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Design and Fabrication of Belt Grinding Machine

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Abstract : *Grinding is an abrasive machining process that uses a grinding wheel as the cutting tool. A wide variety of machines are used for grinding. Although belt grinding abrasive belt have Stronger cutting Ability than that on the manual grinding. The main aim is to design vertical Abrasive belts grinding Machine to achieve good tolerance as well as better surface finish for Various materials such as metal, glass, Ceramic, rock and specified material. The abrasive belt grinding can reduce the surface roughness of work Pieces and accuracy 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 aluminium oxide belt hardness makes it suitable for use as an abrasive and As a component in cutting tools with significant proportion. We have designed such Abrasive Belt vertical Grinding Machine having better advantages over manual grinding..*

Keywords – *Abrasive- Rough Surface, tolerance ,ceramic, Aluminium oxide*

I. INTRODUCTION

The metalworking and woodworking industries frequently use abrasive belt grinding as a finishing technique. Although coated abrasive belts and bonded wheels are utilized in the same speed range, they are often not treated when the abrasive gets dull. Abrasive belt grinding is a type of grinding tool with a unique shape that requires a driving wheel and straining device to make the belt strained and move quickly. Under specific pressure, the contact between the abrasive belt and the work piece surface can aid in the realization of the entire grinding and milling process. A crude machining technique used on wood and other materials is belt grinding. In industry, it is frequently used as a finishing technique.

Solidworks was used in the design of this belt grinder machine. In addition to a small grinder, grinding paper, and an abrasive belt grinder, it has a motor that moves the pulley that is attached to it. The tensioner spring is used to vertically fasten the second pulley to the wooden foundation. After that, the grinding paper is put into the pulley. A base frame is included to support the small grinder, which aids in the grinding of wood. A DC motor, spring, base frame (support frame), abrasive grinder belt, connection, and a pulley are used in the machine's design. In addition to providing two superior surface finishes and a larger belt area for grinding operations than wheel grinding, this machine aids in shaping the material with less effort.

II. LITERATURE REVIEW

[1] Mr. Shubham patil et. al, 2021 [1] Work Abrasive belt is used to grind any shape of object Like circular, rectangular and polygon. In this Project aluminum oxide belt which grind Any material like wood, stainless steel, cast iron, Glass are used. As per material specification we can also Vary speed with the help of variable frequency Drive. Work abrasive belt is used to grind any Shape of object like circular, rectangular and Polygon. In this project aluminum oxide belt which grind any material like wood, stainless Steel, cast iron, glass are used. As per material Specification we can also vary speed with the help Of variable frequency drive.

[2] Avinash parkhe et. al, 2020 [2] Abrasive belt grinding can reduce the Surface roughness of work pieces and accuracy Mean while 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.

[3] An jiaxiang et. al, 2019 [3] Abrasive Belt grinding technology is an important part of the Precision forming process of complex profile parts. Based on the planning of grinding path, contact Model and material removal model, when researchAnd application progress of abrasive belt grinding Technology at home and abroad are summarized, And the problems and research 5 directions in the Research of complex profile abrasive belt grinding Technology are pointed out.

[4] Mr. Arwizet karudin et. al, 2018 [4] Belt burrs have their own advantages in several Types of work, but still, belt grinders are rarely Used. The existing belt grinding functions are Considered too minimal and makes people choose To use other grinders. Using a belt grinder will Certainly provide benefits to the user because the Belt grinding efficiency is good in certain Operations.

[5] Vigneashwara Pandiyan et. al, 2017 [5] The removal of material from a surface due to the Belt grinding process has a non-linear relationship With the process variables. Process variables Include the grit and abrasive type of grinding belt, Belt speed, contact wheel, grinding force, and Grinding force. This paper describes a systematic Approach to optimize process parameters to achieve The desired stock removal in a compliant Abrasive Belt Grinding process.

III. PROBLEM STATEMENT

In order to increase the effectiveness, reliability, and safety of the manual grinding process—which now use sandpaper—the project focuses on designing and building a manual belt grinding machine. Sandpaper grinding by hand is a physically demanding and time-consuming process that frequently produces uneven surfaces because of the user's variable pressure. Additionally, it takes a lot of time, is prone to human error, and can cause operator fatigue, all of which lower the work's quality.

IV. OBJECTIVE

The objective of this project is to design and fabricate an abrasive belt grinding machine that is used for precision grinding and allows for high precision and surface finishing on a variety of materials for applications like edge smoothing, tool sharpening, and surface preparation.

