SNS COLLEGE OF TECHNOLOGY
AN AUTONOMOUS INSTITUTION

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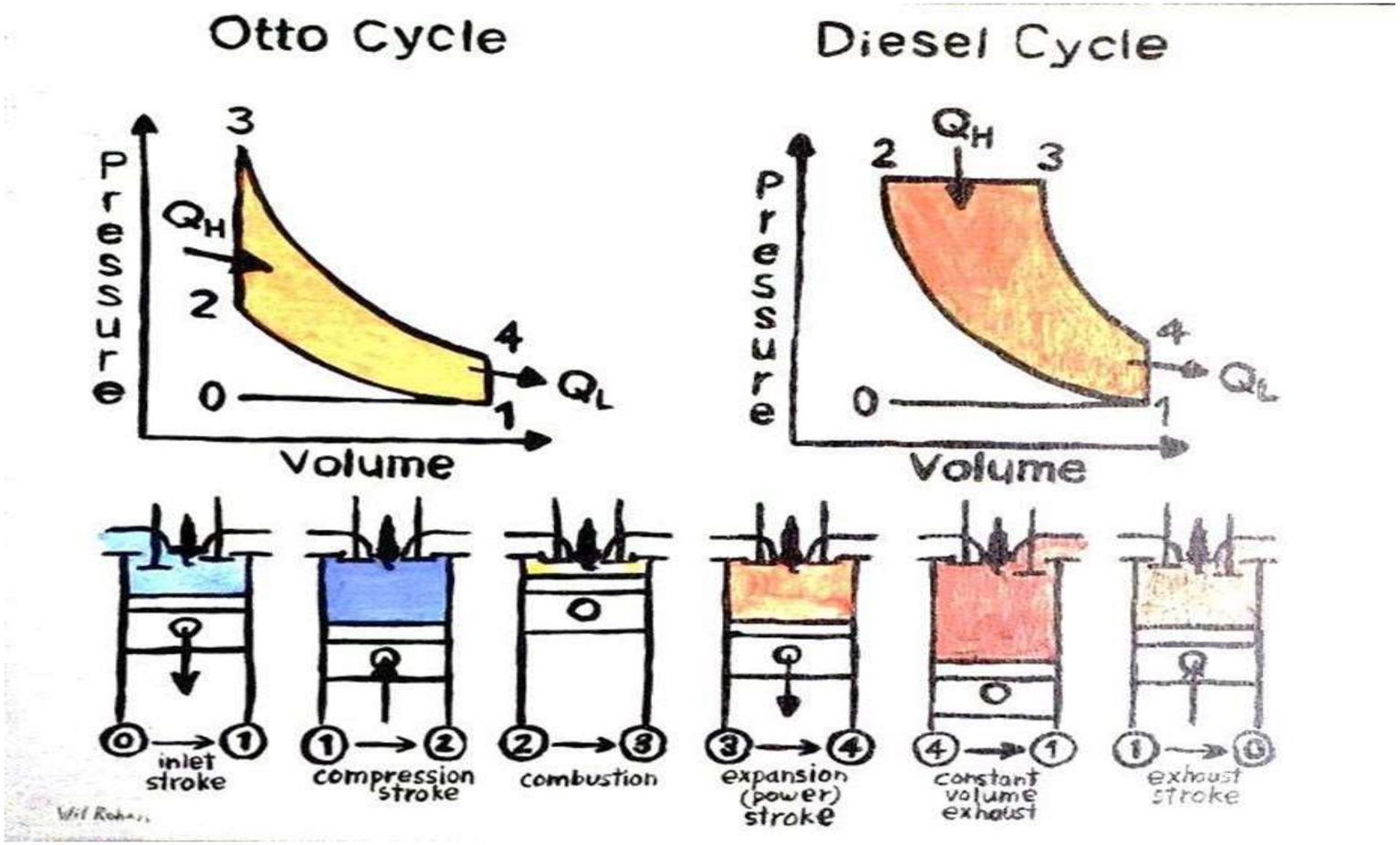
DEPARTMENT OF AGRICULTURE ENGINEERING

