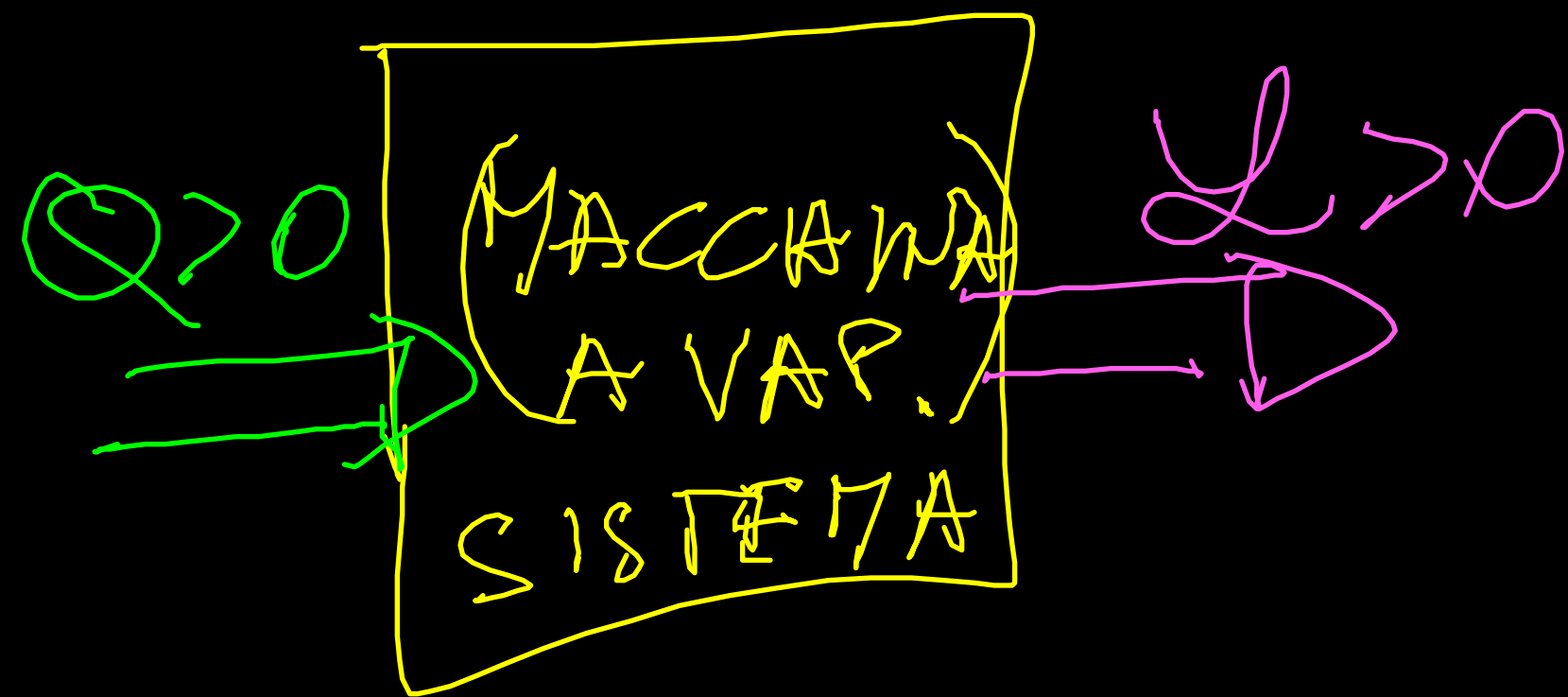
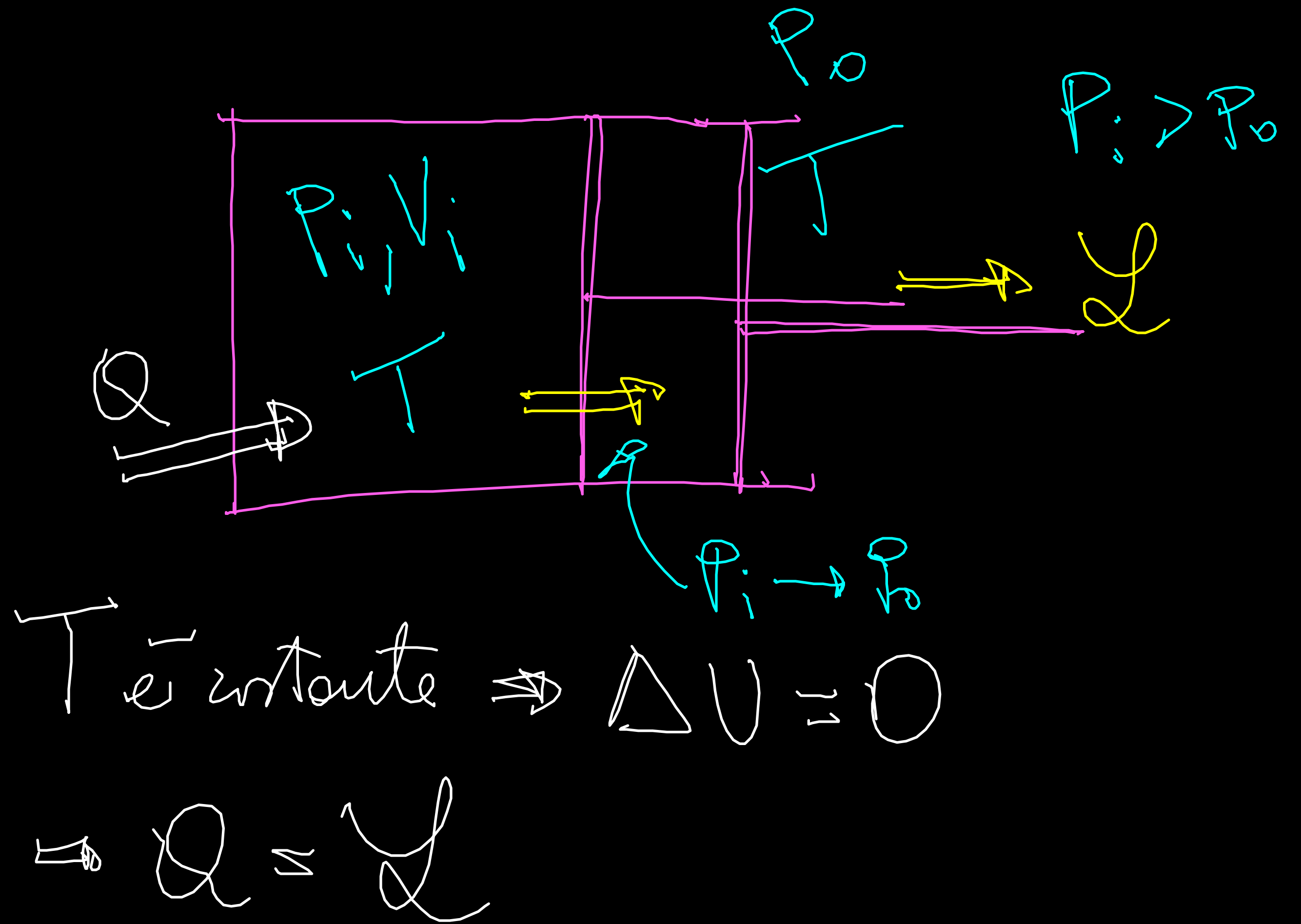


