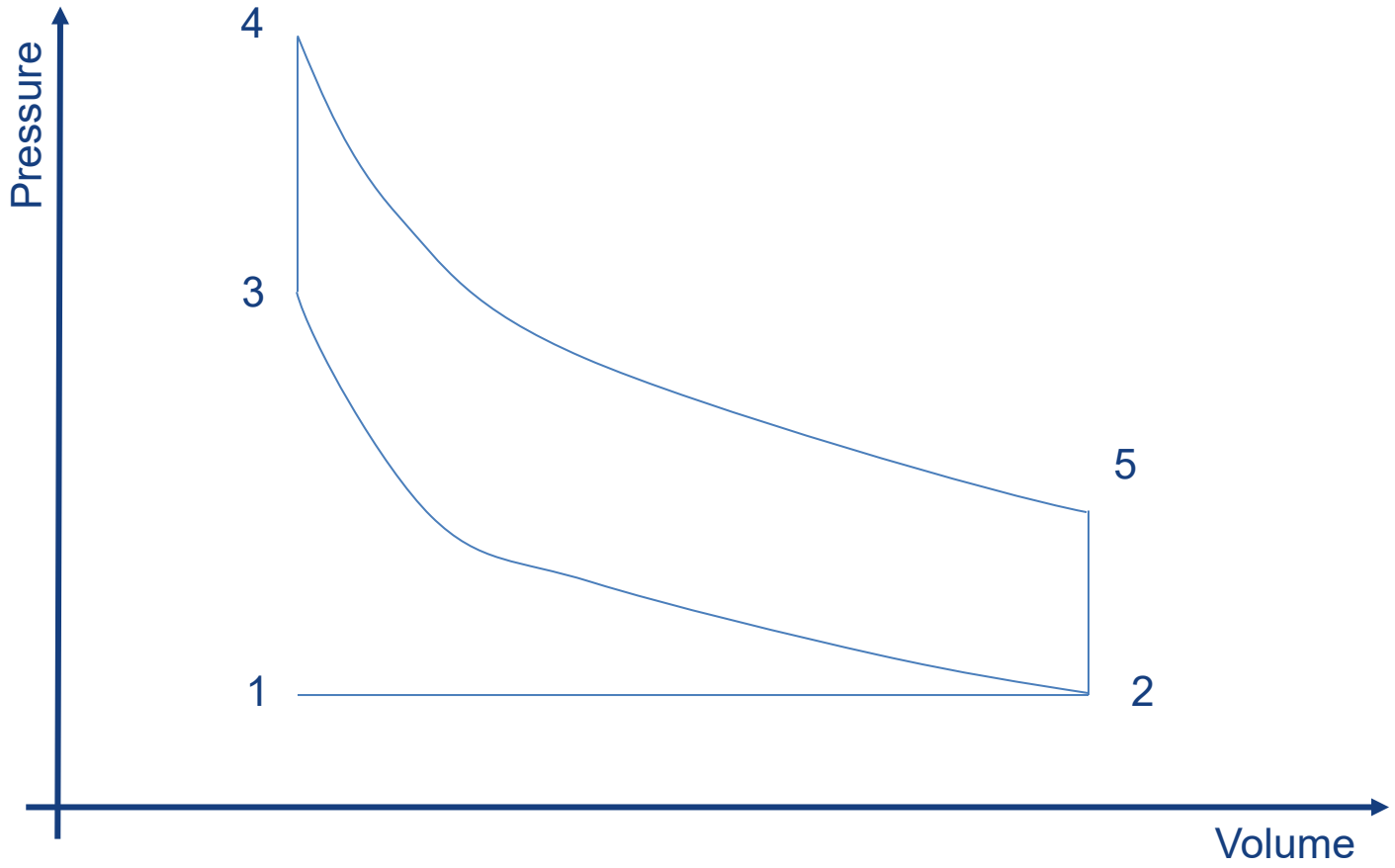
TECHNISCHE UNIVERSITÄT

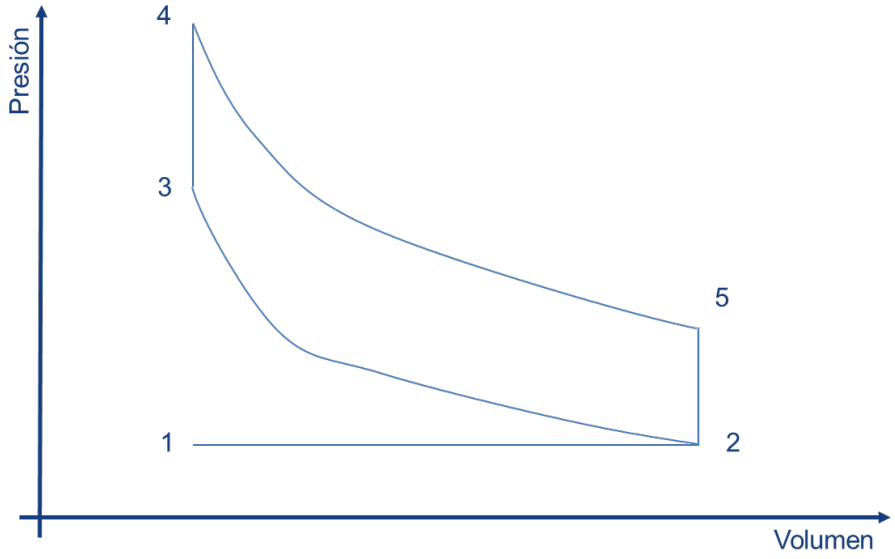
Gas and Diesel Cycle

AUTOPISTA

Gasoline – Otto's Cycle



Gasoline – Otto's Cycle



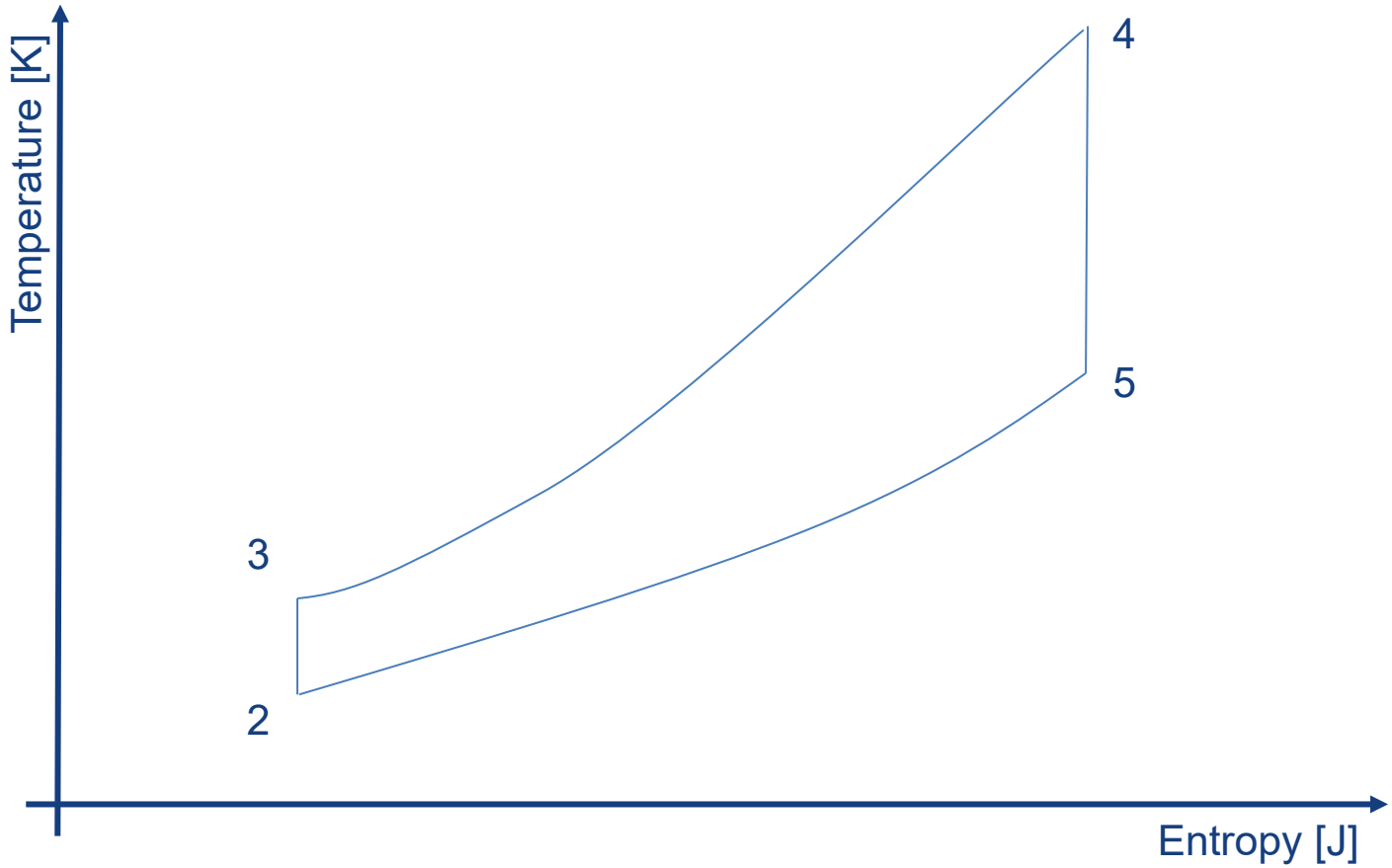
Process

- 1-2 Air intake (inhale)
- 2-3 Compression
- 3-4 Combustion
- 4-5 Expansion
- 5-2 Heat dissipation
- 2-1 Gases going out (exhale)

Thermodynamics:

- 3-4 Constant volume
- 4-5 Adiabatic process: No heat transfer.
- Work: The area made by 2-3-4-5-2.

