

I C Engine

TWO STROKE ENGINES

Introduction

1.3.4 Two-Stroke Engine

As already mentioned, if the two unproductive strokes, viz., the suction and exhaust could be served by an alternative arrangement, especially without the movement of the piston then there will be a power stroke for each revolution of the crankshaft. In such an arrangement, theoretically the power output of the engine can be doubled for the same speed compared to a four-stroke engine. Based on this concept, Dugald Clark (1878) invented the two-stroke engine.

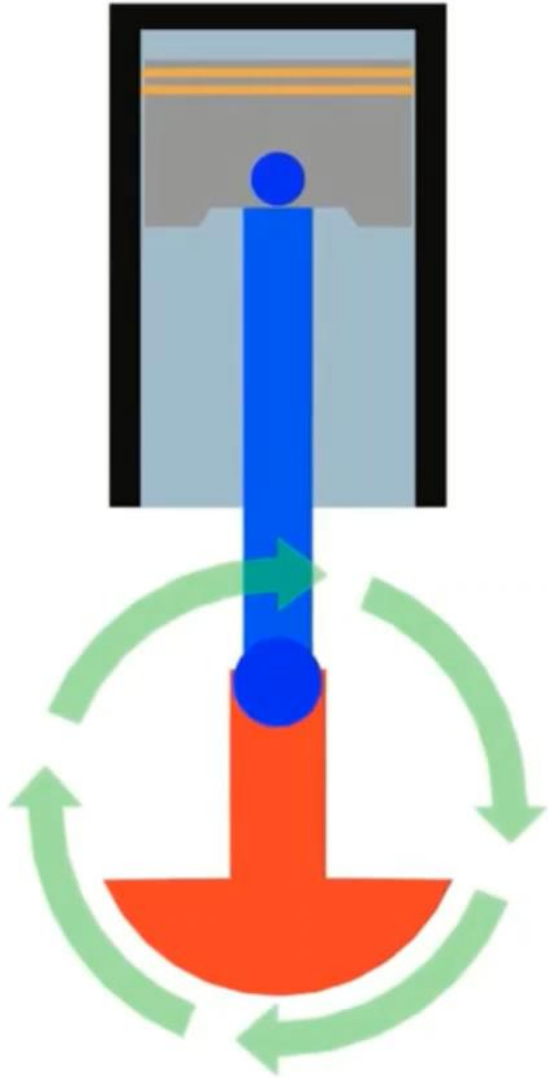
Introduction

In two-stroke engines the cycle is completed in one revolution of the crankshaft. The main difference between two-stroke and four-stroke engines is in the method of filling the fresh charge and removing the burnt gases from the cylinder. In the four-stroke engine these operations are performed by the engine piston during the suction and exhaust strokes respectively. In a two-stroke engine, the filling pro-

cess is accomplished by the charge compressed in crankcase or by a blower. The induction of the compressed charge moves out the product of combustion through exhaust ports. Therefore, no piston strokes are required for these two operations. Two strokes are sufficient to complete the cycle, one for compressing the fresh charge and the other for expansion or power stroke.

Working

Internal Combustion



Crank Mechanism

Working

Figure 1.8 shows one of the simplest two-stroke engines, viz., the crankcase scavenged engine. Figure 1.9 shows the ideal indicator diagram of such an engine. The air or charge is inducted into the crankcase through the spring loaded inlet valve when the pressure in the crankcase is reduced due to upward motion of the piston during compression stroke. After the compression and ignition, expansion takes place in the usual way.

