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NUMERICAL CONTROLLED DRESSING ATTACHMENT FOR GRINDING OF FEED DRUM

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ABSTRACT

During the abrasive cutting process the grinding wheel is subject to wear and to clogging up. As a consequence, the defined cutting topography, which is made up of abrasive grains and bonding material, gradually changes for the worse with possible severely detrimental effects on the grinding result (work piece quality, increased forces, etc.) To maintain work piece quality and cutting performance, it is of paramount importance to maintain this defined cutting topography by repeated dressing and to make the best use of the potential tool life of a given grinding wheel. As there is some confusion concerning dressing terminology, a few clarifying definitions are in order. Generally, all processes which serve to regenerate the cutting ability of a grinding wheel are called "dressing"". Dressing includes the terms "truing" and "conditioning". However and unfortunately, these different terms are sometimes used interchangeably. "Truing" primarily means to create a perfectly round and true running grinding wheel, and it can also mean giving the wheel a particular profile. Therefore, "truing" is often used as just meaning "profiling". "Conditioning", strictly speaking refers to the removing of bond from around the abrasive grains, mostly referred to in the context of resin bonded super abrasive wheels. Dressing must be seen as an integral part of the grinding process; it increases productivity and quality when targeted and applied in the correct way. Preconditions that must be met are that the dressing results are reproducible and the wear of dressing tools predictable and controllable.

Keyword : - *Grinding, topography, detrimental, dressing, truing, conditioning, abrasive grains, profiling, resin, abrasive wheels, productivity, profile, tool.*

1. INTRODUCTION

A stationary dresser is a metal blade with a single diamond brazed into the tip. A CNC dressing program moves it across the face of the wheel, moving in and out to create the desired profile. The grinding wheel's profile is controlled by the CNC program used to dress the wheel, rather than by the profile of the dresser itself. We

had design the stationary type of dresser because of its certain advantages like, unlike other dressers it don't develop mirror image of the profile that has to be grind, because of which any slight change in the dimensions, the set-up cannot be used further. So with the help of these 3-axis dressing attachment any changes in the dimensions of the rolls can be made easily, so these dressers can be used in the mass production for manufacturing number of rolls of the tapered bearing at a less cycle time which may direct effect in increased production rate.

As per TIMKEN 2011, Tapered roller bearings are bearings especially constructed to endure both radial and axial loads simultaneously even under extreme environmental conditions and varying speeds. The type is composed of four inter-reliant components:

- The cone
- The cup
- Tapered rollers and
- The cage.

The rolling elements are positioned in a way that all of them meet a common axial point so as to provide a perfect rotating movement with low friction and increased power density. They have high radial and axial (thrust) load capacities at low to intermediate speeds. The inner and outer ring raceways are segments of cones and the rollers are also made with a taper so that the conical surfaces of the raceways and the roller axes if projected, would all meet at a common point on the main axis of the bearing. This geometry makes the motion of the cones remain coaxial, eliminating sliding motion in the bearing.[1]

1.1 Problem Statement:

- To get a precise profile on the feed drum through the grinding operation.
- To increase the accuracy and reduce the cycle time in grinding the feed drum.
- There are human errors due to manual feed.
- The roll mills of taper bearing require high accuracy and the correct angle.

1.2 Objective:

The main aim for our project was to design a 3-Axis dressing attachment for the grinding wheel, in which the dressing attachment will act like a tracer for the grinding wheel. The dressing attachment will guide the wheel to cut the required profile on the roller.

- To optimize the production cycle time.
- To increase the accuracy in the production of the roll mills.
- To reduce the timing in the grinding of the feed drum.
- To get required surface finish.

2. COMPARISON BETWEEN MANUAL AND NUMERICAL CONTROLLED DRESSING ATTACHMENT

Fig -1: Manual Dressing Attachment

Fig -2: Numerical Controlled Dressing Attachment

2.1 Achievements:

Parameter	**Comparison**		**Result**
	Manually	Numerical Control	
Cycle Time Reduction	40 min	20 min	50% time reduction
Worker	Complete Supervision Required	Supervision Required Only for program input	Less Manpower Required
Production rate of Feed drum	12 per shift	22 per shift	10 Nos. increased per shift
Taper Angle	3.12 deg.	3.47 deg.	Close to desired taper angle of 3.49 deg.

