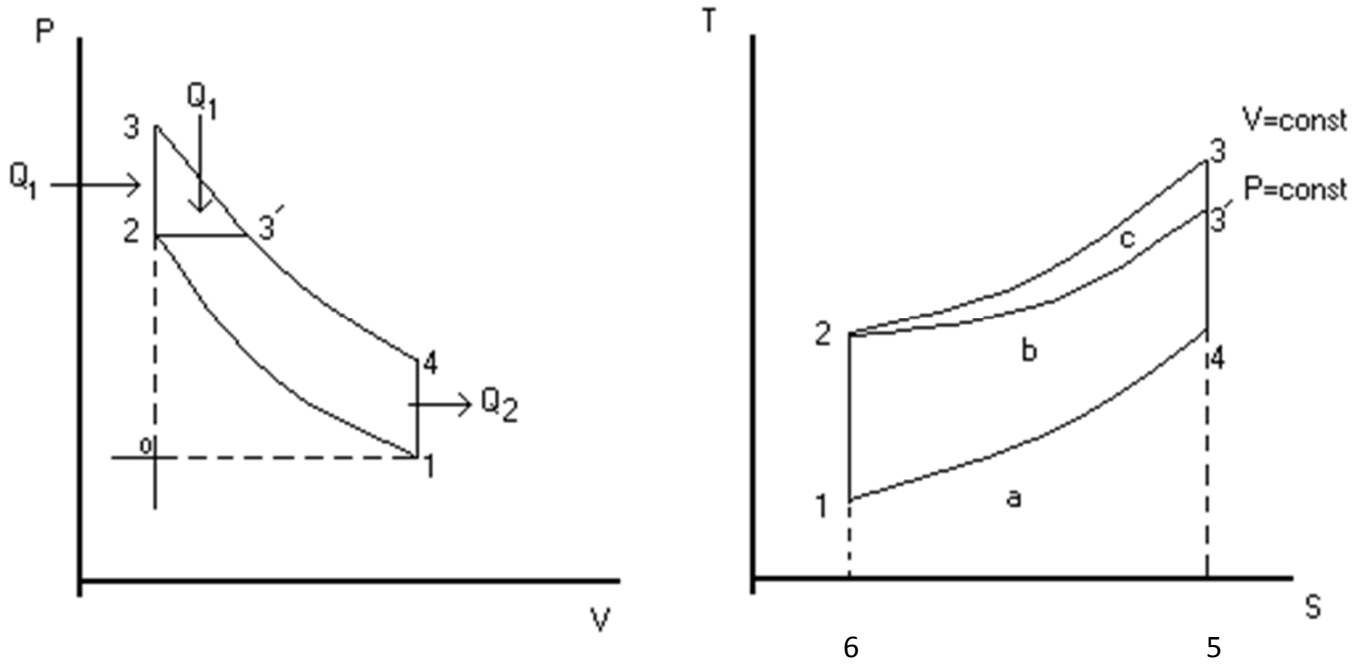
MAK 3031- Internal Combustion Engines

Asst. Prof. Dr. Levent YÜKSEK
Yıldız Technical University-Automotive Sub-Division
Internal Combustion Engine Laboratory

Week-3/Engine Thermodynamics

Equal (ε) compression ratio and equal Q_2 comparison of air standard Otto ve Diesel cycles.



Heat input for Otto cycle Q_1 is the area between the points (6,2,3,5,6) ,
Generated work of Otto cycle is the area between the points (1,2,3,4,1)

Heat input for diesel cycle Q_1 is the area between the points (6,2,3′,5,6)
Generated work of diesel cycle is the area between the points (1,2,3′,4,1)

