Abstract

This paper presents the second part of the development and application of gas turbine performance analysis software. The simple ideal cycle and the real cycle engines were considered in the first paper. Four modifications to the simple cycle engine are considered here. These are regenerative cycle, intercooled cycle, reheat cycle, and the cycle with all three modifications combined. The mathematical models of the performance of each engine cycle is developed and implemented in the developed software. The thermal efficiency and specific fuel consumption (sfc) of each engine cycle over a wide range of pressure ratios are generated and compared. The thermal efficiencies of the intercooled plant and the reheat plant are lower than that of the simple cycle plant; also, their sfc are both higher than that of the simple cycle plant indicating that they are not suitable stand-alone modifications. These two plants also respond to increase in turbine entry temperature slowly. The regenerative cycle provides greater thermal efficiency at lower pressure ratios which decreases to that of the simple cycle plant at the optimum pressure ratio. The sfc of the regenerative cycle is smaller than that of the simple engine cycle, and increases to the value of the simple cycle plant at the optimum pressure ratio.
This plant responds to increase in TET greatly; even more than the cycle with all three modifications combined, and is a suitable stand-alone modification to the simple cycle plant. The cycle with all modifications combined has the highest thermal efficiency value at lower pressure ratios which decreases to the simple cycle value at a pressure ratio higher than the optimum pressure ratio. The sfc of this cycle is the lowest and increases to the simple cycle value at a higher pressure ratio. The developed software could form a useful tool in system design.

References


Index Terms

Computer Science Software Engineering
Keywords

Regenerative cycle, intercooled cycle, reheat cycle, specific fuel consumption, turbine entry temperature.