Analysis and optimization of integrated gas turbine, heat recovery steam generator and multi-effect thermal vapour compression desalination plant

Sepehr Sanaye[*]   **Saeid Asgari**

Energy System Improvement Laboratory (ESIL)
School of Mechanical Engineering
Iran University of Science & Technology (IUST)

Abstract

The method and results of 4E analysis and multi-objective optimization, for a gas turbine, HRSG and Multi Effect Thermal Vapor Compression desalination unit (METVC) are investigated in this paper. To optimize the system and to determine the optimal values of design parameters, the genetic algorithm was used. The first objective function was considered as the sum of investment and operational costs as well as penalty for producing NO_x emissions. The second objective function was the cycle total amount of exergy destruction. The optimal values of design parameters such as drum pressure of Heat Recovery Steam Generator (HRSG), pinch point temperature in HRSG, top brine temperature, last stage temperature, minimum temperature difference of condenser and number of effects were then estimated. Also the effects of gas turbine part load, as well as ambient temperature and fuel cost changes on the optimal values of design parameters were analyzed.

Keywords: Cogeneration, Desalination, 4E Analysis, Optimization

* Corresponding author: Sepehr Sanaye, Energy Systems Improvement Laboratory, Mechanical Engineering Department, Iran University of Science and Technology, Narmak, Tehran, Iran, 16488,
Tel-Fax: +98-21-77240192
E-mail address: sepehr@iust.ac.ir