

# **Experimental and Numerical Study for Turbulent Flow Drag Reduction in piping system of District Cooling**

## **Thesis ABSTRACT**

In the present study an experimental and numerical investigations were performed for district cooling piping system in order to decrease the energy consumption as an application of the drag reduction phenomena. Simulation was carried out using finite volume method In order to maximize system efficiency by reducing pumping power due to the appearance of drag reduction phenomenon at certain concentrations of ethylene glycol in water. The drag reducing agent used is ethylene glycol ( $C_2H_6O_2$ ), this agent is considered as an organic liquid compound used as an anti-freeze by reducing freezing temperature of water and rising boiling point of water. Several concentrations were tested and the simulation results were in fair agreement with the experimental case studies. Results showed that with increasing ethylene glycol concentration the drag reduction increases till it reaches a maximum value of 10% at concentration of 4000 PPM and  $Re=26700$ . An empirical correlation between Reynolds number and concentration has been developed to estimate the DR%. This correlation showed a good agreement with the experimental results with a maximum error range 4%.