Mathematical modeling of the thermal effect on the aquatic environment from thermal power plant by using two water discharged pipes

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Abstract: In this work presents a mathematical modeling of the thermal load on the aquatic environment by using two water discharged pipes of TPP. It is solved by the Navier-Stokes and temperature transport equations for an incompressible fluid in a stratified medium. [1], [3], [4]. Numerical method is based on the projection method [2] which was approximated by the finite volume method. The numerical solution of the equation system is divided into four stages. At the first step it is assumed that the momentum transfer was carried out only by convection and diffusion. Intermediate velocity field is solved by 5-step Runge-Kutta method. At the second stage, the pressure field is solved by found the intermediate velocity field. Poisson equation for the pressure field is solved by Jacobi method. The third step is assumed that the transfer is carried out only by pressure gradient. The fourth step of the temperature transport equation is also solved as momentum equations. The obtained numerical results of stratified flow for two water discharged pipes were compared with experimental data and with numerical results for one water discharged pipe. General thermal load in the reservoir-cooler decreases comparing with one water discharged pipe and revealed qualitatively and quantitatively approximately the basic laws of hydrothermal processes.

Keywords: Stratified medium, Navier-Stokes equation, Thermal discharge, Operational capacities of thermal power plant

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References

[1] Fossati, M.,Piedra-Cueva, I. "Numerical modelling of residual flow and salinity in the Rio dela Plata", *App. Math. Modelling*, vol. 32(6), pp. 1066-1086, 2008.

[2] Chorin, A.J. "Numerical solution of the NavierStokes Equations", *Math.Comp*, vol. 22, pp. 745-762, 1968.

[3] Issakhov, A. "Mathematical modeling of the discharged heat water effect on the aquatic environment from thermal power plant", *Int. J. of Nonlin. Sc. and Num. Simulation*, vol. 16(5), pp. 229–238, 2015.

[4] Issakhov, A. "Mathematical modeling of the discharged heat water effect on the aquatic environment from thermal power plant under various operational capacities", *App. Math. Modelling*, Vol. 40(2), pp. 1082–1096, 2016.