

Effect of Piston Diameter on Internal Combustion Engine Having Six Cylinders

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ABSTRACT

Earlier as in the case of petrol or diesel engine when more power is required or if there are some kind of unwanted exhaust emission then oversized pistons are used which are generally larger in diameter as compared to standard one. This paper mainly based on change in performance of the internal combustion engine having six cylinders by changing the diameter of piston. This paper compares various piston diameter performance in which we keep the friction power constant. This IC engine is work on 4-stroke diesel engine having 6 number of piston cylinder arrangement and for supply of diesel, rotary fuel injection system with KBS for cold start is use.

Keywords: Piston diameter, 4-stroke engine, centrifugal governor, friction power

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INTRODUCTION

An IC engine (internal combustion engine) is a combination of mechanical components which produce power from certain chemical. These chemicals are of different type having different composition. These chemicals are also bifurcated by their property like flame point, frizzling point, octane number etc. Now days generally gasoline (petrol), diesel and natural gas like CNG are used in internal combustion engine for producing useful power. These chemicals are known as fuel. This fuel is placed inside the cylinder of engine for combustion at certain pressure ratio. The pressure ratio of engine is decided according to type of fuel use in engine for producing power. Pressure ratio of SI engine (petrol engine) is in between 6 and 10 bar and pressure ratio of CI engine

(diesel engine) is in between 16 and 20 bar. The actual pressure ratio is selected according to power output required from the internal combustion engine [1–3].

Different mechanisms are used for putting fuel inside the engine cylinder. These mechanisms are decided according to type of fuel used because of their different properties. In SI engine system like carburetor are used in which gravity play an important role for putting fuel inside the cylinder. On the other hand, in CI engine fuel injection system are used in which fuel is forced to put inside the cylinder by means of pump and injector. In some systems, KBS are also provided to fuel pump which help to provide easy start of vehicle in cold weather and also to provide more power supply whenever required [4].

The power output of engine also depends upon bore diameter (cylinder diameter) and piston diameter of engine, i.e., amount of volume available inside the cylinder for air fuel mixture. During maintenance (repairing) of engine, sometimes bore diameter are also increase and as oversize piston are used. Due to the more wearing of original size bore the compress air get leak and proper pressure ratio is not maintained, therefore improper combustion occurs. Also, when more power required for different work bore diameter and piston size increase. Figure 1 show the block of engine during dismantling of engine. Table 1 represent the comparison between stander size and over size piston. Figure 2 represent comparison of standard and oversize piston property.

Type of Internal Combustion Engine

Reciprocating engine

- a. Single cylinder
- b. Multi cylinder
 - In-line engine

- V engine
- Radial engine
- Opposed cylinder engine
- Opposed piston engine.

Rotary engine

- a. Single rotor engine
- b. Multi rotor engine.

HISTORY

First patent on IC engine was publish by Robert Street in 1794 also during this Thomas Mead filed patent on gas engine. The internal combustion engine patent by Robert Street is also work on liquid fuel. John Steven built the first American internal combustion engine. French engineer's Nicephore Niepce and Claude Niepce ran a prototype internal combustion engine with the help of controlled dust explosions. In this same year, Switzerland engineer François Isaac, De Rivaz built an internal combustion engine which work on spark ignition.



Fig. 1. Engine block during dismantling.

Table 1. Comparison of standard and oversize piston property [1, 2].

S.N.	Parameter	Standard piston	Over-sized piston
1	Torque (N-m)	416	418.5
2	Indicated mean effective pressure (bar)	9.2	9.17
3	Indicated power (kw)	105	105.25
4	Break power (kw)	95	95.51
5	Frication power (kw)	10	10.16
6	Fuel consumption	Comparatively less	Comparatively more

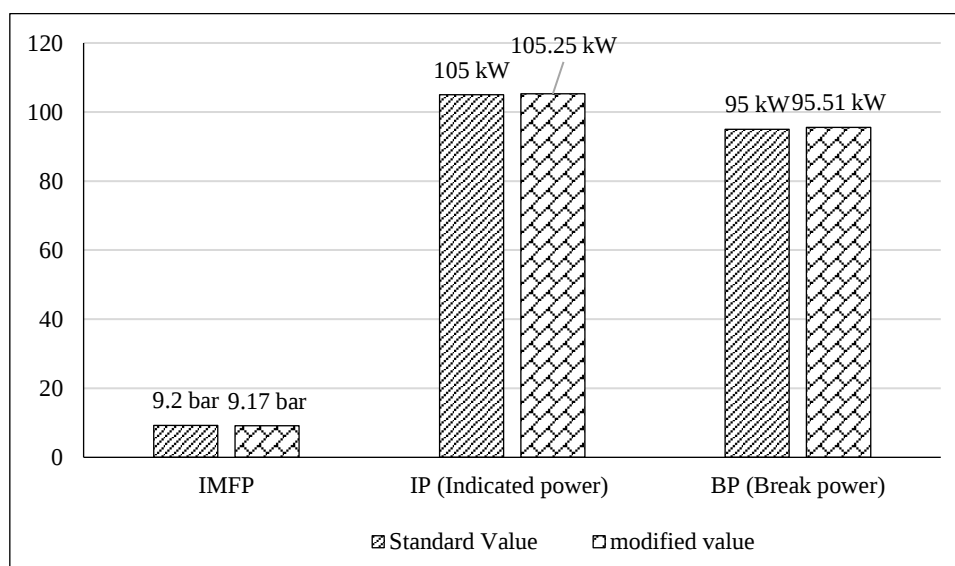


Fig. 2. Comparison of standard and oversize piston property [1].

used for industrial application is patented by Samuel Brown in 1823. In 1864, Nicolaus Otto patented the first atmospheric gas engine. In 1872, American George Brayton invented the first commercial liquid-fueled internal combustion engine. In 1892, Rudolf Diesel developed the first compressed charge, compression ignition engine [5].

METHODS

In the case of IC engine, there may be a problem of power output or fuel consumption or emission problems according to the use and age of engines. Due to this the solution acquired for this problem is oversizing of pistons. Where we use the oversized pistons as compared to standard one so as to obtain the proper working of engine. Here the bore can be increased by 1 mm, 0.25 mm, 0.50 mm, 0.75 mm by mounting the engine block over the machine. This will increase the size of bore minutely so that oversized piston can be used in it. After completion of reboring process the bore is polished with honing tool by using the diesel or petrol as coolant and flushing medium. Due this polishing process the bore becomes smooth so that the oversized piston can be installed in it easily.

CONCLUSION

It is observed that engine with greater diameter piston provides comparatively more power at same condition. It also causes the change in firing sound of the engine. Also, the indicated mean effective pressure is reduced. The fuel consumptions of engine are also increasing.

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