

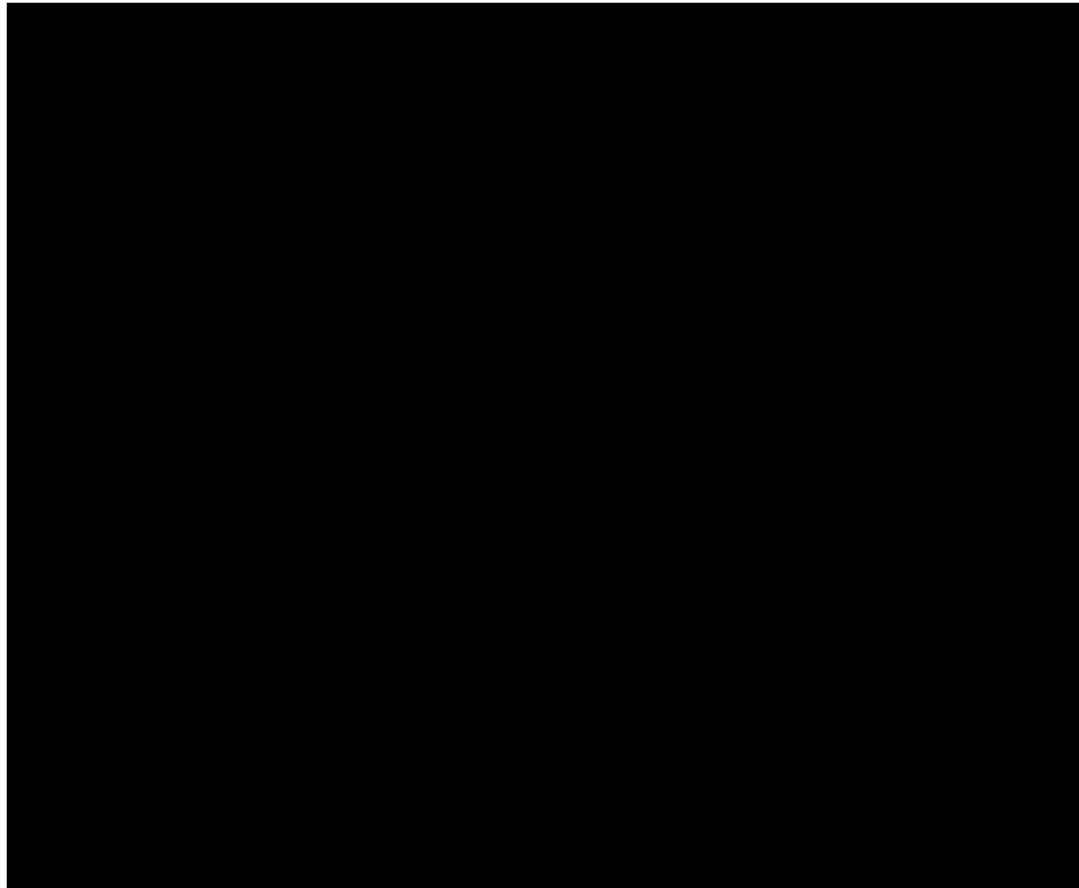


# MAK 3031- Internal Combustion Engines

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Sub-Division  
Internal Combustion Engine Laboratory

