

AN OVERVIEW OF THE DEFECT IN THE MANUFACTURING OF ROUND HEADED CENTRE BOLT WITH ITS SOLUTION

Nisarg Khandare

G.H. Raison College of Engineering, Nagpur
Maharashtra, India

“UG Student, Department of Mechanical Engineering, GHRCE Nagpur”

Abstract:-

The objective of this paper is to identify and understand cold forging processes of round headed centre bolt, investigate the defect and provide solution for it. In cold forging a metal piece is shaped to required product by compressive force applied by punches. Cold forging is one of the oldest methods used in manufacturing. It is easy as well as time saving method of production. Forging drawing is a very important part before the start of forging process. The stages in which forging will be done is shown in the forging drawings. The main advantage of cold forging process is that metal is not wasted like in machining. Also, Complex parts can be easily formed by proper designing of punch and dies. The dimensional accuracy obtained is very close to the specified dimension. Majority of cold forging parts are manufactured for the automobile industry. Cold forging process not only saves material but also saves time. The only drawback of cold forging is that it uses trial and error method for the formation of product. Man skill is used for this. Recently the use of technology is done and various softwares are being used for prediction of the states during forging. Initially different kinds of material that can be used for cold forging are discussed. The defect and solution provided is for round headed centre bolt made of alloy steel. A brief description of formation of centre bolt by cold forging is described. Finally the problem in the formation of round headed centre bolt and solution are discussed which have helped in reducing the rejection of the round headed centre bolt.

Keyword:- cold forging, die and punches, compressive force, dimensional accuracy, round headed centre bolt

1. Introduction:

There are different kind of bolts namely- Hex head bolt, Special bolts, Banjo bolts, Centre bolts, Connecting rod bolts, Weld bolts, U bolts, T Bolts and Eye Bolts which are widely used in different industries and have their special applications. The round headed centre bolt is a job that has two important parts namely head and shank. Further threading is provided on the shank. On the head of centre bolt the grade of the material is indicated. The material used for manufacturing of centre bolt is preferably alloy steel. The manufacturing of the centre bolt is done in three different stages. First the steel wire is parted to required length, second the formation of preliminary cone is done and finally compressive forces are applied through the punch to form the circular head of the bolt. This paper describes the defect occurred during cold forging of round headed centre bolt and solution provided for it.

2. Review of cold forging:

Cold forging is a process in which a part of metal wire is shaped to required product by applying compressive forces by using specified die and punches. Cold forging is one of the oldest methods used in manufacturing industries. In cold forging metal is deformed below its recrystallization point. This process is usually cheaper than hot forging. It is simple as well as time saving method of manufacturing. The most important part at the initial stage in forging is the construction of forging drawing. The forging drawings are prepared in order to ease the process of forming parts. The forging of the products highly depend on forging drawing where the number of dies required, the die dimensions and finally the length of the wire to be cut is decided on the paper. These all factors determine the specific type of cold forging machine to be used for formation of the product.

2.1 Some important features of Cold Forging are:

- Corrosion resistant
- good quality
- durable
- less machining required so less wastage of material in form of chips
- dimensional accuracy
- cheaper products
- reduction in the steps of manufacturing

2.2 Cold forged parts can be used in:

- Various Automobiles parts
- Agricultural Equipments
- Electrical Engineering products
- Furniture
- Aerospace

2.3 Types of material that can be used for cold forging:

- Carbon steel
- Alloy steel
- Copper
- Aluminium
- Brass/Bronze

2.4 Some types of steels that can be used for Cold Forging are:

- Low carbon steel: SAE 1008, 1010,1015,1018,1020
- Medium carbon steel: SAE 1541, 1030 ,1040
- Alloy steel :-SAE 4135,4140,Boron steel, SAE 8620, 16mncr5, 15B41 ,15B25

3. Cold forging of round headed centre bolt:

The steps which occur during the formation of round headed centre bolt are:

- 1) The required length of steel wire is cut by the cutter in forging machine itself.
- 2) The punch and die are utilised in second stage for the formation of preliminary cone.
- 3) Finally the compressive forces are applied through the punch and the formation of circular head of required dimension takes place.



Figure 1:- Round headed centre bolt

Further the secondary processes have to be done for obtaining the final product. The round headed centre bolt is first sent for head shaving and chamfering process where the excessive material is removed to obtain required dimension of head and the angle of chamfer. Further grinding process is carried out before threading so that the major diameter after threading is within the dimensions specified. Next process is the threading process where the required type of threading is done on round headed centre bolt. Rolled type of threading mostly used for threading of centre bolts. Finally heat treatment is done (if required, according to the material used for

manufacturing the centre bolt that is, grade 5 material requires heat treatment whereas grade 2 material does not). This process is called tempering. It strengthens the product.

4. Case study:

4.1 Problem:

Head shift during cold forging process of the round headed centre bolt.

4.2 Root cause:

- 1) Use of flat punch in cold forging process.
- 2) Use of Inadequate design of punch.



Figure 2:- inadequate design of the punch

4.3 SOLUTION PROVIDED:

- To provide a punch having round slot for avoiding the head shifting problem.



Figure 3:- adequate design of punch.

5. Results Obtained:

- 1) Rejection reduced to zero, earlier which was 7000.

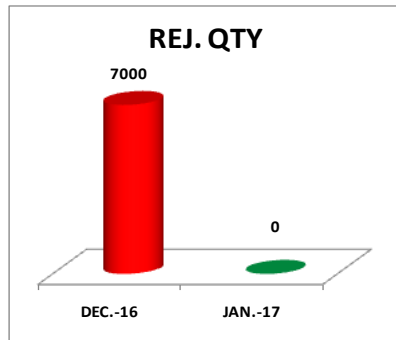


Chart 1:- rejection amount

- 2) Head does not move out.
- 3) Dimensionally correct head.
- 4) Material wasted in machining avoided and so does the machining process.

6. Conclusion:

Cold forging process has an important role to play in the future. With more advancement in CAD designing, the solutions can be analyzed before practical implementation. The popularity of cold forging will go on increasing in the future due to its simple techniques.

The necessary changes made in the design of die and punches give positive results. The cold forging of round headed centre bolt became easier after providing the solution for the defect discussed above. The rejection quantity reduced to 0 from 7000.

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