

Modelling of Organic Rankine Cycle for Waste Heat Recovery Process in Supercritical Condition

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Abstract : Organic Rankine Cycle (ORC) is the most commonly used method for recovering energy from small sources of heat. The investigation of the ORC in supercritical condition is a new research area as it has a potential to generate high power and thermal efficiency in a waste heat recovery system. This paper presents a steady state ORC model in supercritical condition and its simulations with a real engine's exhaust data. The key component of ORC, evaporator, is modelled using finite volume method, modelling of all other components of the waste heat recovery system such as pump, expander and condenser are also presented. The aim of this paper is to investigate the effects of mass flow rate and evaporator outlet temperature on the efficiency of the waste heat recovery process. Additionally, the necessity of maintaining an optimum evaporator outlet temperature is also investigated. Simulation results show that modification of mass flow rate is the key to changing the operating temperature at the evaporator outlet.

Keywords : Organic Rankine cycle, supercritical condition, steady state model, waste heat recovery

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