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Design and Manufacturing of Lathe Tool Post Grinding Attachment

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Abstract - *Now a days every one want to reduce the cost and time required for manufacturing of any product. To reduce this time and money we can use the lathe tool post grinding attachment instead of conventional grinding processes such as centreless grinding and cylindrical grinding. The lathe tool post grinding attachment is very handy to use. It attaches on lathe machine where tool post is attached. We can achieve speeds up to 3,500 RPM for external grinding and up to 12,000 RPM for internal grinding by varying size of driving and driven pulleys.*

Key Words: Lathe tool post grinding, modelling in catia.

1. INTRODUCTION

Any product can be finished or semi-finished by using one or more processes on the same machine or different machines. So we have idea of designing and fabricating the multipurpose machine which can be attached on lathe machine. We have selected the lathe machine because it is most basic of all machines and this is why it is called as "mother of all machines". In our project we tried to perform operation which is perpendicular to spindle axis i.e., grinding. The conventional Lathe machine can perform limited operation such as Facing, Turning, Tapering, Knurling, Grooving, Parting etc. For further operations, such as surface finishing etc., we have to transform work pieces to another location. Due to this time required for manufacturing the product increases and also increases the cost of product. To overcome this problem, we designed and fabricated the Lathe tool post grinding attachment.

The tool post grinder is used for surface finishing of any product with proper limits. The work piece is held in the chuck and the grinding wheel removes abrasive particles which are in contact with the wheel. The grinding wheel achieves speed up to 3,500 RPM for external grinding and 12,000 RPM for internal grinding. With the help of this attachment, we can achieve accuracy up to 0.002mm.

2. Objective

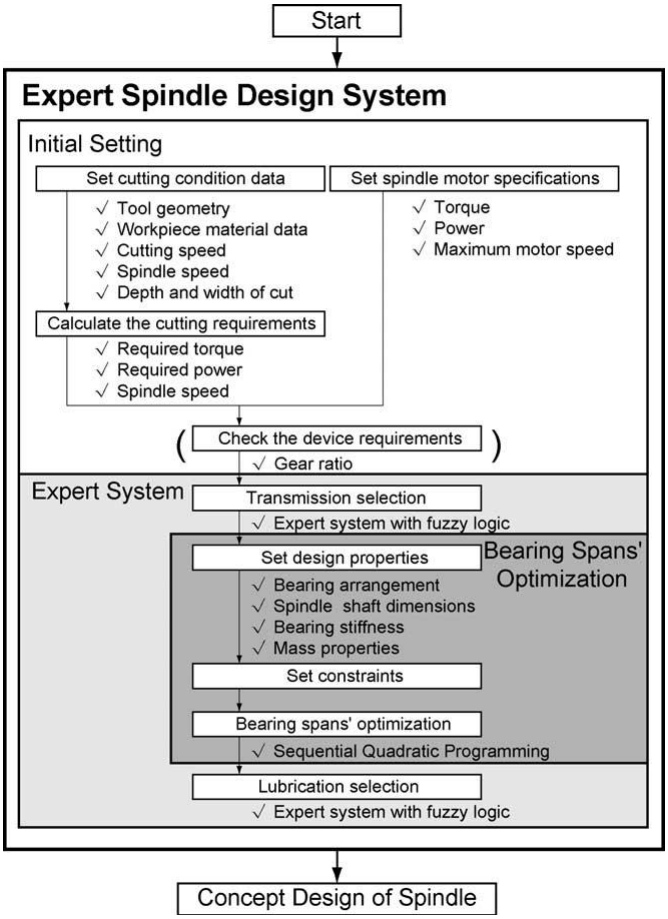
a. The main objective is to reduce manufacturing time and cost of the product.
b. To increase accuracy and minimize tolerance.
c. To increase the safety of worker by reducing traveling of heavy jobs.
d. Reduces the initial investment and maintenance cost.

3. Problem statement

To design and manufacture lathe tool post grinding attachment for surface finishing operations on cylindrical components with minimum operating and maintenance cost, low initial investment and reduced manufacturing time.

4. Design Methodology

The main part of the lathe tool post grinding attachment is spindle shaft from design point of view. The parts of the spindle are Quill, Quill cover, Front and back cover, etc. The dimensions of all the above parts are calculated from standard spindle design book and standard parts are selected from the NSK standard spindle catalogue. For these parts we selected EN8 and EN19 (High alloy steel) material for manufacturing.



Spindle shaft is designed with dimensions which are calculated according to analytical process by using spindle design book. According to these dimensions we designed spindle shaft on Catia software. Spindle shaft is the main rotating body in this grinding machine. Due to this we selected EN19 material which is high quality alloy steel and it is well known for high ductility and shock resistance. Catia model of spindle shaft is shown in fig 1.

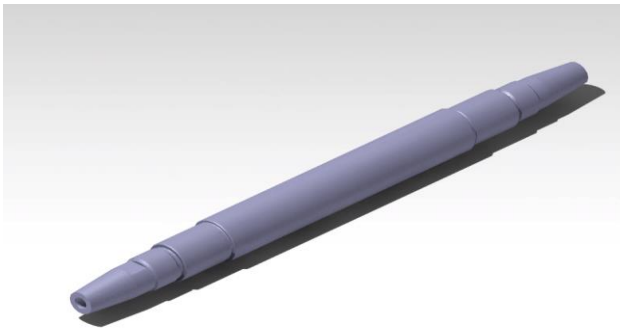


Figure 1. Spindle Shaft

The overall length of spindle is 330mm and maximum diameter is 40mm.

