



Elimination of cylinder head valve guide wrong fitment

Deepak Sekar

deepaksekar797@gmail.com

Hindustan Institute of Technology
and Science, Chennai, Tamil Nadu

Mohan Y

yrmohan20@gmail.com

Hindustan Institute of Technology
and Science, Chennai, Tamil Nadu

Mithun C

mithunkonvict@gmail.com

Hindustan Institute of Technology
and Science, Chennai, Tamil Nadu

ABSTRACT

The Engine is powered by burning the air-fuel mixture inside the combustion chamber and the power is delivered to run the Vehicle. The mixture of air-fuel is required in the correct quantity to attain maximum efficiency. There are two valves present in the Engine cylinder head which is inlet and exhaust valve. This two valve will have different parameters, in which the exhaust valve is small and the inlet is big compared to the exhaust valve. Valve Guides and valve seats are very important for the continuous proper working of the inlet and exhaust valves. The valve guide is helpful for the valve to sit in the correct position with respect to the valve seat. Valve Guide is a cylindrical piece which is manually loaded in the machine and pressed into the cylinder head during the cylinder head machining process. Since the valve guide is inserted in the valve guide press machine manually there is a chance of inserting in the wrong direction inside the cylinder head. This problem leads to a drastic amount of scrap and increases in material cost. The solution to this problem can be solved by adding an airline and pressure sensor in the valve guide holder in valve guide press machine. This can eliminate the problem and also improves in the quality time and in the reduction of the amount of scrap.

Keywords—Cylinder Head, Valve Guide, Poke-Yoke

1. INTRODUCTION

In any OEM automobile company will set their goal at increasing the quality, time and reducing the amount of scrap. The cylinder head is an aluminium metal piece which sits above the cylinder block and sealed with the help of gasket. Cylinder heads are made by casting in the casting shop and this it is machined in the cylinder head machining shop. Finished parts are sent to the assembly shop to assemble the engine. The cylinder head machining line comprises of various operations like 2D Marking, Rough cell machining, initial washing, initial leak testing, valve guide and valve seat assembly, Cam bracket assembly, final washing, a plug assembly, final lead test and visual inspection. During the cylinder head machining process some parts get rejected due to various defect, major defect rate is due to the valve guide the wrong fitment.

2. PROBLEM IDENTIFIED

During the cylinder head machining process the valve guide is clamped in the valve guide press machine manually by the Operator. Since it is manually done there is a chance of Clamping the valve guide in the wrong direction in the valve Guide press machine by the operator. From figure 1 and 2, the correct and wrong direction can be seen. There is no detection system in the valve guide press machine whether the valve guide is clamped in the correct direction or in the wrong direction.

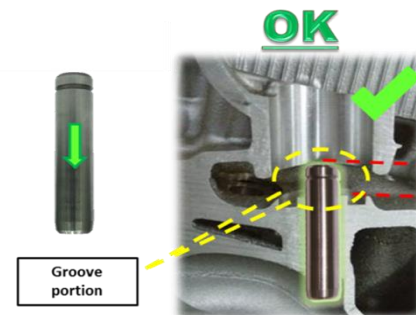


Fig. 1: Valve guide clamping in the correct direction

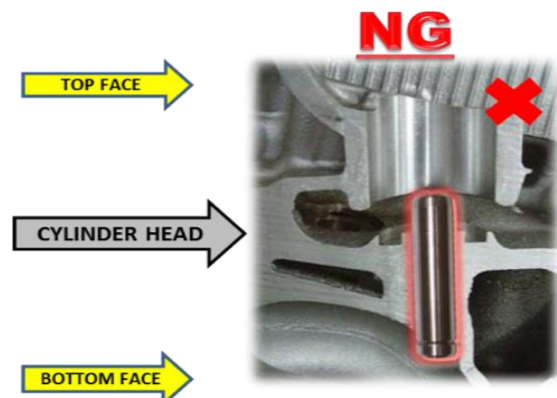


Fig. 2: Valve guide clamping in the wrong direction

3. VALVE GUIDE HOLDER SPECIFICATION

Valve guide holder in the machine has two airlines and the pressure sensor, which is connected with the clamp which locks the valve guide when it is inserted in the groove side (correct

direction). Valve guide holder can be removed by removing the bolts. The holder consists of Press-fit pin lock nut and screw, spring, present check/seating whole, press fit pin, chuck finger/hook, locking pin and circle. The valve guide press fit pin can be removed separately and it consists of a surface which determines the height of guide O ring enters into this groove/flute. There is a hollow hole for the air flow. To remove the press fit pin release the locknut and screw. The valve guide clamps/unclamp structure is when the chuck finger/hook shuts the seating/present check hole. When the chuck opens the seating hole opens and valve guide clamped. This is the structure of the valve guide holder.

4. VALVE GUIDE HOLDER WORKING

In the normal condition when the valve guide is not fitted. The chuck finger shuts the seating chuck hole and the clamp locks the airline and the pressure is increased so in the pressure gauge the pressure will be 0.1Mpa.

When the valve guide is fitted in the holder the chuck opens, seating hole opens and valve guide is clamped. The airline is open and the pressure comes to zero so in the pressure gauge the pressure will be 0Mpa.

When the valve guide is inserted in the correct direction the groove will get locked by the chuck. So the valve guide will not go more than that but when the valve guide is inserted in the wrong direction that is the chamfered side the valve guide will go to the maximum length since there is no groove to get locked. The problem is even if the valve guide is wrongly inserted in the holder the machine will show preparation ok and ready for the next process.

5. SOLUTION

The solution to this problem solved by adding an extra air-line and a pressure sensor on the maximum length where the valve

guide reach when it is inserted in the wrong direction in the valve guide holder. So that when the valve guide is inserted in the wrong direction it will go to the maximum length and lock the airline and a pressure will be increased and when the pressure is increased and the machine will show preparation not okay and the alarm will go on so that the operator will come to know that is the wrong side and he can insert it in the correct direction.

6. CONCLUSION

6.1 Before condition

During the cylinder head machining process the valve guide is clamped in the valve guide press machine manually by the operator. Since it is manually done there is a chance of clamping the valve guide in the wrong direction in the valve guide press machine by the operator.

6.2 After condition

The additional air-line and pressure sensor will detect when the valve guide is inserted in the wrong direction. If it is in the correct position the machine will allow the operator for the next process with a green signal, else the alarm will go and the machine will not go for the next process. So this can eliminate the cylinder head valve guide wrong fitment during the cylinder head machining process.

7. REFERENCES

- [1] International Journal of Mechanical and Production Engineering, Volume - 6, Issue - 3, Mar-2018.
- [2] V S Biraris, Dr E R Deore a-case study of defects reduction in a valve guide of cylinder heads for large engines manufacturing process by applying six sigma principles and dmaic problem-solving methodology.
- [3] Implementation of six sigma in a manufacturing process by Adan Valles, Jaime Sanchez, Salvador Noriega, and Berenice Gomez Nunez.