

CHP Sizing in Residential Building Using MINLP Optimization Method

Soheil Malekshah

Department of Power Engineering, Faculty of Electrical Engineering, South Tehran Branch, Islamic
Azad University, Tehran, Iran
Email: Soheil.malekshah@gmail.com

Arin Hovanessian

Young Researchers and Elite Club, South Tehran Branch, Islamic Azad University, Tehran, Iran
Email: arin_hovanessian@yahoo.com

Gevork B. Gharehpetian

Electrical Engineering Department, Amirkabir University of Technology, Tehran, 15875-4413, Iran
Email: grptian@aut.ac.ir

Abstract— Combined heat and power (CHP), or cogeneration, is one of the power and heat generation systems that applied in a wide range of residential applications. The CHP unit most applications are in the residential building that the both electricity generation and the heating consumption supplying is applied. In CHP, the heat losses of the gas turbine are used for the building heating purposes. In this paper, the optimal size of the CHP unit based on the electrical power grid purchasing cost, CHP unit and boiler operation cost, CHP unit and auxiliary boiler annual investment cost, emission cost and the power load consumer benefit cost due to power marketing to the power grid are defined as the most important parameters of the objective function that are minimized using Mixed Integer Nonlinear Programming (MINLP) optimization method. The approaches of the paper are organized into two different scenarios of CHP unit presence in the residential building. In the case of the CHP unit connection to the residential building, the electrical and thermal loads are supplied. But, in the case of the CHP unit disconnection from the residential building, the thermal and electrical loads are supplied by the auxiliary boiler and power grid, respectively.

Keywords- Auxiliary boiler; CHP unit; MINLP optimization method; Natural gas; Residential building