

## Pinch Technology for Minimization of Water Consumption at a Refinery

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**Abstract :** Water is the most significant entity that controls local and global development. For the Gulf region, especially Saudi Arabia, with its limited potable water resources, the potential of the fresh water problem is highly considerable. In this research, the study involves the design and analysis of pinch-based water/wastewater networks. Multiple water/wastewater networks were developed using pinch analysis involving direct recycle/material recycle method. Property-integration technique was adopted to carry out direct recycle method. Particularly, a petroleum refinery was considered as a case study. In direct recycle methodology, minimum water discharge and minimum fresh water resource targets were estimated. Re-design (or retrofitting) of water allocation in the networks was undertaken. Chemical Oxygen Demand (COD) and hardness properties were taken as pollutants. This research was based on single and double contaminant approach for COD and hardness and the amount of fresh water was reduced from 340.0 m<sup>3</sup>/h to 149.0 m<sup>3</sup>/h (43.8%), 208.0 m<sup>3</sup>/h (61.18%) respectively. While regarding double contaminant approach, reduction in fresh water demand was 132.0 m<sup>3</sup>/h (38.8%). The required analysis was also carried out using mathematical programming technique. Operating software such as LINGO was used for these studies which have verified the graphical method results in a valuable and accurate way. Among the multiple water networks, the one possible water allocation network was developed based on mass exchange.

**Keywords :** minimization, water pinch, water management, pollution prevention

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