Answer on Question #43262-Physics-Molecular Physics-Thermodynamics

Cyclic heat engine draws 350 KJ heat from a source at 1000 K. It supplies 125 KJ of heat to the low temperature reservoir at400 K and performs 225 KJ of work. Is this machine reversible, irreversible, or impossible? Why?

Solution

$$\eta_{Carnot} = 1 - \frac{T_L}{T_H} = 1 - \frac{400\ K}{1000\ K} = 0.6.$$

$$\eta_{Engine} = \frac{|Q_H| - |Q_L|}{|Q_H|} = \frac{225\ \text{KJ}}{350\ \text{KJ}} = 0.64.$$

This machine is impossible, because $\eta_{Engine} > \eta_{Carnot} = \eta_{MAX}$.