Experiment No:7

AIM: - To study Two stroke & Four stroke Diesel Engines.

APPARATUS USED: - Model of Two-stroke & Four-stroke Diesel Engines.

THEORY-

CYCLE- When series of events are repeated in order, it completes one cycle. Cycle is generally classified as Four stroke cycle and Two stroke cycle.

a) ***Four stroke cycle-*** In Four stroke cycle, four operations are required to complete one cycle. These four operations are suction, compression, power and exhaust.

b) ***Two stroke cycle-*** In a two stroke cycle, the series of events of the working cycle is completed in two strokes of the piston and one revolution of the crankshaft. The four operations i.e. suction, compression, power and exhaust are completed during two strokes of the piston.

ENGINE- A power producing machine is called an engine.

HEAT ENGINE- An engine which converts heat energy into mechanical energy is called a heat engine.

Types of heat engine –

a) ***External Combustion engine-***The engine in which the combustion of fuel takes place outside the cylinder is called an external combustion engine.

b) ***Internal Combustion engine-*** The engine in which the combustion of fuel takes place inside the cylinder is called an internal combustion engine.

FOUR STROKE DIESEL ENGINE

Four-stroke cycle Diesel engine or Compression ignition engine or constant pressure cycle engine is meant for heavy duty applications, like heavy motor vehicles, stationary power plants, ships and big industrial units, train locomotive , tractor and bus application. In this the air compressed in the engine cylinder and fuel is injects through injector.

Working of the four stroke Diesel engine-

a) ***Suction Stroke-***The inlet valve opens during this stroke and only air is sucked into the engine cylinder. The exhaust valve remains closed. When the piston reaches Bottom Dead Centre (BDC), the suction stroke is completed as shown in Fig. (1) and inlet valve also closes.

b) ***Compression Stroke-*** The piston moves from Bottom Dead Centre (BDC) to Top Dead Centre (TDC) position. Both the valves remain closed. The air drawn during suction stroke is compressed.

c) ***Expansion or Power or Working Stroke-*** Just before the piston completes its compression stroke, the diesel injected gets ignited and the rapid explosion takes place. The expansion of hot gases pushes the piston down to BDC position. Both the valve remains closed and the useful work is obtained from the engine.

d) ***Exhaust Stroke-*** The piston moves from BDC to TDC, the exhaust valve opens and the inlet valve remains closed. The piston pushes the exhaust gases out through the exhaust valve to the atmosphere till it reaches the TDC position and the cycle is completed.

