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Improving the Performance of Gas Turbine Power Plant by Modified Axial Turbine

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Abstract : Computer-based optimization techniques can be employed to improve the efficiency of energy conversions processes, including reducing the aerodynamic loss in a thermal power plant turbomachine. In this paper, towards mitigating secondary flow losses, a design optimization workflow is implemented for the casing geometry of a 1.5 stage axial flow turbine that improves the turbine isentropic efficiency. The improved turbine is used in an open thermodynamic gas cycle with regeneration and cogeneration. Performance estimates are obtained by the commercial software Cycle – Tempo. Design and off design conditions are considered as well as variations in inlet air temperature. Reductions in both the natural gas specific fuel consumption and in CO₂ emissions are predicted by using the gas turbine cycle fitted with the new casing design. These gains are attractive towards enhancing the competitiveness and reducing the environmental impact of thermal power plant.

Keywords : axial flow turbine, computational fluid dynamics, gas turbine power plant, optimization
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