Grinding Wheel Attachment for CNC VTL Rem 1.6m

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Abstract

Our project is to design and fabrication of a special attachment of grinding wheel in vertical boring machine. The main aim of our project is to reduce the time duration machining process and to increase the production rate. Boring machine is converted into universal machine which help to do boring and grinding in the same machine. This reduces the setting time of the job in another machine for grinding. As both operations are done in a same machine setting time is reduced and production rate is increased, labour cost can be decreased. This will increase the profit level of the industry. Therefore our project will focus on reducing the waste setting time of job for various operations and increase the production rate, profit level and quality of the product.

Keywords— surface finish, grinding wheel attachment, boring, drilling

I. INTRODUCTION

COMPONENT OF ATTACHMENT

ISO 50 adapter
1. Shaft
2. Grinding wheel holder
3. Grinding wheel

The above components are explained below with neat sketches.

ISO 50 ADAPTER
The ISO 50 adapter is the component used to connect the shaft to the spindle of the CNC VTL machine. The rotary motion of the spindle is transmitted to the grinding wheel through the shaft with the help of spindle adapter. The tongue in the adapter helps the operator to easily attach it with the spindle which helps to keeps the shaft from deformation.

SHAFT
The shaft is the main component of the grinding attachment. The shaft is used for getting attached to the spindle of automatic tool changer (ATC) and holds the grinding wheel.

RAW MATERIAL
The material chosen for shaft is ferrous metal which is taken from Scrap.
The ferrous material has high stability and it can withstand vibration produced during the machining process and it is more economical consider to other materials.

**MACHINING OF SHAFT**

The various operations done on the raw material are as follows:

1. Facing
2. Turning
3. Grinding
4. Drilling
5. Thread cutting

**FACING**

In machining facing is the act of cutting a face, which is a planar surface, on to the work piece. Within this broadest sense there are various specific types of facing, with the two most common being facing in the course of turning and boring work and facing in the course of milling work. We have done facing for 1mm all-round the work piece.

**TURNING**

Turning is a machining process in which a cutting tool, typically a non-rotary tool bit describes a helical tool path by moving more or less linearly while the work piece rotates. Here computer numerical control is commonly used for turning operations.

The different types of turning are: - straight turning, taper turning, profiling or external grooving.

Initially step turning is carried out for the raw material which is followed by taper turning at one end of the work piece for required dimension with respect to the taper in the grinding wheel holder. Here, we have chosen the Morse taper.

**MORSE TAPER**

Morse taper was invented by a scientist named Stephen A. Morse who lived in 1800s has also invented a number of basic machining tools.

In the meantime, Morse tapers are an accepted standard that follows the International Organization for Standardization (ISO). Morse tapers are numbered from #0 to #7, with diameters from 0.35” (9 mm) to 3.4” (87 mm). A Morse taper can be identified e.g. by measuring the diameter of the wider end:

The below table shows the standard values of Morse taper

The Morse taper’s slope is set to about ~1.5°

**GRINDING**

Grinding is the process of smoothing of surface with very fine finishes and very accurate dimensions. The shaft is subjected to grinding operation to remove the unwanted chips from the shaft to get good surface finish and accurate dimension for making assembly process easier.

**DRILLING**

Drilling is a cutting process that uses a drill bit to cut or enlarge a hole of circular cross section in solid material. Drill bit a rotary cutting tool, often multi point.

The bit is pressed against the work piece and rotated at rates from 100 to 1000s of revolution per minutes. This forces the cutting edge against the work piece, cutting of chips from the hole as it is drilled. Drilling is done at the taper side of the shaft in order to pass the high pressure fluid to disengage grinding wheel attachment from the shaft.

**THREAD CUTTING**

Threading is the process of creating a screw thread. There are many method of generating threads, including subtractive methods, deformative or transformative methods, and additive methods. Here we have used inner thread for tightening purpose of grinding wheel holder with the shaft. Thread cutting can be done on both inner and outer side of the work piece. In our project, threading operation is carried out in the shaft at the side of grinding wheel attachment.

After the required operation have been done the shaft with required dimensions.

Thus the shaft of the special attachment is machined for the required dimensions from the raw material. This shaft is used for attaching the spindle attachment and the grinding wheel holder with it.

**GRINDING WHEEL HOLDER**

The next component of special attachment is the grinding wheel holder. The purpose of using the holder is to attach a grinding wheel to the spindle through the shaft. It is machined under the principle of Morse taper for getting self-locking and self-centering with the shaft.
GRINDING WHEEL

Grinding wheel is a wheel composed of an abrasive compound and used for various grinding and abrasive machining operations such wheels are used in grinding machines. The wheels are generally made from a composite material consisting of coarse particles and bonded together by a cementing matrix to form a solid circular shape. The manufacture of these wheels is a precise and tightly controlled process. Grinding wheels are consumables although the life span can vary widely depending on the use case, from less than a day to many years. The inner and outer diameter of the grinding wheel depends on the inner diameter of the work piece to be grinded.

Arrangement of components in the attachment

BORING

Boring is a process of producing circular internal profiles on a hole made by drilling or another process. It uses single point cutting tool called a boring bar. In boring, the boring bar can be rotated or the work piece can be rotated. Machine tool which rotates the boring bar against a stationary work piece are called boring machines (also boring mills). Boring can be accomplished on a turning machine with a stationary boring bar positioned in the tool post and rotating work piece held in the lathe chuck.

GRINDING

Grinding is an abrasive machining process that uses a grinding wheel as cutting tool. Grinding practice is a large and diverse area of manufacturing and tool making. It can produce very fine finishes and very accurate dimensions. Grinding is a subset of cutting, as grinding is a true metal cutting. This process gives good surface finish to the material and improves its quality.

II. SURFACE FINISH

Surface finishing may be defined as any process that alters the surface of a material or aesthetic or functional purposes. The basis material (whose surface is being altered) can be a metal, a plastic, and concrete, a ceramic i.e. any material used for engineering or decorative purposes.

III. DRAW BACKS OF MACHINE BEFORE ATTACHMENT

- Time consumption is more
- Decrease in production rate
- Accidental damage may occur to the job during the transfer of job from boring machine to grinding machine
- Job setting time is increased
- Labour cost is high

IV. ADVANTAGES OF SPECIAL ATTACHMENT

Increase in production rate
- Both grinding and turning are done in single CNC VTL machine
- It can be used as an multipurpose machine
- Involvement of labour can be reduced
- Time consumption is less and labour cost is reduced
- Job setting time is reduced
- Good surface finish up to 0.8μ and quality of product is also improved

V. CONCLUSION

After implementation of the project the production rate and profit level of the industry is increased. As both grinding and boring are done in the same machine there is no need of making a second setting in the grinding machine.

The production time for the job is reduced as well as the labour cost is also reduced. The quality of the
product increases so that the assembly of job is easier than before.

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