# Week-1/Classifications

Inline and V-type cylinder arrangement



# Week-1/Classifications

Radial piston engine cylinder arrangement



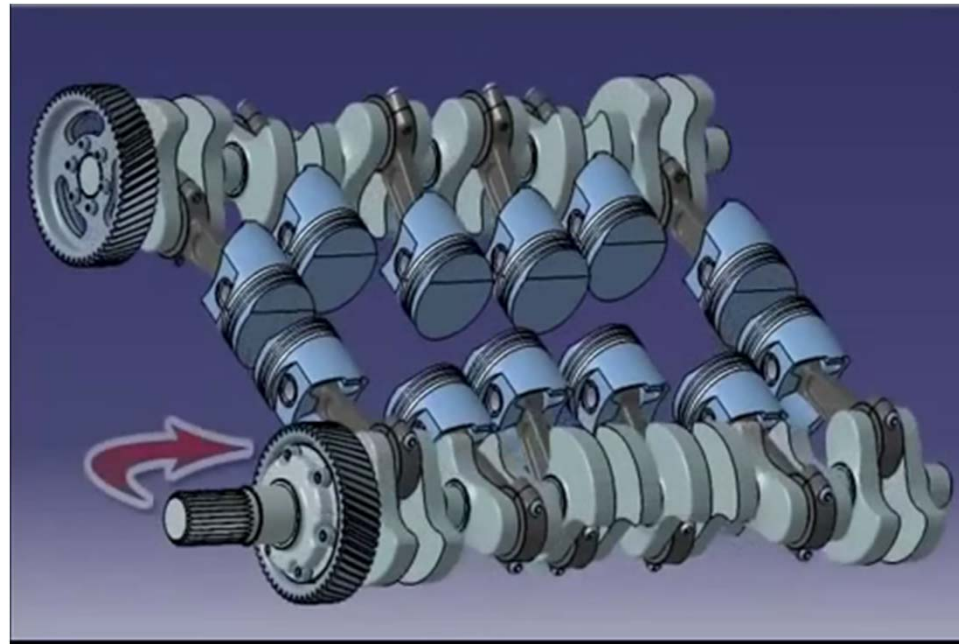
# Week-1/Classifications

Boxer engine cylinder arrangement



# Week-1/Classifications

Opposite piston engines



# Week-1/Classifications

Rotary piston engines-Wankel engine



# Week-1/Classifications

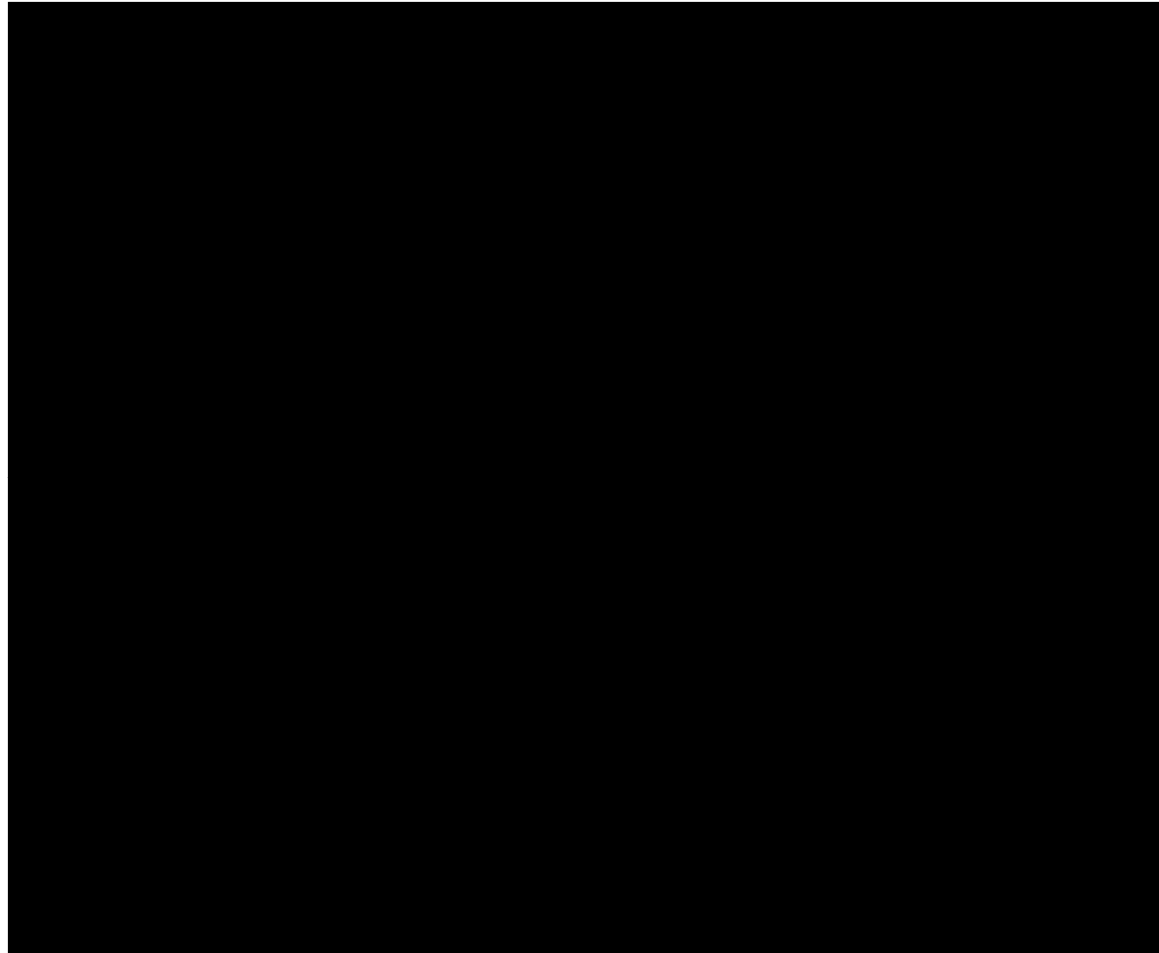
- Classification based upon cooling system
  - Liquid cooled engines (Water/oil)
  - Air cooled engines
- Classification based upon operation area
  - Lawn movers/power generators
  - Diesel generator engines
  - Marine applications
  - Automotive applications
  - Railway applications
  - Non-road construction engines and farm tractor app.
  - Aviation engines