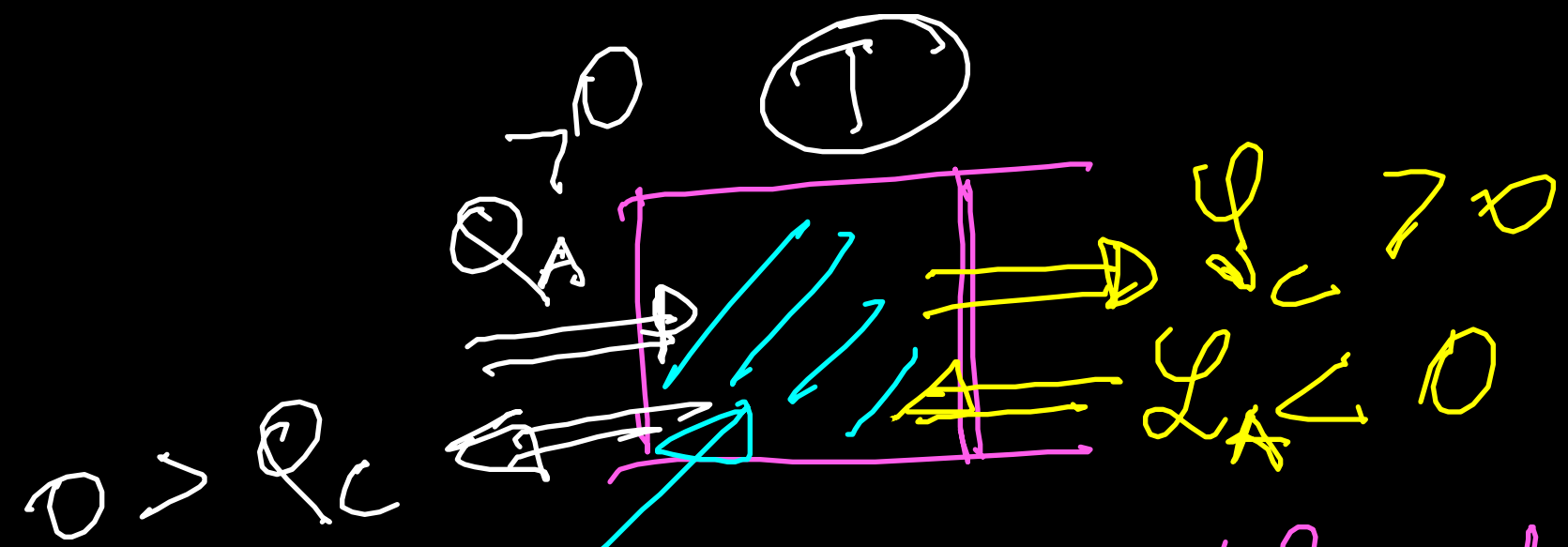
MACCHINE TERMICHE



$$\Delta U = Q - L$$



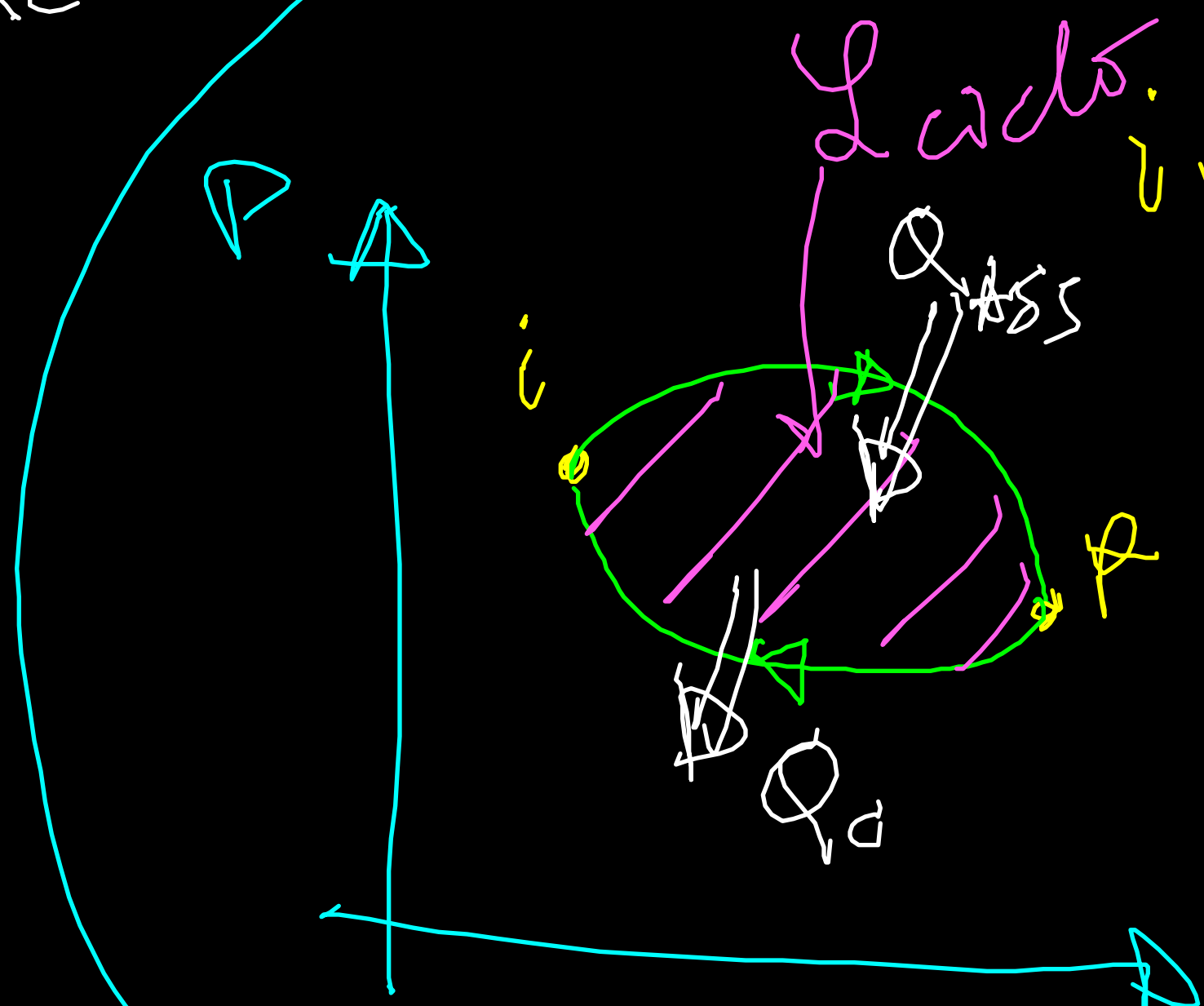
MACCHINA TERMICA CICLICA



$$\Delta U = 0 \quad (\text{CICLO})$$

$$Q_{\text{ciclo}} = L_{\text{ciclo}}$$

