



## SCIENTIFIC & RESEARCH PROJECTS

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### Project Title:

**Energy Benchmarking of Thermal Power Plants Analysis Using Pinch Analysis**

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### Abstract:

Benchmarking of process industries with respect to energy consumption has always been a challenging issue for effective management of energy resources. Having developed a precise model for estimating the energy consumption, we have a powerful tool to measure and identify the opportunities for improvements through a plant. In this study, a mathematical-conceptual model is presented for one-way benchmarking of thermal power plants applying Pinch concepts. Using the environmental variables of the ambient air and relative load of gas turbine, the model presented for the combined cycle power plants provides a standard for the functional parameters of the unit. Another model is presented for the conventional steam cycle power plants enabling the prediction of the results of energy retrofit projects on these power plants based on combined Pinch and Exergy Analysis. By this model, the relationships between minimum temperature difference in heat exchanger networks and the enhanced efficiency, heat transfer area increment, and energy consumption decline are specified. A mathematical model is also proposed for estimating the natural gas heating value and CO<sub>2</sub> emission based on natural gas composition. The proposed models have been validated using data of other existing power plants and showed enough accuracy of given targets.