International Journal of Advance Research in Science and Engineering
Volume No.07, Special Issue No. (03), January 2018
www.ijarse.com
IJARSE
ISSN: 2319-8354

Implementation and Analysis on Carbide Boring Tool for Increasing Tool Life

Prathamesh Vishwas Waghmare[1], Parag Arun Yeshi[2]
Omkar Suresh Thakur[3], Amol Parshuram Khairnar[4]
Deepak Padmakar Patil[5]
[1,2,3,4,5]*Nashik, Maharashtra, (India)*

ABSTRACT

The importance of manufacturing process is that without it no product reach to customer satisfaction. hence, for the engineering it is important to convert design into actual product and this one possible only when we go through suitable manufacturing process. Hence the manufacturing process isvalue affection process in which raw material gets converted into finish good. As tool is important element of manufacturing a component. A component is manufactured by much process such as turning, boring drilling operation. All these manufacturing process having its own importance. Among this manufacturing of component basic boring of component with good finishing is preferred for most of the job or small amount of production. This boring tool is costly so we have designing and analyzing the boring tool for horizontal CNC machine a new technology of tooling for operation which increase the tool life and also increase &improve the productivity and also increase the quality of component.

KEYWORDS:Boring, Carbide Tool, Chip Formation, Polycrystalline Diamond, Robo Drill.

I. INTRODUCTION

Lathes boring is a cutting operation that uses a single point cutting tool or a boring head to produce conical or cylindrical surfaces by enlarging an existing opening in a work piece. For non-tapered holes, the cutting tool moves parallel to the axis of rotation. Lathe boring usually requires that the work piece be held in the chuck and rotated. As the workpiece is rotated, a boring bar with an insert attached to the tip of the is bar fed into an existing hole. When the cutting tool engages the work piece, a chip is formed. Depending on the type of tool used, the material, and the feed rate, the chip may be continuous or segmented. The surface produced is called a bore.

The geometry produced by lathe boring is usually of two types straight holes and tapered holes. Several diameters can also be added to each shape hole if required. To produce a taper, the tool may be fed at an angle to the axis of rotation or both feed and axial motions may be concurrent. Straight holes and counter bores are produced by moving the tool parallel to the axis of work piece rotation. Horizontal boring machine or horizontal boring mill is a machine tool which bores holes in a horizontal direction. There are three main types — table, planer and floor. The table type is the most common and, as it is the most versatile, it is also known as the universal type Implementation and Analysis On Carbide Boring Tool for Increasing Tool Life. [1]

All computer controlled machines are able to accurately and repeatedly control motion in various directions. Each of these directions of motion is called an axis. Depending on the machine type there are commonly two axes. Additionally, a. Rather than applying completely mechanical devices to cause motion as is required on most conventional machine tools, CNC machines allow motion control in a revolutionary manner.[2]

All forms of CNC equipment have two or more directions of motion, As the boring operation is operated in horizontal CNC machine for boring the aluminium component (front & rear fork) as it required for the mass production implement such a tool to increase the tool life and also the reduce the cycle time and also increase the production of component.

II. LITERATURE REVIEW

Numerous boring tools have been developed continuously since the first boring tool material suitable for use in metal cutting, carbon steel, was developed. Cemented carbides are the most popular and most common high production tool materials available today. The productivity enhancement of manufacturing processes is the acceleration of improved boring tools with respect to the achievement of a superior tribological attainment and wear-resistance. This resulted in developing hard coating for boring tools; these hard coatings are thin films of one layer to hundreds of layers. These hard coatings have been proven to increase the tool life by as much as 10 folds through slowing down the wear phenomenon of the boring tools. This increase in tool life allows for less frequent tool changes, therefore increasing the batch sizes that could be manufactured and in turn, not only reducing manufacturing cost, but by using the carbide boring tool also reducing the productivity cost & time required is more as well as the tool life is short**.** [3]

In addition to increasing the tool life, hard coating deposited on cutting tools allows for improved and more consistent surface roughness of the machined work piece. The surface roughness of the machined work piece changes as the geometry of the cutting changes due to wear, and slowing down the wear process means more consistency and better surface finish. The majority of carbide boring tools in use today employ chemical vapour deposition or physical vapor deposition hard coatings. The high hardness, wear resistance and chemical stability of Improving boring Tool Life a Review 68 these coatings offer proven benefits in terms of tool life and machining performance. The first technique of diamond coating deposits thin films on the boring tools through various chemical reactions and coatings were traditionally deposited using the CVD technique.[4] Another technique is diamond coating. This method deposits thin films on the boring tools through physical techniques, mainly sputtering and evaporation. The reason diamond coating is becoming increasingly favourable over CVD is the fact that the coating process occurs under much lower temperature. The high temperature during the CVD process causes deformation and softening of many boring tool substrates and especially hard steel speed (HSS).