Week-3/Engine Thermodynamics

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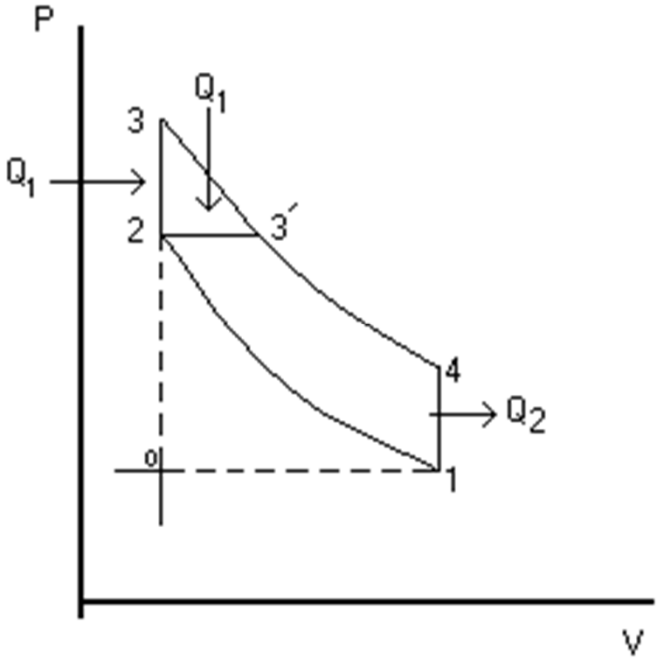
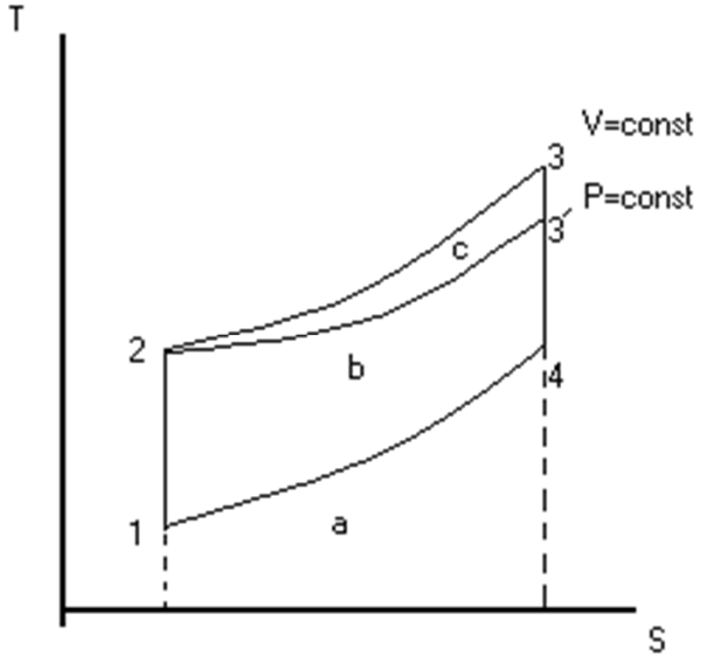




