

Modelling and thermal analysis of organic rankine cycle with superheater and preheater

ABSTRACT

Escalating fuel prices and carbon dioxide emission are causing new interest in methods the waste heat rejected to the environment and at the same time that can minimize the usage of fuel. One viable means is the conversion of exhaust engine waste heat to a more useful form of energy. The aim of this study is to model and investigate the thermal performance of an Organic Rankine Cycle (ORC) system which is used as waste heat recovery of exhaust gas from a turbofan engine. A simulation study has been done on the ORC in two different types of system configurations in order to predict which design will give a better thermal performance. Parameters such as net power output and the ORC system efficiency are used to represent and compare the thermal performance of both of the designs. The simulation is done by using MATLAB and REFPROP. The selection of the best configurations is based on the thermal efficiency of the system. It is found that the ORC system with superheater gives a better thermal efficiency that the one with preheater. The results also show that thrust specific fuel consumption (TSFC) of the turbofan engine reach a lower value by using ORC with superheater instead of with preheater. Hence implementation of ORC system for waste heat recovery to an aircraft engine can bring a great potential to the aviation industry.

Keyword: Modelling; Organic rankine cycle; Turbofan engine; Waste heat recovery