Gasoline – Otto's Cycle



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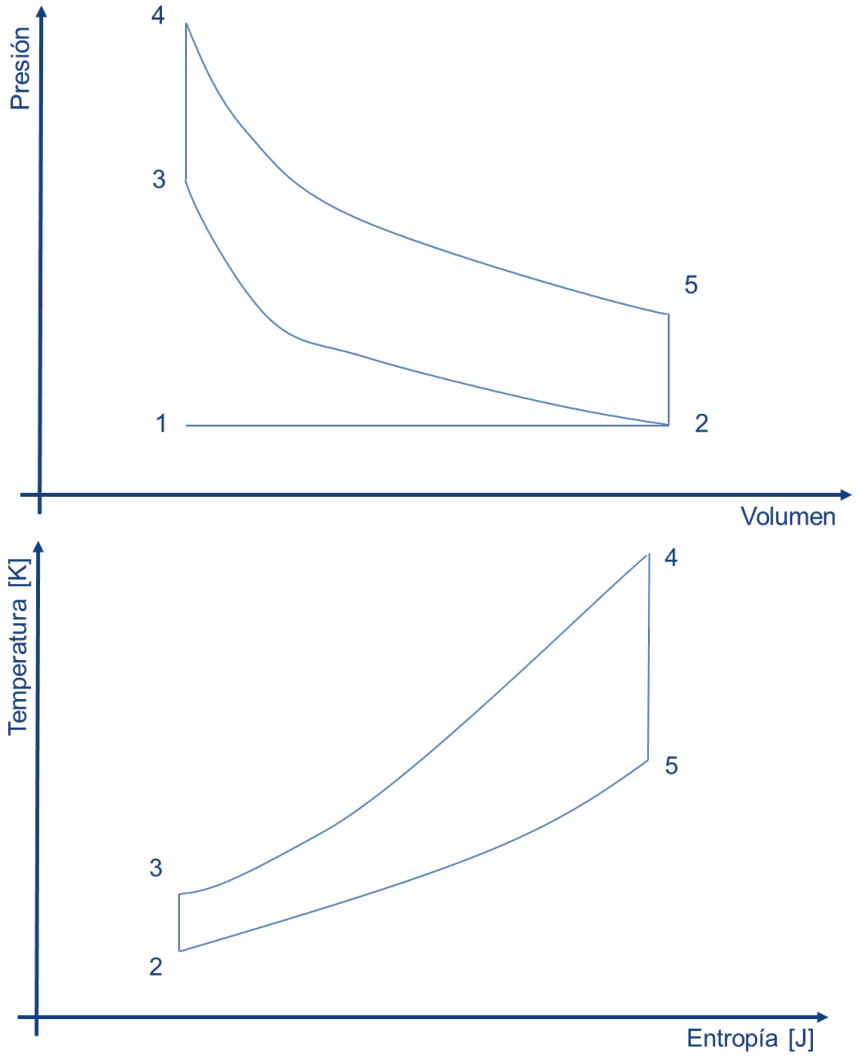
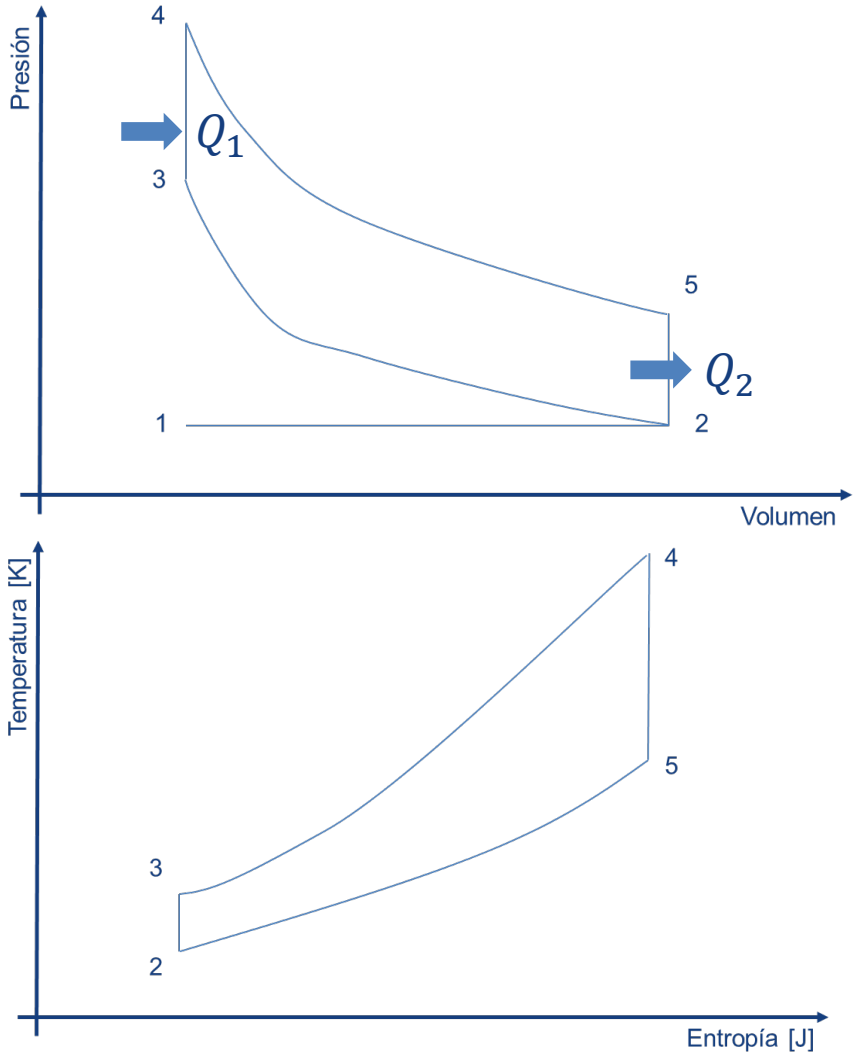


To ease your analysis please consider the following notes:

- P2 is the lowest pressure in the system
- P4 is the highest pressure
- V2 = V5 y V3 = V4
- T2 is the lowest
- T4 is the highest
- Compression = V1/V2
- 3-4 Heat going in
- 5-2 Heat dissipation

