



Simulation and optimization of the Cooling Water distribution system in LHC plant

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to obtain the Master's degree in Chemical Engineering
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Tarragona, April 2024

Abstract

The cooling water system at Dow Chemical Ibérica's ethylene production plant represents a production bottleneck in summer due to increased cooling requirements. In addition, several heat exchangers users of the system have reliability problems due to low velocities caused by a poor distribution which leads to fouling and pitting corrosion problems. Therefore, it is required to improve its distribution to meet the needs of the plant in summer and enhance the reliability of the heat exchangers.

The present project aims to optimize the cooling water distribution system of the cracker plant through its hydraulic simulation in order to improve the reliability and performance of the critical heat exchangers identified in the system in terms of cooling water velocity and heat transfer.

To do so, first of all, a literature review was done to keep up to date on large cooling water distribution systems, and a project database was created by gathering all necessary information to build the hydraulic model (equipment data sheets, equipment geometry drawings, piping isometrics, flowsheets, piping and instrumentation diagrams, MET design documents...).

Following this, the hydraulic model of the plant's cooling water system was simulated and once validated with real plant data, it was analyzed for a period of maximum production and in the summer season, identifying the critical heat exchangers of the system in terms of fluid velocity and heat duty.

Finally, after identifying the critical heat exchangers, different actions were studied to improve its reliability and thermal performance. In the short term, it is proposed to block the cooling water in some heat exchangers out of service in the system to redistribute more water to the critical heat exchangers. In the medium term, it is planned to implement restriction orifices in the heat exchangers with excess heat duty to redistribute the excess water flow to the critical heat exchangers. And in the long term, since it involves increasing the capacity of the system and requires the resizing of the distribution nozzles of the different cells of the cooling tower and a more in-depth study of the performance of the tower for the new capacity, the impellers of the pumps can be increased according to their technical data sheets, and the possibility of adding a new pump to the system is also considered, although the latter is not very feasible since it involves very significant investment costs.

The optimization of the cooling water system results in increase production especially in summer, savings in heat exchanger cleaning costs and savings in other plant utilities.

This project is part of Dow's internal projects and is under confidential restrictions. For further information, please directly contact Karina Cuevas.

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