$(Q_1)\_Otto = a + b + c$

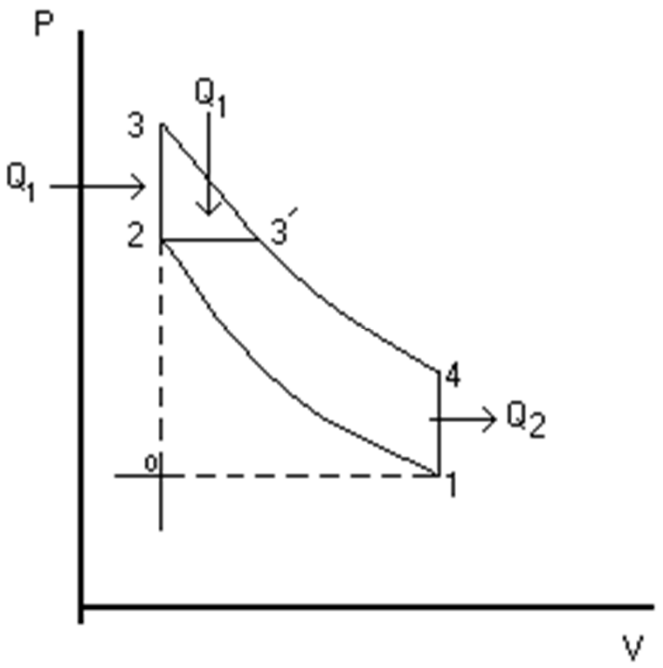
$(Q_1)\_Diesel = a + b$

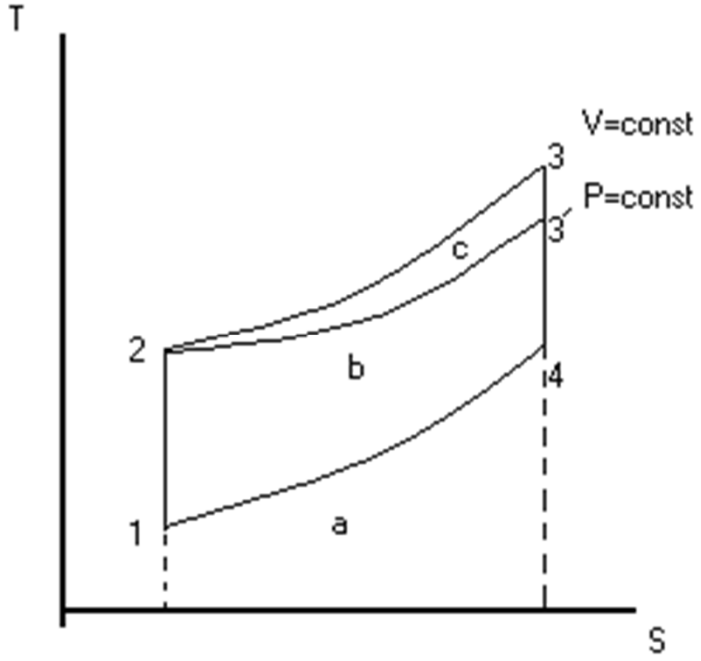
$(Q_2) = a$

$\eta_t = 1 - (Q_2/Q_1)$

Week-3/Engine Thermodynamics

Equal (ε) compression ratio and equal Q_2 comparison of air standard Otto ve Diesel cycles.