$$\Rightarrow Q_A + Q_C$$



$L_{\text{add.}}$ $i \rightarrow f$ ESP

$$L_{i \rightarrow f} > 0$$

$f \rightarrow i$ COMPR.

$$L_{f \rightarrow i} < 0$$

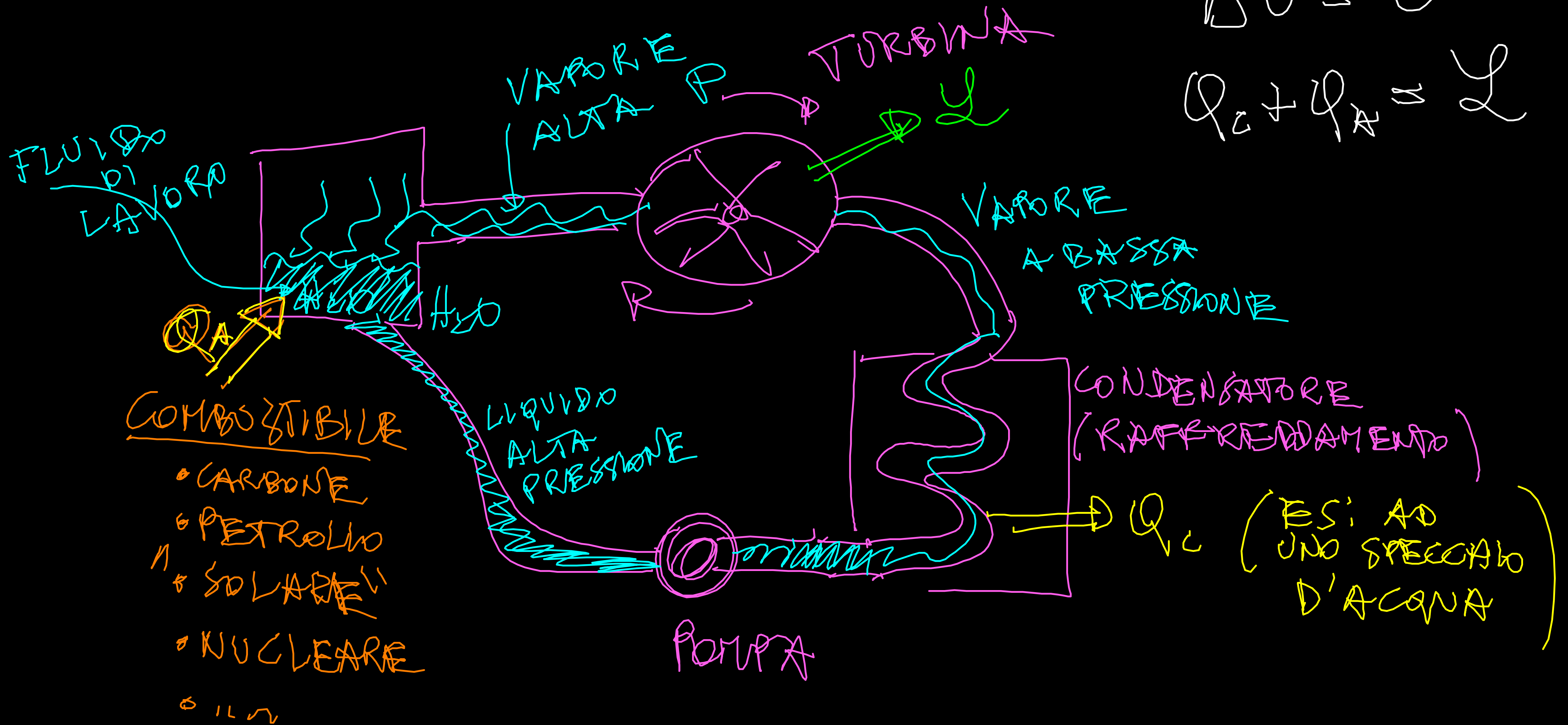
$$L = L_{i \rightarrow f} + L_{f \rightarrow i} > 0$$

