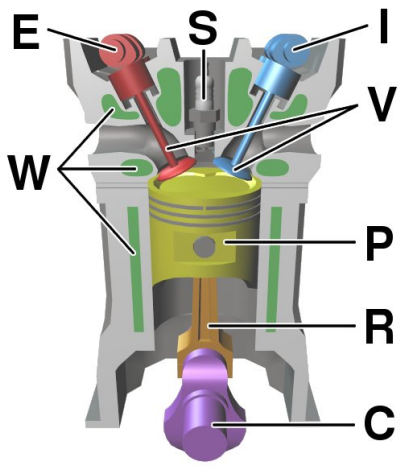
Piston

A **piston** is a component of reciprocating engines, pumps and gas compressors. It is located in a cylinder and is made gas-tight by piston rings. In an engine, its purpose is to transfer force from expanding gas in the cylinder to the crankshaft via a piston rod and/or connecting rod. In a pump, the function is reversed and force is transferred from the crankshaft to the piston for the purpose of compressing or ejecting the fluid in the cylinder. In some engines, the piston also acts as a valve by covering and uncovering ports in the cylinder wall.



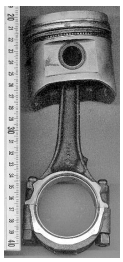
Components of a typical, four stroke cycle, DOHC piston engine. (E) Exhaust camshaft, (I) Intake camshaft, (S) Spark plug, (V) Valves, **(P) Piston**, (R) Connecting rod, (C) Crankshaft, (W) Water jacket for coolant flow.

Piston engines

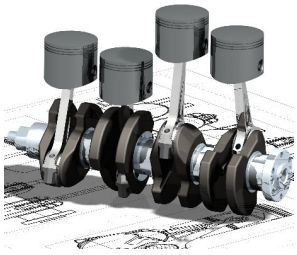
Internal combustion engines

There are two ways that an internal combustion piston engine can transform combustion into motive power: the two-stroke cycle and the four-stroke cycle. A single-cylinder two-stroke engine produces power every crankshaft revolution, while a single-cylinder four-stroke engine produces power once every two revolutions. Older designs of small two-stroke engines produced more pollution than four-stroke engines. However, modern two-stroke designs, like the Vespa ET2 Injection utilise fuel-injection and are as clean as four-strokes. Large diesel two-stroke engines, as used in ships and locomotives, have always used fuel-injection and produce low emissions. One of the biggest internal combustion engines in the world, the Wärtsilä-Sulzer RTA96-C is a two-stroke; it is bigger than most two-storey houses, has pistons nearly 1 metre in diameter and is one of the most efficient mobile engines in existence. In theory, a four-stroke engine has to be larger than a two-stroke engine to produce an equivalent amount of power. Two-stroke engines are becoming less common in developed countries these days, mainly due to manufacturer reluctance to invest in reducing two-stroke emissions. Traditionally, two-stroke engines were reputed to need more maintenance (despite exceptions like the Ricardo Dolphin engine, and the Twingle engines of the Trojan car and the Puch 250 motorcycle). Even though the simplest two-stroke engines have fewer moving parts, they could wear out faster than four-stroke engines. However fuel-injected two-strokes achieve better engine lubrication, also cooling and reliability should improve considerably.

Gallery

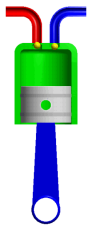


A piston and its connecting rod.

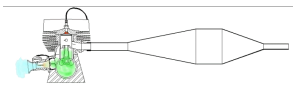


CAD drawing of crankshaft and pistons.

Large pistons (over 0.5 m incl. connecting rod).



Simplified piston animation.



Two-stroke engine with a tuned expansion pipe

Steam engines

Steam engines are usually double-acting (i.e. steam pressure acts alternately on each side of the piston) and the admission and release of steam is controlled by slide valves, piston valves or poppet valves.

Pumps

Piston pumps can be used to move liquids or compress gases.

Air cannons

There are two special type of pistons used in air cannons: close tolerance piston and double piston. While in close tolerance piston, O-rings are used as valve but in double piston, O-rings are not used.

There are some features of close tolerance piston mentioned below:

1. Piston can swell and stick.
2. Fits tightly in the cylinder.
3. Tight tolerance fit.
4. Properties alter due to atmospheric change.
5. Backlash may such,some of the bin material into the valve which also can cause the piston to stick.

Common features of double piston:

1. Cannot swell and stick.
2. Fits loosely in the cylinder.
3. No tight tolerance fit.
4. Properties are not altered due to atmospheric change.
5. Two depression on the top of the piston so make enough clearance.
6. Even if foreign material enters the valve,the double piston does not stick.

Drawbacks

Since the piston is the main reciprocating part of an engine, its movement creates an imbalance. This imbalance generally manifests itself as a vibration, which causes the engine to be perceivably harsh. The friction between the walls of the cylinder and the piston rings eventually results in wear, reducing the effective life of the mechanism.

The sound generated by a reciprocating engine can be intolerable and as a result, many reciprocating engines rely on heavy noise suppression equipment to diminish droning and loudness. To transmit the energy of the piston to the crank, the piston is connected to a connecting rod which is in turn connected to the crank. Because the linear movement of the piston must be converted to a rotational movement of the crank, mechanical loss is experienced as a consequence. Overall, this leads to a decrease in the overall efficiency of the combustion process. The motion of the crank shaft is not smooth, since energy supplied by the piston is not continuous and it is impulsive in nature. To address this, manufacturers fit heavy flywheels which supply constant inertia to the crank. Balance shafts are also fitted to some engines, and diminish the instability generated by the pistons movement. To supply the fuel and remove the exhaust fumes from the cylinder there is a need for valves and camshafts. During opening and closing of the valves, mechanical noise and vibrations may be encountered. A two-stroke engine does not require valves,

meaning it doesn't need a camshaft, making these engines faster and more powerful.

See also

- Air gun
- IRIS engine
- Flamethrower
- Fire piston
- Fruit press
- Hydraulic cylinder
- Knurling
- Slide whistle
- Wankel engine (an internal combustion engine with a rotary 'piston')
- Steam locomotive components
- Rocket engine nozzle effectively forms the piston for rockets

External links

- Piston Engines Essay [1]
- How Stuff Works - Basic Engine Parts [2]
- Piston highlight: Hypervideo of construction and operation of four cylinder internal combustion engine courtesy of Ford Motor Company [3]

References

[1] http://www.centennialofflight.gov/essay/Evolution_of_Technology/piston_engines/Tech23.htm
[2] http://auto.howstuffworks.com/engine2.htm
[3] http://www.asterpix.com/console?as=1187646965017-e57383c789