Second Laureate
Applied Research

- **Research Work Title:** **A novel computational-operational solution to water tube boiler performance optimization using natural gas fuel with environmental considerations**
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- **Collaborating Organizations:** **K.N. Toosi University of Technology, Sepehr Energy Company, Montazer Ghaem Power Generation Management Company**
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Abstract:

Gas fuels have lower cost and impact on the environment when compared to liquid fuels, which leads to its higher appreciation in industries and other applications. However, the difference in gas fuels combustion properties may result in a decrease in power output and efficiency.

This project, based on years of empirical and numerical investigation, utilizes the available resources and manufacturing potential to provide an appropriate methodology in modeling and simulating burners and furnaces with a better performance.

In this work, we individually analyzed and modeled all parts of a water tube boiler. In particular, we focused on combustion parts and burners due to their importance and complexity. In addition to developing an empirical simulator, the furnace has been modeled precisely using Computational Fluid Dynamics tools. The resulting models for the individual parts are used to develop a comprehensive numerical simulator. Based on feasible changes in the burner and boiler structure, the computational simulator is used to determine the applicable method that achieves a higher power and efficiency.

Applicable modifications that are economical are applied in the unit, giving results confirmed to be successful. This solution is considered as a combination of OFA and Fuel Biasing approach.

This solution, compared to other suggested solutions coming from foreign contractors, shows substantial economic efficiency.