

## Investigation on the Economic Viability of Hydrogen Fired Industrial Gas Turbines for Power Generation Application

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**Abstract :** With the growing environmental concerns and regulations associated with fossil fuel usage, the quest for a more favorable, environmentally friendly fuel becomes imperative. Recently, researchers and Original Equipment manufacturers (OEMs) have started exploring means of burning hydrogen in gas turbines because of its potential environmentally friendly nature and performance benefits. However, there are concerns, such as technical and economic challenges, which need to be addressed for its implementation to be feasible. This study presents the investigation of the economic viability of using hydrogen as an alternative to fossil fuels in gas turbines for power generation applications. GasTurb details 5.1 was employed to model the hydrogen-enriched natural gas fuel, while GasTurb 11 was used to model and simulate the performance of the intercooler combined cycle gas turbine engine fired with different fuels. When the heat rate of the engine fired separately with natural gas and hydrogen were compared, the results show that the engine fired with natural gas produced a heat rate of 7180kJ/kWh while hydrogen fuel generated 7134kJ/kWh. Also, when the economic analysis of the engine operated separately with natural gas and hydrogen was compared for the entire life cycle (20 years) of the power plant, it was observed that the net present value for the engine fired with natural gas is £736,271,747 as against -£981,795,830.2 for hydrogen.

**Keywords :** gas turbine performance, hydrogen, natural gas, return on investment, power plant

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