

VALVE TIMING DIAGRAM OF FOUR CYCLE DIESEL ENGINE

Ex No :

Date :

Aim :

To draw the valve timing diagram of the given four stroke cycle diesel engine.

Apparatus Required :

1. Four stroke cycle diesel engine
2. Measuring tape
3. Chalk
4. Piece of paper

Theory and Description :

The diagram which shows the position of crank of four stroke cycle engine at the beginning and at the end of suction, compression, expansion, and exhaust of the engine are called as Valve Timing Diagram.

The extreme position of the bottom of the cylinder is called "Bottom Dead Centre" [BDC]. In the case of horizontal engine, this is known as "Outer Dead Centre" [ODC]. The position of the piston at the top of the cylinder is called "Top Dead Centre" [TDC]. In case of horizontal engine this is known as "Inner Dead Centre" [IDC]. In case of horizontal engine this is known as "inner dead centre" [IDC]

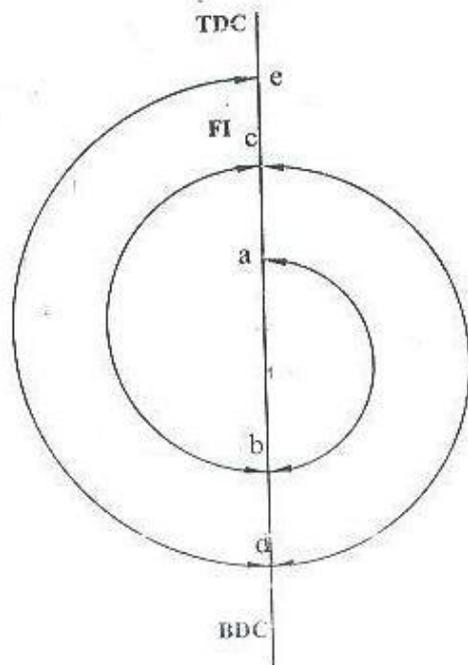
In an ideal engine, the inlet valve opens at TDC and closes at BDC. The exhaust valve opens at BDC and closes at TDC. The fuel is injected into the cylinder when the piston is at TDC and at the end of compression stroke. But in actual practise it will differ.

Inlet Valve opening and closing :

In an actual engine, the inlet valve begins to open 5° to 20° before the piston reaches the TDC during the end of exhaust stroke. This is necessary to ensure that the valve will be fully open when the piston reaches the TDC. If the inlet valve is allowed to close at BDC, the cylinder would receive less amount of air than its capacity and the pressure at the end of suction will be below the atmospheric pressure. To avoid this the inlet valve is kept open for 25° to 40° after BDC.

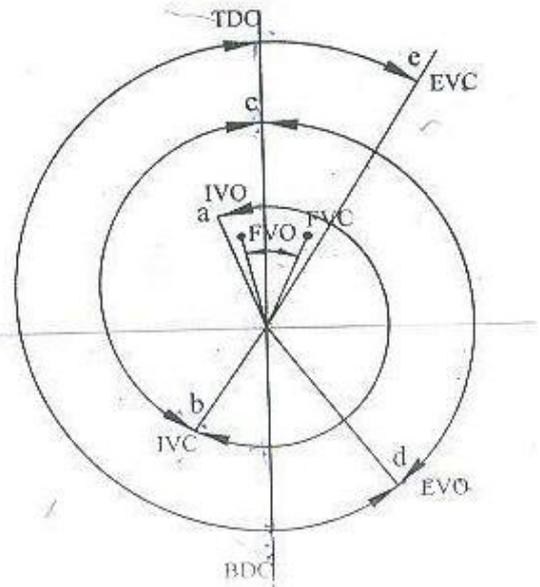
Exhaust valve opening and closing

Complete clearing of the burned gases from the cylinder is necessary to take in more air into the cylinder. To achieve this the exhaust valve is opens at 35° to 45° before BDC and closes at 10° to 20° after the TCC. It is clear from the diagram, for certain period both inlet valve and exhaust valve remains in open condition. The crank angles for which the both



IDEAL VALVE TIMING DIAGRAM

ab - Suction (180°)
 bc - Compression (180°)
 cd - Expansion (180°)
 de - Exhaust (180°)
 FI - Fuel Injection
 (Fuel Valve open and close
 at TDC immediately)



ACTUAL VALVE TIMING DIAGRAM

IVO - Inlet Valve Open
 IVC - Inlet Valve Close
 EVC - Exhaust Valve Close
 EVO - Exhaust Valve Open
 FVO - Fuel Valve Open
 FVC - Fuel Valve Close
 ab - Suction - More than 180°
 bc - Compression - less than 180°
 cd - Expansion - Less than 180°
 de - Exhaust - More than 180°

Observation and Tabulation :

1. Circumference of the flywheel = X cm

$$\therefore 1 \text{ cm} = \frac{360}{X} \text{ degree}$$

S.No.	Event	Position of crank w.r.to TDC or BDC	Distance in cm	Angle in degrees
1.	IVO	Before TDC		
2.	IVC	After BDC		
3.	EVO	Before BDC		
4.	EVC	After TDC		
5.	FVO	Before TDC		
6.	FVS	After TDC		

valves are open are called as overlapping period . This overlapping is more than the petrol engine.

Fuel valve opening and closing :

The fuel valve opens at 10° to 15° before TDC and closes at 15° to 20° after TDC . This is because better evaporation and mixing fuel.

Procedure :

1. Remove the cylinder head cover and identify the inlet valve , exhaust valve and piston of particular cylinder.
2. Mark the BDC and TDC position of flywheel
This is done by Rotating the crank in usual direction of rotation and observe the position of the fly wheel , when the piston is moving downwards at which the piston begins to move in opposite direction . i.e from down to upward direction . Make the mark on the flywheel with reference to fixed point on the body of the engine. That point is the BDC for that cylinder .Measure the circumference . That point is TDC and is diametrically opposite to the BDC .
3. Insert the paper in the tappet clearance of both inlet and exhaust valves
4. Slowly rotate the crank until the paper in the tappet clearance of inlet valve is gripped .make the mark on fly wheel against fixed reference . This position represent the inlet valve open (IVO) . Measure the distance from TDC and tabulate the distance .
5. Rotate the crank further , till the paper is just free to move . Make the marking on the flywheel against the fixed reference . This position represent the inlet valve close (IVC). Measure the distance from BDC and tabulate the distance .
6. Rotate the crank further , till the paper in the tappet clearance of exhaust valve is gripped . Make the marking on the flywheel against fixed reference . This position represents the exhaust valve open (EVO) . Measure the distance from BDC and tabulate .
7. Then convert the measured distances into angle in degrees

Result :

The valve timing diagram for the given four stroke Diesel engine was drawn.