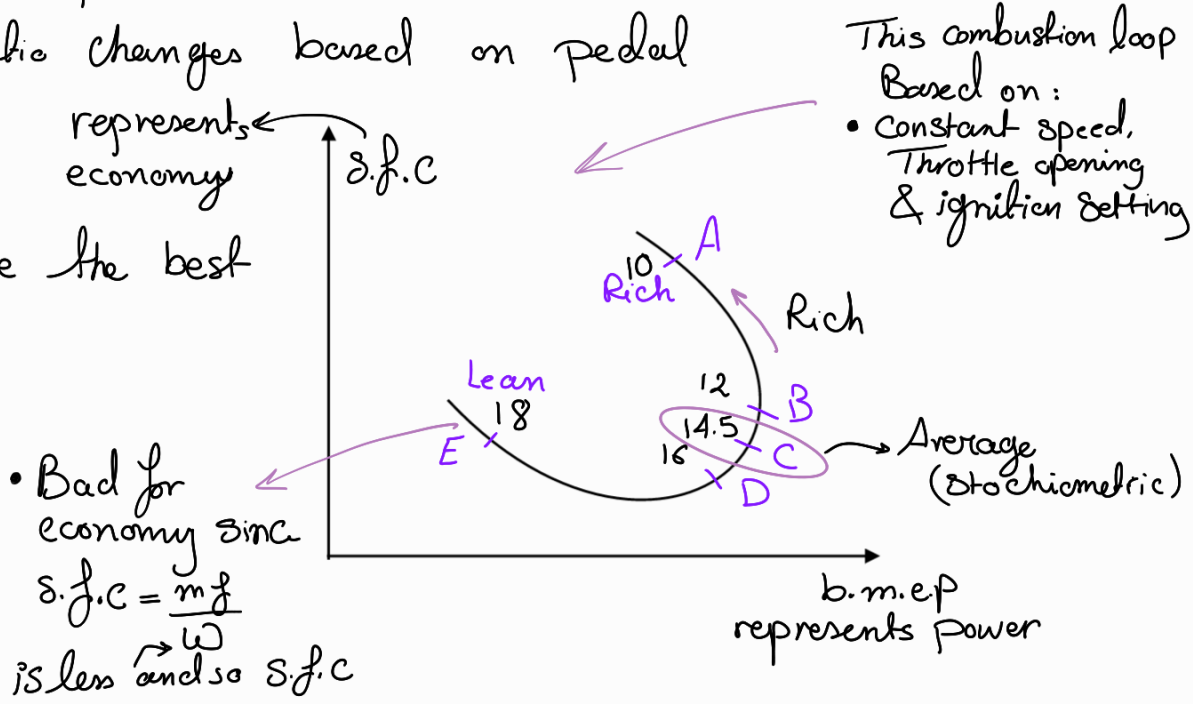
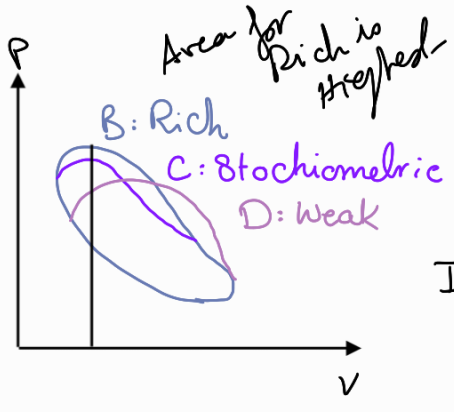
Chapter 1: Spark ignition engines

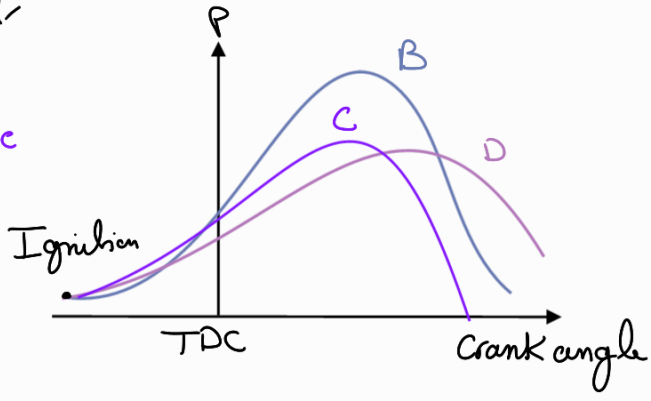
- These engines operate on mixtures near stochiometric Air/fuel ratio changes based on pedal

