

Design and Optimization of Sustainable Buildings by Combined Cooling, Heating and Power System (CCHP) Based on Exergy Analysis

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Abstract : In this study, the design and optimization of combined cooling, heating, and power system (CCHP) for a sustainable building are dealt with. Sustainable buildings are environmentally responsible and help us to save energy also reducing waste, pollution and environmental degradation. CCHP systems are widely used to save energy sources. In these systems, electricity, cooling, and heating are generating using just one primary energy source. The selection of the size of components based on the maximum demand of users will lead to an increase in the total cost of energy and equipment for the building complex. For this purpose, a system was designed in which the prime mover (gas turbine), heat recovery boiler, and absorption chiller are lower than the needed maximum. The difference in months with peak consumption is supplied with the help of electrical absorption chiller and auxiliary boiler (and the national electricity network). In this study, the optimum capacities of each of the equipment are determined based on Thermo economic method, in a way that the annual capital cost and energy consumption will be the lowest. The design was done for a gas turbine prime mover, and finally, the optimum designs were investigated using exergy analysis and were compared with a traditional energy supply system.

Keywords : sustainable building, CCHP, energy optimization, gas turbine, exergy, thermo-economic

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