FLUIDO DI LAVORO = SISTEMA

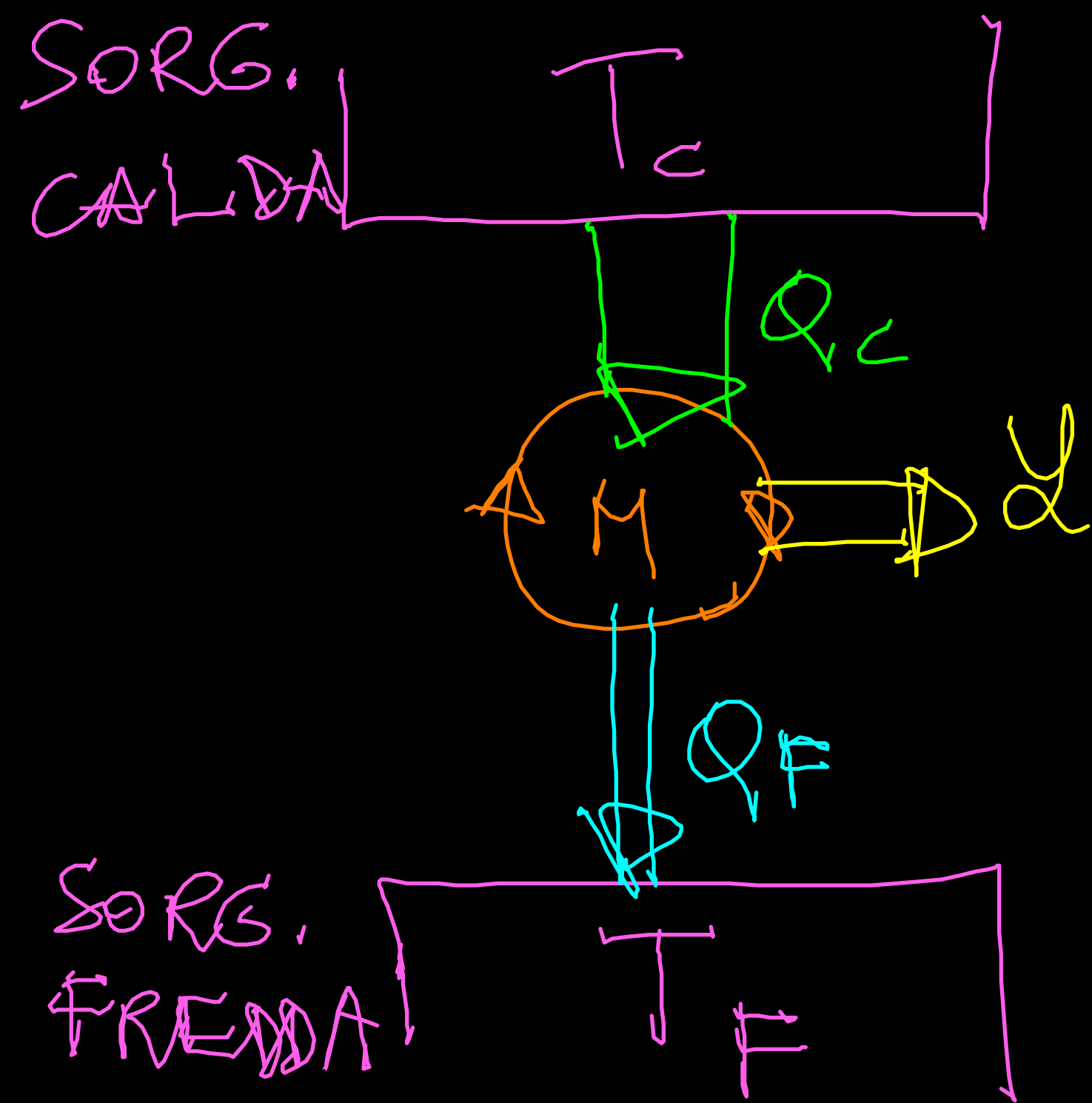
ESEMPIO QUALITATIVO

$$\Delta U = 0$$

$$Q_C + Q_A = L$$



RENDIMENTO DI UNA MACCHINA TERMICA CICLICA



$$Q_c > 0, \quad l > 0, \quad q_f < 0$$

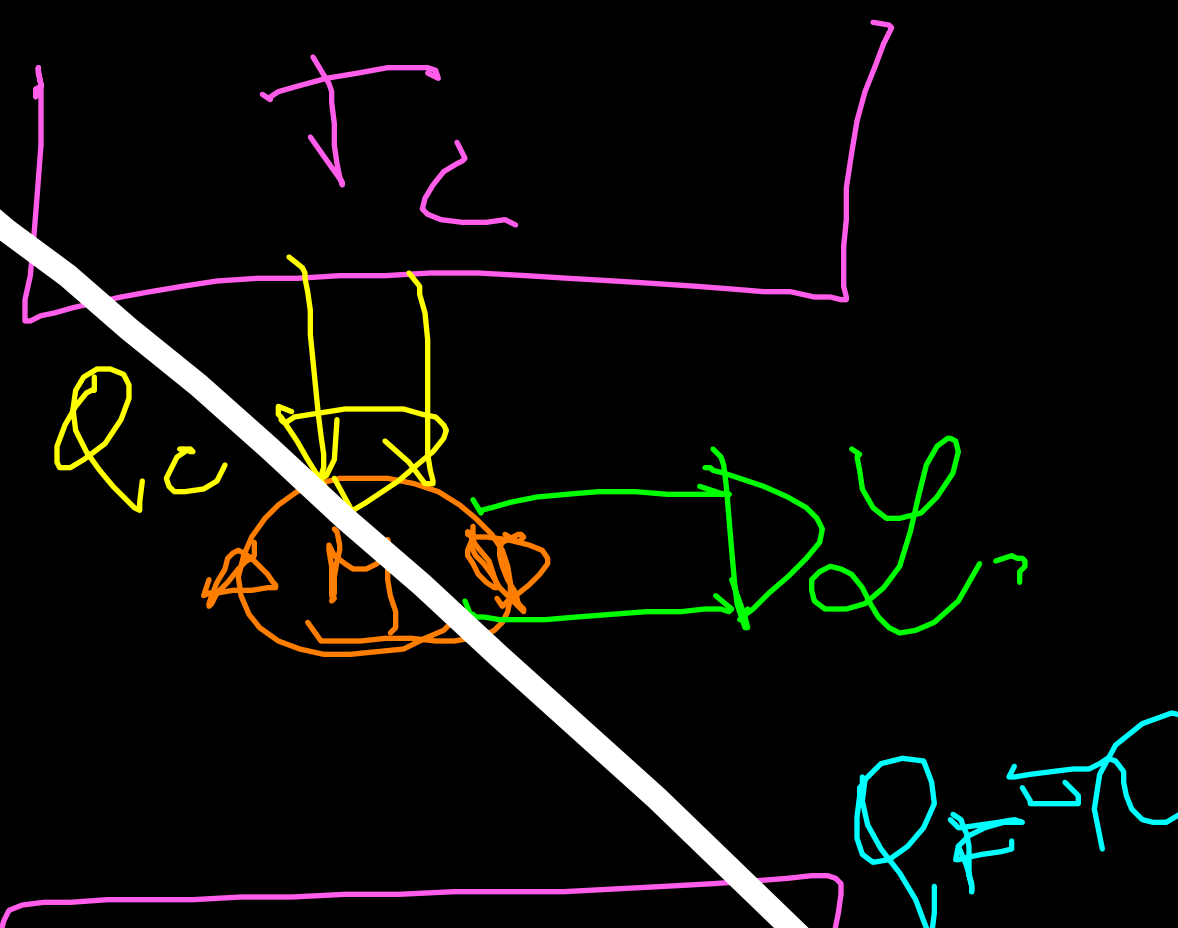
