

Given:

Heat is transferred to a heat engine from a furnace at a rate of 80 MW.

Required:

If the rate of waste heat rejection to a nearby river is 50 MW, determine the net power output and the thermal efficiency for this heat engine.

Solution:

The heat supplied to the heat engine is given as

$$\dot{Q}'_H := 80 \text{ MW}$$

The heat rejected by the heat engine is given as

$$\dot{Q}'_L := 50 \text{ MW}$$

The net work that the heat engine outputs is then found by

$$\dot{W}'_{\text{net,out}} := \dot{Q}'_H - \dot{Q}'_L = 30 \cdot \text{MW}$$

The thermal efficiency is then found by

$$\eta_{\text{th}} := \frac{\dot{W}'_{\text{net,out}}}{\dot{Q}'_H} = 37.5\%$$