

ANALYSIS OF HIGH OIL PRESSURE PHENOMENA IN PETROL ENGINE

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ABSTRACT - Oil pressure is an important factor in the longevity of most internal combustion engines. With a forced lubrication system, oil is picked up by a positive displacement oil pump and forced through oil galleries into bearings, such as the main bearings, big end bearings and camshaft bearings or balance shaft bearings. Other components such as cam lobes and cylinder walls are lubricated by oil jets. Sufficient oil pressure ensures that the metal of the rotating shaft (journal) and the bearing shell can never touch, and wear is therefore confined to initial start-up and shutdown. There are many factors that affected oil pressure of engine like oil temperature, viscosity of oil, engine speed, and area of oil gallery. High oil pressure is very dangerous phenomena for engine it may cause very serious damage to the engine. It is important to study these phenomena. In this research paper some of basic reason behind the high oil pressure problem is discussed.

Keywords – Oil Pressure, High oil pressure, Lubricant Oil, Oil Viscosity, Viscosity Index, Oil Temperature, Oil filter.

INTRODUCTION

Oil pressure is an important factor in the longevity of most internal combustion engines. With a forced lubrication system, oil is picked up by a positive displacement oil pump and forced through oil galleries into bearings, such as the main bearings, big end bearings and camshaft bearings or balance shaft bearings. Other components such as cam lobes and cylinder walls are lubricated by oil jets. Sufficient oil pressure ensures that the metal of the rotating shaft (journal) and the bearing shell can never touch, and wear is therefore confined to initial start-up and shutdown.

What Is Oil Pressure?

Oil pressure is created when the oil is pushed through the engine by the oil pump, forcing it in faster than it wants to flow and, Oil pressure is not created by oil pump as our general Misconception. Pump only create discharge, pressure is generated by the restriction in oil pathways. It's the same as holding your finger over the end of a garden hose, the smaller opening created by your finger increase pressure the water flowing through the hose.

High Oil Pressure

Oil pressure is higher when the engine is cold due to the increased viscosity of the oil, and also increases with engine speed until the relief valve in the oil pump opens to divert excess flow. Oil pressure is lowest under hot idling conditions, and the minimum pressure allowed by the manufacturer's tolerances is usually given at this point. Excessive oil pressure may indicate a blocked filter, blocked oil gallery or the wrong grade of oil. Low oil pressure indicates worn bearings or a broken oil pump.

Lubricant Oil

Lubricating oil is meant to reduce friction between two surfaces. If it is too viscous the oil will be thick and sticky and need too much energy to keep the parts moving. If the oil is too thin, then the parts will rub together and create friction. What is needed is oil that has just the right amount of viscosity to keep the two surfaces apart. Oil becomes less viscous as the temperature goes up. In an automobile engine, the oil needs to be viscous at a range of temperatures. It needs to work when the engine is first started and is cold, and keep working when the engine gets very hot, perhaps as much as 200 °C. The best oils, with a high viscosity index score, will keep their viscosity the same across the temperature range.

Oil Viscosity

Viscosity is a property of the fluid which opposes the relative motion between the two surfaces of the fluid that are moving at different velocities. In simple terms, viscosity means friction between the molecules of fluid, when the fluid is forced through a tube.

Viscosity Index

The viscosity index (VI) is an arbitrary, unit less measure of the change of viscosity with temperature, mostly used to characterize the viscosity-temperature behavior of lubricating oils. The lower the VI, the more the viscosity is affected by changes in temperature. The viscosity of a lubricant is closely related to its ability to reduce friction in solid body contacts. Generally, the least viscous lubricant which still forces the two moving surfaces apart to achieve "fluid bearing" conditions is desired. If the lubricant is too viscous, it will require a large amount of energy to move (as in honey). If it is too thin, the surfaces will come in contact and friction will increase.

