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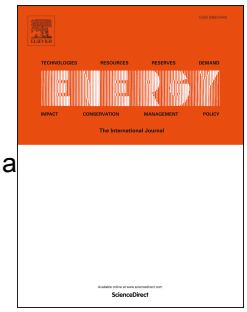

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Off-design performance analysis of a power-cooling cogeneration system combining a Kalina cycle with an ejector refrigeration cycle

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Abstract

This paper conducts the off-design performance analysis of a novel power-cooling cogeneration system combining a Kalina cycle and an ejector refrigeration cycle for low-grade hot water. Five plate heat exchangers, a separator, an axial inflow turbine, two pumps, an ejector and two throttle valves are adopted. The ejector refrigeration cycle using R134a is driven by the ammonia-poor solution from the separator. A novel method for predicting the off-design performance of the power-cooling cogeneration system is proposed. Variable hot water parameters, condensation temperature and evaporator temperature are analyzed by the sliding pressure operation approach. The results indicate that the system shows 619.74 kW net power and 71.28 kW cooling at design conditions. As the mass flow rate ratio or the inlet temperature of hot water increases, the net power, thermal efficiency and exergy efficiency increase, while the cooling and cooling exergy decrease. The exergy efficiency reaches the maximum of 39.82% at the saturated evaporator temperature of 6 °C. The cooling is more strongly affected by the hot water inlet temperature than the saturated condensation temperature, while the turbine efficiency, net power, thermal