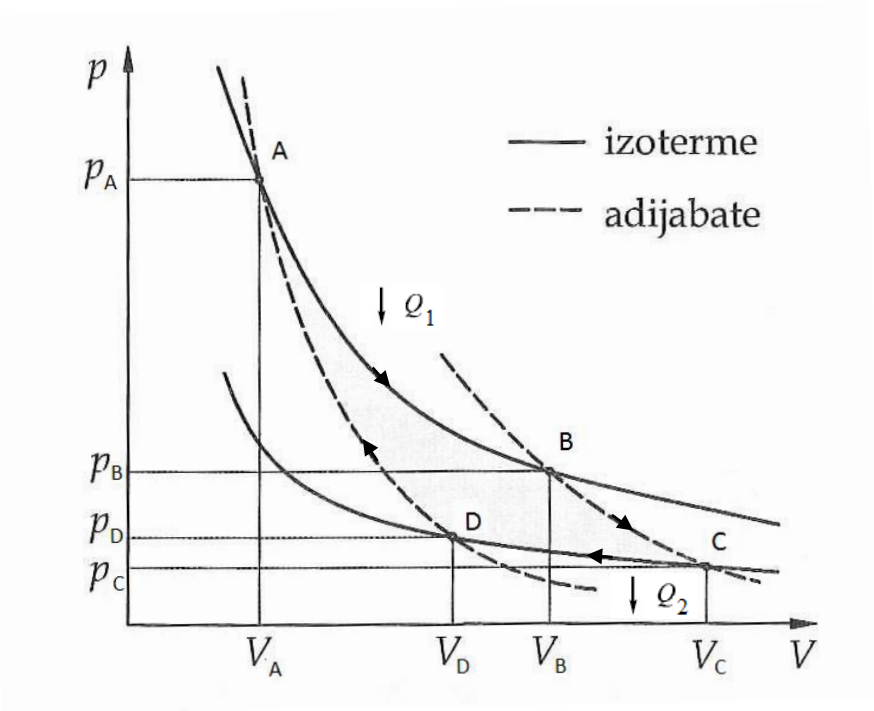
# Kružni procesi
# Entropija

# Carnotov kružni proces

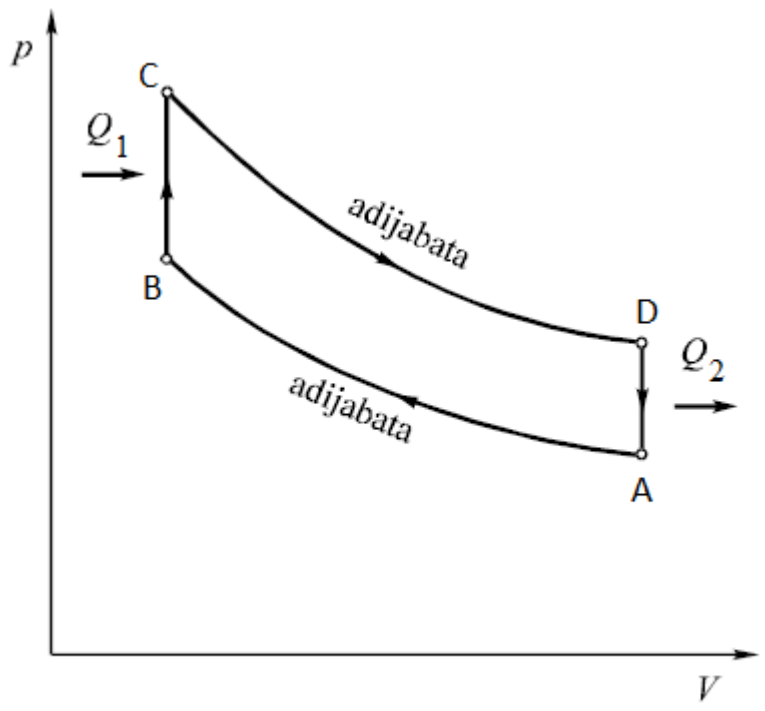



A-B izotermna ekspanzija
B-C adijabatska ekspanzija
C-D izotermna kompresija
D-A adijabatska kompresija