V. METHODOLOGY

This machine is constructed on one base plate and is supported through vertical column. The motor is also mounted on base plate from which drive is given to grinding belts through pulleys. One adjustable column is also provided to attach and remove the belts easily. The grinding belt Rotates when motor starts and its movement used to grind or finish the surface similar to grinding wheel. The table Is also attached to vertical column to put the work piece while performing the grinding operation. Due this vertical rotation of belts its maximum area is utilized for finish the surface due to which less time Is required for grinding with maximum material removal rate than wheel grinding operation. As you know that nowadays wheel grinding machines are mostly used for grinding operation. In most the workshops it is used for grinding, to remove the sharpen edges, sharpen the cutting tools by giving different angles. But in such wheel grinding machines there is one problem that very less area of wheel available to perform the Grinding operation. Due to this area of contact in between grinding wheel and workpiece maximum time is Required finish the surface or to grand the surface. To avoid this major disadvantage we have developed this Vertical abrasive belt grinding machine. The basic working principal of this machine is too grand or to finish the surface using Abrasive belts which to be mounted on this designed machine. Due to this abrasive belts used maximum area of Belt is comes in contact with workpiece due to which material removal rate or surface finish rate is more in less Time as compared to wheel grinding machine

The different parts of the belt grinding machine and their Material:

1)Base(Cast Iron or Steel)**:** It gives the machine its primary structural support, which keeps everything steady. The performance and longevity of the machine may suffer if the base is not strong and firmly fixed.
2)Worktable (Mild Steel or Stainless Steel) or Aluminum: To position and move the workpiece, a worktable is necessary. In order to allow operators to modify the material during grinding or other processes, it is often fixed to the base and has the ability to spin.
3)Column Steel (Cast Steel or Mild Steel): Supporting the grinding wheel and other parts and keeping the machine stable, the column offers vertical support.
4)Abrasive Belt (Aluminum Oxide**,** Silicon Carbide): The grinding wheel engages with the workpiece as it is pushed by the machine's motion. The grinding or abrasive action is carried out by the wheel moving up and down.
5)Pulleys **(**Cast Iron, Steel, or Aluminum): The belt system and pulleys enable the abrasive wheel to move. They are crucial for moving the belt that powers the grinding operation from the motor.

6)Belt Supporting Plate (Steel or Aluminum): By keeping the belt stationary and preventing excessive movement when the workpiece makes contact, this plate helps to maintain steady performance.
7)Motor(0.5 HP to 1 HP): The motor is the power source that drives the abrasive belt and is connected to the belt.

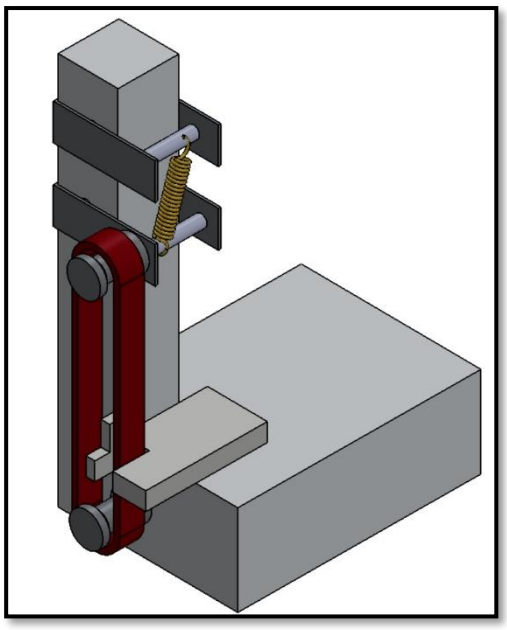

Figure 3.1 Mini Belt Grinding Machine

VI. CONCLUSION

Grinding is an abrasive machining process that uses a grinding wheel as the cutting tool. A wide variety of machines are used for grinding. Although mini belt grinding abrasive belt have stronger cutting ability than that on the grinding wheel. But as wheel grinding is having some disadvantages in form of time required to finish the surface, material removal rate, surface finish obtained etc. To over such disadvantages this vertical abrasive belt grinding machine is designed using Solidworks software to overcome disadvantages of wheel grinding machine. Also this machine helps too grand or to finish the surface using abrasive belts which to be mounted on this designed machine. Due to this abrasive belts used maximum area of belt is comes in contact with workpiece due to which material removal rate or surface finish rate is more in less time as compared to wheel grinding machine.

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Given the history of great works, which shows that no great job has ever been completed without the active or passive support of one's surroundings in close quarters, it is easy to see how active participation from my group members could enhance project execution. I am really appreciative to our project guide, Mr. Tejas Chaudhari, for his proactive direction during the project's completion. Finally, I would like to express my gratitude to everyone who was unable to be named here but who did a great job motivating me to pursue the certain.

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