COURSE CODE & NAME: 16AGT301 & HEAT POWER ENGINEERING

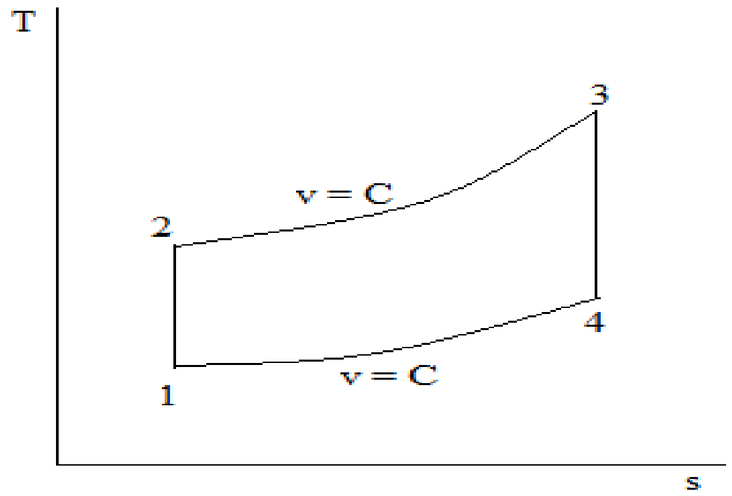
III YEAR / V SEMESTER

UNIT : 2 CLASSIFICATIONS AND PRINCIPLES OF IC ENGINES
TOPIC 7 : P-V Diagram and Valve Timing Diagram

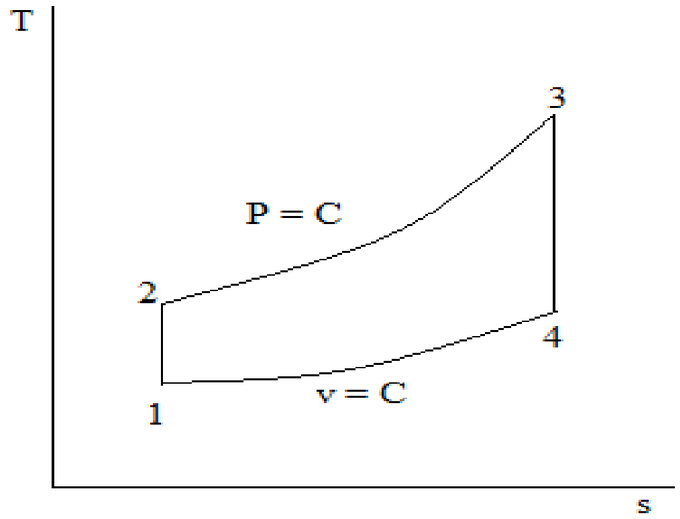
P-v Diagrams of S I & CI Engines



T-s Diagrams of S I & CI Engines

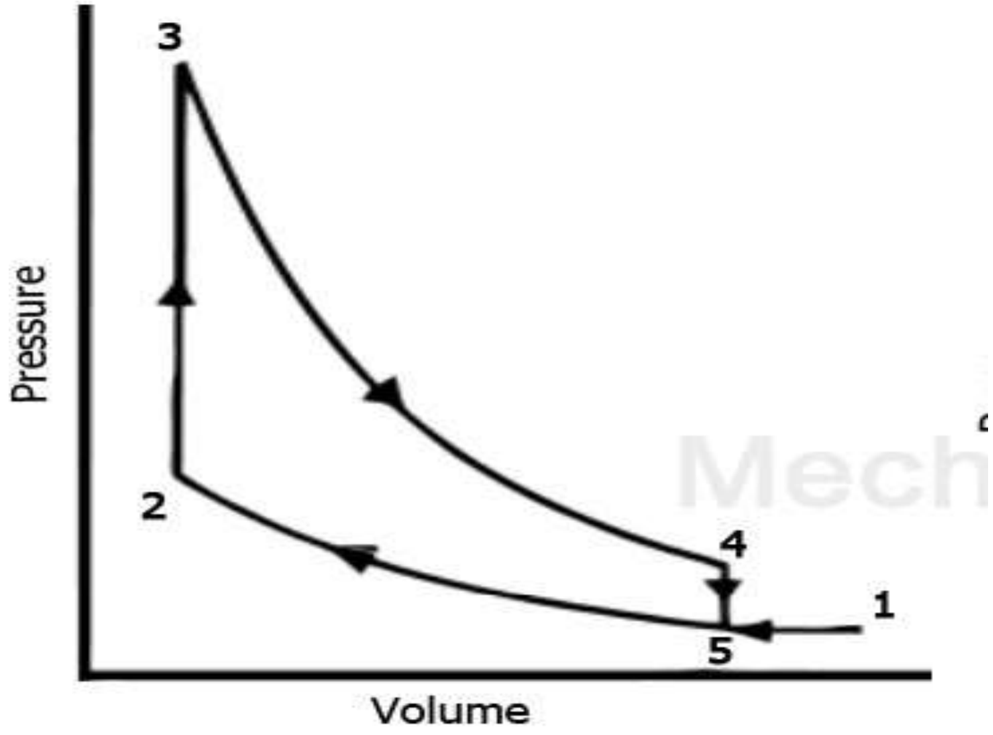


Otto Cycle



Diesel Cycle

P-v diagram of two stroke petrol engine



Theoretical P-V Diagram for two-stroke petrol engine.