$$\eta_{Otto} = 1 - \frac{a}{a+b+c}$$

$$\frac{a}{a+b+c} < \frac{a}{a+b}$$

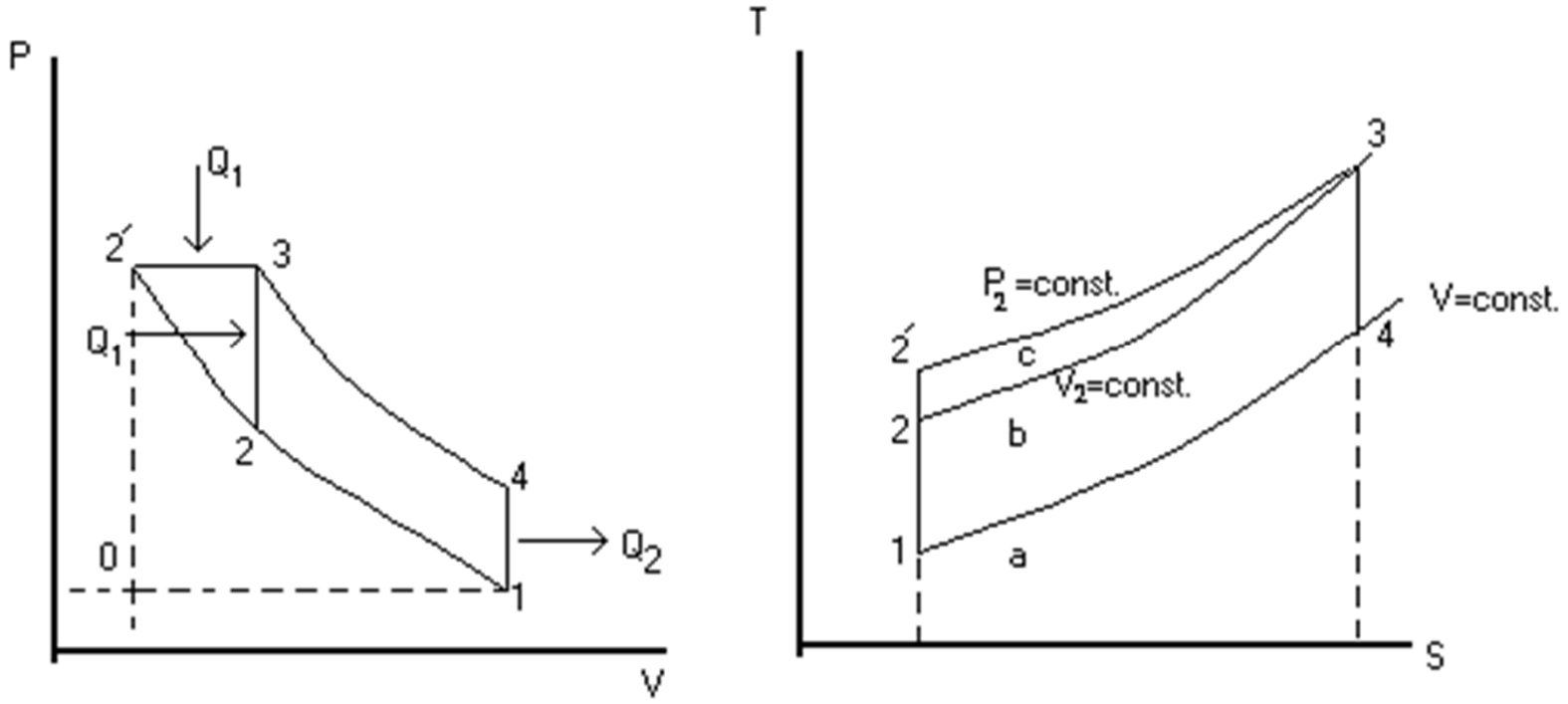
$$\eta_{Diesel} = 1 - \frac{a}{a+b}$$

$$\eta_{Otto} > \eta_{Diesel}$$

Week-3/Engine Thermodynamics

Equal maximum in-cylinder pressure and ve equal Q_2

Comparison of Air-standard Otto and Diesel cycles



$(Q_1)\_Otto = a + b$

$(Q_1)\_Diesel = a + b + c$

$(Q_2) = a$

$\eta_t = 1 - (Q_2/Q_1)$

$\eta_{Otto} = 1 - \frac{a}{a+b}$

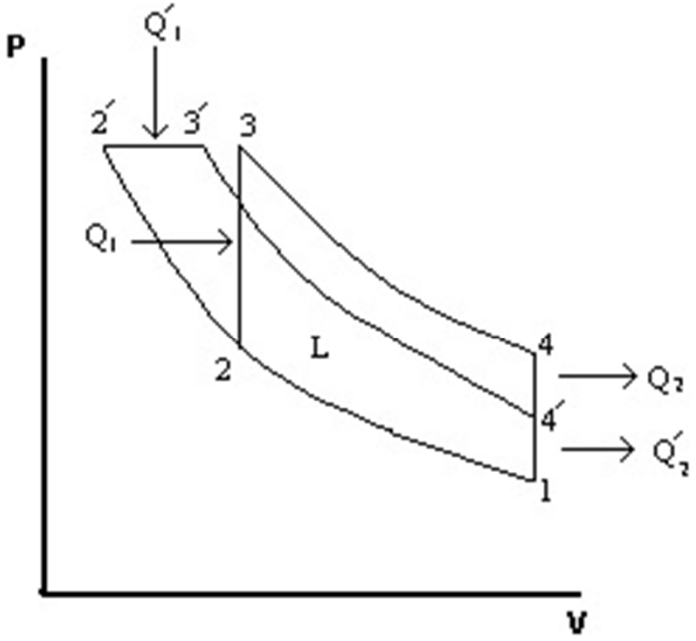
$\eta_{Diesel} = 1 - \frac{a}{a+b+c}$

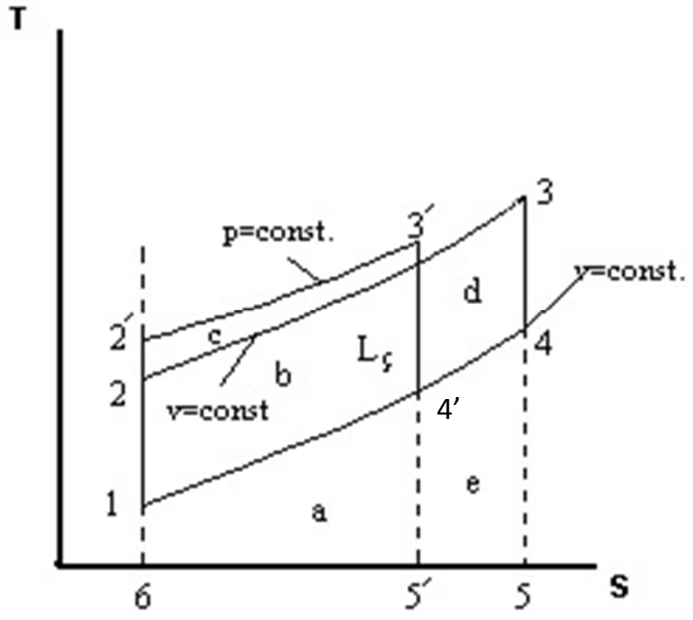
$\frac{a}{a+b} > \frac{a}{a+b+c}$

