



Redesign of Reciprocating Engines, Compressors and Pumps for Higher Power to Weight Ratio:

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ABSTRACT: By Providing a Hemispherical cavity in the piston end and hemispherical dome in the cylinder head, efficiency of the engine, pump and compressor can be improved by progressive compression in the compressive stroke, and gradual blow in the power stroke.

KEY WORDS: Engine, Pump, compressor, Reciprocating, Efficiency.

INTRODUCTION

By modifying the geometrical shape of the piston and cylinder head into a hemisphere projection in the Head and Hemispherical cavity in the Piston end it is possible to get progressive closure and opening of the clearance volume. In the suction stroke, compression stroke, Power stroke and final clearing stroke called exhaust stroke no sudden impulse will result in smoother power flow in either way.

1.1 Piston, Connecting Rod, Crank Shaft and Flywheel Redesign:

Evenly distributed pressure during all the four stroke of the reciprocating mechanism will lead to redesign of piston, connecting rod, crank shaft and flywheel. Pressure acting on the piston top surface is distributed over a larger surface area and hence the required wall thickness may get reduced similarly piston pin connecting rod, crank shaft will experience lower force per unit time.

Flywheel which is used as a rotating mass to suppress the speed fluctuation and supply the energy back the mechanism in the compression stroke. The required mass of the flywheel also gets altered due to reduced impulse peak pressure in the power stroke and compression stroke.

1.2 Comparison and Calculation of Unit Pressure for a Peak Pressure:

Take peak pressure as P and diameter of the cylinder and piston as D . For the regular piston and cylinder unit pressure is $(P/\text{Circular Area of the piston})$ that is $P/[\pi \text{ Square of } R]$ whereas for hemispherical dome and cavity the unit pressure will be $P/(2 \pi \text{ Square of } R)$

The peak unit load gets reduced by half for the change in geometry. Its enough if the Piston, connecting rod, crank shaft and flywheels are designed for half the peak unit load on the hemispherical piston and its suitable head.

2.1 Clearance Volume and Compression Ratio:

Same compression ratio which is used for auto ignition of the fuel injected IC Engines and usual clearance volume for the reciprocating pumps and compressors with all other components like valves and inlet and exhaust port in the case of reciprocating engines can be provided.

2.2 Increased Power to Weight Ratio:

Hemispherical dome piston and Hemispherical cavity cylinder head can result in reduction of peak load and the weight of each of the components so designed to suit the reduced peak load will result in reduced overall size and weight of the IC Engine, pump and compressor. Power to weight ratio gets increased after changing the geometry of the piston and head into hemisphere.

CONCLUSION

By changing the geometrical shape of piston and head into hemispherical dome and hemispherical cavity it is possible to achieve overall power to weight ratio increased. The proposed conceptual idea is fit get commercialized.