International Journal of Research in Engineering, Science and Management
Volume-2, Issue-3, March-2019
www.ijresm.com | ISSN (Online): 2581-5792

Fabrication of Roller Bearing using CNC Machining

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***Abstract*: This paper focuses on the problem of inconsistency in the production of roller bearing. Just as other mechanical components, roller bearings can also undergo premature failure due to various reasons. One must differentiate between bearing durability during operating speeds and bearing service life, which determines the bearing lifetime, since the bearing has to stand up to lot of stress, it must be produced with minimum error. The main aim of this paper is to give effective solution to this problem. Computer numerical control (CNC) is automated control of machining which reduce the inconsistency in the production of roller bearing. The manufacturing process 100% checked and feedback provided to ensure the integrity of the process and product. The other factors like Predictable uniformity, or repeatability, in the manufacturing process is crucial to ensuring consistent bearing performance.**

***Keywords*: CNC, machining operation, computer-based control of machining**

1. Introduction

The first CNC machines also known as NC machines were built in the 1940s and 1950s, based on tools that already existing were modified with motors that moved the controls to automate the mechanism. These early servomechanisms were rapidly implemented with analog and digital computers, creating the modern CNC machine tools as more consistent machining processes. Computer numerical control (CNC) is the computer-based control of machining like tools drills, boring tools, lathes by means of a computer. An CNC machine used for machining of a blank piece of metal, or composite based on program instruction to meet the requirement without a manual operator operating the machine. CNC machines combine a motor based machining tool and o are motorized to have a standard platform, which are controlled by a computer, according to program input instructions. Instructions are delivered to the CNC machine in the form of graphical computer-aided design also called as CAD files.

2. Fabrication of roller bearing

A. Selection of raw material

First we have to choose the suitable raw material for the production of roller bearing. Mild steel and Stainless steel are most preferred raw materials. Mild steel contains about 5% of carbon in it making it malleable and ductile. Mild steel has a relatively low tensile strength, when compared with others but it is cheap and easy to form. The surface hardness can be increased through carburizing. On the other hand, Stainless steels are most known for their corrosion resistance, the corrosion resistance increase with increase in chromium. There many types of stainless steel based on the chromium content present in the material. The raw material is selected based on several factors like cost of material, ductility etc. In this process with we prefer with mild steel over the stainless steel.

3. Machining operations

A. Operation 1: facing

The first operation in machining operation is facing. Facing process is first and essential process in the CNC machining. The main aim of the facing operation is remove flat surface present in the raw material. Machining is done based on the NC part programming. Facing is done to remove surface roughness on the raw material, this is reason that facing operation is always the first operation in the CNC machining.

B. Operation 2: Turning

The second operation in machining operation is turning. The type of turning operation done is O.D turning. O.D turning is done to cut the raw material into the required shape. Basically there are three types of turning operation they are O.D turning, I.D turning and face turning.

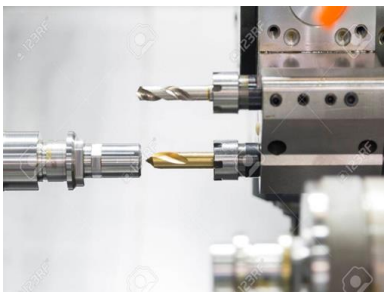

Fig. 1. Turning

C. Operation 3: Drilling

The third operation in the machining process is drilling. The type of Drilling operation done is center drilling. The drill pit used in drilling operation in multi-point, which is pressed

against the raw material in rate of revolutions per minute, for making a drill hole in the raw material. Center drill basically has three angles 60', 82', & 90', the type of drilling used is semi-automated drilling in the CNC machine. The main purpose of center drill is to machine an accurate center hole in the raw material.

Fig. 2. Drilling

D. Operation 4: Boring

The fourth operation in the machining process is boring. Boring is done to enlarge the drilled hole. The type of boring done is rough boring, this type of boring is done to remove high amount of material. Boring is done to cut down the internal–diameter and also for the boring operation of external–diameter. Boring is the single point cutting tool.

Fig. 3. Boring

The boring head contains components like gun barrel, engine cylinder etc. Metal boring tool is used for boring of metals. Boring produce smooth and accurate holes by enlarging the hole in the work piece.

