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Design and Manufacturing of Tumbling Machine

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Abstract - *The paper presents an analysis of the applicability of tumbling machining for smoothing sharp edges and deburring. The basic conditions for the formation of burrs in machining and shapes of burrs on the edges of objects machined, at the exit of the tool have been defined. Possible ways of removing burrs are quoted. The results of research of deburring and smoothing, rounding sharp edges using tumbling machining are presented. To illustrate the surface taper ratio and edge the optical microscope Nikon Eclipse MA 200 with the image analysis system NIS 4.20 was used. The effect of treatment time on the final effect of removing burrs from aluminum tube after cutting with band saw was defined.*

vibro-abrasive machining operators are exposed to loud occupational noises when loading and unloading the metal products in vibro-abrasive machining. The increase in the number of hearing loss injuries in the metal stamping industry initiated OSHA's Special Emphasis Programs in designated industries and locations across the United States. Because occupational hearing loss injuries do not manifest themselves until years later, it is critical that employers install engineering controls immediately in order to protect worker's hearing and prevent hearing loss injuries.

The sound level and noise exposure results indicate that the noise cover is an effective control in reducing the sound levels produced by the vibro-abrasive machining and reducing noise exposures for the vibro-abrasive machining. Sound levels and operator's noise exposures can be further reduced through the combination of machine configuration, hearing protection, use of absorption material to cover the walls, ceilings, and floors, enclosing the machines in a separate room, and the use of noise covers over the vibro-abrasive machining.

Key Words: fine machining; tumbling machine; rotofinish; tumbling; burrs removing;

1. INTRODUCTION

In the era of fierce competition it becomes necessary to search for effective methods for surface finishing. Finishing processing is the troublesome element of a technology process. In many cases, significant hand work is required what increases the cost of these operations. This situation is of particular importance in the case of complex parts in mass production. The desire to reduce the production costs and stabilize production in terms of quality, requires the search for effective methods of finishing. One of the possibilities to propose methods of finishing in automated production systems is vibro-abrasive smoothing. Though it gives good results still it produces large amount of noise which is hazardous to human health. The tumbling process is a loud operation that often results in sound levels that far exceed the OSHA and ACGIH exposure limits. Employees that operate this tumbling process often wear hearing protection, such as, ear plugs or ear muffs and participate in a hearing conservation program. Some tumbling machines have sound covers that come manufactured and installed with the tumbling machine. However, most tumbling machines are open-topped and shop owners typically rely just on personal protective equipment as the only option for controlling the noise exposure levels for their workers. No studies have been published on sound levels generated from vibratory finishing machines in the manufacturing industry .Hearing loss has numerous causes. A person may be born with reduced hearing or develop hearing loss due to genetic reasons or illnesses, nosoacusis. Everyone also experiences hearing loss with age, called presbycusis. Furthermore, someone may experience temporary or permanent hearing loss caused by noise exposures outside the work environment, such as listening to loud music or using chain saws and lawn mowers for long periods of time without using hearing protection. Such hearing loss is sociacusis. The types of hearing loss of interest in this study, conductive and sensorineural, are caused by occupational noise exposures. Conductive hearing loss occurs when the transmission of sound from either the external or middle ear are damaged which then interferes with the transmission of sound to the inner ear. Conductive hearing loss can happen as the result of an accident at the workplace. Tumbling machine is used to burnish, de-burr, clean, polish, and to remove dust particles on work pieces. In this process a number of work pieces and abrasives are pored into tumbler drum as the tumbler drum starts rotating due to collasion between drum abrasives and work pieces polished work piece results out. The abrasives used are also called as media. A wide variety of media is available to achieve the desired finished product. Common media materials includes; sand, granite chips various metal abrasive etc.

A horizontal barrel is filled with the parts which is then rotated. Variation of this process usually include media and other lubricants. As the barrel is rotated the material rise until gravity causes the uppermost layer to landslide down to the other side.

In a wet processes a compound, lubricant, or barreling soap is added to avoid to aid the finishing process, prevent rusting and to clean parts. A wide variety of media is available to achieve the desired finishing product. Common media material include: sand, granite chips, slag, steel, ceramics and synthetics. Moreover, these materials are available in a wide

variety of shapes. Usually different shapes are used in the same load to reach into every geometry of the part.

Tumbling is an economical finishing process because large batches of parts can be run with little or no supervision by the operator. A full cycle can take anywhere from 6 to 24 hr. with the barrel turning at 20 to 38 RPM. Tumbling is usually most efficient with the barrel half full. Some processes also use a filter system to allow parts or other material in the cylinder to be separated. The disadvantages of this process are that the abrasive action cannot be limited to only certain areas of the part, cycle times are long, and the process is noisy.

