

Design and Manufacturing of Adjustable Belt Grinder for Grinding of Any Shape of Object

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Abstract— The machine we designed and fabricated is used for grinding any shape of object like circular, rectangular and polygon. In our project the work abrasive belt is used to grinding the material. The abrasive belt is rotated by single phase induction motor. Hence our project namely adjustable belt grinder. In this project we use aluminum oxide belt. The aluminum oxide belt grind any material like wood, stainless steel, cast iron, glass etc. As per material specification we can also vary speed with the help of the VFD.VFD stands for variable frequency drive. A variable frequency drive is a type of motor controller that drives an electric motor by varying the frequency and voltage of its power supply. They are used for controlling the speed of an AC motor. The abrasive belt grinding can reduce the surface roughness of work piece and accuracy of meanwhile. Aluminium oxide belt with high stock removal cleaning and polishing is effectual. The abrasive belt grinding as compared to wheel grinding have more efficient with efficiency and parameter range. It is conclude that aluminum oxide belt hardness makes it suitable for use as an abrasive and as a component in cutting tools with significant proportion.

Keywords: Variable Frequency Drive (VFD), Aluminum Oxide Belt, Surface Speed (Feat per Minute)

I. INTRODUCTION

This project to design and manufacturing adjustable belt grinding machine which can be used as versatile grinding machine by changing its work area from 0 to 180 degree with four rollers and length of the belt could be adjustable for making belt at belt at proper tension. Our project is design and manufacturing of abrasive belt grinder. It is used to grind machining surfaces to super finish & accuracy. Abrasive belt grinding is common finishing process, in metal & wood working industries. Coated abrasive belts are used with same speed range. Adjustable Belt grinding is one of the most Effective ways for finishing machining with higher dimensional accuracy and better surface quality and very suitable for producing work piece surface with complex geometrical shapes. Belt grinding is rough machining procedure utilized on wood and different material. It is commonly utilized as a completing procedure in industry. A belt grinder machine is designed using CATIA. It consist of 1 HP motor which is fundamentally rotates the pulley attached to it, along with a mini grinder grinding paper and an abrasive belt grinder. The second pulley is attached to the wooden base vertically with the tensioner spring. Grinding Paper is then fitted in pulley. To support the mini grinder a base frame is provided, it helps in grinding wooden material. Grinding machine is designed using AC motor, spring base frame, Abrasive grinder belt, coupling and pulley. This machine helps to shape the material without putting much

effort and getting surface finish, and also getting larges area of belt for grinding operation than wheel grinding.

II. METHODOLOGY

The abrasive belt is used to grind the material. The abrasive belt is rotated by the single phase induction motor. In our project where the component are arranged over the frame structure. The roller wheel is mounted on the two end bearing with bearing cap by suitable arrangement. There are two rollers wheel is used in our project to rotate the abrasive belt.one side of the roller wheel shaft, one v-pulley is coupled by the suitable arrangement.

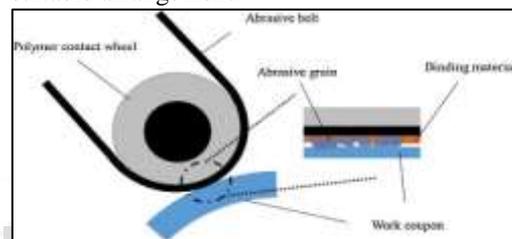


Fig. 1: Principle of operation abrasive belt grinder

The single phase induction motor with V-pulley arrangement is used to rotate the abrasive belt through the belt drive mechanism. This whole arrangement is fixed on the frame structure where the component rests.

A. Problem Identification

The abrasive belt grinding which is used currently have the working area as fixed one. The work can be rotated here the work area cannot be changed. So it can be used only for components which can be carried by hand and the fixed components where we have grind down or upside cannot be done with the current machines. In normal hand grinding the burr removal and finishing process cannot done at same level in a large surface.

B. Solution methodology

In this project we are going to design and fabricate a abrasive belt grinding which can be used as versatile grinding machine, the work area can be rotated from 0 degree to 180 degree. The 0 degree work area can be used for bottom grinding of component, the 90 degree work area can be used for vertical grinding of component and The 180 degree work area can be used for top grinding of component.

III. MANUFACTURING DRAWING PREPARATION

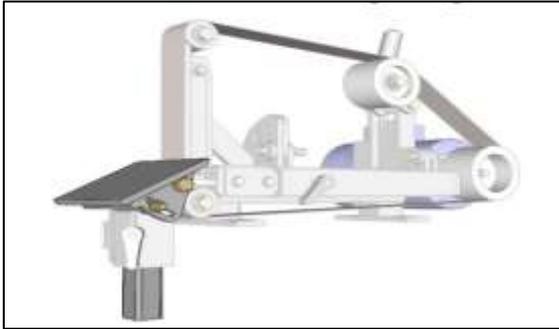


Fig. 2: 3D view of abrasive belt grinding machine.

A appropriate assembly drawing will be generated to assist in visualizing the real drawing and making required adjustments while taking into account the design and location of various components. Following components are used in abrasive belt grinding machine.