$\eta_{Diesel} > \eta_{Otto}$

Week-3/Engine Thermodynamics

Equal maximum in-cylinder pressure and equal work output
Comparison of Air-standard Otto and Diesel cycles





$(Q_1)\_Otto = a + b + d + e$

$(Q_1)\_Diesel = a + b + c$

$(Q_2)\_Otto = a + e$

$(Q_2)\_Diesel = a$

$\eta_t = 1 - (Q_2/Q_1)$

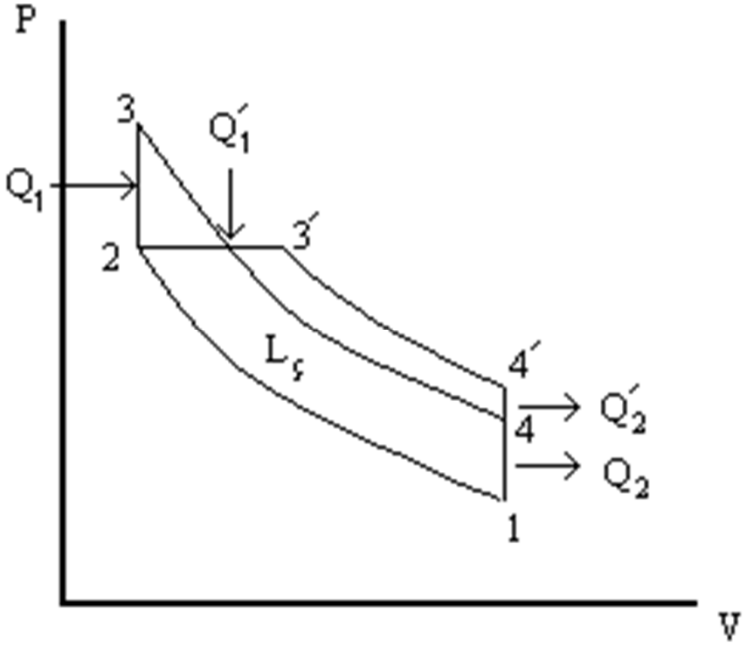
$$\eta_{Otto} = 1 - \frac{a+e}{a+b+d+e}$$

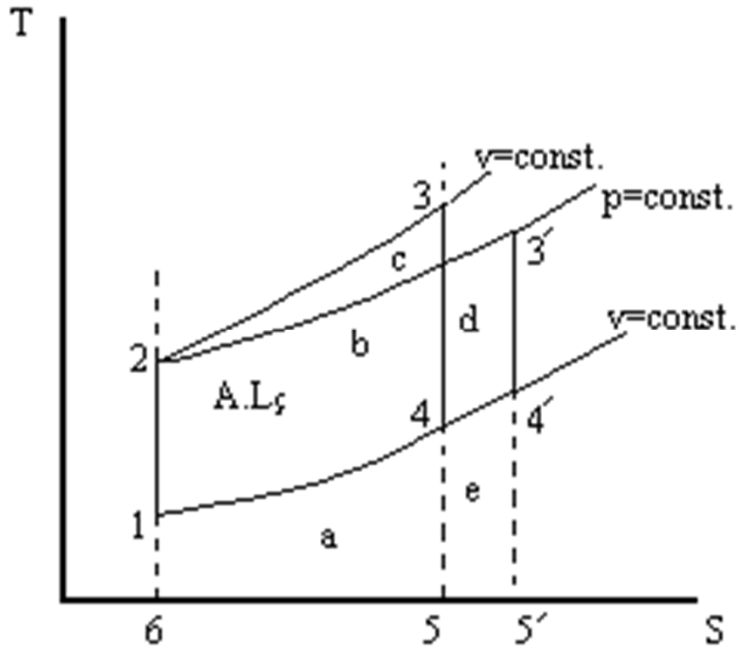
$$\eta_{Diesel} = 1 - \frac{a}{a+b+c}$$

$\eta_{Diesel} > \eta_{Otto}$

Week-3/Engine Thermodynamics

Equal compression ratio and equal work output
Comparison of Air-standard Otto and Diesel cycles





