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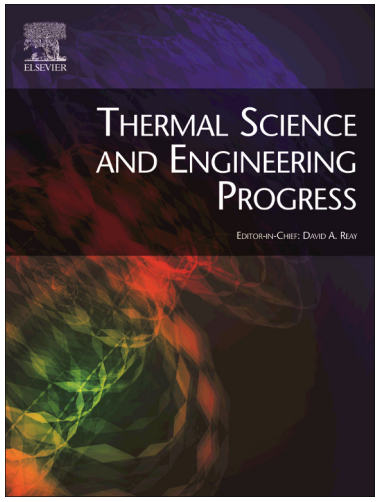

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Numerical study of water flow rates in power plant cooling systems

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Abstract

The paper presents a mathematical model for studying series-parallel hydraulic systems. The analytical approach is based on a set of non-linear algebraic equations solved using numerical techniques. As a result of the iterative process, a set of volumetric flow rates is obtained for the water flows through all the branches of the hydraulic system investigated. As examples of the practical applications, the following are investigated: a cooling system of a power boiler's auxiliary devices and a closed cooling system containing condensers and cooling towers. In the first example, the calculations show the influence of changes in the characteristics of circulating pumps or elbows on the total cooling water flow rate in the installation analyzed. Such an approach makes it possible to analyze different variants of the modernization of the system studied, as well as to indicate its critical elements. In second case, knowledge about the water distribution in the cooling system can improve cooling processes inside cooling towers and, in this way, have a direct influence on better pressure conditions inside condensers. The results of numerical modelling are useful during modernization of the installation. By examining various solutions, an investor can choose the optimal variant of the reconstruction of the installation from the economic point of view.