A. Pulley:-

Flat belt pulleys are used in transmission systems that are driven by flat belts. Typically high speed, low power, and application in machinery the flat pulleys used for wide range of industrial application. Flat belt drive pulleys apply motive power to the belt. The pulley wheels are attached to shaft by grub screw or key and keyways.



Fig.3: Pulley

B. Single Phase Induction Motor

It is found to drive the roller shaft which fixed on the end of the frame structure. The free end of the shaft in the motor a large pulley is found around which the belt runs, the other specification about the motor is discussed in design part. Because it has but a single alternating current source. A single phase motor can only produce an alternating field. One that pulls first in one direction, then in the opposite as the polarity of the field switches.



Fig. 4: Single phase induction motor

C. Flat belt

Flat belts are usually made up of leather rubber and fabric. Belt made of leather has high coefficient of friction there by ideal for flat belt. The inside layer are made of canvas fabric or other material which transmit the majority of the load handled by flat belt are designed for light duty power transmission and high performance conveying. They are best suited for application with smaller pulleys and large central distance. Flat belts can connect inside and outside.

Pulleys can come in both endless and jointed construction.



Fig. 5: Flat belt

D. Ball Bearing

This is standard size ball bearing No-6202NBF. This is enable the roller to rotate & wear the load smooth and rigidity. Friction is bound to occur between the rotating shaft and the part that supports the rotations. Bearings are used between the two components. The bearing serve to reduce friction and allow for smooth rotations. This cut down on the amount of energy consumption. The bearing is a remove the load and decrease the load of effort.



Fig. 6: Ball Bearing

E. Main frame structure

This is made mild steel material. The whole part is mounted on this frame structure with the suitable arrangement. Boring of bearing size and open box done in one setting so as to align the bearing properly while assembly. Provisions are made to cover the whole assembly. This means that no part can move relative to the other part in a frame while part can move relative to one another machine.

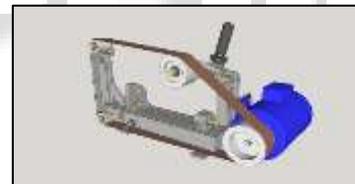


Fig. 7: Main frame structure

F. Bearing cap

Bearing cap is made of mild steel material. This is machined as per the drawing. This covers the bearing and also tight the bearing with the main body by welding. A bearing cap is removable disk that prevents unwanted particles from entering into the place where the bearing are contained. You should remove the bearing cap and pull the oil seal out. Some people call it a bearing cap, but its main purpose is to prevent dirt getting into the roller bearing.



Fig. 8: Bearing cap

G. Abrasive Belt

Belt grinding is an abrasive machining process used on metals and other materials. It is typically used as a finishing process in industry. A belt, coated in abrasive material, is run over the surface to be processed in order to remove material or produce the desired finish. This abrasive belt is manufactured in various grades as per customer demand their needs and expectation, We have select the grades according to the material which we have grind. Abrasive belt consist of abrasive grains applied to a backing made of cloth film form& sponge, proper material. Abrasive belt mounted on rotating wheels or pulleys and are used in application such as surface finishing, grinding.



Fig. 9: Abrasive belt

IV. RESULTS AND DISCUSSION

Like grain type and grit grade the material you are processing will also affect recommended surface speed. The greater the density of the material the harder it will be and the higher the abrasive speed will generally need to be effective recommended surface speed by material can be found in the table below

Sr No	Material to be proceed	Surface speed (feat per minute)
1	Acrylic	960-2700
2	Glass, ceramic and stone	1560-2700
3	Lacquers and varnishes	1560-2940
4	Hard and hardened steel	1560-2940
5	Plastic and rubber	1920-3540
6	Titanium and titanium alloys	1920-4920
7	wood	2940-4920
8	Aluminum and zinc	3540-5880
9	Stainless steel, tool steel and high speed steel	3540-5880
10	Copper and brass	4820-6840
11	Cast iron and carbon steel	4920-8820

V. CONCLUSION

- 1) As per the problem identified during survey in company, case study of problem, and also with help of research papers, international journals; we conclude that adjustable belt grinder is effective method for surface Finishing.
- 2) Abrasive belt grinding and polishing combines many operations for efficient surface finishing.
- 3) The purpose of the finishing material as the feed is given automatic finish may be achieve.
- 4) This model provides 95% Accuracy.

ACKNOWLEDGMENT

This project has been successful as a result of the efforts of many people and it is our pleasure to express our gratitude to all the people helped us through all the phases of the academic project work. We are highly intended to our team members without whom this project was just an idea. The efforts and help that they gave for the completion of this project are of the most value. We would like to express our special gratitude to all the staff members who provided us valuable information. First of all we would like to express our sincere thanks to our guide, Prof. KADAM.S.S whose valuable suggestions helped us to improve and complete our project in time. It is a part of intimate feeling to mention the constant encouragement & inspiration of our Head Prof. R.V. Pethkar, Department of Mechanical Engineering for their support. Last but not the least, our parents and those who helped me directly or indirectly throughout this dissertation work who have willingly helped us out with their abilities.

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