

Thermodynamic study of syngas combustion in gas microturbines with regeneration composed with metallic and ceramic materials

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Abstract

The objective of this research is to carry out an energetic evaluation of syngas combustion in gas microturbines with regenerators made with two different types of material: metallic or ceramic. A modified chemical equilibrium model was used to calculate syngas composition obtained from sugarcane bagasse gasification in a fluidized bed gasifier using steam as gasifying agent. For the gas microturbines with a regenerator of metallic materials, combustion temperatures of 850, 900, and 950 °C were established; and for those with a regenerator of ceramic materials, combustion temperatures of 1150, 1250, and 1350 °C were established. The range for the compression ratio was 2 to 6, and the excess air percentages employed were 400, 500, and 600%. Excellent results were obtained: maximum power ratio was 1.87 kWh/Nm³, maximum cycle efficiency was 57%, and maximum regenerator effectiveness was 100%. Thus, syngas combustion performance in the gas microturbines with regeneration was excellent.

Keywords: power generation, gas microturbines with regeneration, syngas.

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