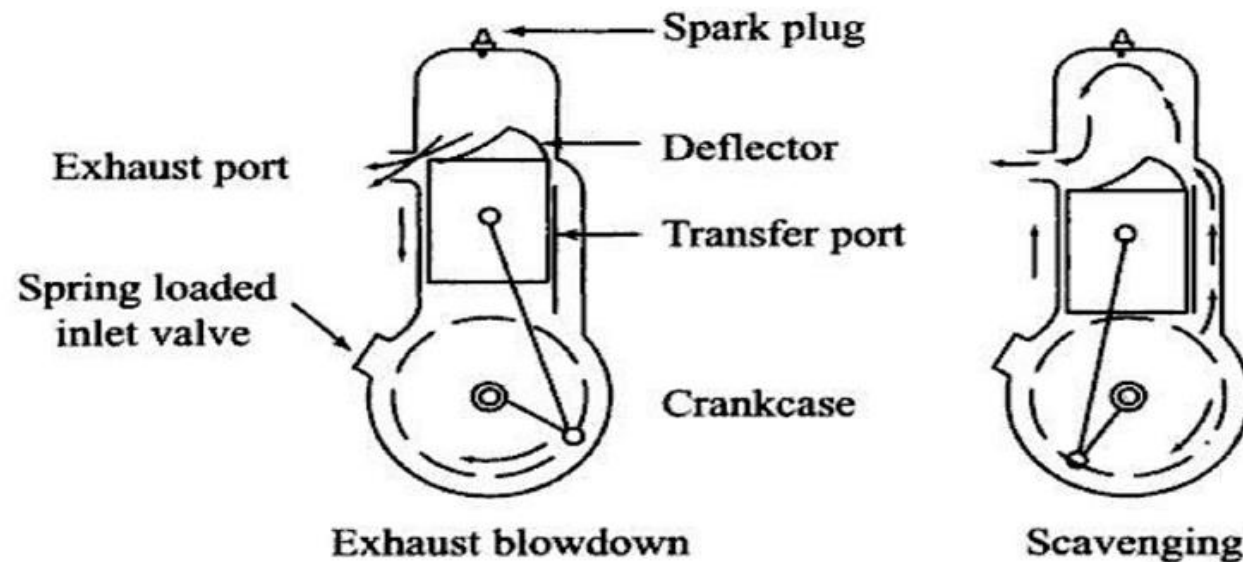


Fig. 1.8 Crankcase Scavenged Two-Stroke Engine

During the expansion stroke the charge in the crankcase is compressed. Near the end of the expansion stroke, the piston uncovers the exhaust ports and the cylinder pressure drops to atmospheric pressure as the combustion products leave the cylinder. Further movement of the piston uncovers the transfer ports, permitting the slightly compressed charge in the crankcase to enter the engine cylinder. The top of the piston has usually a projection to deflect the fresh charge towards the top of the cylinder before flowing to the exhaust ports. This serves the double purpose of scavenging the upper part of the cylinder of the combustion products and preventing the fresh charge from flowing directly to the exhaust ports.

The same objective can be achieved without piston deflector by proper shaping of the transfer port. During the upward motion of the piston from *BDC* the transfer ports close first and then the exhaust ports close when compression of the charge begins and the cycle is repeated.

Advantages and Disadvantages of Two Stroke Engine

Four-Stroke Engine

The thermodynamic cycle is completed in four strokes of the piston or in two revolutions of the crankshaft. Thus, one power stroke is obtained in every two revolutions of the crankshaft.

Because of the above, turning moment is not so uniform and hence a heavier flywheel is needed.

Two-Stroke Engine

The thermodynamic cycle is completed in two strokes of the piston or in one revolution of the crankshaft. Thus one power stroke is obtained in each revolution of the crankshaft.

Because of the above, turning moment is more uniform and hence a lighter flywheel can be used.

Advantages and Disadvantages of Two Stroke Engine

Four-Stroke Engine	Two-Stroke Engine
<p>Again, because of one power stroke for two revolutions, power produced for same size of engine is less, or for the same power the engine is heavier and bulkier.</p>	<p>Because of one power stroke for every revolution, power produced for same size of engine is twice, or for the same power the engine is lighter and more compact.</p>
<p>Because of one power stroke in two revolutions lesser cooling and lubrication requirements. Lower rate of wear and tear.</p>	<p>Because of one power stroke in one revolution greater cooling and lubrication requirements. Higher rate of wear and tear.</p>

Advantages and Disadvantages of Two Stroke Engine

Four-Stroke Engine

Four-stroke engines have valves and valve actuating mechanisms for opening and closing of the intake and exhaust valves.

Because of comparatively higher weight and complicated valve mechanism, the initial cost of the engine is more.

Two-Stroke Engine

Two-stroke engines have no valves but only ports (some two-stroke engines are fitted with conventional exhaust valve or reed valve).

Because of light weight and simplicity due to the absence of valve actuating mechanism, initial cost of the engine is less.

Advantages and Disadvantages of Two Stroke Engine

Four-Stroke Engine	Two-Stroke Engine
Volumetric efficiency is more due to more time for induction.	Volumetric efficiency is low due to lesser time for induction.
Thermal efficiency is higher; part load efficiency is better.	Thermal efficiency is lower; part load efficiency is poor.
Used where efficiency is important, viz., in cars, buses, trucks, tractors, industrial engines, aeroplanes, power generation etc.	Used where low cost, compactness and light weight are important, viz., in mopeds, scooters, motorcycles, hand sprayers etc.