The use of coolant to increase tool life has been an issue with different views. The inherent brittleness of carbides makes them susceptible to severe damage by cracking if sudden loads of thermal gradients are applied to their edge. Conventional machining uses 300-4000 l/h of coolants during machining. Environmental considerations mandate use of minimal coolant in the range of 6-70 ml/h. This is termed dry machining. Dry machining is desirable to avoid the extra costs and environmental problems associated to cutting fluids. High

speed machining of hardened steel has the potential of giving sufficiently high quality of the machined surface to make finishing operations such as internal grinding surface and polishing unnecessary. Thus the coolant pressure is mainly important in carbide boring tool as the coolant pressure decrease the tool gets wear out and damage the component as to overcome the problem the coolant pressure should maintain the constant pressures while the boring operation is carried out. [4]

III. PROBLEM STATEMENT

According to the existing situation of working tool which ia a carbide tool for hollow deep boring. Its tool life is less and which is not cost effective and also requires more cycle time. Hence, to reduce cycle time and cost and to increase life of tool by considering cost efficiency. Hence, analysis and evaluation should be done by considering all the parameters. [6]

By analysing the existing condition the carbide tool is used for boring operation for manufacturing the component on CNC Horizontal machine this booing tool which is of carbide material used for hollow deep boring operation as which required the more cycle time and the tool life is less which is not cost effective and also the wear of tool occurs thus, To analysis the comparative boring tool for the manufacturing the component to overcome all the situation

IV. OBJECTIVE

1. To find feasible solution to solve the problem of mass production industry.
2. The overall cost of boring tool should be less.
3. The design of boring tool and it can be assembled in existing system.
4. Less time required for manufacturing feasible solution.
5. It should manufacture in accurate dimension. .
6. The material of boring tool should comparatively solve all existing problems.
7. Design of boring tool by changing the material properties and to increase the tool life of boring tool.
8. Boring Tool should reduce the cycle time of boring operation.
9. Design of boring tool should also a cost effective and also preferable to use for mass production of component

V. SCOPE

1. To design a boring to increase the mass production.
2. To increase the quality of deep boring.
3. It also increases the tool life of boring tool.
4. The production increase hence increases the productivity.
5. PCD boring tool is cost effective hence it is cost efficiency.
6. The tool is used in CNC horizontal machine.

VI. MACHINE SPECIFICATION

The FANUC RoboDrill Longed is the largest of the RoboDrill line-up. This extended X axis horizontal machining canter is capable of outperforming most all other drilling and tapping manufacturers. Offering milling capability comparable to a 40 taper machines, the α-D14Lib offer the flexibility of machining larger parts or having multiple set up in the same machine.

6.1 Features of Machines: -

1. Compact design of machine
2. Upto 2-axis simultaneously machining
3. Thermal growth compensation
4. Helical interpolation program storage
5. Quick tap recovery system
6. Easy to automatic
7. Auto doors system

Sr. no	Parameters	Specification	Measurements
1	Coolant pressure	5-10 Bar	Presure gauge
2	Clamping pressure	15-25 Bar	Presure gauge
3	Coolant temperature	40 ° C	Visual display
4	Boring feed rate	250-300 mm/min	Numerical display
5	Countering boring feed rate	100-200 mm/min	Numerical display
6	Rapid itching feed rate	100-150 mm/min	Numerical display
7	Cutting speed rate	450 m/min	Cutting speed formula

