Ch. 9 공기표준사이클
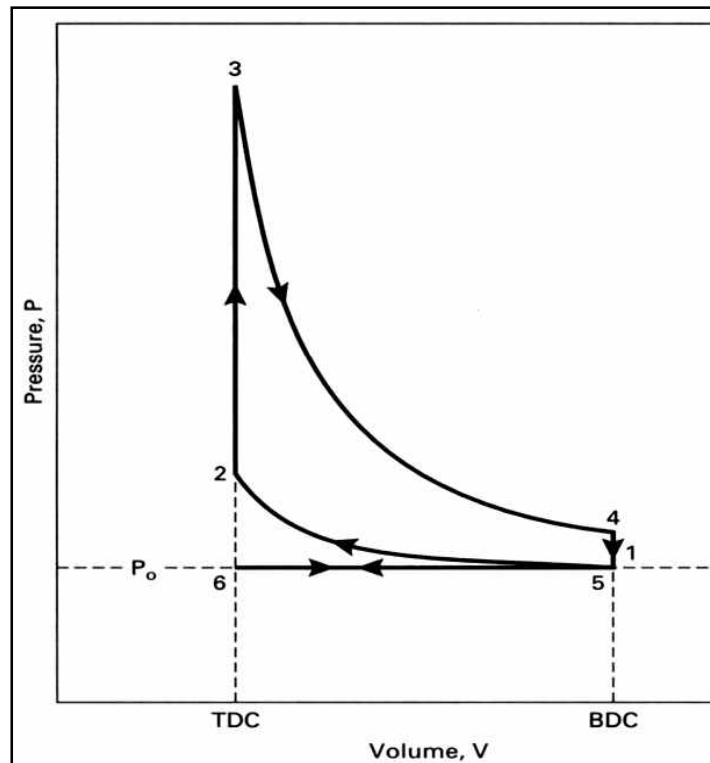
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9.1 공기표준 오토사이클
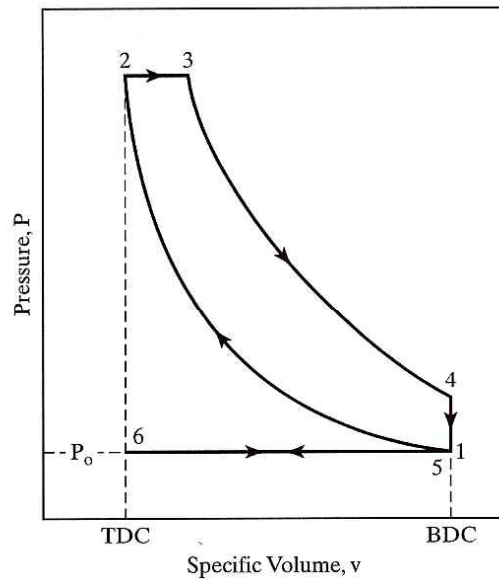

1-2: Isentropic Compression

2-3: Constant Volume Heat Addition

3-4: Isentropic Expansion

4-5: Constant Volume Heat Rejection

5-6: Exhaust at 1 atm

6-1: Intake at 1 atm

● 공기표준 오토 사이클 열효율:

$$
\begin{aligned}
\left(\eta_t\right)_{\text{OTTO}} &= \frac{\left|w_{\text{net}}\right|}{\left|q_{\text{in}}\right|} = 1 - \frac{\left|q_{\text{out}}\right|}{\left|q_{\text{in}}\right|} \\[2mm]
&= 1 - \frac{c_v(T_4 - T_1)}{c_v(T_3 - T_2)} = 1 - \frac{(T_4 - T_1)}{(T_3 - T_2)} \\[2mm]
&= 1 - \left(\frac{T_1}{T_2}\right)\left(\frac{(T_4/T_1) - 1}{(T_3/T_2) - 1}\right) = 1 - \left(\frac{T_1}{T_2}\right) \\[2mm]
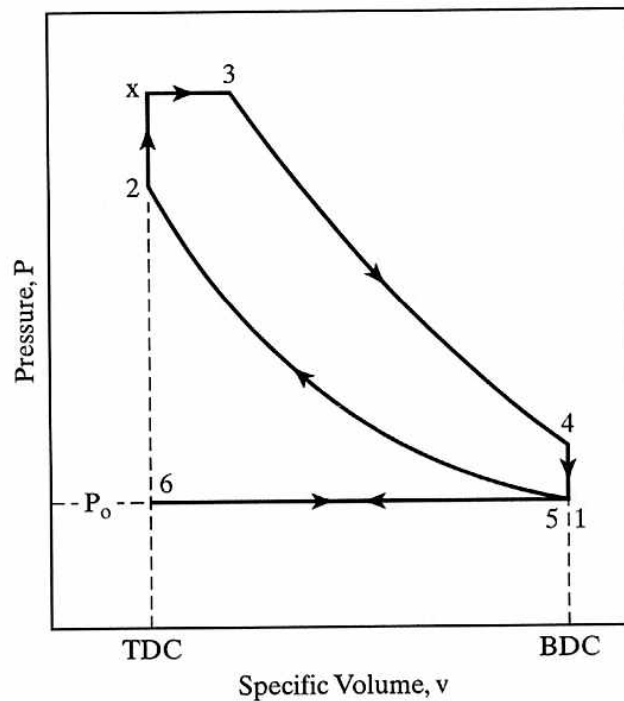&= 1 - \left(1/r_c\right)^{k-1}
\end{aligned}
$$

9.2 공기표준 디젤사이클

1-2: Isentropic Compression

2-3: Constant <u>Pressure</u> Heat Addition

3-4: Isentropic Expansion

4-5: Constant Volume Heat Rejection

5-6: Exhaust at 1 atm

6-1: Intake at 1 atm

● 공기표준 디젤 사이클 열효율:

$$
\eta = \frac{\left| w_{\text{net}} \right|}{\left| q_{\text{in}} \right|} = 1 - \frac{\left| q_{\text{out}} \right|}{\left| q_{\text{in}} \right|} = 1 - \frac{c_v (T_4 - T_1)}{c_p (T_3 - T_2)}
$$

$$
= 1 - \left(\frac{1}{r_c} \right)^{k-1} \left[\frac{(\beta^k - 1)}{k(\beta - 1)} \right]
$$

9.3 공기표준 듀얼사이클

1-2: Isentropic Compression

2-x: Constant <u>Volume</u> Heat Addition

x-3: Constant <u>Pressure</u> Heat Addition

3-4: Isentropic Expansion

4-5: Constant Volume Heat Rejection

5-6: Exhaust at 1 atm

6-1: Intake at 1 atm

● 공기표준 듀얼 사이클 열효율:

$$
\eta = \frac{\left|w_{\text{net}}\right|}{\left|q_{\text{in}}\right|} = 1 - \frac{\left|q_{\text{out}}\right|}{\left|q_{\text{in}}\right|} = 1 - \frac{c_v(T_4 - T_1)}{\left[c_v(T_x - T_2) + c_p(T_3 - T_x)\right]}
$$

$$
= 1 - \left(\frac{1}{r_c}\right)^{k-1} \left[\frac{\alpha(\beta^k - 1)}{\left\{k\alpha(\beta - 1) + \alpha - 1\right\}}\right]
$$