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Optimization of Supercritical CO2 Power Cycle for Waste Heat Recovery from Gas Turbine with Respect to Cooling Condition

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Abstract : This study describes the optimization of supercritical carbon dioxide (S-CO2) power cycle for recovering waste heat from a gas turbine. An S-CO2 cycle that recovers heat from small industrial and aeroderivative gas turbines can outperform a steam-bottoming cycle despite its simplicity and compactness. In using S-CO2 power cycles for waste heat recovery, a split cycle was studied to maximize the net output power by incorporating the utilization efficiency of the waste heat (lowering the temperature of the exhaust gas through the heater) along with the thermal efficiency of the cycle (minimizing the temperature difference for the heat transfer, exergy loss). The cooling condition of the S-CO2 WHR system has a great impact on the performance and the optimum low pressure of the system. Furthermore, the optimum high pressure of the S-CO2 WHR systems for the maximum power from the given heat sources is dependent on the temperature of the waste heat source.

Keywords : exergy loss, gas turbine, optimization, supercritical CO2 power cycle, split cycle, waste heat recovery
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