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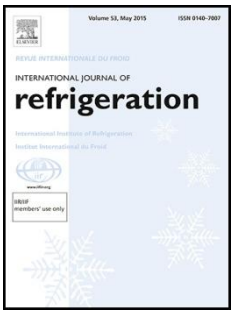

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LOCAL STABILITY ANALYSIS OF AN IRREVERSIBLE REFRIGERATOR WORKING AT THE MAXIMUM THERMO-ECOLOGICAL FUNCTIONS: COMPARISON

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Highlights

- We analyse the local stability of an irreversible refrigerator.
- Ecological functions E and ECOP are taken as objective functions.
- We derive the expressions of the relaxation times at two optimal steady-states of the maximums E and $ECOP$.
- We compare the local stability of the system working in maximums E and ECOP.

Abstract

This paper compares the local stability of an irreversible compression refrigerator working in the maximum ecological function (E) and in the maximum ecological coefficient of performance ($ECOP$). The goal was to analyze the dynamic of the steady-state of the refrigerator when it undergoes a small perturbation. By using the linearization technique and the stability analysis, the expressions of the relaxation times of the irreversible refrigerator are derived at two optimal steady-states of the maximum E and $ECOP$ functions. It is found that the relaxation times are function of the heat capacity, overall heat transfer surface area, heat reservoirs temperature ratio, degree of internal irreversibility, heat transfer coefficients, and heat leakage rate. The influence of heat leakage rate, internal irreversibilities and heat resistances on the relaxation times are discussed. The phase portraits for the trajectories are presented. Finally, a comparative study was done on

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