# Week-1/Homework-1.2

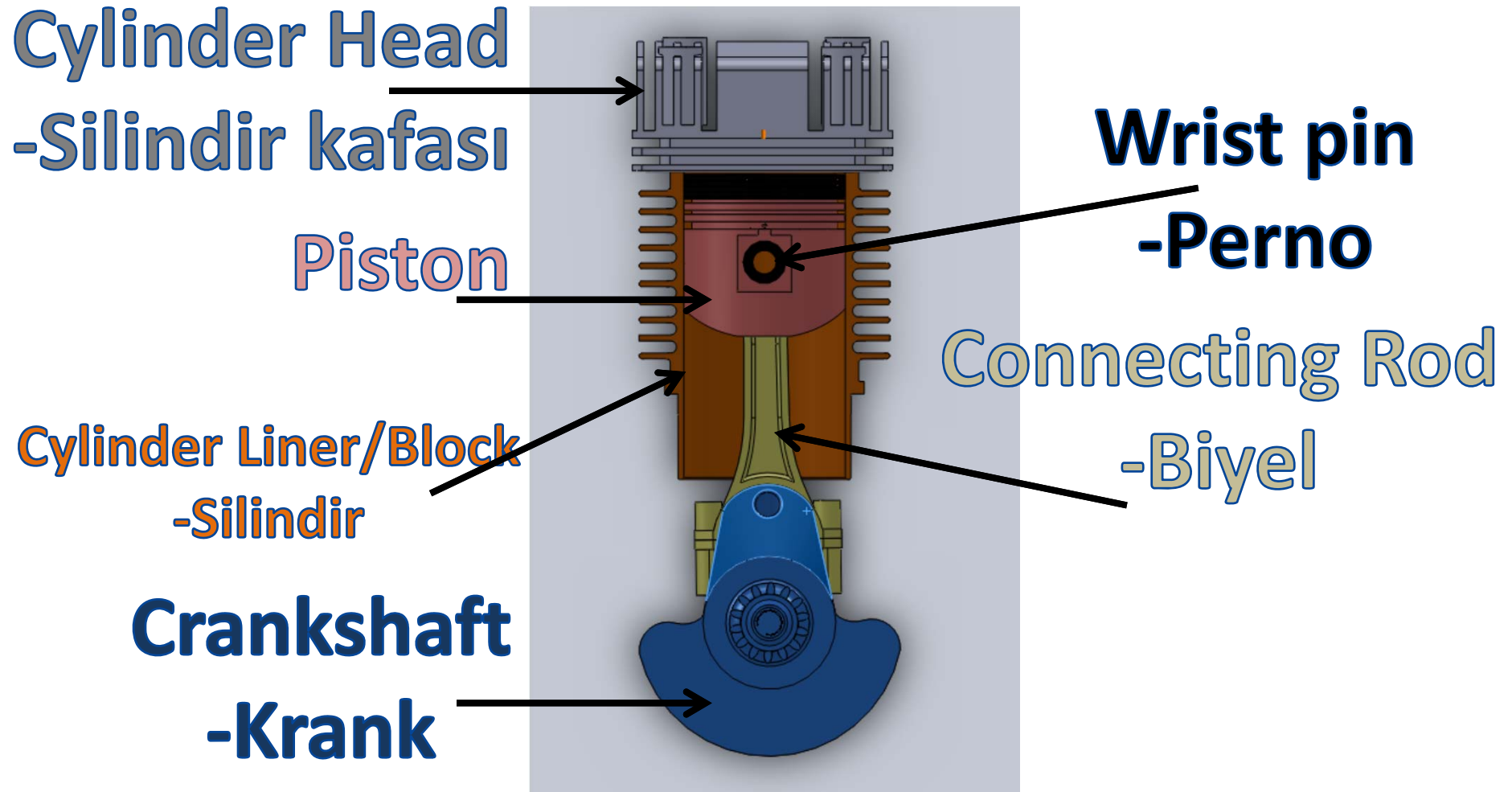
- Prepare a study about below-listed topics.
  - Stirling engine, how it works, why it hasn't operated widely today?
  - What is the benefits and drawbacks of Wankel rotary engine?