$(Q_1)\_Otto = a + b + c$

$(Q_1)\_Diesel = a + b + d + e$

$(Q_2)\_Otto = a$

$(Q_2)\_Diesel = a$+e

$\eta_t = 1 - (Q_2/Q_1)$

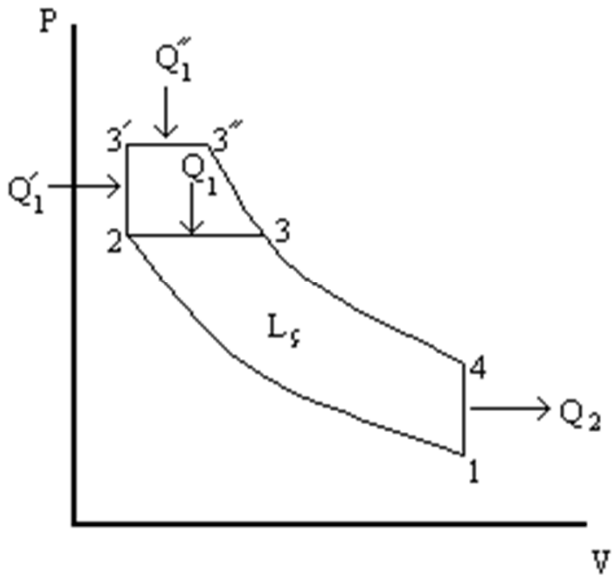
$$\eta_{Otto} = 1 - \frac{a}{a+b+c}$$

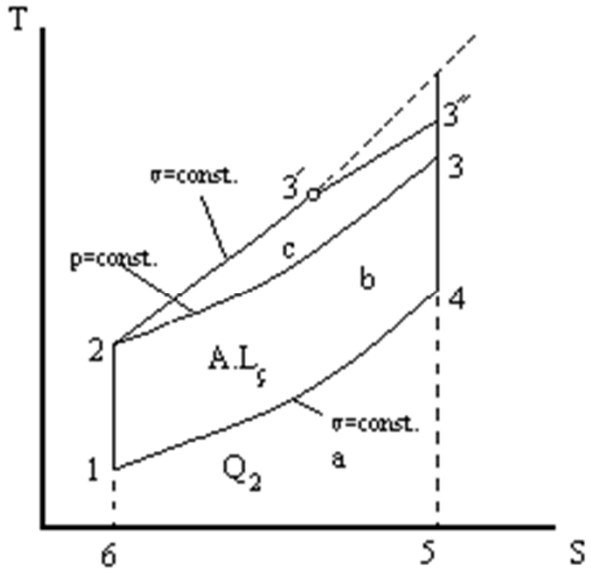
$$\eta_{Diesel} = 1 - \frac{a+e}{a+b+d+e}$$

$\eta_{Otto} > \eta_{Diesel}$

Week-3/Engine Thermodynamics

Equal compression ratio and heat output Q_2
Comparison of air standard diesel and dual cycles