Oil Pressure and Oil Temperature

Oil pressure is depending upon oil temperature and oil viscosity, as oil temperature decrease oil viscosity increase and as result oil pressure increase. If oil viscosity is too high oil density will be on higher side, so resistance to flow will be less and oil will not circulate properly in the engine. And any obstruction will come in oil gallery then oil pressure increase. In cold session, in early morning when we will do first crank to engine oil viscosity is too high and oil temperature is too low, so result oil pressure is too high and gives some horrible defect in engine. Sometimes oil pressure is too high above 15 Bar.

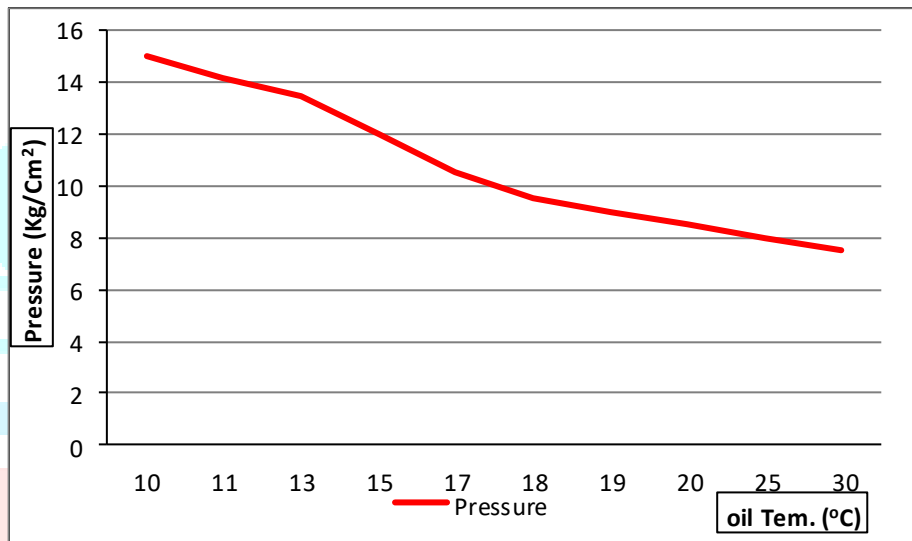


Figure 1: oil Pressure Vs Oil Temperature Graph

From above graph, it is clear that as oil temperature decreases oil viscosity increases and results in oil gallery oil pressure increases.

General Lubrication System

Basic oil pathway is oil strainer to pickup tube to oil pump to Oil gallery to oil filter to crankshaft-main bearing end bearing, camshaft bearing, and camshaft to crankpin.