- faktor korisnosti

$$\eta_C = 1 - \frac{T_2}{T_1}$$

# Ottov kružni proces



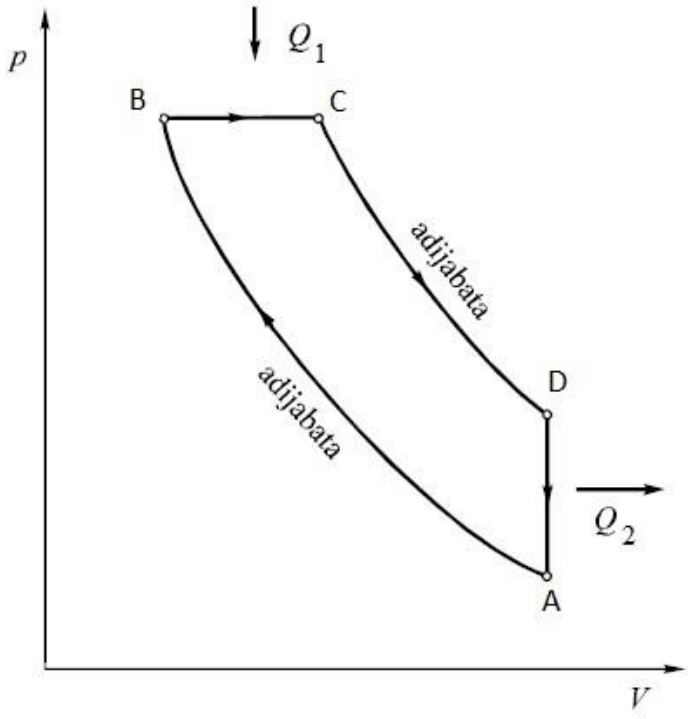

A-B adijabatska kompresija

B-C izohorno zagrijavanje

C-D adijabatska ekspanzija

D-A izohorno hlađenje

# Dieselov kružni proces



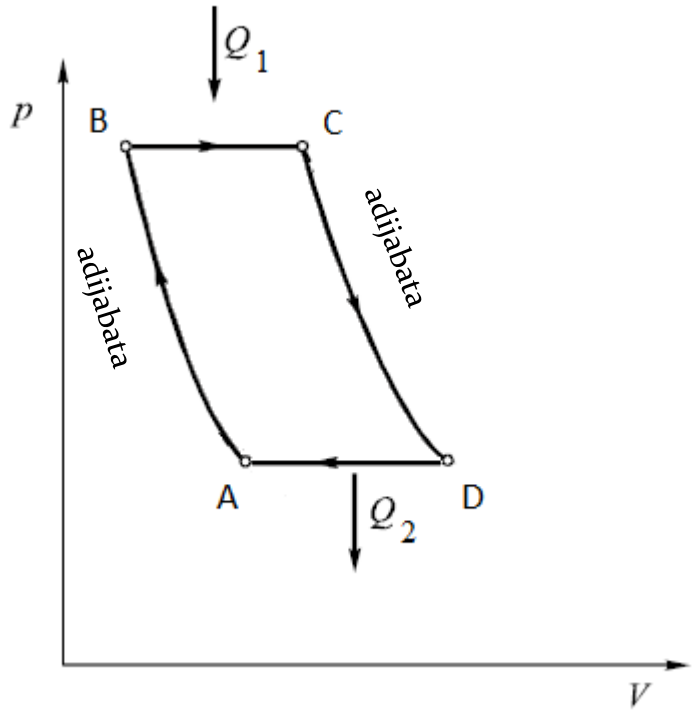

A-B adijabatska kompresija

B-C izobarna ekspanzija

C-D adijabatska ekspanzija

D-A izohorno hlađenje

# Jouleov kružni proces




A-B adijabatska kompresija

B-C izobarna ekspanzija

C-D adijabatska ekspanzija

D-A izobarna kompresija

# Rad pri promjenama stanja plina

- izobaran proces

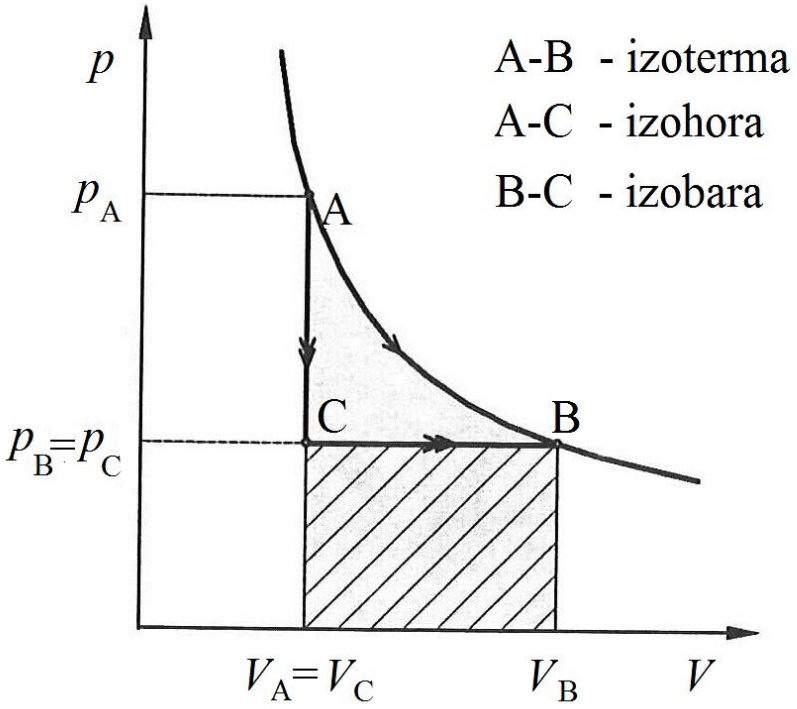
$$W = p(V_2 - V_1)$$

- izoterman proces

$$W = nRT \ln \frac{V_2}{V_1} = nRT \ln \frac{p_1}{p_2}$$

- adijabatski proces

$$W = \frac{nR}{\kappa - 1}(T_1 - T_2)$$




Poissonove jednadžbe

$$\frac{p_1}{p_2} = \left(\frac{V_2}{V_1}\right)^{\kappa} \qquad \frac{T_1}{T_2} = \left(\frac{V_2}{V_1}\right)^{\kappa - 1} \qquad \frac{T_1}{T_2} = \left(\frac{p_1}{p_2}\right)^{\frac{\kappa - 1}{\kappa}}$$

# Promjena entropije

- reverzibilna promjena

$$\Delta S = S_2 - S_1 = \int_1^2 \frac{\delta Q}{T}$$

- drugi zakon termodinamike

$$\Delta S \geq 0$$

$>$ ireverzibilan proces

$=$ reverzibilan proces

# Promjena entropije

1. adijabatski proces

$$\delta Q = 0$$

$$\Delta S = 0$$

2. čvrsto tijelo i tekućina

$$\Delta S = mc \ln \frac{T_2}{T_1}$$

3. idealni plin

$$\Delta S = nR \ln \frac{p_1}{p_2} + nC_{\mathrm{m},p} \ln \frac{T_2}{T_1}$$

$$\Delta S = nR \ln \frac{V_2}{V_1} + nC_{\mathrm{m},V} \ln \frac{T_2}{T_1}$$