Table -1: Achievements

3. DRESSING ATTACHMENT FOR GRINDING OF FEED DRUM

A grinding dresser or wheel dresser is a tool to dress the surface of a grinding wheel. Grinding dressers are used for making different profile on grinding wheel. The dressing attachment for a grinding wheel is designed in order to guide the dresser in horizontal and vertical directions, so that the desired tapered profile can be applied on the grinding wheel. The horizontal and vertical movements are controlled precisely by steeper motors attached with the help of couplings and lead screws. The maximum play for dresser in horizontal and vertical directions is limited by limit switches. The roller has this profile on its entire surface through its length, the critical parameters for these are the given angle, and the angle given is of 3.49 degree. [3]

Fig -2: Testing of Dressing Attachment with Pen

3.1 Design of Plates:

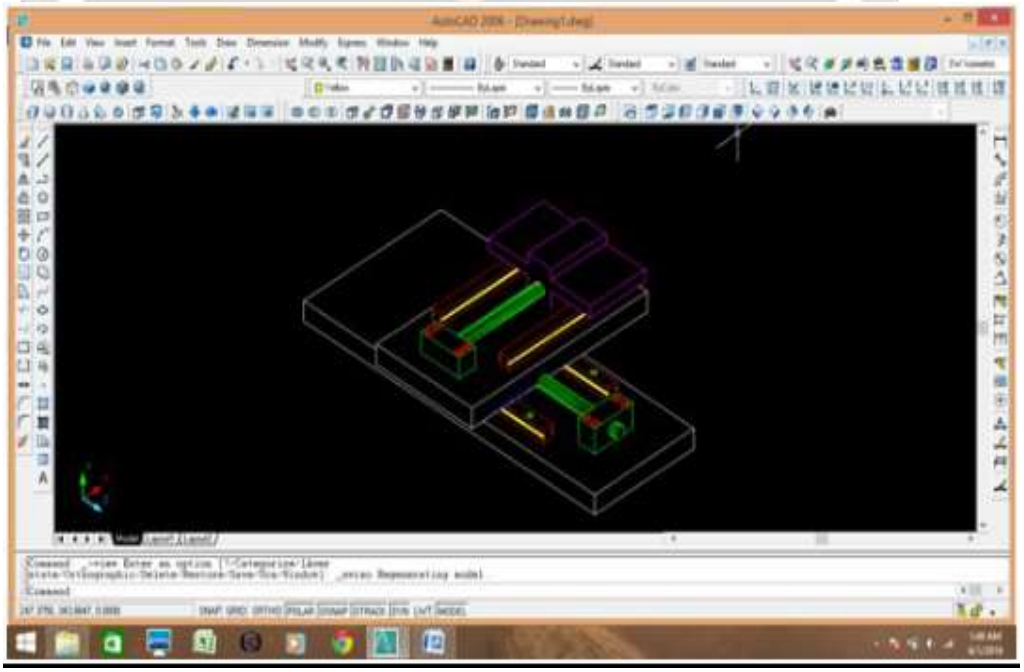

Fig- 3: Wireframe Drawing of Assembly

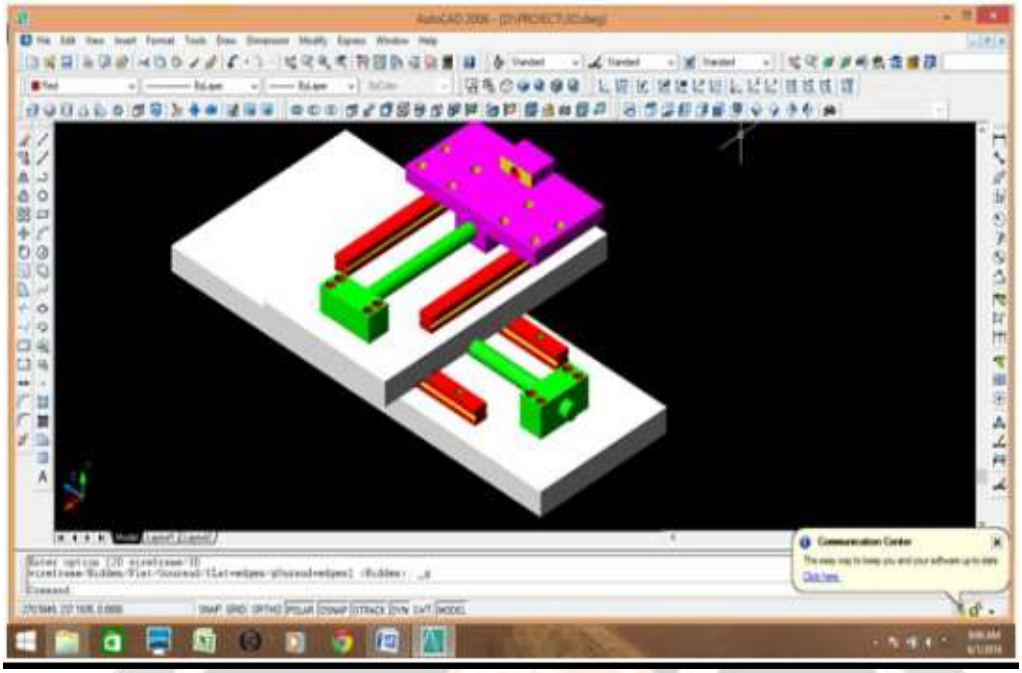

Fig- 4: Solid Drawing of Assembly

3.2 Process Sheet:

Sr. no.	Job name	Operations performed	Total Duration
1.	Z-Plate	• Profile Cutting • Semi finish Milling • Drilling • Taping • Boring • Surface Grinding • Blackodising	3 Days
2.	Y-Plate	• Profile Cutting • Semi finish Milling • Drilling • Internal Chamfer • Taping • Boring • Surface Grinding • Blackodising	3 Days
3.	Motor Support Plate	• Profile Cutting • Semi finish Milling • Drilling • Internal Chamfer • Taping • Boring • Counter Boring • Surface Grinding • Blackodising	1 Day
