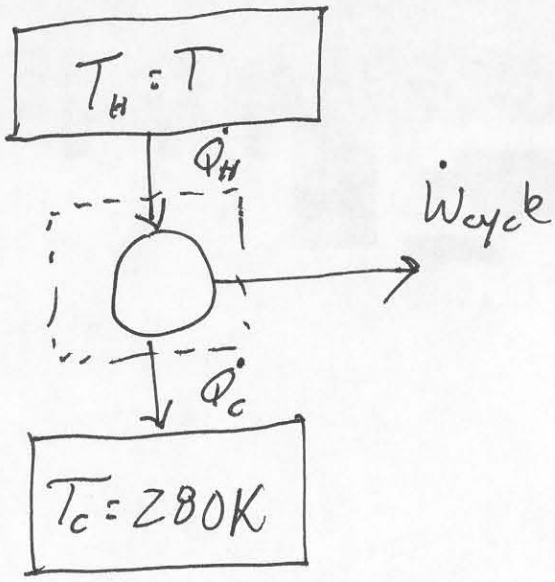
5.26 Power Cycle



$\dot{W}_{cycle} = 40kW$

$\dot{Q}_C = 1000\frac{kJ}{min} = 16.67kW$

$\dot{W}_{cycle} = \dot{Q}_H - \dot{Q}_C$

$\dot{Q}_H = 40kW + 16.67kW$

$\dot{Q}_H = 56.67kW$

$$\eta = 1 - \frac{\dot{Q}_C}{\dot{Q}_H} = 1 - \frac{16.67kW}{56.67kW} = \underline{0.705}$$

$$\eta_{max} = 1 - \frac{T_C}{T_H}$$

We know that

$\eta \leq \eta_{max}$

OR

$$0.705 \leq 1 - \frac{280K}{T}$$

which gives $0.295 \geq \frac{280K}{T} \Rightarrow T \geq 949K$

So minimum theoretical T is 949K