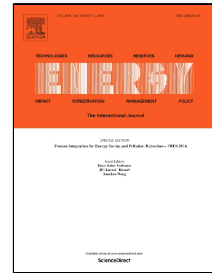


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# *Optimization of multi-plants cooling water system*

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**Abstract:** Conventionally, cooling water system is optimized within a single plant. In reality, a set of cooling towers supply water for multiple plants. This paper presents an optimization model for multi-plants cooling water system. Instead of using a set of uniform pumps to transport cooling water, this work proposed a novel multi-loops pump network and an updated main-auxiliary pump network to reduce pumping energy. Distance factors and pipeline layouts are considered owing to the long distance between plants and pump station. Connecting patterns of different pump networks are investigated and corresponding piping costs are treated as optimized variables. Cooler and pump networks, cooling tower and pipeline layouts are optimized simultaneously. The model is formulated as a mixed-integer nonlinear programming (MINLP) problem. The objective is to obtain the cooling water system with minimized total annual cost. Two case studies are used to illustrate the effectiveness of the proposed structure.

Key work: cooling water system, pump network, multi-plants, pipeline layout, MINLP.

## **1. Introduction**

Cooling water systems are widely used to dissipate low-grade heat of chemical and petrochemical process industries, electric-power generation stations, refrigeration, and air conditioning plants[1]. Cooling water system consists of cooler network, pumping system and cooling tower. The pumps in cooling water system consume a large

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