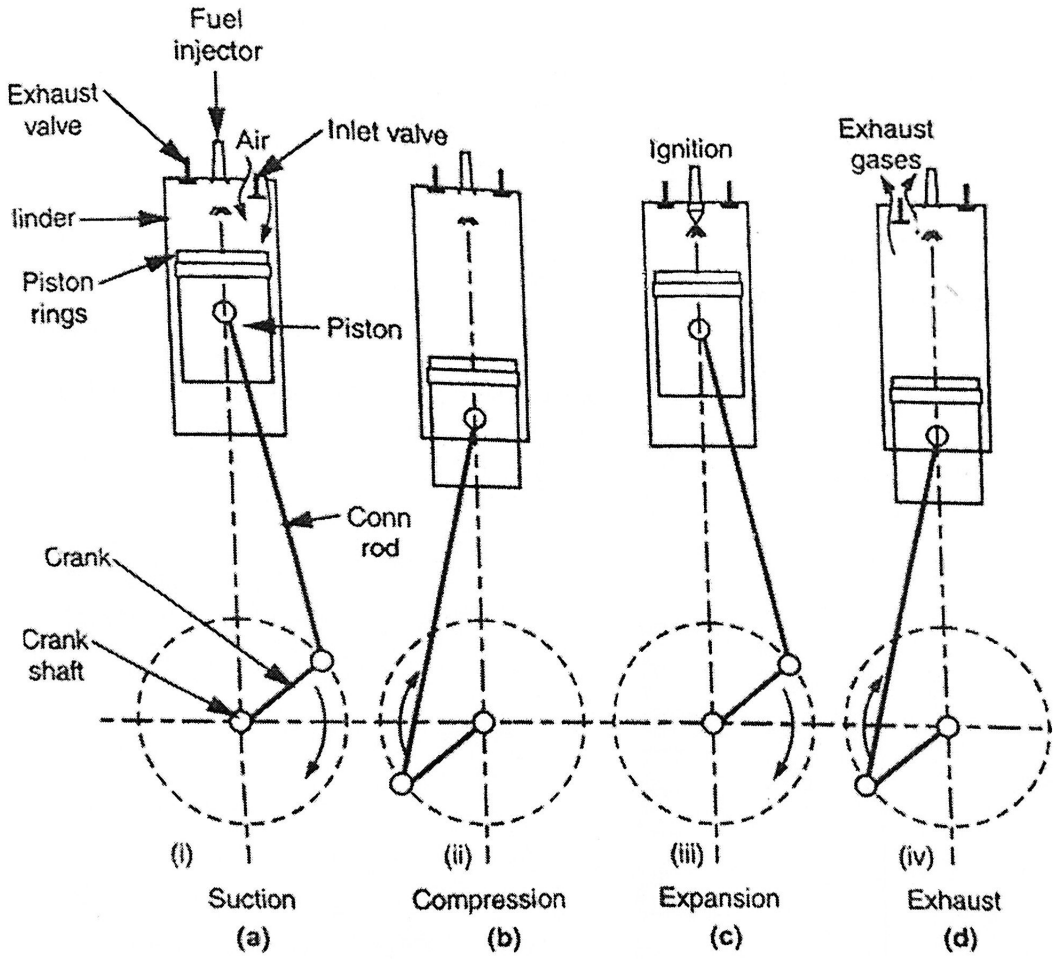


Fig- FOUR STROKE CYCLE DIESEL ENGINE

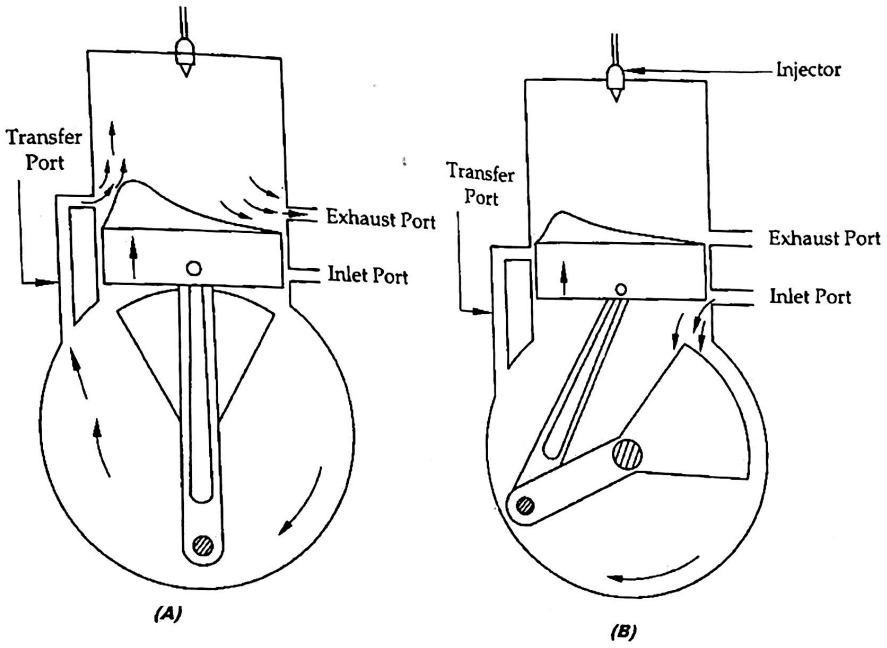
TWO STROKE DIESEL (C.I. ENGINE-)

The working principle of a two stroke diesel engine is discussed below:

1st stroke: To start with let us assume the piston to be at its B.D.C. position (Fig. a). The arrangement of the ports is such that the piston performs the two jobs simultaneously.

As the piston starts rising from its B.D.C. position, if closes the transfer port and the exhaust port. The air which is already there in the cylinder is compressed (Fig. b).

At the same time with the upward movement of the piston, vacuum is created in the crank case. As soon as the inlet port is uncovered, the fresh air is sucked in the crank case. The charging is continued until the crank case and the space in the cylinder beneath the piston is filled (Fig. c) with the air. At the end of the stroke, the piston reaches the T.D.C. Position.



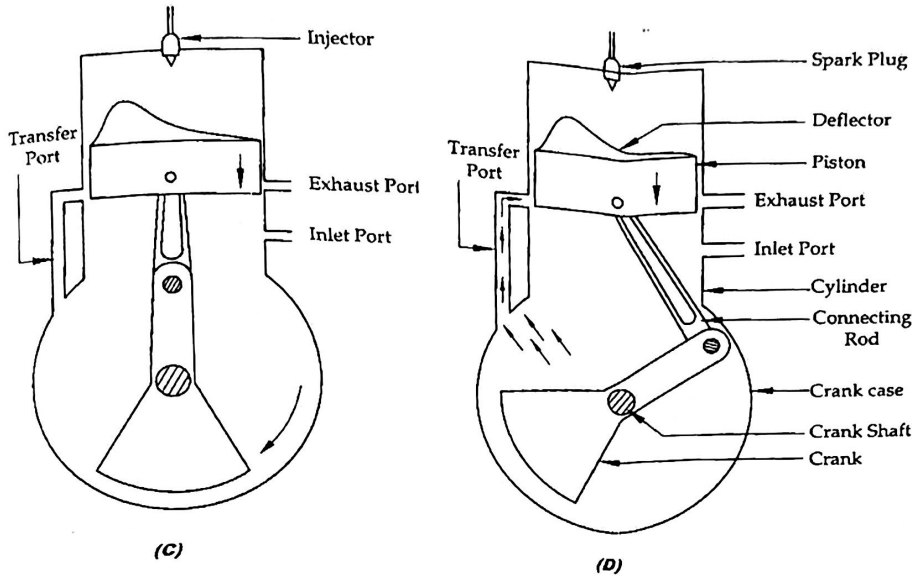


Figure- Working Principle of 2-stroke Diesel Engine

2nd stroke: Slightly before the completion of the compression stroke, a very fine sprays of diesel injected into the compressed air. The fuel ignites spontaneously.

Pressure is exerted on the crown of the piston due to the combustion of the air and the piston is pushed in the downward direction producing some useful power (Fig. c). The downward movement of the piston will first close the inlet port and then it will compress the air already sucked in the crank case.

Just the end of power stroke, the piston uncovers the exhaust port and the transfer port simultaneously. The expanded gases start escaping through the exhaust port and at the same time transfer port (Fig. d) and thus the cycle is repeated again.

The fresh air coming into the cylinder also helps in exhausting the burnt gases out of the cylinder through the exhaust port (Fig. d). This is known as scavenging.