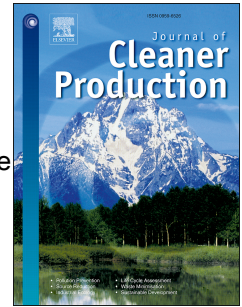


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Introducing a novel optimized Dual Fuel Gas Turbine (DFGT) based on a 4E objective function

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Abstract

Today, there is growing interest to produce biogas by anaerobic digestion process with regard to the decrease in fossil fuel sources, global warming, and the rising level of water, air and soil pollution resulted from drainage of the discharge of human and industrial wastewater, urban solid waste, and livestock dung in the environment. Furthermore, the high cost of biogas production equipment and instability in biogas production during different times and seasons increased the need to design a stable and reliable system for generating power. In the present study, a Dual Fuel Gas Turbine (DFGT) was presented. In this turbine, a mixture of biogas and natural gas was used as fuel. To make a quantitative comparison between different Biogas and Natural gas Ratios (BNR), a Price Objective Function (POF) was introduced based on the energy, exergy, environmental and economic (4E) analyses. Finally, considering the minimum POF, the optimum combination of biogas and natural gas, which happened at BNR of 0.55 in the investigated case, was achieved. It seems that introducing POF as a comprehensive economic index creates a clear vision about the fate of using DFGT for investors. Consequently, using the DFGT system with optimum BNR can pave the way for sustainable production by small farms and micro investors.

Keywords: Biogas; Dual Fuel; Gas Turbine; 4E

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