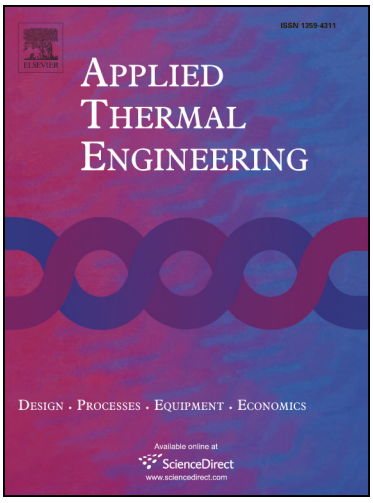

Research Paper

Thermodynamic and thermoeconomic analysis and optimization of a novel dual-loop power/refrigeration cycle

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Thermodynamic and thermoeconomic analysis and optimization of a novel dual-loop power/refrigeration cycle

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Abstract

Exploration of the ejector refrigeration cycle (ERC) in the combination with well-known power cycles to produce cooling output as well as power output is highlighted in recent decades. Since organic Rankine cycle (ORC) is practically usable than other power cycles, a combination of the ORC/ERC in a novel form is presented. Power and refrigeration sub-cycles are combined by a common condenser in separate loops to form dual-loop power/refrigeration cycle. The exhaust of the turbine is mixed with the outlet flow of the ejector, and then the mixed flow is fed into the condenser. Thermodynamic and thermoeconomic analysis of the proposed cycle are carried out with different working fluids (i.e., isobutane, isobutene, butene, cis-2-butene, n-butane, R236fa, and R245fa) showing that among all working fluids isobutane is the best one from thermodynamic, thermoeconomic, and environmental viewpoints. The results of exergy analysis showed that among all components generator accounts for the biggest exergy destruction rate followed by the heater for all selected working fluids. In addition, multi-objective optimization

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