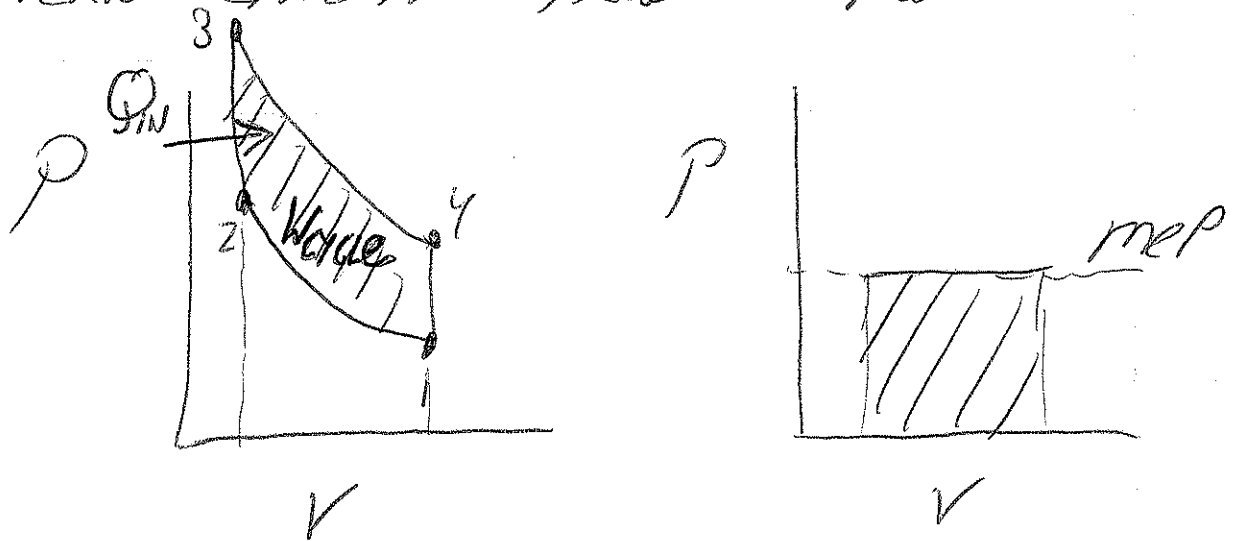


MEAN EFFECTIVE PRESSURE NOTES



MEAN VALUE THEOREM

$$W_{\text{cycle}} = \int p \, dV = P_{\text{MEP}} (V_1 - V_2)$$

$$P \text{ (Power)} = \frac{W_{\text{cycle}} N^{\text{ENGINE SPEED (rev/sec)}}}{P_R} = \frac{P_{\text{MEP}} (V_1 - V_2) N}{P_R}$$

↑
rev/
(POWER STROKE)

ALSO

$$P = \omega T = 2\pi N T$$

↑
TORQUE

DERIVATION:

$$MEP = W_{cycle} / (V_1 - V_2)$$

$$\frac{MEP}{P_1} = \frac{W_{cycle}}{P_1 (V_1 - V_2)}$$

Compression
Ratio

$$V_1 - V_2 = V_1 (1 - V_2/V_1) = V_1 (1 - 1/r_c) = V_1 (r_c - 1)/r_c$$

$$W_{cycle} = \eta_{GR} Q_{in}$$

$$\text{SO, } \frac{MEP}{P_1} = \frac{\eta_{GR} Q_{in} r_c}{P_1 V_1 (r_c - 1)}$$

BT

$$PV = mRT$$

(IDEAL GAS LAW)

STRONG
RELATION
OF r_c

$$\text{SO, } \frac{MEP}{P_1} = \frac{\eta_{GR} (Q_{in}/m) r_c}{R T_1 (r_c - 1)}$$

Hence:

$$MEP = \frac{P_1 \eta_{GR} (r_c) Q_{in}/m r_c}{R T_1 (r_c - 1)}$$

SENSITIVITY STUDY...

AS $P_c \uparrow$ $mep \uparrow$ $P \uparrow$
(METHOD OF LOAD CONTROL IN SI ENGINE)

AS $\dot{Q}_{in}/m \uparrow$ $mep \uparrow$ $P \uparrow$

(IMPLICATIONS FOR FUEL/AIR RATIO)

AS $T_c \uparrow$ $mep \downarrow$ $P \downarrow$
(BENEFITS OF SUPERCHARGING)

AS $N \uparrow$ mep - NO CHANGE! $P \uparrow$