Gasoline – Otto's Cycle



Formulas

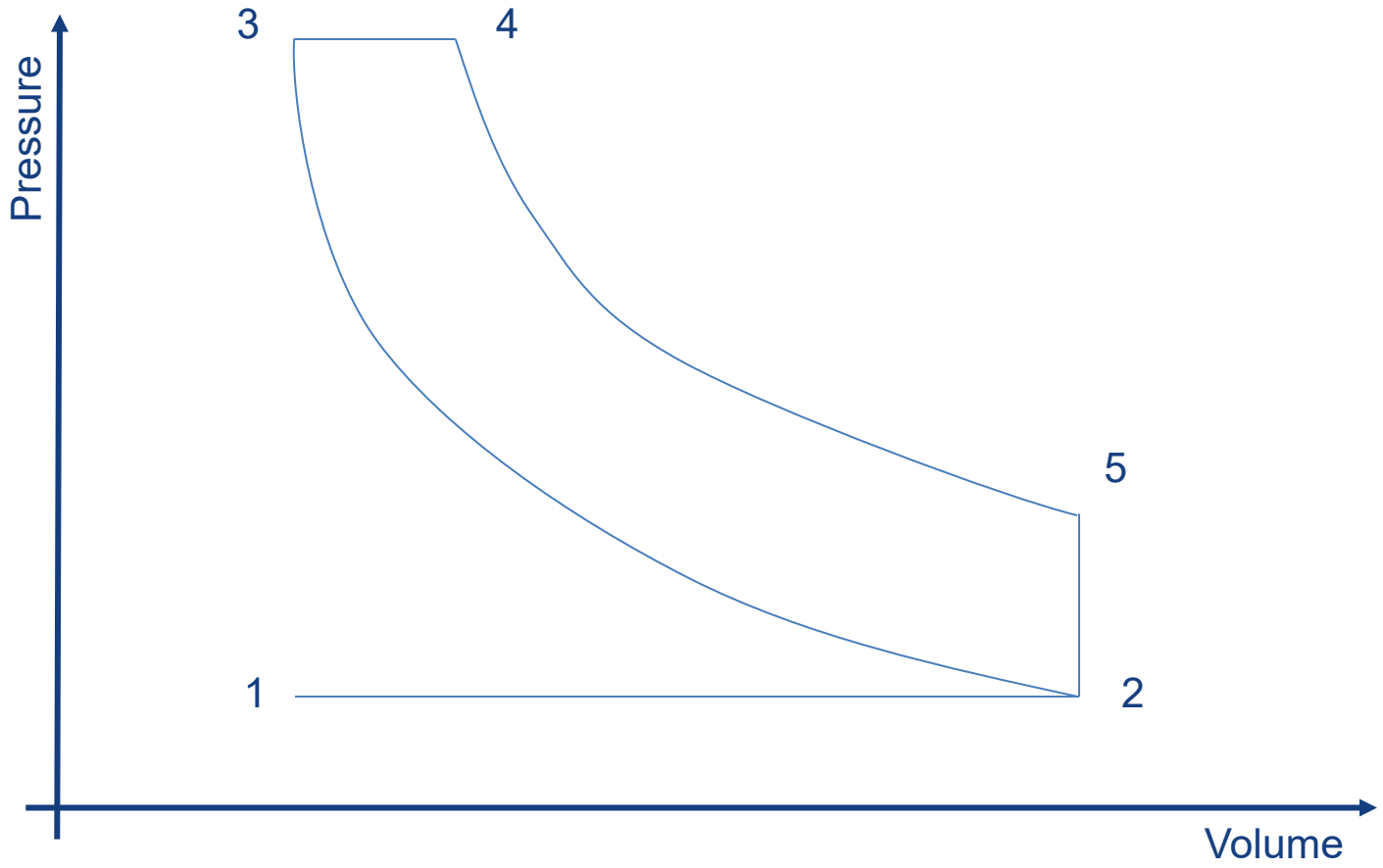
$$T_5 = T_4 \frac{f \cdot Q}{C_v}$$

$$P_5 = P_4 \frac{T_5}{T_4}$$

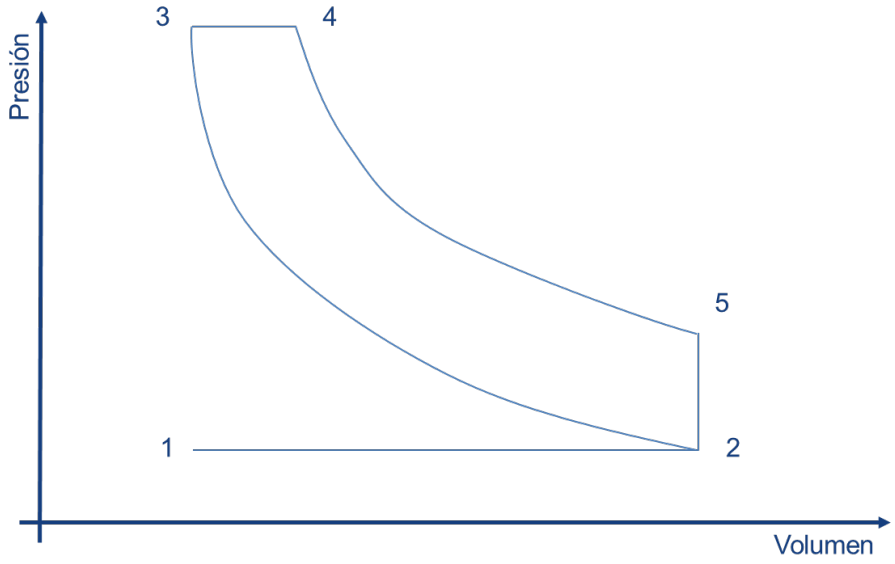
$$T_3 = T_2 \left(\frac{V_2}{V_3}\right)^{k-1}$$

$$P_3 = P_2 \left(\frac{V_2}{V_3} \cdot \frac{T_3}{T_2}\right)$$

Diesel



Diesel



