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## **LOCAL STABILITY OF A GENERALIZED IRREVERSIBLE CARNOT ENGINE WORKING AT THE MAXIMUM ECOLOGICAL FUNCTION**

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### **Abstract**

On the basis of a generalized irreversible Carnot heat engine (GICHE) model with the losses of heat resistance, heat leakage and internal irreversibility, the local stability of the heat engine at the maximum ecological function (MEF) is studied with Newton's heat transfer law between working fluid and heat reservoirs. It is derived that a general expression of relaxation time described as stability of the system refers to heat capacity  $C$ , overall heat transfer surface area  $F$ , heat reservoirs' temperature ratio  $\tau$ , the degree of internal irreversibility  $\phi$  heat transfer coefficients  $\alpha$  and  $\beta$  and heat leakage. Distribution information of phase portraits of the system is obtained. The results are general and provide guidelines for designing the real heat engines.

*Key words:* ecological optimization, finite time thermodynamics, generalized irreversible Carnot engine, local stability, Newton's heat transfer law, phase portrait

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