Table 01: Machine Specifications

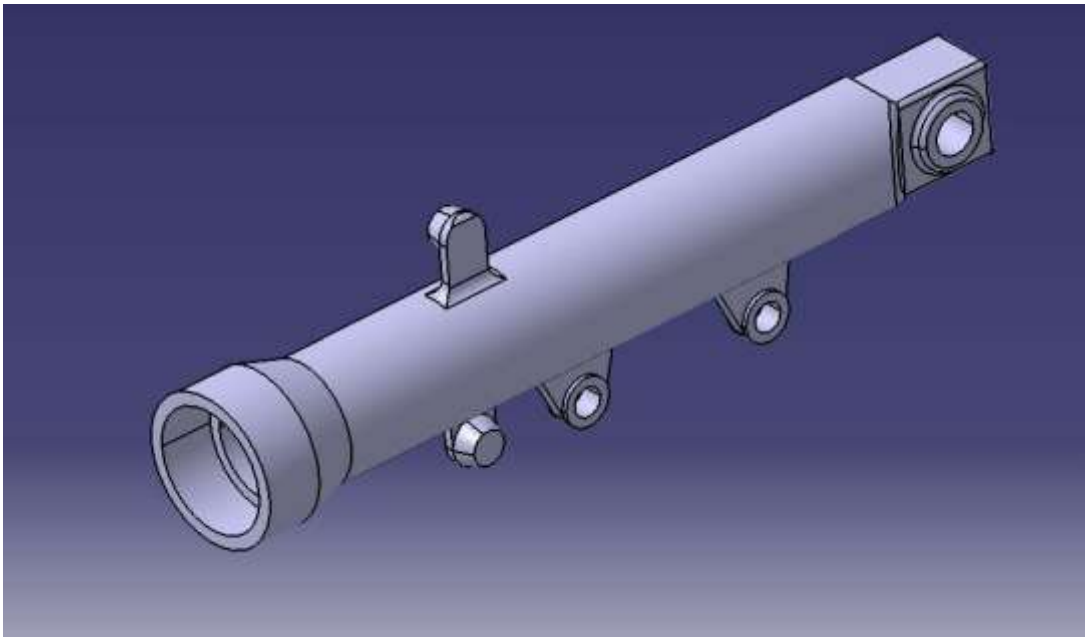

Fig1 Front Fork Shock Absorber CAD Model

Fig 2 Actual Component

VII. FINDING PROBLEM IN EXISTING SYSTEM

On visiting organization we found existing problem on boring operation for manufacturing the component on Horizontal CNC machine on which the boring opration is required more cycle time .As existing situation carbide tool is used for boring operation which have less tool life and the quality of operation is poor. Which also reduce the production rate in mass production.

For using the high quality of boring tool which required more investment of cost in boring operation in mass production which required more capital cost which is too high. So analysis the different material composition for manufacturing the boring tool with proper attachment on CNC machine. By considering the cost efficiency design, the boring tool and implement the tool for boring operation.

7.1Finding Possible Solution:

After finding the problem in existing system, the next step is to find the possible ways to design and manufacture a suitable tool for boring operation. Which reduce the cycle time & also increase the tool life, the production rate by considering the cost efficiency.

7.2 Designing The Sketch:

In this according to problem situation the sketch of boring tool is done.

Creating model:

Model of the existing system and modified system is creating with the help of CATIA.

Selection of material:

In this the various material composition should analysis and select the tool material.

Calculation:

In this the calculation on tool life, cycle time& production rate should be done.

Fabrication:

It is the process in which an item is made from raw or semi finish materials Manufactured by precise machining process

Details of the arrangement:

This step is important for making as the tool arrangement on CNC machine as per the existing arrangement.

Implement & overcome all problem defects:

In this the design of tool should solve all existing problems and overcome all problem defect by calculating the various parameters

Testing of the tool:

It is the final step regarding to the finalization of the one of the possible solution for manufacturing of gear on lathe machine. This will be done by industry itself. Implementation and Analysis On Carbide Boring Tool For Increasing Tool Life.

Implement in mass production

In this after completing the testing of tool on machine implement the boring tool in boring operation in mass production.

7.3 Calculation of Existing Carbide Tool: - [1]

1. Spindle speed: $N=Vc*1000/\pi*ID$

N= 1559.06 rpm

2. Depth of cut: Ap=D-d/2

Ap =6mm

3. Cutting force: Fc=A*Kc

Fc = 198.7538 kN

4. Cutting torque: Mc=FC*Dm/2

Mc =0.5465 N-m

5. Cutting power: Pc=2*π*n*Mc

Pc =890223 kW

6. Chip thickness ratio: Rc=t/tc

Rc =1.25 mm

7. Material removal rate: `MMR=1000f*d*V

MMR =39.2mm3/sec

8. Cycle time: Time=Process time +move time +inspection time +queue time

Time=178+12+20+180

Time=390 sec

9. Tool life: Vc*T^n=C

4*T^0.2=45 (Where Vc=cutting speed m/sec)

T=**180203.247 sec** (WhereT=Tool life, C= Taylor's constant for Al alloy)

Total component manufacture=**1012 No's**

7.4 Advantages

1. Finer the grain particle, lower the tool toughness.
2. Finer the grain particle, higher the tool hardness.
3. Higher the hardness, greater the wear resistance.
4. Lower cobalt content, lower toughness. Implementation and Analysis On Carbide Boring Tool for Increasing Tool Life.