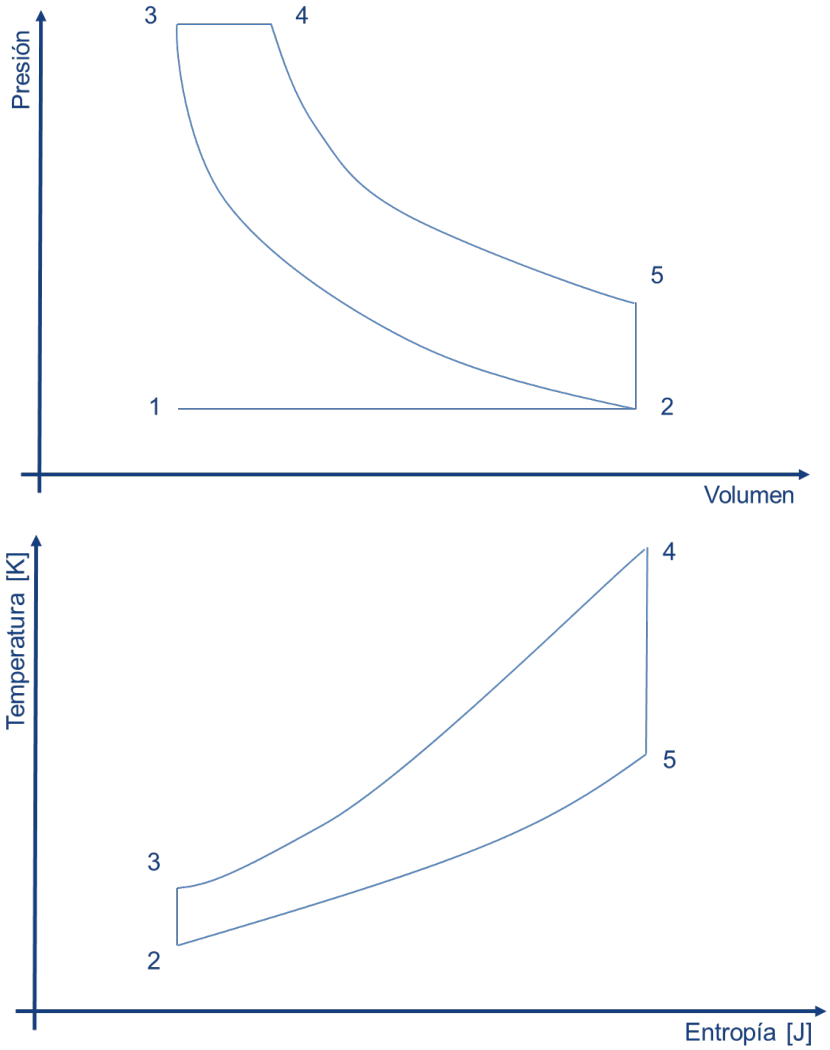
Process

- 1-2 Inhale
- 2-3 Adiabatic compression
- 3-4 Isobaric combustion
- 4-5 Adiabatic expansion
- 5-2 Heat dissipation
- 2-1 Exhale

Thermodynamics

- 3-4 is an isobaric combustion. The pressure remains constant.
- Heat dissipation at 5-2 is a process with constant volume.
- Work: Area within 2-3-4-5-2.

