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Thermodynamic performance and environmental sustainability of adapted organic Rankine cycles at varying evaporator pressure

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ABSTRACT

Thermodynamic performance and environmental sustainability (ES) of adapted organic Rankine cycles (ORCs) at varying evaporator pressure (EVP) are presented. The paper assesses the most sustainable ORCs at varying EVPs. The modified ORCs apart from the generic cycle include the ORC-internal heat exchanger (IHE), ORC-turbine bleeding, and ORC-turbine bleeding and regeneration. The considered performance indicators are power output (POT), overall exergy efficiency and overall exergy destruction (OED), while the ES indicators comprise waste exergy ratio (WER), exergetic sustainability index (ESI) and environmental effect factor (EEF). From the

results obtained the OEF, OED and POT for the ORCs ranged between

, and , respectively, at EVP of 2 and 3 MPa. Similarly, WER, ESI and EEF

ranged between , and correspondingly, for the same EVPs. The findings indicate the ORC-IHE and ORC-turbine bleeding and regeneration are more sustainable using the R113 than R141b refrigerant.

KEYWORDS:

[EnvironmentalsustainabilityexergyORCregeneration](#)

Disclosure statement

No potential conflict of interest was reported by the authors.

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