# Week-1/Principles of operation



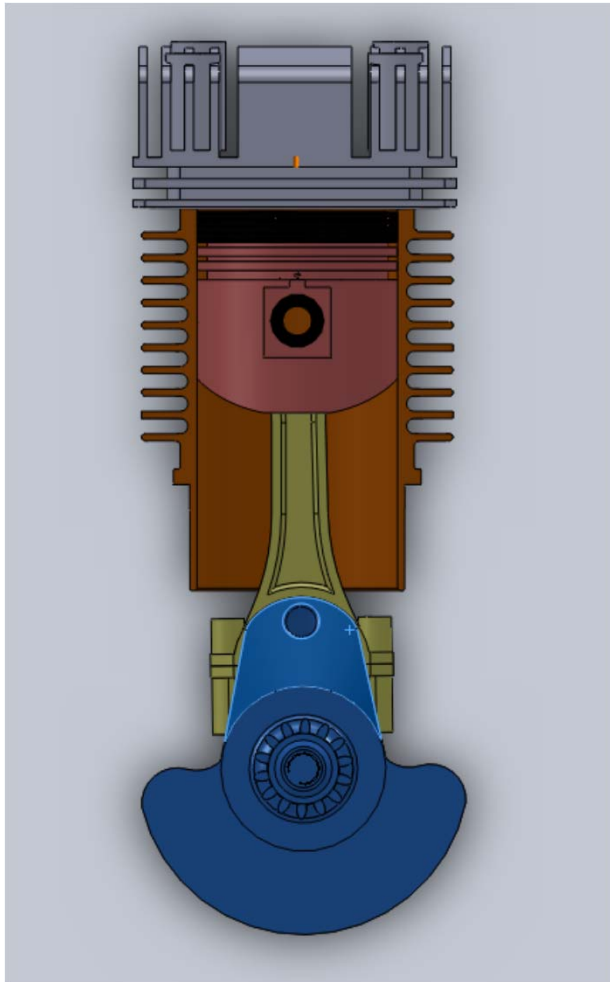
# Week-1/Principles of operation



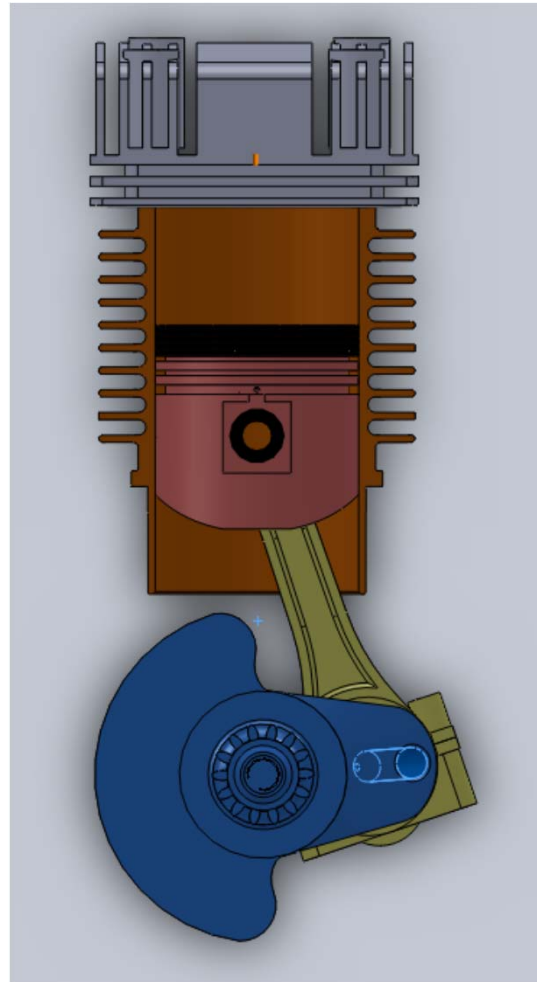
# Week-1/Principles of operation

- Top Dead Centre (TDC)- Üst Ölü Nokta (Ü.Ö.N.)
- 
- Bottom Dead Centre(BDC)- Alt Ölü Nokta (A.Ö.N.)
- 
- Middle Centre (MC)- Orta ölü nokta (O.Ö.N.)
- 
- Stroke- Piston Stroku (H)
- 
- Displacement volume/Stroke volume-- Strok Hacmi ( $V_h$ )
- 
- Clearance Volume--Sıkıştırma Hacmi veya ölü hacim (  $V_o$  )
- 
- Total cylinder volume-- Toplam Hacim ( $V_t$ )
- 
- Compression ratio--Sıkıştırma oranı ( $\epsilon$  )
- 
- Cycle--İş Çevrimi:

