Abstract

This work centers on the development, validation and application of a gas turbine performance analysis software. Design point performance analysis can be carried out and the target engine is the simple cycle engine with one compressor and one turbine which is suitable for power applications. The software is developed based on the ideal Brayton cycle and the real cycle. The latter incorporates isentropic efficiencies of the compressor and the turbine, combustion efficiency, combustor pressure loss and exhaust pressure loss. The software is tested for accuracy using both engine operation field data and engine design data from MS5001PA gas turbine engine. By using well defined engine operation data and choosing a set of percentage losses and efficiencies characterizing the real engine cycle, the results from the developed software closely approximate those of the field data as well as the engine design data. Ideal cycle simulation results of the variations of different parameters with pressure ratio (PR) for fixed value of turbine entry temperature were obtained; while thermal efficiency increases continuously with PR and heat input decreases continuously with PR, net work output on the other hand increases to a maximum at an optimum PR and decreases with further increase in
PR. Both the optimal PR and the maximum net work output increases with the turbine entry temperature for fixed value of fuel flow rate. Although, the simulation results are obtained from the ideal Brayton cycle, they do serve as preliminary design results for detailed engine design.

References


Index Terms

Computer Science

Applied Sciences
Keywords

Design point, Validation, Isentropic efficiencies, Combustion efficiency, Simulation