The other parts in the assembly are supporting parts for proper working which are given below. These parts dimensions are also calculated by analytical method. Catia design of some main parts which supports the spindle are as follows

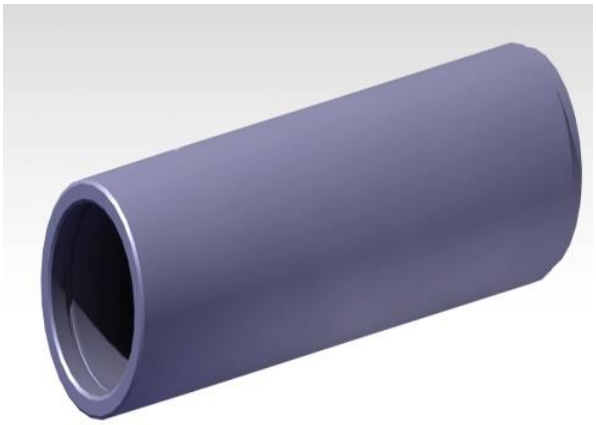


Figure 2. Quill Cover

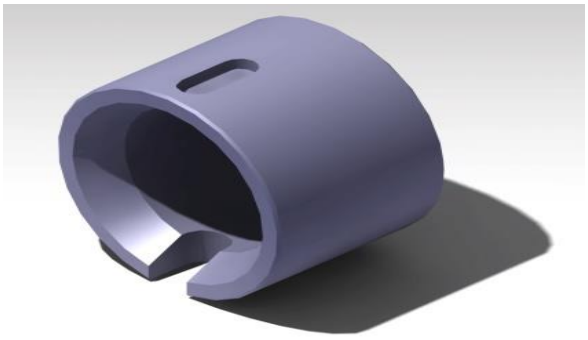


Figure 3. Cup

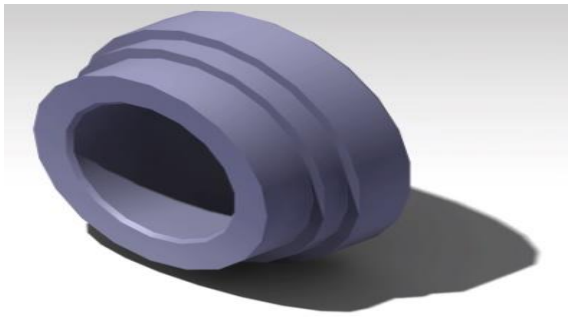


Figure 4. Grease seal

Base plate is the main part which attaches grinding machine to lathe machine on the tool post. Motor is attached on this body and main spindle shaft is attached on the front side with C-clamp. We choose C-clamp because it is easy to remove the spindle shaft from body. This body is manufactured by casting process.

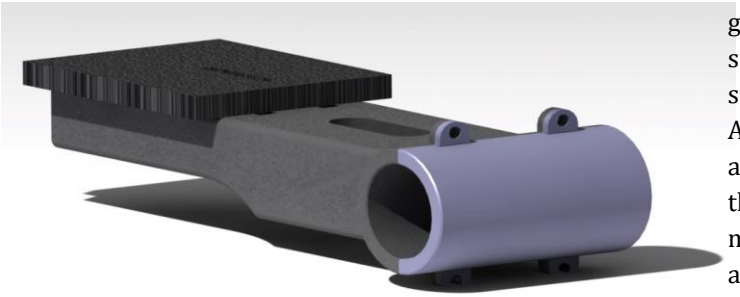


Figure 5. Main Supporting Body

The standard parts like bearing, washers, nuts and bolts, studs, power transmission elements are selected according to dimensions which are calculated by analytical method. We choose taper roller bearing for this application which is suitable for this machine. The power transmission elements are of different types like gear drive, belt pulley, direct coupling and motor.

We select belt pulley as a power transmission element because it has good torque and thermal characteristics. Initial and Maintenance cost is low as compared to others and it is also less noise producing.

The overall assembly of this machine shown in fig

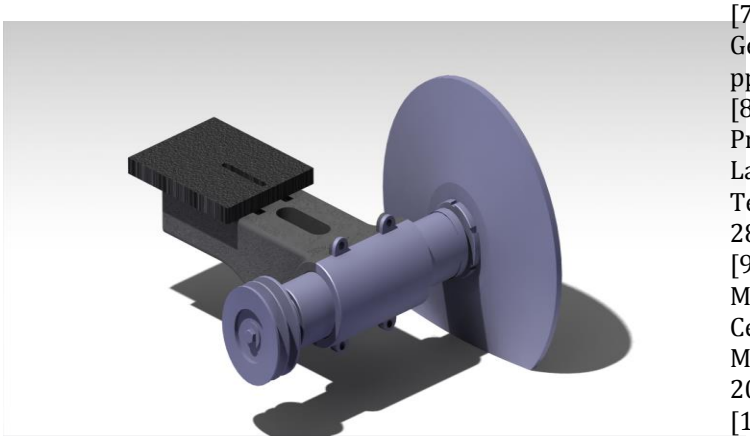


Figure 6. CAD model of assembly

5. CONCLUSION

As compared to other grinding machines it requires less initial and maintenance cost. It is compact in size and handy to use. Can be easily moved from one location to other without any special means of transportation. Accuracy and surface finish of this grinder is same as conventional grinding machine. Large size work piece can be easily surface finish with this grinder by providing base plate to supporting body. Accuracy up to 0.002mm can be achieved. As initial investment is less, one can easily afford this attachment. Also the maintenance cost and operation cost of this attachment is low as compared to conventional grinding machines. Hence, if kept idle in absence of jobs there is no any considerable loss to the owner.

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