Optimal Design of Water and Hydrogen Networks
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Abstract
Process integration technology is an efficient way to reduce the consumption of freshwater and hydrogen utility consumption. Pinch-based graphical approaches and mathematical methods of process integration are widely employed in water network and hydrogen network optimization. So far as we know, the pinch based design methods have one and only one target—the minimum utility consumption. However, in the practical design, there are many other concerns. For example, the integrated network may be disrupted by the fluctuation of actual operating conditions such as the flowrate fluctuation of hydrogen streams in refineries. When there are several different distributions of hydrogen network with the same utility consumption, it is necessary to measure their robustness. In this paper, a new graphical design method, graphical nearest neighbors is proposed to design the networks that meet the targeting result. In mass load versus flowrate diagram, once the minimum utility is targeted, the networks can be achieved through this method. Then a new concept, mixing potential (M) is proposed for the first time to verify the most robust network configuration from alternative designs when they are confronted with flowrate fluctuations. An example is illustrated to show the effectiveness of this method.

Keywords: graphical methods; network design; mixing potential; robustness

References