7.5 Disadvantages

1. Low material removal rate.
2. It is difficult to drill deep holes, as slurry moment is restricted.
3. Excessive tool wear due to high temperature.
4. Tungsten carbide has high hardness due to which tool get wear out fast.
5. More cycle time is requiring.

7.6 Solution is not feasible because of the following reasons

1. As tungsten carbide is used for deep boring operation which required more cycle time.
2. This boring tool life is less, hence its effect the cost of production value
3. As its give moderate surface finishing for internal boring of component.
4. In case of low coolant pressure, occurs the wear of tool due to the brittleness of tool material
5. This operation for advanced machining process decrease the production rate of component.
6. Reduce the Overall production cost of company

7.7 Calculation of polycrystalline diamond: -[1]

1. Spindle speed: - N=Vc*1000/π*D

N=2598.44 rpm

2. Cutting force: - Fc=A*Kc

Fc =320.57 kN

3. Cutting Torque: - Mc=Fc*Dm/2

Mc=0.88N-m

4. Cutting power: - Pc=2*π*n Mc/60

Pc=239.88 kW

5. Chip thickness ratio: - Rc=T/Tc

Rc =2.0883mm

6. Chip Flow Velocity: - Vf=Vc*Rc

Vf=13.92 m/s

7.8 Advantages

1. Polycrystalline boring tool have high wear resistance.
2. Tool life is up to 60 times better than tungsten carbide and 240 times better than high-Speed steel.
3. Polycrystalline coating tool have high cutting speed, hence used for high speed machining
4. By polycrystalline coating tool have Fine surface finishes.
5. This coating tool Reduces machine downtime, and also increased the production rate
6. High quality parts can manufacture by this diamond coating tool.
7. Long tool life.
8. Polycrystalline coating diamond tool have high thermal resistance.

7.9Disadvantages

1. As its required high initial cost for manufacturing the tool.
2. Its required high coolant pressure as PCD is brittle material gets wear in case of coolant pressure drop
3. The proper coolant pressure should maintain. Implementation And Analysis On Carbide Boring Tool For Increasing Tool Life.
4. By using this tool the life of tool will increase

5 The tool design gives the chip flow arrangement which do not affect the surface finishing of component

6 This tool may reduce the cycle time required for manufacturing the component

7. By designing the tool the cost required for manufacturing per component is also reduced.
8. The tool also aim at increasing the productivity, hence reducing the production time.

VIII.CONCLUSION

The main objective of our project is to minimize the earlier disadvantage of tool the interference is that to increase the productivity and production rate also the tool life.

The tool is designed as per design parameter. The design is drafted using AutoCAD software the tool is designed to produce improve the quality and developing innovative design for the flow path of chip to avoid the inner surface finishing also time & cost efficient.

REFERENCES

1. ASM Hand book, 1998 Destefani, J.D., 1998. ASM Handbook. Properties and selection: non-ferrous alloys and special purpose materials. ASM international. Introduction to titanium alloy volume 2.
2. M. Narasimha, R. Reiji Kumar, Achamyelehaemro Kassie, Performance of Coated Carbide Tools, The International Journal Of Engineering And Science (IJES), Volume-2 Issue- 6 , Pages 47-54, 2013.
3. Mr. Mahesh. J. Patil, Investigation in Tool Life of Coated and Uncoated Carbide Tools in Turning, dings 2nd National Conference TIME 2010.
4. Bhauniket AL,1996 S.K. Bhaumik.C. divakar,A.K Singh machine Ti-6AI-4V Alloy with a WBN-CBN composite tool materials and design,16(1996).
5. Machine tool hand book (P.H. JOSHI) Design and operation.
6. Production technology: manufacturing process by R.K. JAIN.
7. V.S.Sharma, S.Dhiman,R.Segal and S.K.Sharma,Estimation of cutting forces and surface roughness for hard turning using neural network, journal of Intelligent manufacturing,19(4)(2008)473-83.