4.	Dresser Plate	• Profile Cutting • Semi finish Milling • Drilling • Taping • Boring	2 Days

		• Drill & Slot • Surface Grinding • Blackodising	

Table -2: Process Sheet

4. ELECTRICAL PARTS USED

- Ethernet Motion Controller
- SMPS (Switch Mode Power Supply)
- Stepper Motor Drives
- Limit Switches
- Breakout Board

Fig- 5: Electrical Control Panel

4.1 Information about MACH3 Software:

By using this software, a program comprising of G-codes and M-codes is developed according to cutting motion and speeds. This program is typed in this software to get precise motion of dresser on grinding wheel.

- Mach3 turns a typical computer into a CNC machine controller. It is very rich in features and provides a great value to those needing a CNC control package.
- Benefits of MACH3.
- Minimum requirement of MACH3. [2]

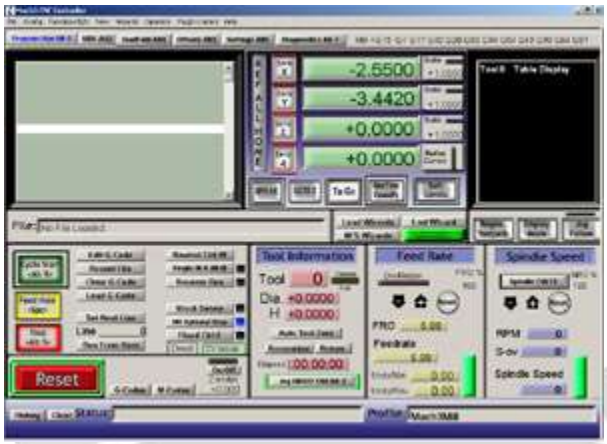

Fig- 6: Mach3 Program

5. CONCLUSION

Hence we conclude that our project was to design a 3-Axis dressing attachment for the grinding wheel, in which the dressing attachment will act like a tracer for the grinding wheel. The dressing attachment will guide the wheel to cut the required profile on the roller. The accuracy with considering the critical parameters of the roller is increased by the use of numerical control attachment. These can be used to reduce the leading cycle time of setting the manual feed attachment. In earlier days the profile on grinding wheel was generated through manual feed but in this project it is automated through numerical control by using Mach3 Software.

6. REFERENCES

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