VALVE TIMING DIAGRAMS

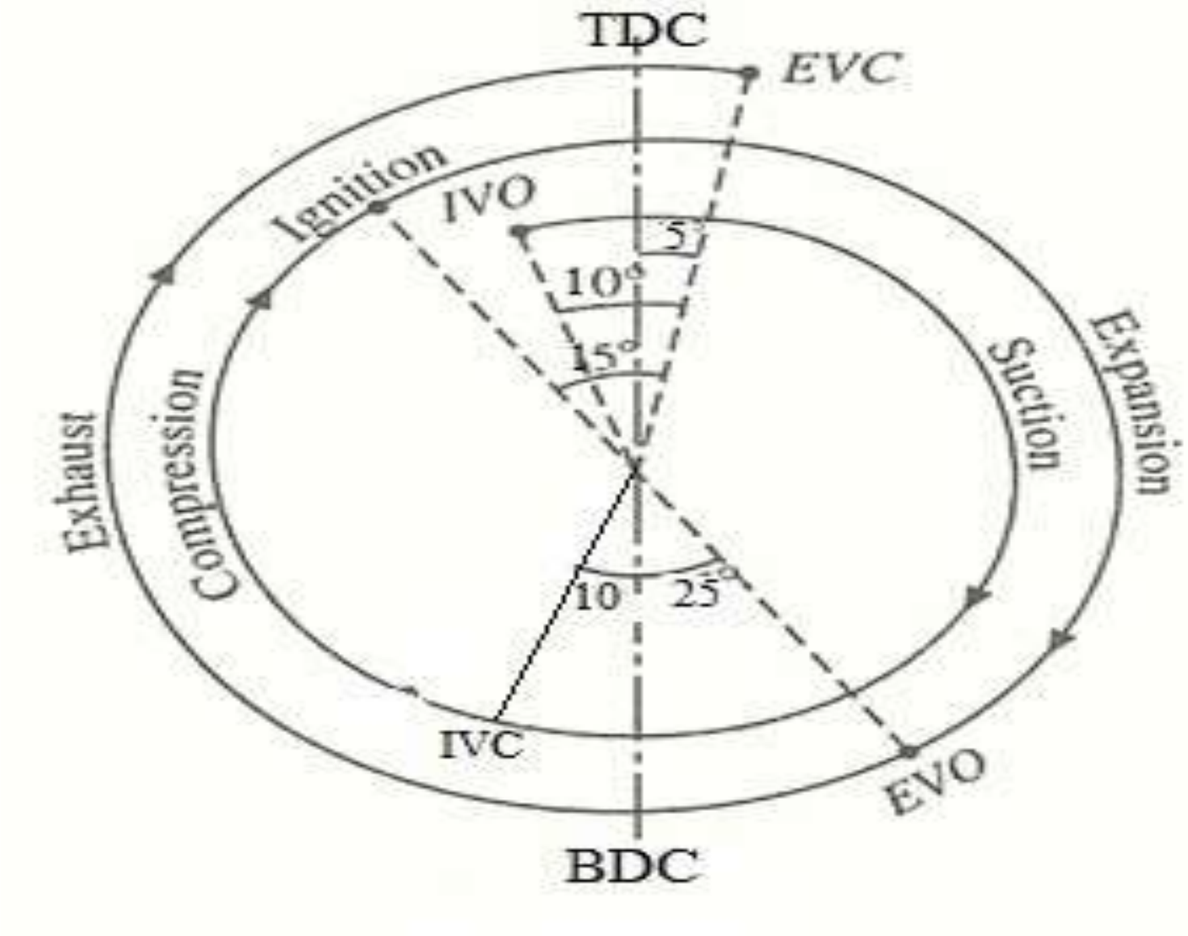
- Valve timingis the regulation of the points in the cycle at which the valves are set to open and close.

