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Multiparametric Optimization of Water Treatment Process for Thermal Power Plants

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Abstract : The formulated problem of optimization of the technological process of water treatment for thermal power plants is considered in this article. The problem is of multiparametric nature. To optimize the process, namely, reduce the amount of waste water, a new technology was developed to reuse such water. A mathematical model of the technology of wastewater reuse was developed. Optimization parameters were determined. The model consists of a material balance equation, an equation describing the kinetics of ion exchange for the non-equilibrium case and an equation for the ion exchange isotherm. The material balance equation includes a nonlinear term that depends on the kinetics of ion exchange. A direct problem of calculating the impurity concentration at the outlet of the water treatment plant was numerically solved. The direct problem was approximated by an implicit point-to-point computation difference scheme. The inverse problem was formulated as relates to determination of the parameters of the mathematical model of the water treatment plant operating in non-equilibrium conditions. The formulated inverse problem was solved. Following the results of calculation the time of start of the filter regeneration process was determined, as well as the period of regeneration process and the amount of regeneration and wash water. Multi-parameter optimization of water treatment process for thermal power plants allowed decreasing the amount of wastewater by 15%.

Keywords : direct problem, multiparametric optimization, optimization parameters, water treatment
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