

## Optimization and Retrofitting for an Egyptian Refinery Water Network

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**Abstract :** Scarcities in the supply of freshwater, strict regulations on discharging wastewater and the support to encourage sustainable development by water minimization techniques leads to raise the interest of water reusing, regeneration, and recycling. Water is considered a vital element in chemical industries. In this study, an optimization model will be developed to determine the optimal design of refinery's water network system via source interceptor sink that involves several network alternatives, then a Mixed-Integer Non-Linear programming (MINLP) was used to obtain the optimal network superstructure based on flowrates, the concentration of contaminants, etc. The main objective of the model is to reduce the fixed cost of piping installation interconnections, reducing the operating costs of all streams within the refinery's water network, and minimize the concentration of pollutants to comply with the environmental regulations. A real case study for one of the Egyptian refineries was studied by GAMS / BARON global optimization platform, and the water network had been retrofitted and optimized, leading to saving around 195 m<sup>3</sup>/ hr. of freshwater with a total reduction reaches to 26 %.

**Keywords :** freshwater minimization, modelling, GAMS, BARON, water network design, wastewater reduction

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