E. Operation 5: O. D turning

The fifth operation in machining is O. D turning. The O. D turning is also known as step O. D turning. There are three types of turning O.D turning, I.D turning, face turning, the O.D turning is done to cut off the raw material to meet the final shape and size.

F. Operation 6: Facing

The sixth operation in machining is facing. Here Facing is done to correct the final total length of the roller bearing. It is done to remove extra shear above the raw material and reach the final length required for the final product.

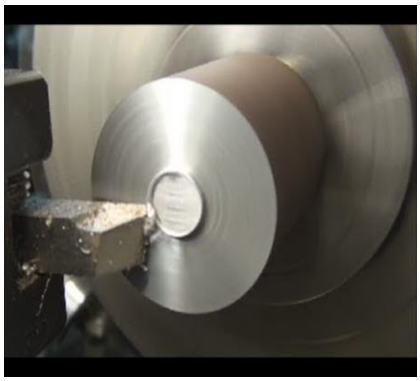

Fig. 4. Facing

G. Operation 7: Threading

The seventh operation in machining threading. Threading is done to create threads in the components, threading is the single point cutting machine. The threading can be done to create both internal threads and external threads. Size of the threading bits are 3/8 it is most used for cylindrical threading.

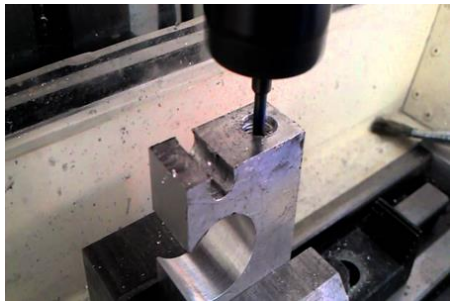

Fig. 5. Threading

The roller bearing requires only the internal threading. A thread is a uniform cylindrical groove cut inside the internal diameter.

4. CNC programming

A. G-CODES

- G00 Rapid Transverse
- G01 Linear Interpolation
- G02 Circular Interpolation, CW
- G03 Circular Interpolation, CCW
- G17 XY Plane, G18 XZ Plane,G19 YZ Plane
- G20/G70 Inch units
- G21/G71 Metric Units
- G40 Cutter compensation cancel
- G41 Cutter compensation left
- G42 Cutter compensation right

- G43 Tool length compensation (plus)
- G43 Tool length compensation (plus)
- G44 Tool length compensation (minus)
- G49 Tool length compensation cancel
- G80 Cancel canned cycles
- G81 Drilling cycle
- G82 Counter boring cycle
- G83 Deep hole drilling cycle
- G90 Absolute positioning
- G91 Incremental positioning

B. M-CODES

- M00 Program stop
- M01 Optional program stop
- M02 Program end
- M03 Spindle on clockwise
- M04 Spindle on counterclockwise
- M05 Spindle stop
- M06 Tool change
- M08 Coolant on
- M09 Coolant off
- M10 Clamps on
- M11 Clamps off
- M30 Program stop, reset to start

5. VMC machining

A. Operation 1: Milling

The first operation in VMC machining is milling. Milling process is used for removing of raw material of the top surface. The milling process has a rotary cutting tool. The cutting tool has multiple cutting tool.

Fig. 6. Milling

B. Operation 2: Grinding

The second operation in VMC machining process is grinding. The type of grinding done is surface grinding, it is done to produce smooth surface on the final product.

Fig. 7. Grinding

6. Conclusion

Thus we have found solution for the inconsistency in manufacturing process of roller bearing, by using CNC machining. Though consistency of bearing increase while manufacturing roller bearing in CNC machining it is highly suitable in the production of roller bearing.

References

[1] Wisudawan, ChandraGalih, “Perancangan Mekanik Mesin CNC Batik,” Jurusan Teknik Mesindan Industri FT UGM, Yogyakarta, 2011.
[2] C. Ahilan, Somasundaram Kumanan, N. Sivakumaran, J. Edwin Raja Dhas, “Modeling and prediction of machining quality in CNC turning process using intelligent hybrid decision making tools” Department of Mechanical Engineering, Oxford Engineering College, Tiruchirappalli.
[3] Sinan Gurel, M. Selim Akturk, “Considering manufacturing cost and scheduling performance on a CNC turning machine” Department of Industrial Engineering, Bilkent University, 06800 Bilkent, Ankara, Turkey”, European Journal of Operational Research, pp. 325–343, 2007.