



$$\textcircled{1} W_1 = Q_1 - Q_2$$

$$\textcircled{2} \eta_1 = \frac{W_1}{Q_1}$$

$$W_2 = Q_2 - Q_3$$

$$\textcircled{3} \eta_2 = \frac{W_2}{Q_2}$$

DIVIDIAMO LA  $\textcircled{1}$  PER  $Q_1$

$$\frac{W_1}{Q_1} = \frac{Q_1}{Q_1} - \frac{Q_2}{Q_1} = 1 - \frac{Q_2}{Q_1} \quad \text{MA } \frac{W_1}{Q_1} = \eta_1 \quad \textcircled{2}$$

$$\text{QUINDI } \eta_1 = 1 - \frac{Q_2}{Q_1} \quad \text{CIOE' } \frac{Q_2}{Q_1} = 1 - \eta_1 \quad \textcircled{4}$$

L'EFFICIENZA TOTALE È IL LAVORO PRODOTTO CHE È  $W_1 + W_2$  DIVISO IL CALORE ASSORBITO CHE VALE  $Q_1$ . QUINDI

$$\eta_{\text{TOT}} = \frac{W_1 + W_2}{Q_1} = \frac{W_1}{Q_1} + \frac{W_2}{Q_1} = \eta_1 + \frac{W_2}{Q_2} \frac{Q_2}{Q_1} \stackrel{\textcircled{3} + \textcircled{4}}{=} \eta_1 + \eta_2 (1 - \eta_1)$$

$$\text{QUINDI } \eta_{\text{TOT}} = \eta_1 + \eta_2 - \eta_1 \eta_2$$

$$\text{ORA } \eta_1 = \frac{1}{2} \left( 1 - \frac{T_0}{T_1} \right) \quad \text{e} \quad \eta_2 = \frac{1}{2} \left( 1 - \frac{T_2}{T_0} \right)$$

SOSTITUENDO I VALORI NUMERICI

$$\eta_{\text{TOT}} \approx 0,400 \quad (40\%)$$