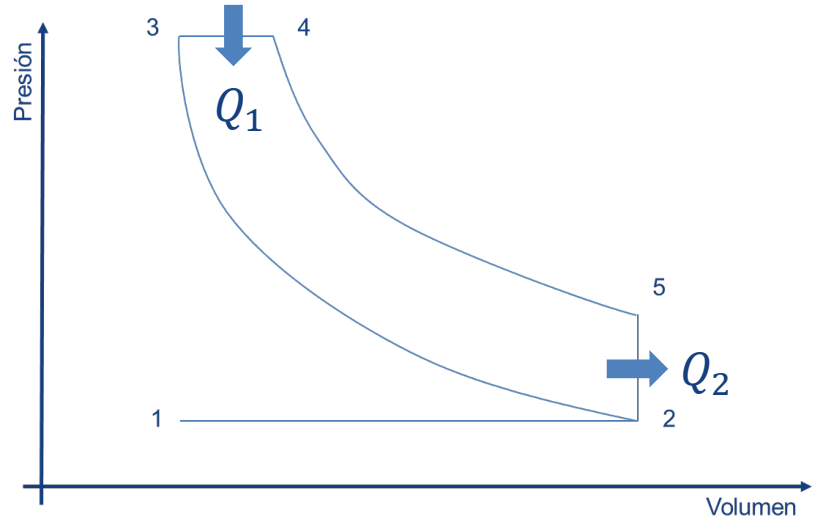
Diesel

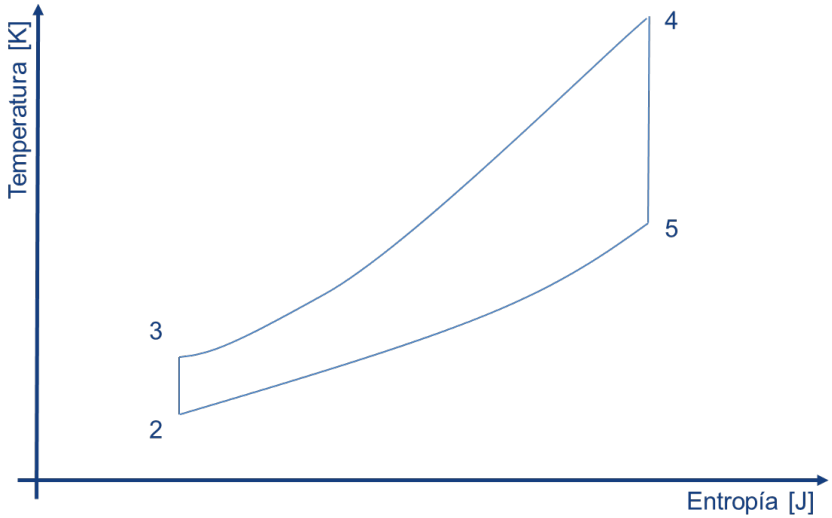


To ease your analysis please note:

- P2 is the lowest pressure
- P3 y P4 are equal
- V2 = V5
- T2 is the lowest
- T4 is the highest
- Compression = V1/V2
- 3-4 Heat going in
- 5-2 Heat dissipation
- Diesel's motor compression is around 15 - 20.

Diesel





Formulas

$$Q_1 = C_p(T_4 - T_3)$$

$$Q_2 = C_v(T_2 - T_5)$$

$$Efficency\ \eta = \frac{Q_1 + Q_2}{Q_1}$$

$$T_4 = T_3 \left(\frac{V_3}{V_4}\right)^{k-1}$$

$$P_4 = P_3 \left(\frac{V_3}{V_4}\right)^{k}$$