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A Short Note on I.C. Engine and Its Components

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ABSTRACT

This article presents a brief description of IC engine and its components. Working principle is also explained which conveys a clear idea about efficiency that it starts immediately without much efforts and has higher efficiency than the external combustion engine. Other aspect of IC is that it is portable because of its light weight and compact size. Since it is safer to use, IC engine is commonly preferred for various industrial applications.

Keywords: combustion, crankshaft, cylinder, efficiency, four stroke

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INTRODUCTION

The foremost commercial model of an IC engine was successfully developed by Étienne Lenoir around 1859. Later, the modern version of it was created by Nikolaus Otto in 1876. The modern version was then utilized in most of the IC engine applications. Lately practical designs have compromised by trade-offs between different properties like efficiency, weight, power, heat, response, exhaust emissions or noise. Efforts are going on in increasing the efficiency of IC engines that will lead to better fuel economy but only if the fuel cost per energy content is the same. Over last 30 years, research and development has helped manufacturers reduce ICE emissions of criteria pollutants, such as nitrogen oxides and particulate matter by more than 99%. Internal combustion engines are those heat engines that burn their fuel inside the engine cylinder. In internal combustion engine the chemical energy stored in their operation. IC engine is applied in road vehicles, light- weighted aircrafts, motorboats and other small machines such as lawn mowers, chain saws and portable engine generators.[1–15]

ENGINE TERMINOLOGY

The engine terminologies are detailed below.

Cylinder

It is a cylindrical vessel in which the piston having a reciprocating motion.

Piston

It is a cylindrical component fitted to the cylinder which transmits the bore of explosion to the crankshaft.

Combustion Chamber

It is the space exposed in the upper part of the cylinder where the combustion of fuel takes place.

Connecting Rod

It inter connects the piston and the crankshaft and transmits the reciprocating motion of the piston into the rotary motion of crankshaft.

Crackshaft

It is a solid shaft from which the power is transmitted to the clutch.

Cam Shaft
It is drive by the crankshaft through timing gears and it is used to control the opening and closing of two valves.

Cam
These are made as core part of the camshaft and are crafted in such a way to open the valves at the current timing.

Piston Rings
It provides a tight seal between the piston and cylinder wall and preventing leakage of combustion gases.

Gudgeon Pin
It forms a link between the small end of the connecting rod and the piston.

Inlet
The pipe which connects the intake system to the inlet valve of the engine end through which air or air fuel mixture is drawn in to the cylinder.

Exhaust Manifold
The pipe which joins the exhaust system to the exhaust valve of the engine via which the product of combustion escape in to the atmosphere.

Inlet and Exhaust Valve
They are provided on either on the cylinder head or on the side of the cylinder and regulating the charge coming in to the cylinder and for discharging the product of combustion from the cylinder.

Flywheel
It is a heavy steel wheel attached to the rear end of the crank shaft. It absorbs energy when the engine speed is high and gives back when the engine speed is low.[16–21]

NOMENCLATURE
This refers to the position of the crank shaft when the piston is in its slowest position.

Bore (D): Diameter of the engine cylinder is refers to as the bore.

Stroke (s): Distance traveled by the piston in moving from TDC to the piston in moving from TDC to the BDC.

Clearance Volume (V): The volume of cylinder above the piston when it is in the TDC position.

Swept Volume (V): The swept volume of the entire cylinder. It is numerically represented by the expression as follows:

$Vd = V_s N$

where V_s is the swept volume and N is the number of cylinder.

Compression Ratio (R): It is the ratio of the total cylinder volume when the piston is at BDC to the clearance volume.

Engine Specification

Type of fuel used:	Petrol
Cooling system:	Air cooled
Number of cylinder:	Single
Number of stroke:	Four Stroke
Arrangement:	Vertical
Cubic capacity:	100 cc

WORKING OF I.C. ENGINE
When fuel comes in contact with air-contained oxidizer inside the chamber under high pressure, combustion reaction takes place due to which huge amount of heat energy is released. This heat energy is then partially converted from combustion to work. With the help of fixed cylinder and moving piston, pressure inside the chamber is varied which in turn helps the crankshaft to rotate. In this way, the heat energy is changed into mechanical energy. Through the system of gears in powertrain, this motion drives the vehicle wheels.

There are only two strokes involved namely the compression stroke and the power stroke, they are usually called as

upward stroke and downward stroke, respectively.

Upward Stroke

During this stroke, the piston shifts from bottom dead center to top dead center, consisting the charge-air petrol mixture in combustion chamber of the cylinder, at the time the inlet port is uncovered and the exhaust, transfer ports are covered. The compressed charge is ignited in the combustion chamber by a spark given by spark plug.

Downward Stroke

The charge is ignited the hot gases compress the piston moves downhill, during this stroke the inlet port is enclosed by the piston and the new charge is compressed in the crankcase, further downward movement of the piston uncovers first exhaust port and then transfer port and hence the exhaust starts through the exhaust port. As soon as the transfer port open the charge through it is forced in to the cylinder, the cycle is then repeated.[21–23]

CONCLUSION

The basic IC engine used two stroke cycle, however, now-a-days internal combustion engines most commonly use a four-stroke cycle especially in cars, trucks, motorcycles, aircraft, construction machinery and many others, The four strokes refer to intake, compression, combustion (power), and exhaust strokes that occur during two crankshaft rotations per working cycle of the gasoline engine and diesel engine.. A stroke refers to the full travel of the piston from Top Dead Center (TDC) to Bottom Dead Center (BDC).

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