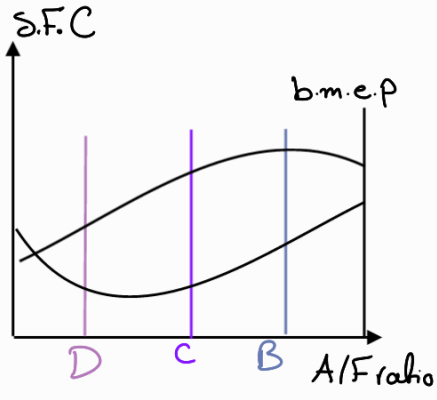


- B, C, D are the best range
- Characteristics diagrams for B, C, D:

Pressure – Volume diagram

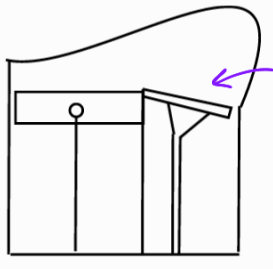






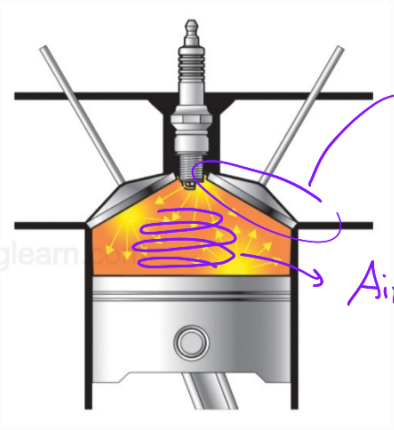
Combustion chambers

- In old chambers:



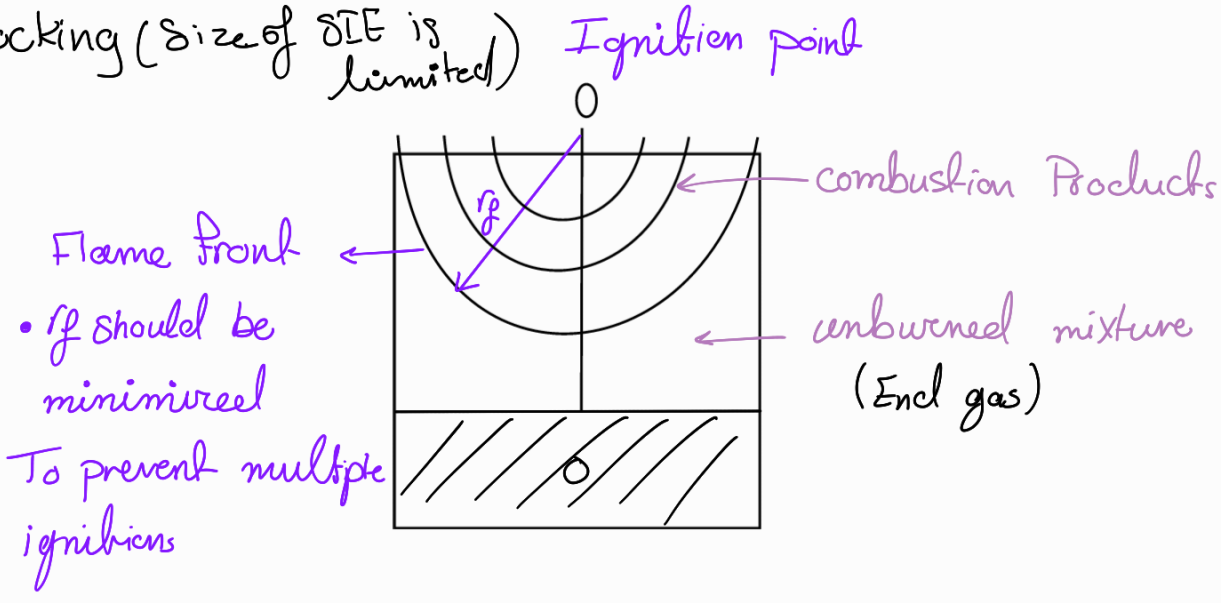
inlet & exhaust valves
C.R = 6:1

- Turbulanc is important and insures rapid combustion
- In new chambers



Considerations in combustion chamber design

1. Flame front traveled distanc should be minimized to avoid knocking (Size of SIE is limited)



2. Exhaust Valve & spark plug should be close to prevent knocking or pre-ignition

3. Sufficient turbulenc should be provided to assure rapid Combustion

4. The end gas should be in a cold region (far from E.V)
close to I.V

Shapes of combustion chambers

1. Wedge : • Simple & cheap
   • Inlet & exhaust manifolds have to be on the same side of cylinder head
2. Hemispherical: • Used for high preformance engines
   (Basic shape)
   • Valves are opposite to eachother to allow cross flow
   • Reduces residual gases
3. Bowl in piston : • Cheaper than hemispherical
4. Bath tub: • Economical & compact
5. Double spark plug: • large flame front- area → rapid combustion with no high heat-transfer and with high turbulance
   • End gas is in the middle and so heat transfer to the walls is reduced
   • Higher Power due to quicker air fuel mixture burning (& complete)

work together

The Best- Topology