Reasons for actual valve timing:-

1. Mechanical Factor: - valves cannot be closed and opened abruptly because they are operated by cams. So that the opening of the valve must commence ahead of the time. (designed dead center)

2. Dynamic Factor: - actual valve timing is set taking into considering the dynamic effects of gas flow.

VALVE TIMING DIAGRAM FOR A FOUR-STROKE SI ENGINE



IVO - 10^0 bTDC

IVC - 10^0 - 60^0 aBDC

EVO - 25^0 - 55^0 bBDC

EVC - 5^0 - 20^0 aTDC

Intake valve timing

- The intake valve starts to open 10^0-20^0 before TDC.
- This is to ensure that the valve will be fully open and a fresh charge starts to flow into the cylinder as soon as the piston reaches TDC.
- As the piston moves out in the suction stroke, the fresh charge is drawn in through the intake valve, when the piston reaches the BDC and starts to move in the compression stroke, the inertia of the entering fresh tends to cause it to continue to move into cylinder.
- To take this advantage, inlet valve is closed 10^0-60^0 after TDC so that maximum air is taken in.
- This is called ram effect.

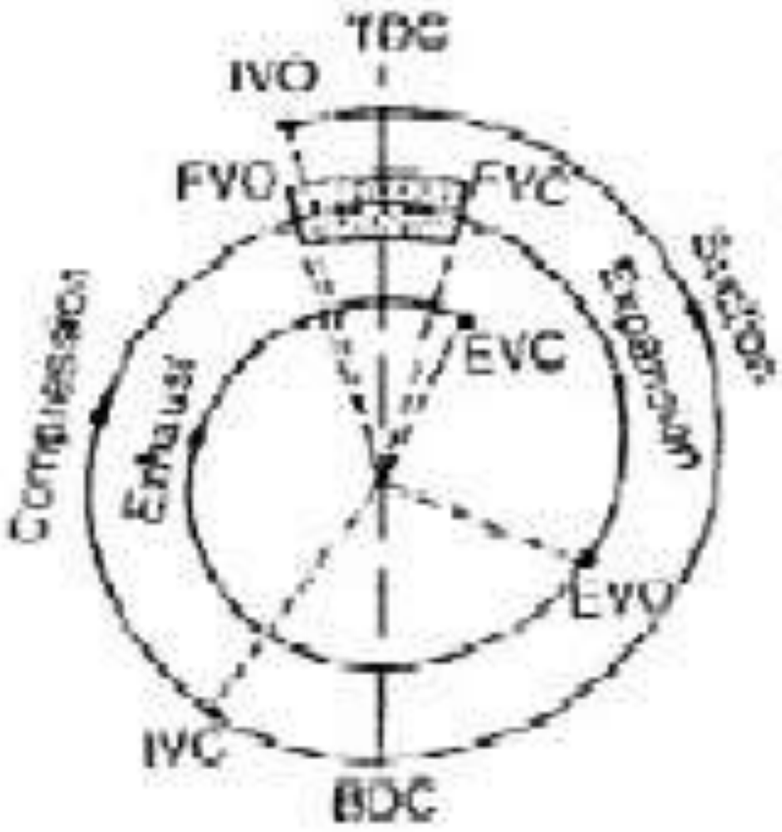
Exhaust valve timing

- Opening of exhaust valve earlier reduces the pressure near the end of the power stroke and thus causes some loss of useful work on this stroke.
- But it decreases the work necessary to expel the burned gases, results in overall gain in output.
- Closing of exhaust valve is delayed few degrees after TDC helps to scavenge the cylinder by carrying out a greater mass of exhaust gas due to its inertia force.
- This results in increased volumetric efficiency.

Valve overlap

- It is a period when both the intake and exhaust valves are open at the same time.
- 15^{o} for low speed engines and 30^{o} for high speed engines.
- This overlap should not be excessive otherwise it will allow the burned gases to be sucked into the intake manifold, or the fresh charge to escape through exhaust valve.

VALVE TIMING DIAGRAM FOR A FOUR- STROKE CYCLE DIESEL ENGINE



TDC : Top dead centre

BDC : Bottom dead centre

IVO : Inlet valve opens (10^0 - 20^0 before *TDC*)

IVC : Inlet valve closes (25^0 - 40^0 after *BDC*)

