Ain shams university
Faculty of engineering

Study the Effect of Changing the Load on the Performance of Combined Cycle

BY

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Statement

This thesis is submitted to Ain Shams University in partial fulfillment for the requirements of the degree of M.SC. in Mechanical Power Engineering. The included work in this thesis has been carried out by the author at the Dept. of Mechanical Power Engineering, Ain Shams University. No part of this thesis has been submitted for a degree or a qualification at any other University or Institute.

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ABSTRACT

Abstract

The electricity sector in Egypt works towards the expansion in the production of electrical power to meet the electricity demand of the other national various sectors. The type of power plant to be established will be selected, either renewable energy (Wind – Solar) power plant, or thermal power plants [steam cycle power plant – simple cycle (gas turbine GT) power plant or combined cycle power plant].

Combined cycle power plant is the best in terms of technical and economical advantages such as, highest efficiency among all kinds of thermal power plants across load ranges (56%), fastest based on GT, short order to operation time, and less generation cost.

Therefore, the real understanding and knowledge of its transient behavior are thought as they may help in improving the possibility of operating it as a variable load unit as well.

The transient behavior of the steam part of the combined cycle power plants is studied under gradual and sudden changes of load. The actual transient readings of Sidi Krir combined cycle power plant are compared with the results of the mathematical model for gradual change of load. Good agreement between the field results and the mathematical model was achieved. Due to good agreement between the actual and the model results in case of gradual load

change, the study is extended to include the case of sudden change of load to show the advantages and disadvantages of each control approach. The results of the case of sudden change of load obtained from the theoretical model showed that the response is much faster than the gradual response. Fast response time does not lead to the occurrence of water hammer, however this fast change may cause thermal stresses on the metal which could lead to thermal cracks.

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