Engineering analysis: piston

Engineering

Engineering analysis Piston This paper gives an engineering analysis of the fluid flow system in a car piston of a two stroke spark ignition combustion engine. The piston is an engine component that helps in compression and sucking of air into the cylinder. It is generally designed to withstand the possible effects that could be as a result of high compression pressures and temperatures that lead to transient loading and shock loads. This paper also addresses the suitable material, piston sizing and nature of the fluid flow system in a car engine. The piston is a very crucial part of the engine due to the distributions of temperatures, the stress variations and the inherent nature of the combustion chamber of the engine.

In the automotive engines, the most common used material for making the piston is Aluminum because of its lightweight, affordability and its availability (Rao, 2011). Due to the high combustion temperatures of the cylinders, copper and nickel are used as the materials to help increase the tensile strength of the piston. These materials also help to increase the hardness and the elastic modulus of the piston. The size of the piston is as follows, 30cm3 clearance volume, bore diameter of 57mm, displacement volume of 145. 55cm3 with the length of stroke to be 57mm and a compression ratio of 5. 8 (Mashadi & Crolla, 2012).

Fluid flow in a piston serves two major functions , to act as a coolant due to the high temperatures of the combustion chamber and also for lubrication to smoothen the numerous reciprocating motions that the pistons makes during the respective strokes (Mashadi & Crolla, 2012). The piston is also designed foe air compression hence the fluid flow analysis is as follows;

The Piston crown design influences the characteristics of the fluid flow field depending on the different shapes of the piston crowns. During the intake

and compression strokes of the pistons, the swirl and tumble air flow is created because of the high turbulence created in the cylinder. This is greatly influenced by the shape of the piston that creates a turbulence of the air to enhance proper mixing with the fuel.

Forced lubrication oil passes though the pores on the piston to enhance lubrication with the cylinder walls and also the cooling fluid to cool off the piston during operation. The oil seals guard these fluids and compression springs on the piston to contain the fluids against leakages.

References

Rao, R. V. (2011). Advanced modeling and optimization of manufacturing processes: International research and development. London: Springer.

Mashadi, B., & Crolla, D. (2012). Vehicle powertrain systems. Chichester, West Sussex, U. K: Wiley.