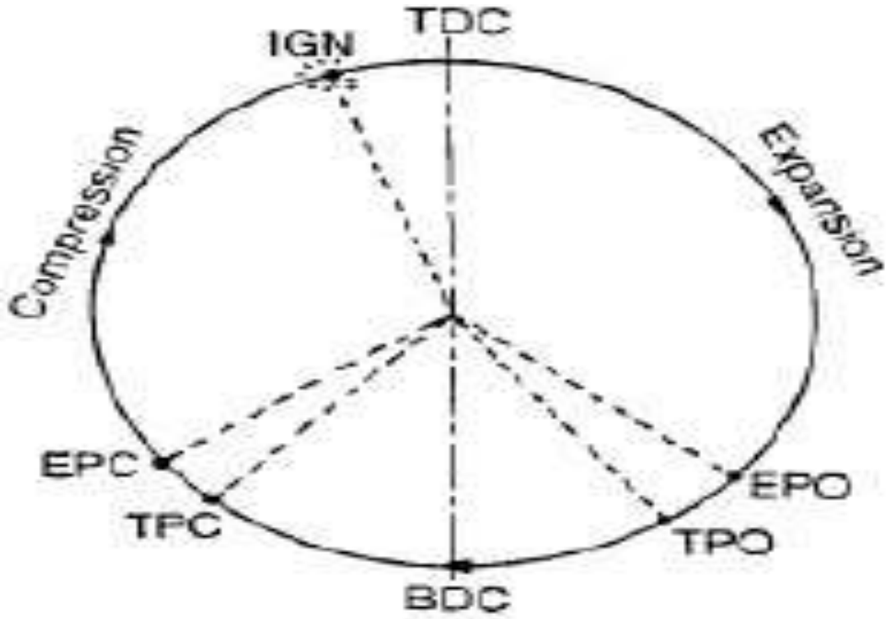
FVO : Fuel valve opens (10^0 - 15^0 before *TDC*)

FVC : Fuel valve closes (15^0 - 20^0 after *TDC*)

EVO : Exhaust valve opens (39^0 - 50^0 before *BDC*)

EVC : Exhaust valve closes (10^0 - 15^0 after *TDC*)

VALVE TIMING DIAGRAM FOR A TWO-STROKE CYCLE PETROL ENGINE



TDC : Top dead centre

BDC : Bottom dead centre

EPO : Exhaust port opens (35° - 50° before *BDC*)

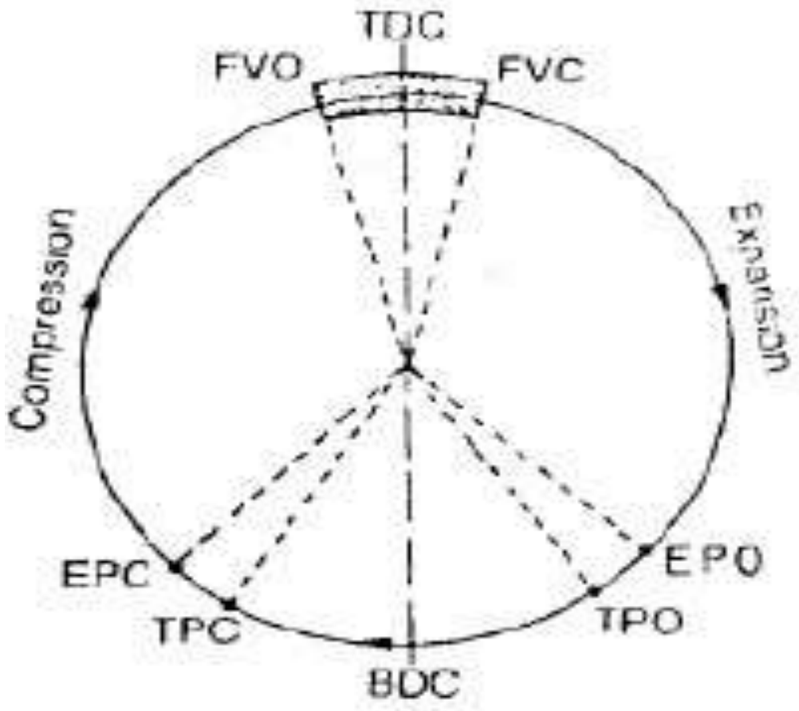
TPO : Transfer port opens (30° - 40° before *BDC*)

TPC : Transfer port closes (30° - 40° after *BDC*)

EPC : Exhaust port opens (35° - 50° after *BDC*)

IGN : Ignition (15° - 20° before *TDC*)

VALVE TIMING DIAGRAM FOR A TWO- STROKE CYCLE DIESEL ENGINE



TDC : Top dead centre

BDC Bottom dead centre

FVO : Fuel valve opens (10^{0} - 15^{0} before *TDC*)

FVC : Fuel valve closes (15^{0} - 20^{0} after *TDC*)

EPO : Exhaust port opens (35^{0} - 50^{0} before *BDC*)

TPO : Transfer port opens (30^{0} - 40^{0} before *BDC*)

TPC : Transfer port closes (30^{0} - 40^{0} after *BDC*)

EPC : Exhaust port closes (35^{0} - 50^{0} after *BDC*)

THANK YOU...