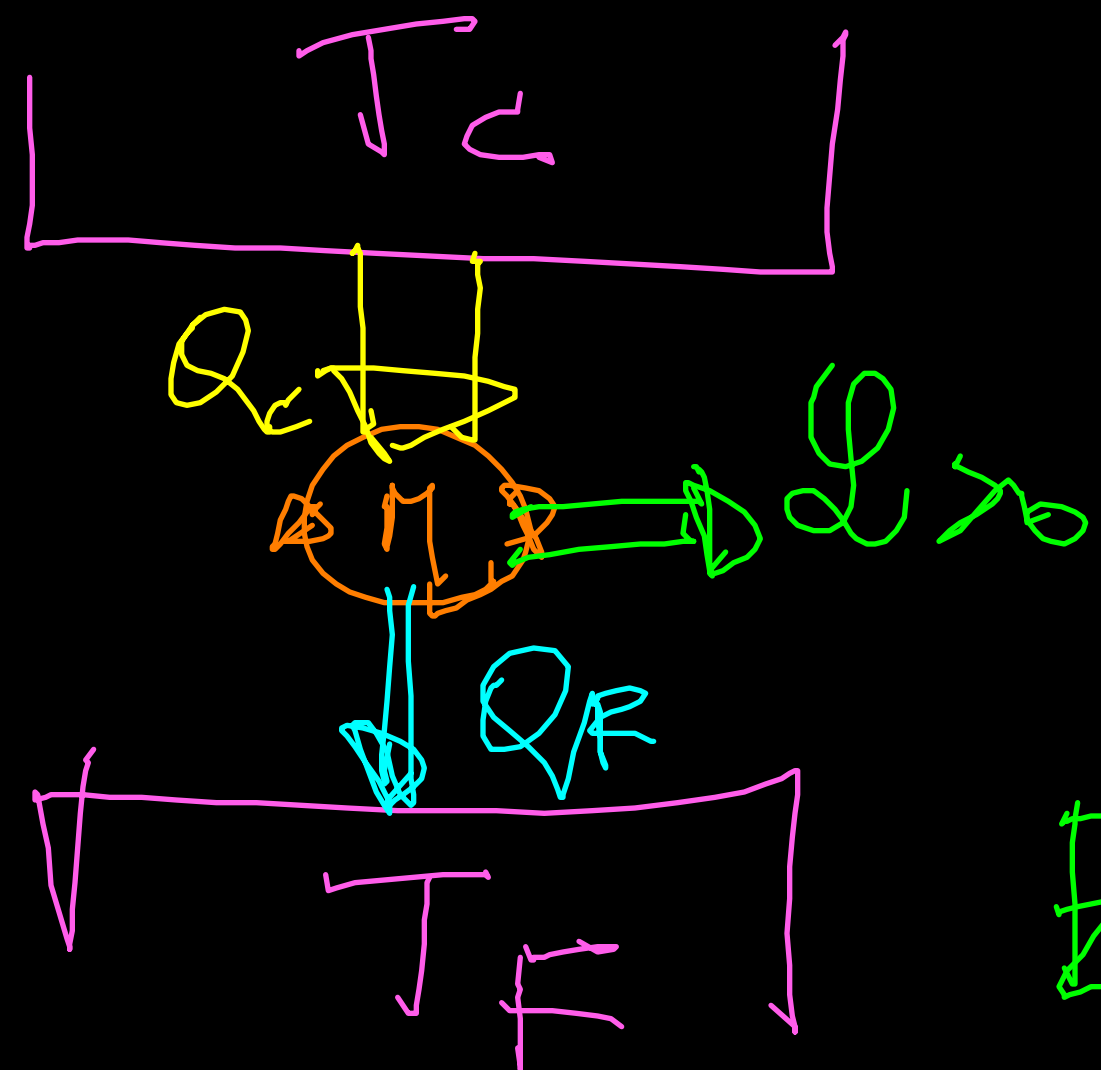
$$l = Q_c + q_f = Q_c - |q_f|$$

RENDIMENTO DI UNA MACCHINA TERMICA

$$\eta = \frac{l}{Q_c} = \frac{Q_c - |q_f|}{Q_c} = 1 - \frac{|q_f|}{Q_c}$$

SE $|q_f| = 0 \Rightarrow \eta = 100\% \Rightarrow$ IMPOSSIBILE !!