$(Q_1)\_Diesel = a + b$

$\eta_{Diesel} = 1 - \frac{a}{a+b}$

$(Q_1)\_Dual = a + b + c$

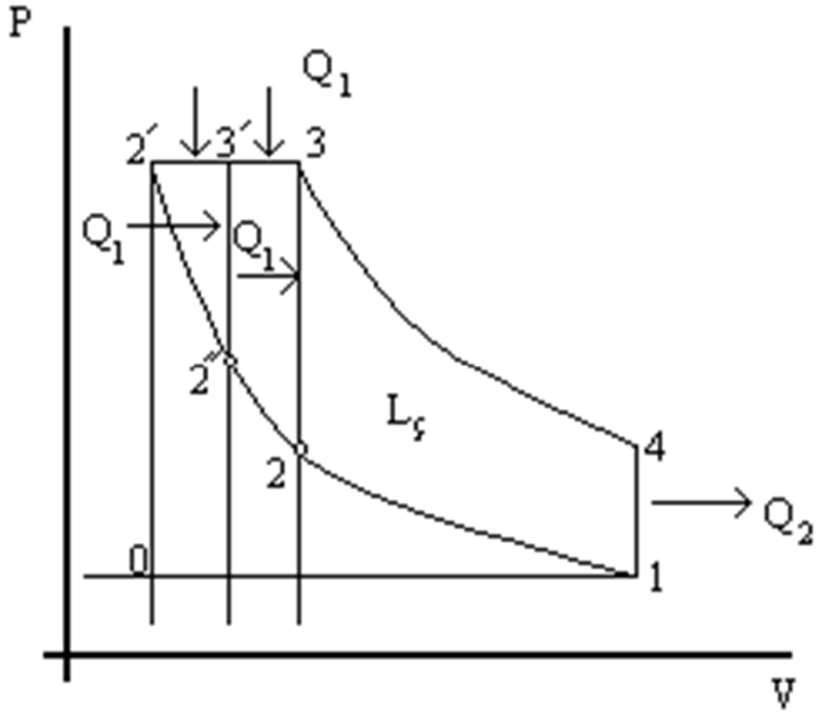
$\eta_{Dual} = 1 - \frac{a}{a+b+c}$

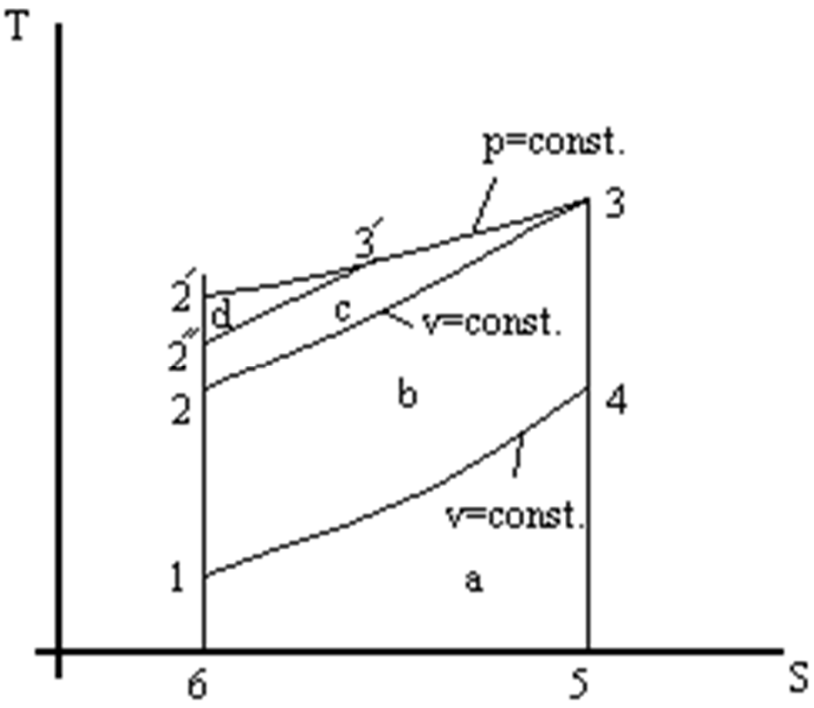
$\eta_{Dual} > \eta_{Diesel}$

$(Q_2) = a$

Week-3/Engine Thermodynamics

Equal heat output Q_2 and equal maximum in-cylinder pressure.
Comparison of air standard Otto , Diesel and Dual cycles





$(Q_1)\_Otto = a + b$

$(Q_1)\_Diesel = a + b + c + d$

$(Q_1)\_Dual = a + b + c$

$(Q_2) = a$

$$\eta_{Otto} = 1 - \frac{a}{a+b}$$

$$\eta_{Dual} = 1 - \frac{a}{a+b+c}$$

$$\eta_{Diesel} = 1 - \frac{a}{a+b+c+d}$$

$$\eta_{Diesel} > \eta_{Dual} > \eta_{Otto}$$