

QUALITY INSPECTION OF ENGINE SPARES

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ABSTRACT

This paper highlights the importance of having know how about inspection and checking of quality of spares of vehicles. Important terminologies like OEM, replacement parts, Genuine and Non-genuine parts etc have been explicitly defined in the article. The quality inspection techniques of engine spare parts like pistons, rings, cylinder liners, crankshaft bearings and thrust bearings have been explained.

INTRODUCTION

Markets are flooded with non-genuine and fake spares and selection of required spare parts is a nightmare even for the qualified engineers. Inspection and identification of vehicles parts is a very critical task, especially the engine parts require extra care, experience & knowledge of critical and non critical dimensions. The engineer performing this job requires special instruments, jigs, fixtures and tolerance charts or standards to perform these jobs satisfactorily. Unfortunately, the required equipment is not available in the maintenance or in service workshops. That makes the inspection engineers' job more difficult and forces them to use indirect methods of inspection. It not only promotes guess work but forces the engineer to accept parts without due quality inspection.

TERMS AND DEFINITIONS

Original Equipment Manufacturer (OEM) & Replacement Parts.

OEM parts are those parts which are fitted on the vehicle at the time of assembly. Replacement parts are those parts which are sold separately to replace worn out or damaged parts during the life span of the vehicle.

Genuine and Non genuine Parts.

Genuine parts are those parts which are quality tested by the engine or vehicle manufacturer and marketed under their own name. Non genuine parts are those parts which are not manufactured / quality tested by the engine or vehicle manufacturer.

Fake Parts.

Fake parts are manufactured by some unknown manufacturer but packed in renowned packing.

Markings, Stamps and Part Numbers.

Mostly, the parts manufacturers place their identification marks in the early stages of manufacture, which also serve the

manufacturer to identify the parts during manufacture. These include cast, forged or embossed markings. The laser writing, electric discharge engraving, screen printing & acid etching could be done on finished parts therefore must be checked thoroughly [1].

Packing.

The quality of packing material and multi color printing must be checked as the locally manufactured packing material lack in finish & multi color printing.

Inspection Standards.

There are various inspection and quality standards such as SAE, BS, JIS & ISO to name a few. Most of these standards do not conflict with each other.

INSPECTION OF SPARES

Quality Inspection of Pistons

The critical parameters for the inspection of pistons are given as follows in order of decreasing importance:-

- **Profile.** Piston profile has a very complex geometry. It is oval or elliptical on its diameter and tapered

on its length. The maximum diameter portion called the guide is most of the time at the bottom end of the piston but sometimes is placed a little above the piston bottom. The piston profile and ring land should be measured separately, taking at least two readings 90 degrees apart with the help of a suitable micrometer. The rule of thumb for the piston to cylinder clearance is 0.025 mm per 25 mm of cylinder bore for petrol and 0.04 mm for diesel engine.

- **Grooves.** The groove depth & groove width must be checked according to the standards. Groove width is more critical and has very tight tolerance limit, on the other hand the depth is less critical and have a wider tolerance limit.
- **Pin Bore.** Pin bores are either press fit or hand push fit.

The press fit is always provided in the service & repair manual. The hand push fit clearance is in the order of 0.012 to 0.018 mm as the clearance increases when the engine attains operating temperature.



Quality Inspection of Piston Pins.

The critical parameters for the inspection of piston pins are outside diameter, length, bore and Chamfers.

Tolerance Limits for Piston Rings.

The critical parameters for the inspection of piston rings are given as under in order of decreasing importance:-

- **Ring Width.** Ring width is a very critical dimension with very little tolerance margin. The ring width must be checked at 3 positions 120 degrees apart with a suitable micrometer.
- **Radial Wall Thickness.** The radial wall thickness is checked with half round micrometer.
- **Free & Closed Gap.** The free gap is measured in the Free State & the closed gap is measured in a special jig. If the special jig is not available the cylinder liner could be used to measure the close gap.

Quality Inspection of Cylinder Liners.

The critical parameters for the inspection of cylinder liners are given as under in order of decreasing importance:-

- **Bore.** It is the most important dimension of the liner and must be checked with the bore gauge or inside micrometer. The measurements must be taken from both ends. The limits are available in the standards.
- **Outside Diameter.** The dry type liners have only one outside diameter but the wet type have many steps on the outside. All outside diameters should be checked with a suitable micrometer. The limits are available in the standards.
- **Flange Height & Width.** Both flange height & width could be checked with the help of a micrometer or a caliper.



Quality Inspection of Crankshaft Bearings.

The critical parameters for the inspection of crankshaft bearings [2] are given as under in order of decreasing importance:-

- **Wall Thickness.** The bearing wall thickness is the most critical of all, it has a very tight tolerance limit and must be checked with a semi round micrometer. The tolerance is different for diesel and gas engines and must be inspected according to the application.
- **Height or Crush.** Crush is also a very important dimension but could not be checked without the help of adjustable hydraulic fixture.
- **Recess or Crush Relief.** The bearing wall also has non linear geometry and the wall thickness close to the parting line is considerably less than the wall at crown. The crush relief tolerance is also provided in the standards and could be checked by semi round micrometer.

Quality Inspection of Thrust Bearings.

The critical parameters for the inspection of thrust bearings are given as under in order of decreasing importance:-

- **Wall Thickness.** The thrust bearings are of two types roll finished or ground. The tolerance limits are different for both finishes therefore must be checked accordingly.

- **Housing Diameter.** The housing diameter is also a very critical dimension but have a wider tolerance limit. The dimension could be checked with calipers.
- **Flatness.** The flatness of the thrust bearings is a very critical dimension and could only be checked with a special fixture called parallel plate fixture.

CONCLUSION

The aim of quality assurance system is that the customers are satisfied if the product is defect free (including latent defects), delivered on time as promised, does not fail early in life and does not fail excessively in service and it is offered at economic prices. Attaining the objective of customer/user satisfaction is not an easily surmountable task. By adopting standard procedures, enhancing awareness about quality and by establishing proper facilities for testing, entire range of spares can be inspected very conveniently. Resultantly, the loss of billions of rupees to national exchequer can be avoided.

REFERENCES

- [1]. Report "Spares Seminar 2004" held at College of Electrical and Mechanical Engineering, Rawalpindi, Pakistan
- [2]. Report "Quality Assurance Seminar 2005" held at College of Electrical and Mechanical Engineering, Rawalpindi, Pakistan