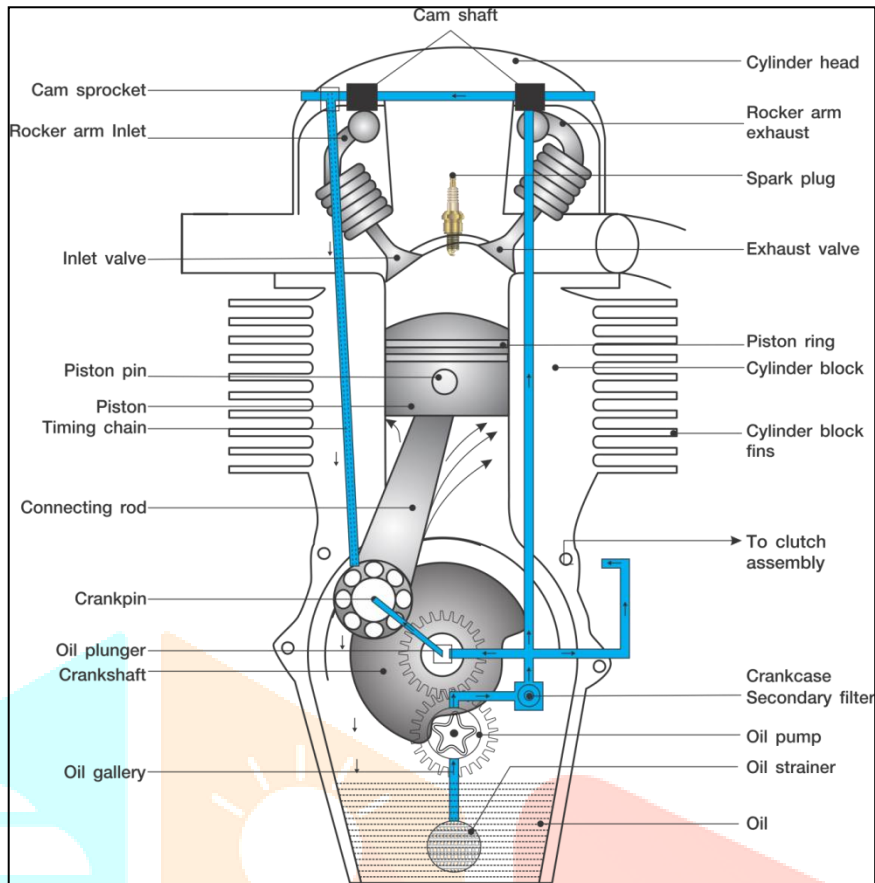


Figure 2: Lubrication System

General Problems for High Oil pressure in Engine

1. **Idling pressure:** The oil pressure is quite high while idling or during start up. This is because of the engine temperature. In turned off condition the engine cools down along with the oil that is flowing inside the Engine. When you start the engine, the temperature increases. This heats up the oil to a level that makes it easy to flow inside the Engine.
2. **Plugged oil filter:** A clogged or plugged filter can reduce the flow rate and cause an increase in the pressure. When you remove oil filter and clean it, the pressure will show a normal reading, if the dirty filter is the reason for the high pressure.
3. **Wrong oil grade:** The quality of the oil you add to the engine can also be the cause behind very low or high pressure. If the oil is very thin or light in weight it will have very low pressure as the thin oil can pass easily through the engine. If the oil is thick, it will need a higher pressure to flow.
4. **Oil pressure sensor:** Sometimes faulty oil pressure sensor sense wrong pressure and very high and low oil pressure on the oil pressure gauge.
5. **Worn oil pump:** Wear or excessive clearance inside the oil pump. Specifications vary, but as a rule gear type oil pumps should have less than about 0.0762 mm of endplay between the gear and cover. The clearance between the teeth and pump housing should usually be less than about 0.127 mm. with rotor style pump, the clearance between the outer rotor and pump housing should usually less than 0.3048 mm, with no more than about 0.254 mm between the inner and outer rotor lobes.
6. **Worn Engine Bearing:** Oil pump produces continually flow in oil galleries and the resistance to that flow produces pressure. Resistance is created by the orifice in the engine block through which oil flows, and the amount of clearance between the bearing and crankshaft journals.

General Solutions for High Oil pressure in Engine

- 1. Proper Grade Oil:** While oil pressure is high, lubrication would not be as efficient. A “good” oil, therefore, has viscosity characteristics sufficient to provide good hydrodynamic lubrication also flows freely around the engine to maintain a continuous supply of lubricant.
- 2. Wide Gallery:** Oil pressure is caused by the oil’s resistance to flow. Therefore, Wide oil galleries and low oil viscosity permit oil to flow freely. The results would be low oil pressure and more reliable lubrication. Conversely, narrow oil galleries and high oil viscosity causes lower oil flow in engine.
- 3. Pressure Relief Valve:** For solving high oil pressure Problem in the engine also provide Pressure relief valve with oil pump. A relief valve in the oil pump is there to cap the oil pressure at a specific amount at high rpms or cold oil. Without it you can shear the oil pump drive shaft.

CONCLUSION

Oil pressure depends on many factors as mention above, so it is very difficult to find the solution of high oil pressure issue without following proper procedure. Step by step approach is required to find the right solution and have to monitor each variable that affect the oil pressure of the engine. Whole oil system consists of oil sump, oil strainer, oil pump, orifice, oil gallery, oil filter. So checking of each part is required to reach right solution of to identify the problem. Other parameter like oil viscosity, oil temperature is also important because oil pressure of engine is directly related to that parameter.

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