Instructor's guide

This short lecture precedes osharmonicproj.

Let's apply the relationship of heat, entropy, and temperature to a contemporary challenge!

We'd like to maximize the efficiency of any process that is based on heat flow as an input.



Coal



Nuclear



Combustion engine



Solar concentrating plant

Figure 1: Just a few examples of heat engines.

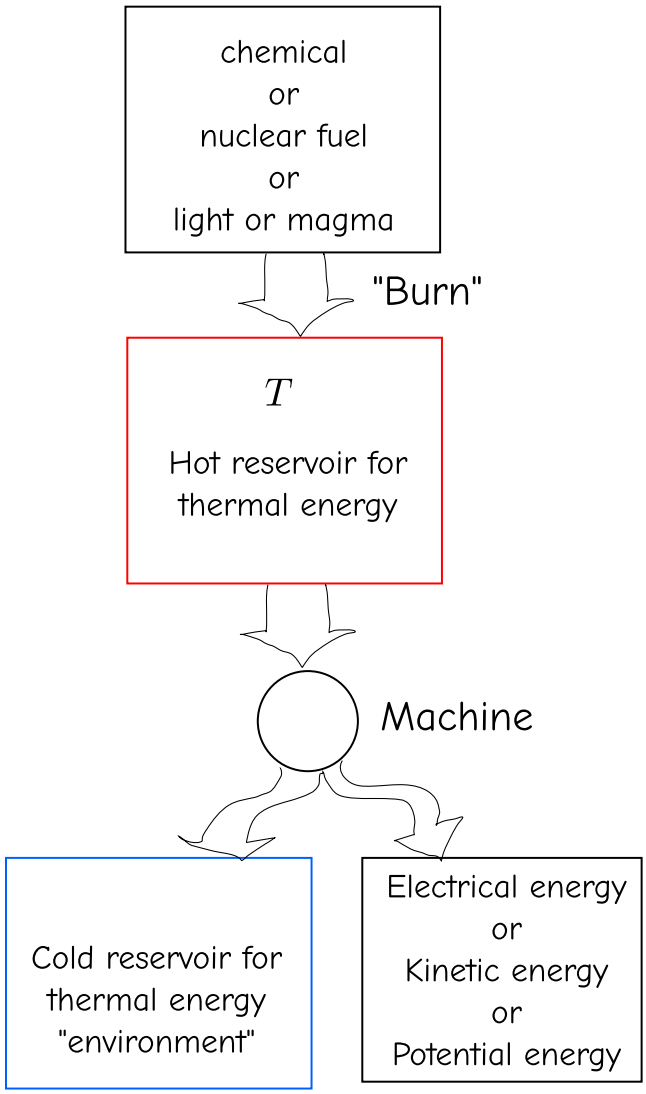


Figure 2: Energy flow diagram

Energy flow diagram The efficiency of the machine is

$$\text{efficiency} = \frac{W}{Q_{\text{in}}} \tag{1}$$

$$e.g. = \frac{500\ \text{J}}{1000\ \text{J}} = 50\% \tag{2}$$

For a car engine, $T_H \approx 600$ K and $T_C \approx 300$ K.

Remember that $\Delta S = \frac{Q}{T}$, and $\Delta S_{\text{tot}} \geq 0$.