SECONDO PRINCIPIO DELLA TERMODINAMICA



↳

ENUNCIATO

b)

KELVIN-PLANCK

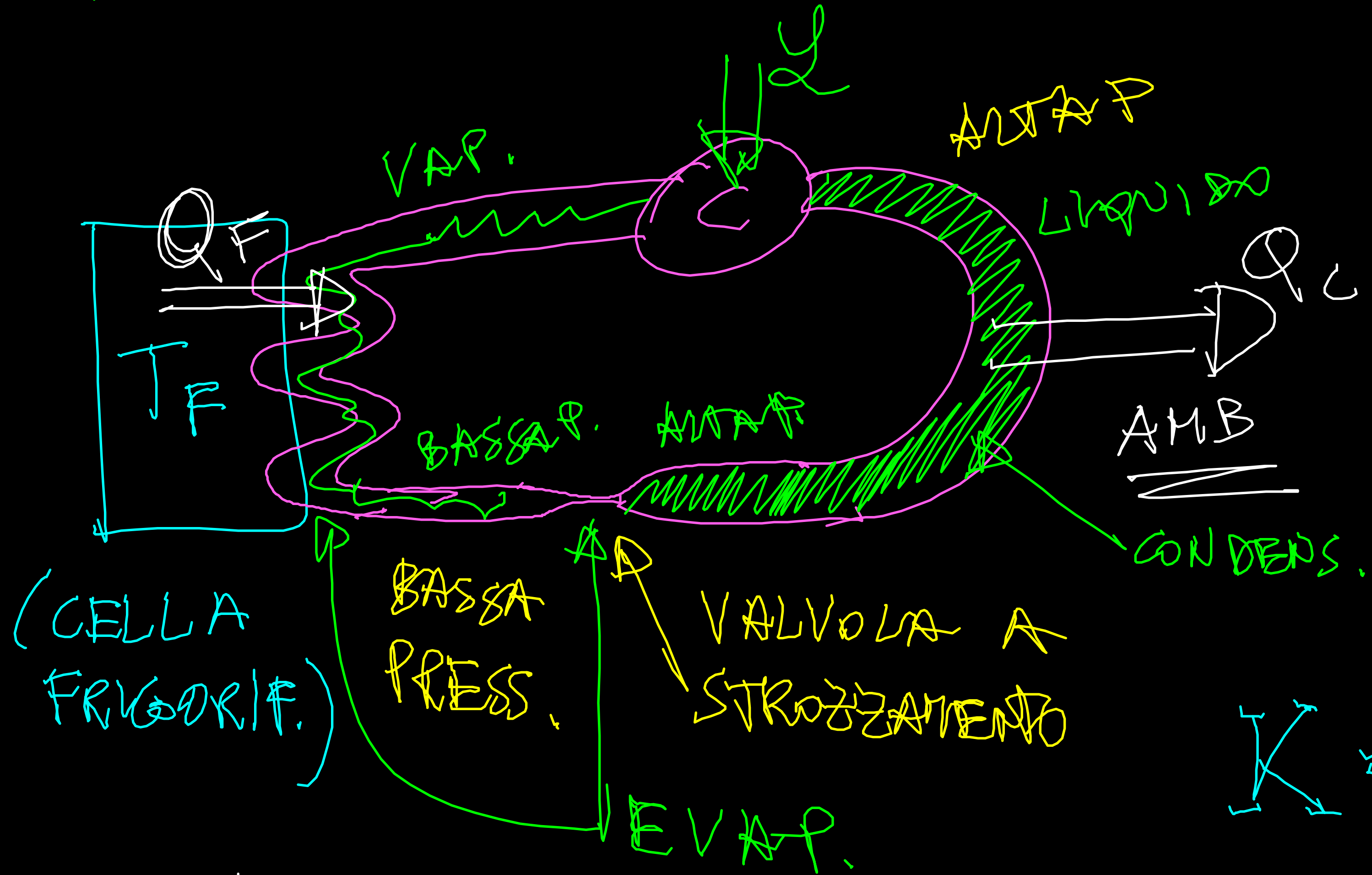
SI

$$\eta < 1$$

~~NO~~

~~$$\eta = 1$$~~

MACCHINE FRIGORIFERE



$$T_C > T_F$$

$$Q_F > 0$$