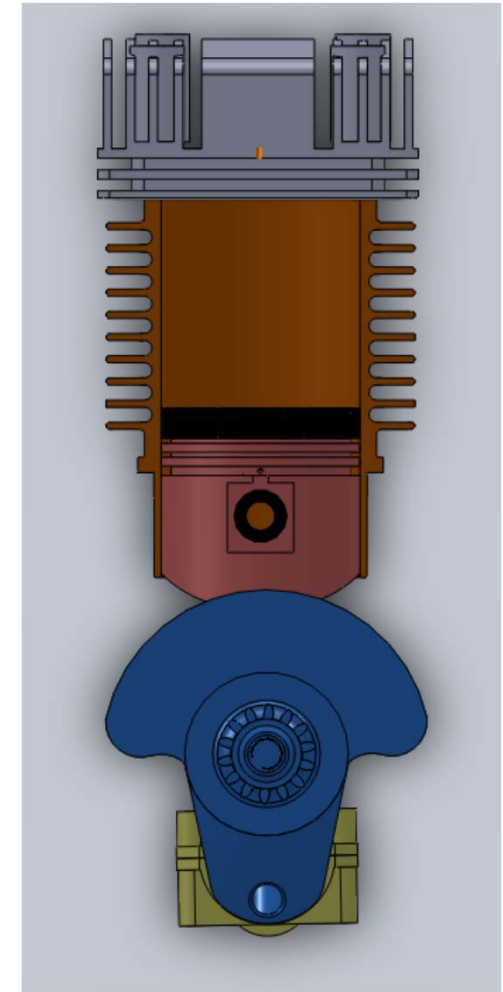
# Week-1/Principles of operation



TDC



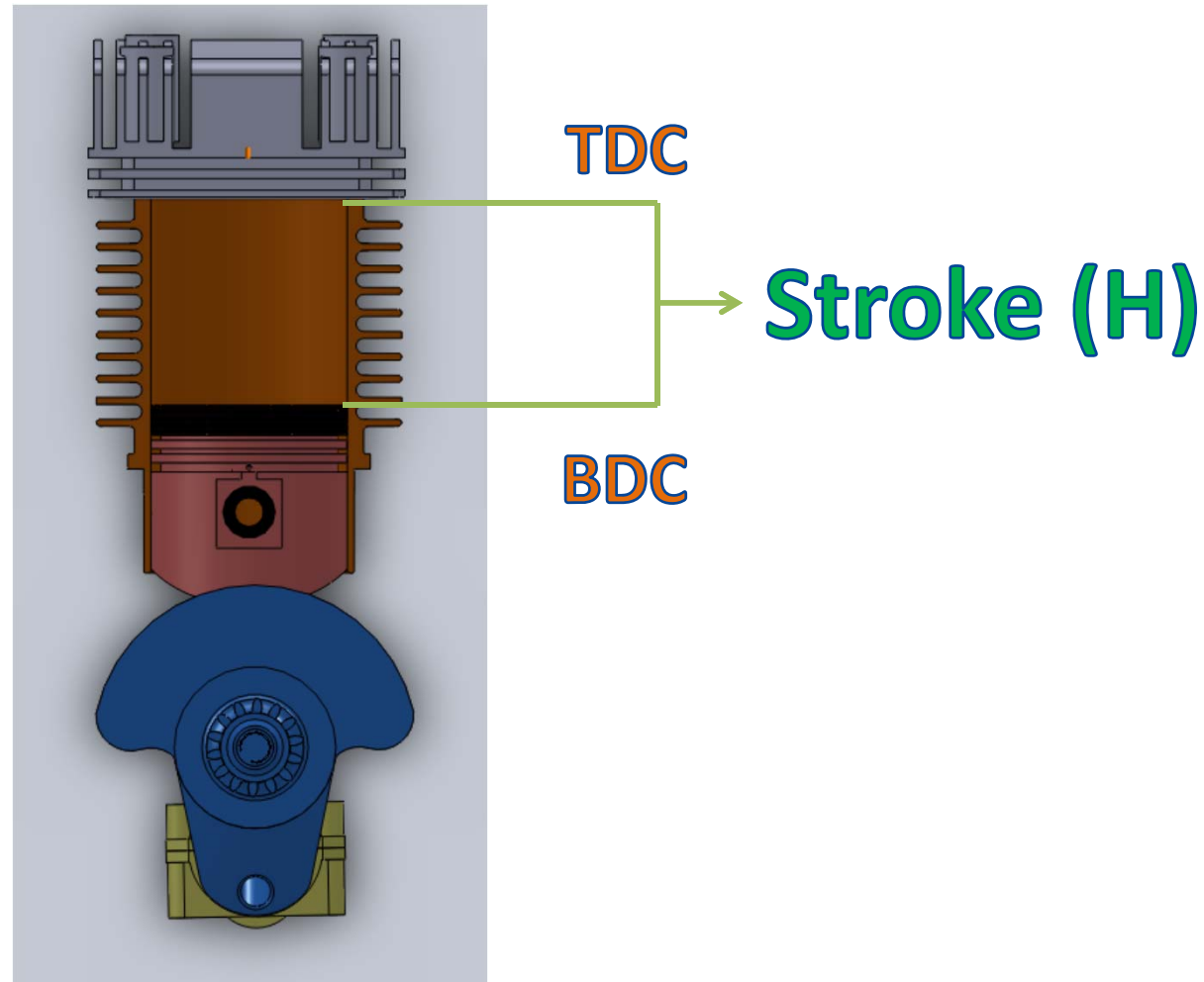
MC



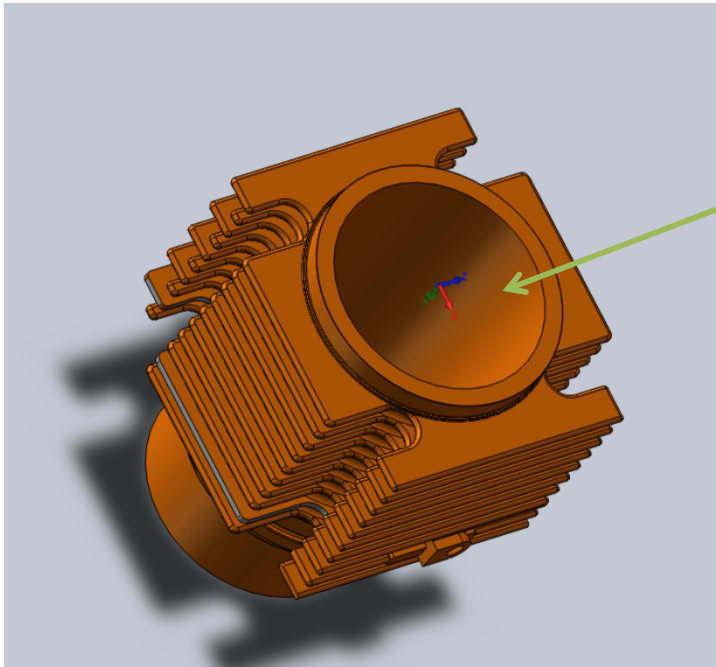
BDC

# Week-1/Principles of operation

- Stroke



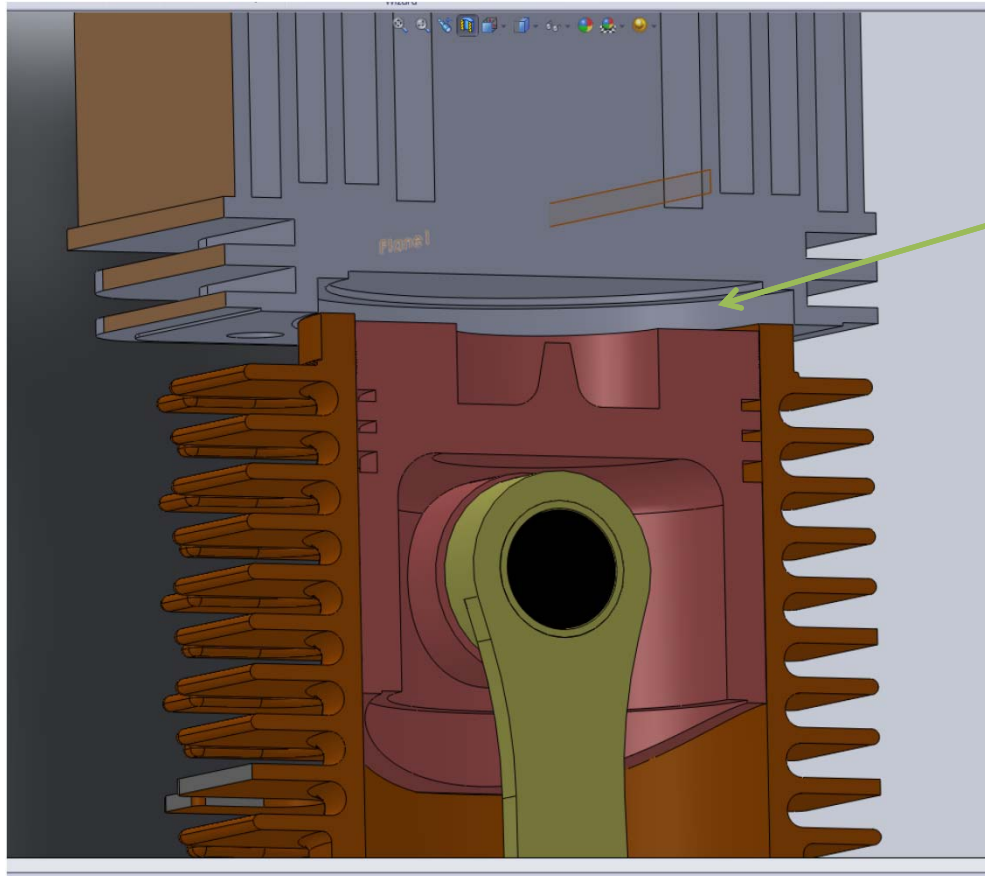
# Week-1/Principles of operation



Cylinder diameter-Silindir Çapı (D)

Displacement volume/Strok hacmi (Vh)=  $\frac{\pi D^2}{4} H$

# Week-1/Principles of operation



**Clearance Volume/  
Ölü hacim-(Vo)**

# Week-1/Principles of operation

Total cylinder volume ( $V_t$ )=Displacement Volume ( $V_h$ )+Clearance Volume ( $V_o$ )

Compression ratio/Sıkıştırma oranı=Maksimum silindir içi hacmin, minimum hacme oranıdır.

Compression ratio/Sıkıştırma oranı= $V_t/V_o$



# Week-1/Homework-1.3

- Investigate the above listed parameters of a mass-production car engine.