1.1 Objective

1. To reduce the overall cost of tumbling machine.
2. To design a apparatus in such way that it will create less noise.
3. To improve the finishing of product by introducing some new abrasives as media.
4. To improve the size of tumbler so that it can polish maximum number of workpiece at a time.

1.2 Scope

The vertical tumbling machines are works on the principle of eccentric drums that produces vibrations but due to vertical position of drums it is having limited scope of operations .and also there maybe problems related to bending of the lowest situated drum. Such machine is producing high amount of noise during its working and also the overall tentative cost of machine is also high.

There is huge scope in design of machine with an optimum cost that also occupies less shop floar space as well as to reduce the noise generating during working. According to the material of work piece there is an huge scope in inventions of new abrasives with lowest cost and easy availability. For ex- for plastic work pieces the wood sawdust can be used which is available easily with less cost, Zeolite, Aluminium oxide grit and silicon carbide grit used as a standard media. White aluminium oxite grit for machining the costly products like a gold ornaments.

By using servomotor and some newly introduced technologies the rotational movement can be vary in some specific pattern that follows after certain interval of time which might be very usefull to achieve good final results.

By changing the geometry of tumbler drum, such as by varying its cross-sectonal area from circular shape towards pentagonal as well as hexagonal shape with an internally provided splines with an specific angle that leads to proper mixing of work piece and abrasive medias so that the desired output can be achieved with more effectiveness.

2. Construction and Working

Finally after survey it is cleared that the main aim of our project is to design an apparatus with an optimum cost that generates less noise and also occupies the less shop floor area.

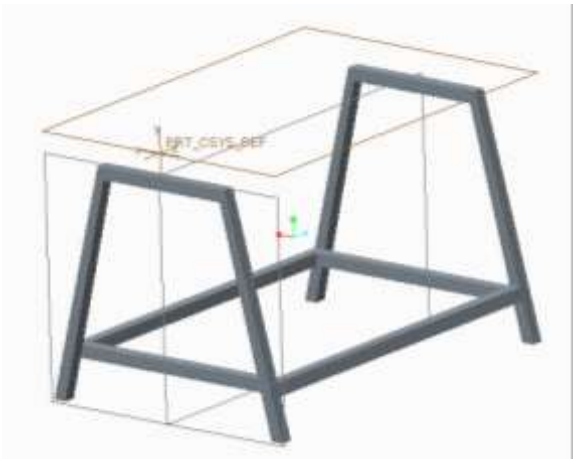

Fig -1: Tumbling Machine Frame

Fig -2: Tumbler Drum

The present invention relates generally to the art of surface finishing by removing the burr. The machine generally consist of the frame on which a tumbler is mounted. The rotary movement is given to the tumbler body by using the motor and pulley arrangement. The workpiece along with suitable media is kept inside the tumbler. Due to the rotary movement of tumbler the rubbing action is takes place between the media and the workpiece which removes the unnecessary burr on the workpiece and provides good surface finish to the workpiece.

The main goal is to reduce minute irregularities and produce a clean, smooth surface. The parts are usually a wet process that uses water and a lubricant or cleaning agent, such as soap or cream of tartar. The barrel is not loaded more than half full and if media is used then 2:1 ratio of media to parts is maintained to keep the parts from rubbing. and thus the final output in the form of polished product is achieved.

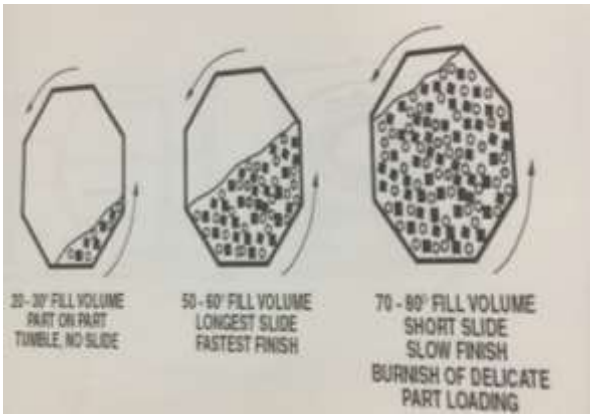

Fig -3: Pouring Principle Diagram

3. CONCLUSIONS

Visual observations already allow to conclude that the sings of corrosion are removed after approx 4-5 hours of machining. To conclude tumbling machining have positive effect on the surface roughness in the case of higher requirements posed finishing surfaces can be used longer machining times polishing. On the basis of the conducted research it can be concluded that the various abrasive medias has cutting properties.

Tumbling machining method is an effective method and can fully replace the finish process small details carried out by conventional methods of files tape polishing and polishing. Small media polishing that allow for rounding off sharp edges can block inside the small pieces items it's leads to in the results to deformation of the internal shape of the materials however it did not have effect the surface roughness

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