

# Engine Valve Lapping

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**Abstract:** The automobile maintenance is a major area in automobile industry. The Internal Combustion engine maintenance is one of the important sections. The valve lapping process is also one of the maintenance processes. The current method used for valve lapping process consumes lot of time to perform the lapping operation. So a separate valve lapping machine is designed to overcome the above problem. The lapping process is a critical operation used to do precision operation. The main parameters considered are pressure, relative velocity, abrasive size, material removal rate.

**Keywords:** Valve lapping, Engine cylinder, Carbon deposits.

## 1. Introduction

The internal combustion engine are mainly used for transportation process [1]. The valve lapping process is carried out to obtain the perfect seat of valve in valve sitting area. [3] The lapping process is used in production firms where the components are required of high precision, surface finish and accuracy [5]. Valve mechanism consists of different arrangements of components which lead to working of valves during intake and exhaust stroke. [6] The most automobile internal combustion engines use poppet valves. The poppet valve looks like a flat disc with a stick over it the stick resembles the valve stem [7]. The lapping operation can also be said as a mirror like finishing operation. It leads to good strength of the material and if any joints are also formed.



Fig. 1. Valve position in cylinder head [1]

## 2. Components used

### A. AC motor

Ac motor is used in the valve lapping machine the motor is controlled by a voltage regulator for different speeds. The lapping tool is clamped to the motor with the help of tool holding device known as chuck. The ac motor is a device which is used to convert the electrical energy into mechanical energy

by using the electromagnetic principle. There are two kinds of ac motors (1) synchronous motor (0) asynchronous motor [11]. The electric motors have an advantage of producing the torque initially in low rpm which is very useful for the valve lapping machine [12].



Fig. 2. A.C induction motor [11]

### B. Lapping stick

The lapping stick is a tool used for the performing the lapping operation. It consists of a suction cup which helps in holding the valve firmly during the lapping operation. A wooden stick is used to hold the suction cup



Fig. 3. Lapping stick commonly used [1]

### C. Lapping paste

The valve lapping paste is used for lapping process. The lapping paste is made up of silica carbide grains as the material removing agent. It contains fine and coarse type of abrasives, the coarse type of abrasives is used for rough lapping operation and fine grain size is used for finishing the lapping operation. The widely used abrasive material for lapping process is aluminum oxide. For rough lapping process the grain size required is 220 and for the fine lapping process the grain size required is 400 [9].

### D. Abrasives types

There two major types of abrasives are (1) natural abrasive (2) artificial abrasive. Some of the natural types of abrasives are diamond slurry, emery, calcium carbonate, sand, corundum. Some of the artificial abrasives are aluminum oxide, silicon carbide. And a new type of light weight abrasive is cubic boron nitride [10].

### E. Machine vise

The machine vise is a work holding device. There are many types of vises such as (1) bench vise (2) wood working vise (3) swivel vise (4) angle vise (5) universal vise. But angle is specifically used so that the angular lapping operation can also be performed for the valves which are positioned in certain angular position [15], [16].

### F. Engine valve

The engine has mainly 2 valves an inlet and an exhaust valve. The most common used valve is a poppet valve. The valves play a major role in the operation of the internal combustion chamber. The exhaust valves in the internal combustion engine plays a vital role all the defects in the engine occurs mostly upon the working of the exhaust valve such as pre ignition run on etc. [13]. The carbon deposits over the exhaust valve are more on the compression ignition engine which are commonly said to be diesel engine. Other than the carbon deposits there may be burs and other deposits [14].

## 3. Literature review

[1] Ayodhya Abeysekara A good valve seat insures the perfect mixture of air-fuel ratio. So valve maintenance is a critical operation which is carried out by skilled operators to avoid the above mentioned problems.

[2] Peter Forsberg Due to the speedy motion of the valve it leads to wear and tear of the engine valves. During compression and expansion stroke (power stroke) the valves must work effectively, so it ensures the tight seal so that the combustion gases don't escape or leaked. So to ensure proper seal the valve lapping process is done.

[3] Xiaobin Le, M.L. Peterson The lapping is an material removal process which removes very fine amount of material by using loose abrasives the abrasive size used for this process is fine abrasive.

[4] Rajesh Ramadas, Saravanasambasivam The lapping process varies from other manufacturing process by the following characteristics (1) the material removal can be done without clamping the component on any work holding devices (2) ultra-precision can be obtained by this process by using very fine abrasives (3) the time taken for the component changing is less (4) work piece of thickness about 0.1mm can be lapped (5) after the lapping process there would be no burs formation and distortion. An experimental design was carried out by taguchi method which results in optimization of lapping and its parameters.

[5] Yuvraj K. lavhale, JeevanSalunke The valves work at high speeds according to the firing order of the combustion gases the components must withstand high temperature such as valve head and valve face which leads the valve to undergo huge thermal stress which results in wear and tear of the valve, poor lubrication.

[6] Mamta R. Zade Here the poppet valve is optimized due to the following advantages (1) simple in construction (2) self-

centering capability (3) the valve is free to rotate about the stem (4) the sealing effectiveness and efficiency can be maintained easily than other types of valves.

[7] S. M. Fulmali, R. B. Chadge, The main factors which has to be considered during the lapping process are as follows (1) surface of the lapping plate (2) speed for lapping operation (3) abrasives type used (4) abrasive size and shape (5) type of binder used (6) material of the lapping plate (7) required force to perform the lapping process (8) strength of the lapping plate.

## 4. Conclusion

The difficulty of holding the internal combustion engine was solved by designing a component. The newly designed machine replaces the manual labor. The vertical movement of the machine was used to lift the cylinder to accommodate different heights of engine. During the process of the internal combustion engine the valve wear gets induced due to the pressure developed in the combustion chamber. The valve wear pattern may vary different type of valves. This may result in leakage in combustion chamber which decreases the performance of the engine and the loss in the economy. During the lapping process the material removal rate would differ from material to material. At the beginning of the lapping process the material removal rate would be high and lower during the end of the process.

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