$$Q_C < 0$$

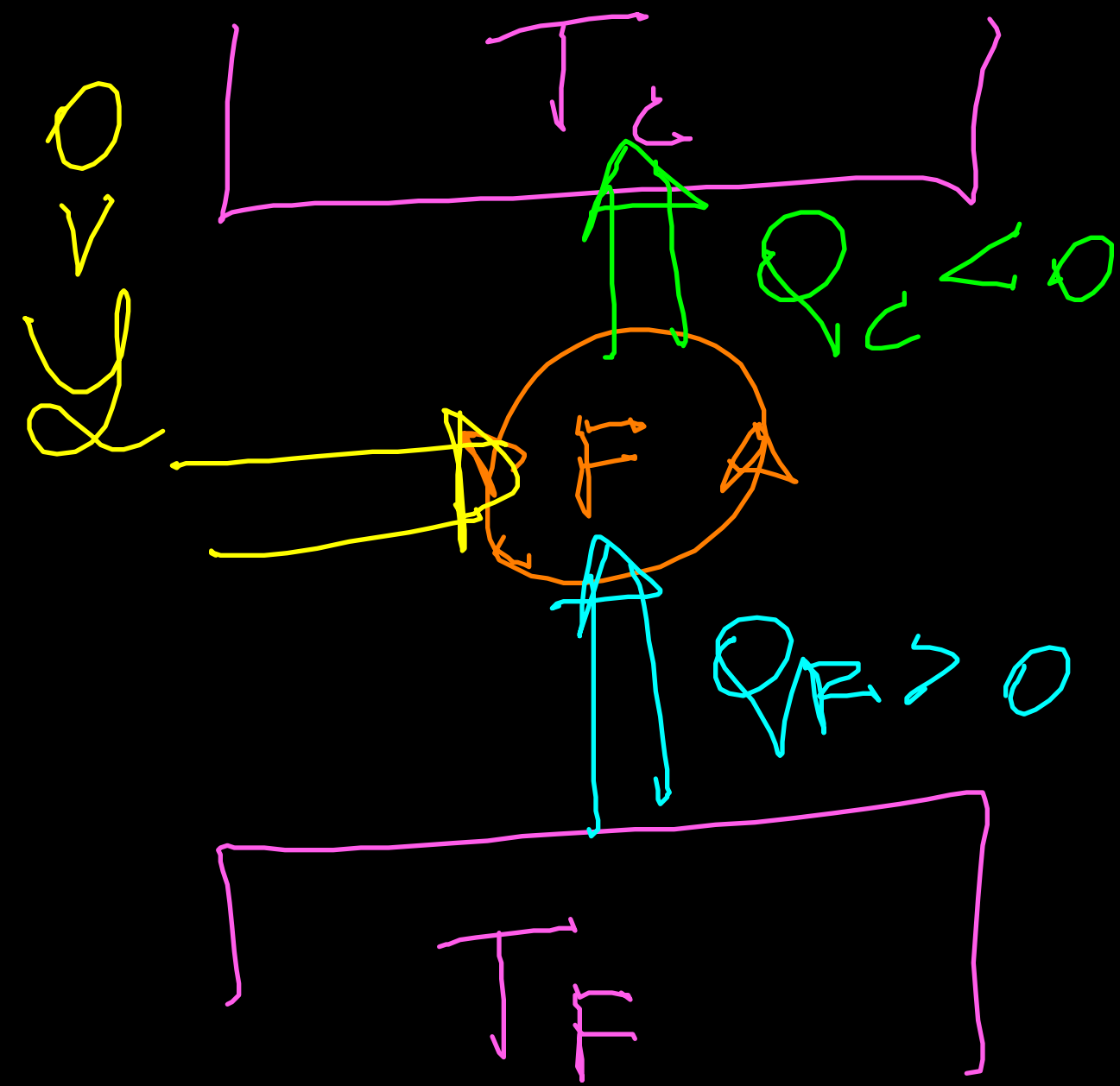
$$Q < 0$$

$$Q = Q_F + Q_C$$

$$K = \frac{Q_F}{|Q|}$$

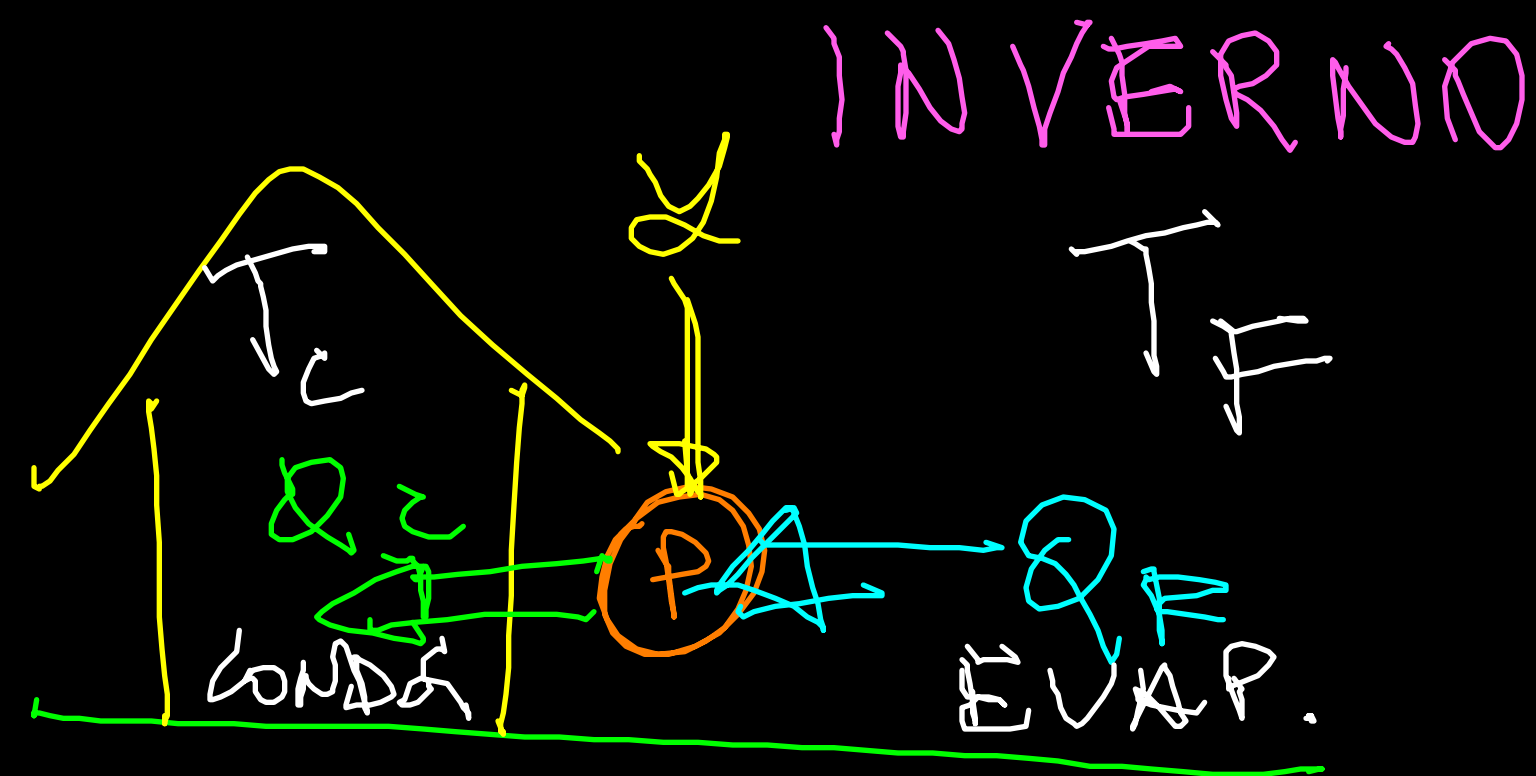
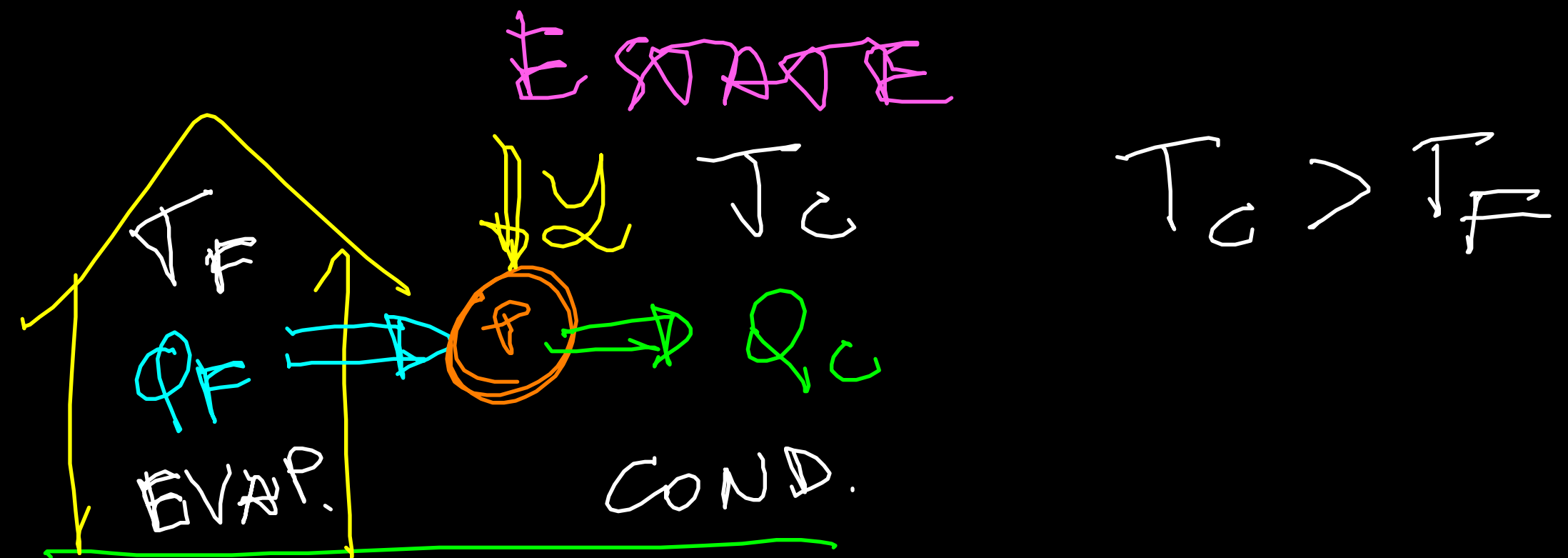
COEFF. DI PRESTAZIONE

