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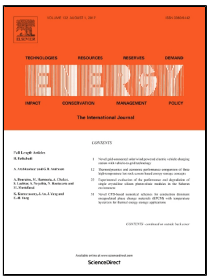

Energy, exergy and environmental analysis of a novel combined system producing power, water and Hydrogen

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Energy, exergy and environmental analysis of a novel combined system producing power, water and Hydrogen

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Abstract

During last years, absorption heat transformers have been used widely for boosting low-grade heat sources. In this paper, a novel multi-generation system including an open absorption heat transformer (OAHT), an organic Rankine cycle with Internal Heat Exchanger (ORC-IHE) and an electrolyzer for hydrogen production is proposed and analyzed from both first and second laws of thermodynamics and exergoenvironmental analysis points of view. To assess the cycle's performance, thermodynamic models were developed and a parametric study was carried out. The results indicate that the net power output and the hydrogen production rate will increase by boosting the inlet temperature of the waste heat using OAHT. By the growth of evaporator temperature, exergoenvironmental impact index, exergetic stability factor and exergetic sustainability index is increasing which is advantageous for the environment.

Keywords: Open absorption heat transformer, organic Rankine cycle with Internal Heat Exchanger, electrolyzer, energy, exergy, exergoenvironmental analysis.

Nomenclature

AHT	absorption heat transformer
COP	coefficient of performance
CV	Control volume
DAHT	double stage absorption heat transformer
EES	Engineering Equation Solver
f	flow ratio
GTL	Gross temperature lift
h	enthalpy (kJ/kg)
IHE	internal heat exchanger