Optimizing the performance of a heat engine: A simulation study
MULUGETA BEKELE, MEHARI BAYOU, YERGOU TATEK, MESFIN TSIGE
— We performed a simulation study of a simple heat engine as it undergoes Carnot-
type cyclic motion in a finite time over a wide range of piston speeds. There exists a
specific piston speed at which the power delivered by the engine is maximum ($P_{\text{max}}$)
and its corresponding efficiency is slightly larger than half of the Carnot efficiency
($1/2 \eta_c$). An optimization criterion leads to a trade-off between high power and
high efficiency with respective values of $4/5 P_{\text{max}}$ and $3/4 \eta_c$. In addition, we found
the time taken at the optimized state to be twice the time taken when operating at
maximum power.