MACCHINA FRIG. \Rightarrow POMPA DI CALORE



$$W = Q_C + Q_F$$

$$|W| = |Q_C| - Q_F$$



PER LA POMPA DI CALORE

$$K_{PC} = \frac{|Q_C|}{|W|}$$

EFFICIENZA
DELLA POMPA
DI CALORE

COEFF. DI PREST.

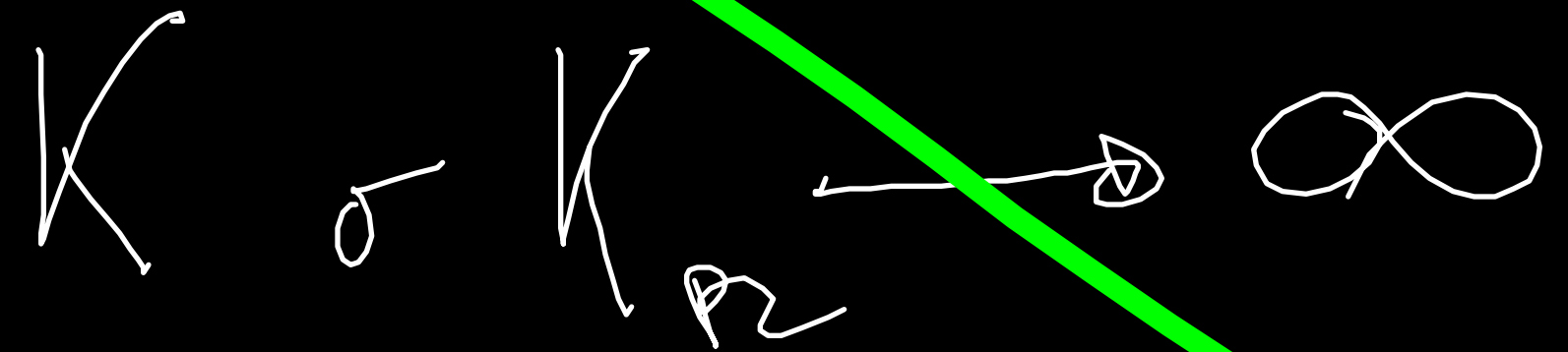
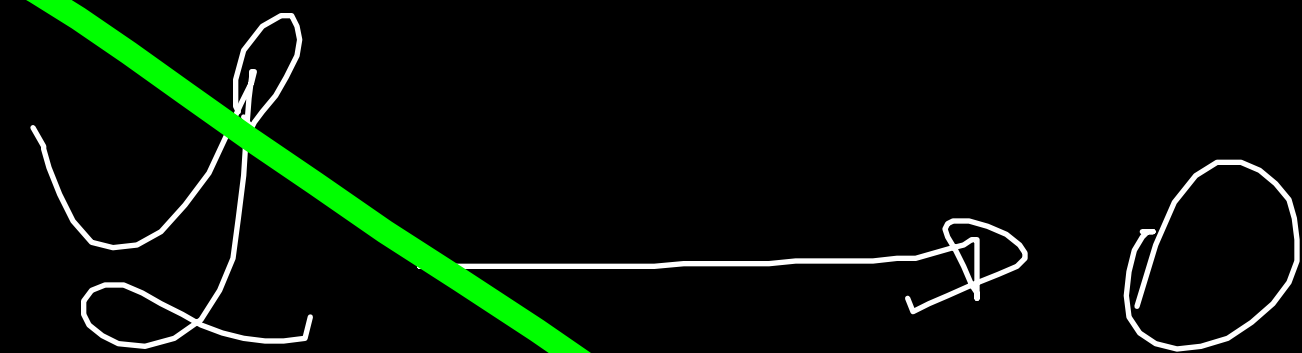
$$K = \frac{Q_F}{|Q_L|}$$

EFFICIENZA
DELLA P.M.C.

$$K_{P.M.C.} = \frac{|Q_C|}{|Q_L|}$$

"IDEALMENTE"

VORREI



NO

II PR. \rightarrow IMPOSS.

ENUNC. DI CLAUSIUS