fans.
3. Build an objective function. Identify constraints e.g. maximum flow rates, maximum plausible CoC.
4. Develop a model for heat exchangers (models have already been developed within the project for induced draft, forced draft and hybrid draft cooling towers).
5. Develop an integrated model structure for heat exchangers and multiple cooling towers (ample assistance can be provided for this endeavor).
6. Develop an optimization algorithm (ample assistance for this too).
7. Write thesis.

Image adapted from:
https://www.greenhumour.com/2010/04/replenishable-resources_22.html

## Objectives of the thesis

Development of an optimization framework for multiple cooling towers and heat exchangers that results in savings of energy and water usage. The framework is intended for implementation within the AQUASPICE project.


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