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STUDY OF REMEDIES ON THE REASONS OF THE BENDING OF CAMSHAFTS

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ABSTRACT

A camshaft is a shaft to which a cam is fastened or of which a cam forms an integral part. A camshaft is generally manufactured by Casting Process.

Casting is a manufacturing process in which a liquid material is usually poured into a mold, which contains a hollow cavity of the desired shape, and then allowed to solidify. The solidified part is also known as a casting and the process is known as Casting Process. Camshaft plays an important role in the engine assembly. So the camshaft should undergo the specified machining and subsequent operations.

Some defects in camshafts like pinhole, extra metal, shrinkage or mainly found defect is a Bend are considered the most common problems in manufacturing of camshafts. The bent camshafts may cause an Engine Failure. So Bend is the natural phenomena due to which the percentage rejection of camshaft foundry plays a big role.

The aim of this project was to study all the reasons which contribute for bend and find the operative and serviceable remedies to minimize the percentage rejection. The Bend may be reduced by some effective methods like changing the squeezing pins layout, shell mold thickness, changing the width of the shell or the shell geometry. The miniature working remedies we suggested and it helped us achieve good results. The remedies suggested are affordable to the industry and applicable in some processes.

INTRODUCTION

A camshaft is a shaft having required number of cams over it. Camshafts are responsible for the accurately-timed fuel injections required by internal combustion engines. Camshafts have multiple cams on them, which are used to open valves through either direct contact or pushrods. A camshaft is directly coupled to the crankshaft, so that the valve openings are timed accordingly.

In internal combustion engines with pistons, the camshaft is used to operate poppet valves. The cam lobes force the valves open by pressing on the valve, or on some intermediate mechanism as they rotate. Camshaft Manufacturing is done mainly by casting process. The whole manufacturing process (casting) is carried out to form a desired camshaft. Camshaft is an important part in engine assembly.

Chilled cast iron is primarily used for production of cam shaft. The development of automobile industry and engine power brings up more advance requirement for properties of camshaft.

After the complete process, the camshafts may bend. Hence to avoid this, some of the remedies are applied during manufacturing of camshafts. The bent camshafts may cause the engine failure which is very undesirable for the engine to run.

CAMSHAFT IS AN IMPORTANT PART IN ENGINE ASSEMBLY.



Fig.: Camshaft

PROCESS STUDY

Defects generally found during manufacturing of camshafts:

1. PINHOLE:

Pin holes are small gas holes either at the surface or just below the surface. When these are present, they occur in large numbers and are fairly uniformly dispersed over the surface.

This defect occurs due to gas dissolved in the alloy and the alloy not properly degassed.

2. SHRINKAGE:

A shrinkage cavity is a depression or an internal void in a casting that results from the volume contraction that occurs during solidification.

3. HOT TEAR:

Hot tears are hot cracks which appear in the form of irregular crevices with a dark oxidized fracture surface. They arise when the solidifying metal does not have sufficient strength to resist tensile forces produced during solidification.

4. WASH:

A cut or wash is a low projection on the drag face of a casting that extends along the surface, decreasing in height as it extends from one side of the casting to the other end. It usually occurs with bottom gating castings in which the molding sand has insufficient hot strength, and when too much metal is made to flow through one gate into the mold cavity.

5. EXTRA METAL:

The extra metal or excess metal is a majorly found defect of the casting. The extra metal means the extra part of the metal body remains as it is somewhere on the casting body during the process and it gets removed when the castings are arrived in the fettling section.

6. BEND:

Bend causes the camshaft to change its shape into a curve. We cannot observe the bend by our naked eyes. Every camshaft industry measures the bend of camshaft by the method TIR (Total Indicated Reading).

The machine setup has the provision in which the casting to be placed and it is rotated. As the pointer touching the casting, shows the reading on the dial gauge in terms of "Thou".

As per the standard, if the pointer shows 43 to 47 thou, the casting is okay and if it exceeds it is considered as Bent Casting.

REASONS AND REMEDIES FOR BEND

1. **Reason:** Improper squeezing pin set up:

Reason 1.1: Un-even squeezing pin height.

Remedy: Change squeezing pins and put equal height squeezing pins.

Reason 1.2: Squeezing pins resting on a tapered portion of shell.

Remedy: Change squeezing pin layout on flat portion of shell.

Reason 1.3: Squeezing pin placement at incorrect location.

Remedy: Re-alignment of squeezing pins for proper pin placement.

Reason 1.4: Squeezing pins absent as against squeezing layout.

Remedy: Check squeezing pins are present against layout after every shift.

2. **Reason:** Un-parallel shell ejection:

Remedy 1: Check air pressure for ejection. The Pressure should be 5.5 kg/square cm. The Maximum pressure should be in between 6.2 to 6.4 kg/square cm.

Remedy 2: Check ejection guide bar.

Remedy 3: Check ejection pins are straight and not bent.

Remedy 4: Ensure enough ejection pins on pattern plate.

Remedy 5: Ensure ejection pins are equal height.

3. **Reason:** Shell bending due to delay in closing.

Remedy: Shell must be closed within 3 minutes from ejection to avoid permanent deformation of shell before assembly.

4. **Reason:** Low shell weight / low shell thickness.

Remedy: Increase shell sand weight by 1 kg/camshaft that can be achieved by increasing mold size. Currently the weight of the shell mold is 1 kg/camshaft.

Increasing investment time by 3-4 seconds.

Increasing pattern plate temperature by 5 degree. Currently it is 260 degree.

5. **Reason:** Shell underbake / overbake.

Remedies:

1. The Shell Baking Temperature should be maintained from 250- 270° C.
2. Ensure temperature controller showing correct temp, ensure temp probe is inserted completely in the pattern plate.

CONCLUSION

Based on the studies made, following conclusions can be drawn:

Also it is feasible to apply these conclusions for the betterment of the production which will reduce the bend in camshafts.

The major area of our project work was Unit-3 and we found their rejection was 8% and we suggested some effective remedies as follows:

1. Currently, the pattern width = 282 mm i.e. 40% bend.

Now, we proposed the width = 332 mm (Increase by 50 mm) i.e. 10% decrease in bend.

2. Currently, the sand shell weight = 1 kg/camshaft.

Now, we proposed the weight = 2 kg/camshaft (Increase by 1 kg/camshaft) will decrease in 20% of bend.

REFERENCES

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