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AUTOMATION Of FEEDING PROCESS TO CENTERLESS GRINDING MACHINE AND AUTO GAUGING

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Abstract - *Vibratory bowl feeders are used to feed small parts into various stations. At each station parts will be rejected, accepted or send for the further machining processes depending upon the orientation of the part. This analysis was for Unity Bushes & Tools Company who was looking to increase the production by increasing the part feed rate by using vibratory bowl feeder. The Scope of this analysis is to produce detailed analysis of the vibration system required to move the parts through the system and show how different spring configurations would affect the flow of the part through the system. From this analysis, we are able in to increase production and reliability of the system.*

Key Words: vibratory Bowl feeder, feeding processes, automation in feeding, small parts feeding mechanism

1. INTODUCTION

This work focused on real time application of vibratory feeder approached us to improve the function of the bowl feeder in order to speed up the cycle time on the grinding machine . This will increase the productivity on the line . A vibratory feeder is an instrument that uses vibration to "feed" material to a process or machine. Vibratory feeders use both vibration and gravity to move material. Gravity is used to determine the direction, either down, or down and to a side, and then vibration is used to move the material. They are mainly used to transport a large number of smaller objects.

Versatile and rugged vibratory bowl feeders will be used for automatic feeding of small to large and differently shaped industrial parts. This technique is old but still commonly used automation machine available by changing the parameters as per the requirements for aligning and feeding machine parts, electronic parts, plastic parts, chemicals, metallic parts, glass vials, pharmaceuticals, foods, miscellaneous goods etc. Standard and custom designs, vibratory bowl feeders will be useful to various industrial sectors for automating high-speed production lines and assembly systems.

With these easy-to-use and high-performing part-feeding machines, customers from varied industrial sectors have achieved lower error rates, less power consumption, better profits, better rates of efficiency and less dependency on manpower. Vibratory bowl feeder is ideal tool to get the required, oriented output of the components at specific feed rate.

In this project we have designed a vibratory bowl feeder for feeding dowel pins to the grinding machine to increase production by increasing part feeding rate by using vibratory bowl feeder. Designing proper bowl feeder for specific part feeding application is critical. Variety of factors such as part size and geometry, orientation required, feed rate, direction of output (clockwise, anti-clockwise) are just a few factors that affect the bowl design. The vibration test is carried out for confirmation of the work.

We have design the bowl to suit the requirement of Unity Bushes & Tools Co. Pune.Finally, we have made vibratory bowl feeder as per the company requirements and verified it by doing the actual operation on grinding machine with satisfactory performance.

1.1 OBJECTIVE

Our aim in this project is to design vibratory bowl feeder that would replace or can be an alternate the manual feeding to centre less grinding machine used in feeding of small components in various work stations. Vibratory feeders use both vibration and gravity to move material. Gravity is used to determine the direction, either down, or down and to a side, and then vibration is used to move the material.

1.2 SCOPE

It has been difficult to work manually in feeding of small parts like dowel pins , small nuts , castle nuts etc. By providing feeding mechanism it becomes easy to use by the operator as well as it gives high performing part feeding mechanism. This automation is beneficial for industrial sector to achieve lower error rates and less power consumption, better profits, better rate of efficiency and less dependency of man power.

2. METHODOLOGY

The electromagnetic parts feeder is a two-mass system. Mass one consists of the heavy base and rubber isolator feet, as well as the electromagnet. Mass two consists of the bowl mounting plate (often called the cross arm), the armature, and the bowl. The two masses are connected through four sets of leaf springs.

When the magnet receives power, vibration occurs because a pulsating magnetic field is established between the armature and the magnet. The springs permit the armature to move toward and away from the magnet, which imparts the vibration into bowl that ultimately moves the parts. The leaf springs are mounted at an angle, causing the parts to left off the bowl surface as they convey forward.

In many countries using 60-hz power, part feeder normally vibrates at a frequency of either 3,600 or 7,200 vibration cycles per minute.

The estimated feeder speed or part travel = 281 in./min (119mm/sec) Due to the effects of gravity, friction, and other factor, the maximum rate of part travel actually achievable is reduced. The 7,200 vibrations/min parts feeder is generally used when handling parts that are difficult to orient and sensitive to vibration. In this feeder, the parts are not moved as far per cycle, but are moved twice as many times as the 3,600 vibrations/min unit. This lower stroke at higher frequency results in better control of the part as it moves through the orientation devices.

