CASTING PRODUCT – AUTOMOBILE ENGINE BLOCK

MATERIAL USED:

In order to meet the above functional requirements the material used for manufacturing the product should contain many properties. They are, the material should contain high strength, modulus of elasticity, wear resistance, ability to withstand vibrations, and corrosion resistance. High strength is mostly concerned in diesel engines because of their high compression ratios compared with petrol engines. In diesel engine its compression ratios are normally 17:1 or greater, but in petrol engine it is nearly 10:1. The material also should have low density to reduce its weight but with higher strength. It should also have a low thermal expansion under high operating temperatures and also a good thermal conductivity to give out the heat in minimum time. When it come to the manufacturing process the material should have good machinability and castability to reduce the time and cost consumed. As if the material is too hard the time and cost for manufacturing increases. When the engine is in running conditions it generates a higher vibration due to the motions in the internal parts like crank shaft and pistons, therefore the material has to be able to absorb the vibration energy without fracturing.

Based on the above features the most widely used material are cast iron and aluminum alloys to manufacture the cylinder block. Cast iron alloys are used because they contain good mechanical properties, low cost, and availability compared with other metals. But certain aluminum alloys contain most of the characteristics of cast iron but with low weight. And also aluminum alloy casted engine block gives a good surface finish and high machinability compared with cast iron alloys. As the technology increases the engineers has found new materials such as graphite cast iron which is lighter and stronger than the grey cast iron mentioned above.

METHOD USED – SAND CASTING:

In the sand-casting processors, the widely used in engine block casting is green sand mould casting. The term green denotes the present of moisture in the sand mold. A combination of silica sand, clay, and water are poured in to the one half of the aluminum block pattern with wood or metal frame. The mould is then compacted by applying pressure or vibrating on the metal frame. This process is repeated for the other half of the mold. Then both halves of the mould are removed from the pattern.

The core shown below provides the space for water jackets around the cylinders. The core has being painted to seal the gas formed during the casting process within the core. And the pink colored ends are not painted to let the gas escape to the out side. Aluminum reinforcing rods are used to give more strength to the core. These rods get melted due to the molten metal poured during casting.

Now the mould is ready for the casting. The molten metal is poured in to the mold through the smaller front center hole which fills the mold from bottom back up to the top through the risers, which can be seen as 8 large holes. When the casting is cooling down the molten metal in the riser is drawn back down in to the casting. The risers act a main part in the casting process by supplying required molten metal during shrinkage.

The rough aluminum block casting is shown above after the removal of the sand mold. the sand is removed by applying vibrating on the casting. The casting has to be machined to get correct dimensions and smooth surfaces of the engine block.

The rough aluminum cylinder block is done with surface grinding to get smooth surfaces in the head gasket face and the faces where other components are fitted. Then the block is ready for the line boring of the main bearing bores. Bearing caps are fitted temporally for the line boring of the main bearing bores. Then in to the line boring of the crank and the cam shaft bearing housings. The boring bar contains multiple tools so in one operation all the boring operations are done. Therefore the boring bar is carefully positioned in the mold.

After the boring has being finished the crank and cam shafts are fitted temporally to check the clearances at the bearings. Now the engine block is ready for the further fittings of crank, cam, cylinders, connecting rods, and valves.

APPLICATION OF CYLINDER BLOCK:

A cylinder block is widely known as an engine block. It's considered as the engine's heart and one of the engine central components. it's produced with high-quality material to achieve the intended goal of its components.

Cylinder blocks play a very important role in the engine's lubrication, temperature control and engine stability. For this reason, it must be made of high quality to avoid shortcoming.

The engine block is designed to withstand a variety of temperatures and load so as to maintain the stability and lubrication of the engine. There are a number of oil galleries in engine blocks that help for the circulation of oil within the engine. Water galleries are also featured to provide cooling to the engine which controls its optimum operating temperature.

A cylinder block is designed depending on the type and specification of the engine model built. This will include its cylinder walls, cylinder sleeves and coolant passages.

Finally, the cylinder block is a structure that contains the cylinders, and other engine parts of an internal combustion engine.

ALTERNATE METHODS:

Diecasting can also be used because its more cost effective and the die wears out easily due to the high temperature of the molten metal.

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