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Parametric Exergy Analysis of Coal Gasifier and Gas Turbine Combustion Chamber with Emission Study

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Abstract

Coal gasification plays an important role in the power generation as it reduces environmental pollution. Direct burning of coal causes much irritation besides pollution to the environment. Clean synthetic gas, produced from partial combustion of coal can be burnt in the gas turbine combustion chamber to run the coal based combined cycle power plant. In this paper attention has been focused on studying the parameters which influence the operation of coal gasification and gas turbine combustion chamber. Pressurized circulating fluidized bed (PCFB) has been used to produce the synthetic gas from the coal. Steam has been internally produced by the heat generation of partial combustion in the coal gasifier. The effects of gasifier pressure, combustion chamber temperature, supplies of air and water/steam have been studied in this analysis. In this thermodynamic analysis it has been found that increasing the gasifier pressure and combustion chamber temperature will give desirable effects, but high amounts of air and water supply is not desirable as it increases the exergetic losses. The effect of the operating parameters as mentioned above is also carried out on the atmospheric emissions.

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