Fig -1: Manual Feeding Of Dowel Pins

3. VIBRATORY BOWL FEEDER

The feeding unit can be classified into two separate units:

1. The bottom called the drive unit.
2. The top called the bowl.

The drive –unit consists of the top plate made of high quality aluminium casting and the base plate made of cast iron. To the base is mounted the solenoid unit and to the top the armature.

The all together construction forms a sturdy unit transmitting even vibration with less noise level. The bottom surface of the base is attached with ant vibration foot mounts. The top, called the bowl is designed and fabricated of **stainless steel 304** material to suit the geometry, orientation and feed rate of a components (product).

COMPONENTS OF BOWL FEEDER

- Auxiliary Hopper
- Bowl
- Spring Plate
- Base Plate
- Vibrator
- Isolated Bottom
- Magnet
- Controller

Cylindrical Bowl

Cylindrical bowls provide a constant feed of components. They are ideal for small components. Materials that can be used in cylindrical bowl are stainless steel, aluminum and steel.

Fig -2: Cylindrical Bowl

FEED TRACK

Moves parts from hopper to assembly work head.

Categories: Gravity - Feeder is located at higher elevation than work head.

Powered - Vibration to move parts toward work head.

Fig -3: Feed Track

CENTERS

If there is an aperture in the bottom of the bowl, either a rotating or fixed centre is required.

Material type: Stainless steel

Fig -4: Feeder Cente

DRIVE UNIT

The use of high performance magnets gives a continuous high feed rate regardless of the number of parts in the bowl. Drive units are renowned for their durability, smooth feed characteristics and low noise levels. Application 50 Hz vibration frequency for heavy additional mass in the bowl
for minor noise emission.

Fig -5: Drive Unit And Base Plate

BASE PLATE

Base plates enable easy mounting of the drive unit to the machine bed. The base plate SRG hat integrated fixing devices for the mounting of control units.

BOWL FEEDER SPECIFICATIONS

Table No. 1 : Feeder Specifications

Dia.	400mm
Height	315mm
Weight	35 Kg
Power consumption	2.3 Units per 8 hours
Current consumption	1.3 to 1.5 A
Voltage/frequency	230V/50Hz
Air gap	0.7/1.2mm
No. of magnets	2nos,320 VA

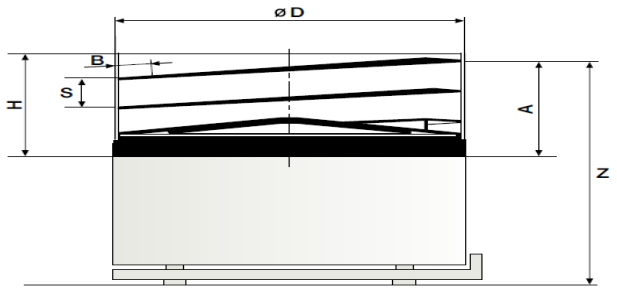

Fig -6: Feeder Design

AUTOGAUGING

In the automation of center less grinding machine, we are focusing on the increase production rate. Thus, to utilize the time and money of the production of dowel pins, we are determining the process of auto gauging of the machine. For that we are focusing on the ring gauge automation of centre less grinding machine. Apart from that we are using the automotive method of doing it. As ring gauge is a cylindrical ring of a thermally stable material, often steel whose inside diameter is finished to gauge tolerance and is used for checking external diameter of a cylindrical object and ring gauge are mainly used for comparative gauging as well as for checking.
Therefore, we are proving a path of its and initializing the gauging so that it becomes cheaper as well as easier for the person to channelize it easily.

3. CONCLUSIONS

Vibration bowl feeder has been overviewed. Its components and various parts are studied. The motion of the bowl and part are analyzed. The behavior of feeder has been adequately represented. The simulation model can be framed out of the force analysis given based on the various bowl parameters and the equations of motion. The further analysis, designing and fabrication of the working model will be completed by February 2017. After which the different experiments will be conducted for efficiency improvement.

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