VIVA-TECH IJRI
ANNUAL RESEARCH JOURNAL
VIVA-TECH INTERNATIONAL JOURNAL FOR RESEARCH AND INNOVATION
ANNUAL RESEARCH JOURNAL
ISSN(ONLINE): 2581-7280

PROCESS IMPROVEMENT OF GRUB SCREW MANUFACTURING IN A SMALL SCALE INDUSTRY

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Abstract : *This study is an approach to investigate the viable impacts of Grub screw manufacturing. Due to increase in demand of grub screw in industry it leads the manufacturer to upgrade the exiting process of manufacturing the grub screw. A method and apparatus for manufacturing a screw capable of mass-producing a multiple screw bolt such as a so-called grub screw, grinding and slotting for use therein. By making the existing machine semi automatic to increase the production rate as well as to reduce the man power required for the production process. Grub screw manufacturing process consists of COLD FORGING, SLOTTING, GRINDING and ROLL THREADING. Slotting machine cuts the slot on the top of screw head. The feeding mechanism demands human effort causing slow production rate and time consuming process. To eliminate this we come up with semi-automatic bowl feeder. As similar problem is faced in the grinding process we decided to combine the slotting and grinding machine into one. This project is focused on increasing the production rate with minimal man power by consuming less amount of time compared with the existing process. For this purpose, an optimized design of existing machine is made consisting of cost effective & quality materials.*

Keywords - *Grub Screw, Semi Automatic, Reduce Human Efforts, Bowl Feeder, Cost Effective, Better Efficiency, Increase Productivity & Consuming Less Time.*

I. INTRODUCTION

Grub Screws are a sort of fastener, in some ways like a bolt, typically product of metal, and characterized by a helical ridge, referred to as a male external thread. Grub Screws are accustomed fasten materials by digging in and wedging into a material when turned, while the thread cuts grooves within the fastened material that will help pull fastened materials together and stop pull-out.

1.1 Project Background

The concept of Grub screws came into existence since olden times, predating the metal screw by at least several hundred years. Screw manufacturing is being chosen for this study and it is among the most established manufacturing industry, screw can be categorized as non-permanent joint or fastener, it is used to join parts that can be easily disassembled. Screw can join metal part with non-metal part, it can join any parts together from any kinds of material, and Screw is non-permanent join so it is suitable for design that need disassemble for maintenance purpose. That is why it widely used in industries, home appliance, automotive industries, and electronic industries and building structures.

1.2 Purpose of Project

Grub Screws are known as industrial fasteners having different types & shapes of heads, lengths and diameters. These are mostly manufactured from **15B25** Wire. The product is Cold Forged, Slotted, Grinded and Roll Threaded. These are used for fastening of mixers, Brake caliper, and grinder machine. Grub Screw is headed and externally threaded, possessing capabilities which permit it to insert into hole and forming its own thread, when being tightened. The project work presented in this report is based on improvement and optimization of grub screw in screw manufacturing company. Making a machine was not just our main objective, but making the current machine optimize and making mechanism more efficient to increase the production was the main reason for us to select this project.

The manufacturing of Grub screw is done at small scale industry. The current machine in the company is not much efficient to produce the current production requirement of the Industry. So our main objective was to accommodate all of this in one project.

So our project deals with optimizing some parts of machine and modifying it for better performance and reducing its cost, with minimum human efforts and also within the given deadline.

II. PROBLEM STATEMENT

Due to current method of manufacturing Grub Screw, it does not meet the requirement of the market which affects the rate of production and also there are lot many manual operations for each process to be performed. Due to which the time required for each operation increases and doesn't make the required quantity. The main processes during the manufacturing are cold forging, slotting, grinding and roll threading. During the operation of Slotting & Grinding the work piece are feed manually. Due to which the time required for each process increases and leads to slow down the production rate and the manufacturer lacks to produce required quantity within the given deadline.

2.1 Objectives

Objectives to be minimized are given below

2.1.1 Manually Feeding

As the major process includes the slotting and grinding of the grub screw. Because of there is no head on the grub screw, feeding of the screw is to be done manually. While feeding in the conventional machine the work piece slides down and falls into the machine as there is no head. Due to continuous human feeding the work piece gets stuck into the machine and it leads to stop the machine and reset the machine by adjusting the grub screw.

2.1.2 Grinding Of the Grub Screw

The current machine in the company is the common vertical bench grinder. So the feeding of the grub screw in done with the help of a plate which consist of 1360 holes drilled into the metal plate. To fill the plate with the grub screw which is to be grind from the bottom side (top side is being slotted first) is filled with the help of two persons which takes time around 10 minutes after that the plate is being mounted on the bench of the vertical grinder with the help of magnetic bench and the operation is performed 2-3 times by adjusting the feed rate of the machine after that unloading is done. This takes time of 4-5 minutes .So the total time required for the grinding process is all about 15-16 minutes, which leads to slow down the process, time consuming & affecting the production rate.

2.1.3 Roll Threading Operation

In The current process the work piece needs to be feed manually into the machine through a screw which has a hole through out the length which is provided over the threading die. As there is manual feeding by hand there is chance of excessive feeding at a time into the machine die which leads to stops the rolling process. Then again we have to restart the machine by removing the stuck screw from the die so that it can work properly. Again the whole process leads to slow down the process and affects the production rate by consuming much time.

2.1.4 Hectic Process & Human Safety
As the whole process needs labor support for feeding operation the process is much hectic as well as there are chances of getting hands into the machine while operating, during the grinding process there is chance of breaking of the grinding wheel when it comes to end part which risks the life of the human.

III. METHODOLOGY

The solution for all this process is that we have proposed an idea for making this process semi-automatic which helps to feed the work piece into the machine. We have majorly combined the two process that are 1) Slotting Operation & 2) Grinding Operation. Because this two are the major time consuming operation in the whole production process. So that it will help us to achieve the required production rate in the given amount of time.

3.1 Working Mechanism

1. Firstly the conventional industrial cold forging machine gives us the work piece in the form of small bullet shape structured, of the dimension 16.50 mm-length & 6mm diameter.

2. Now further we have to put the grub screw obtained from the cold forging operation into the rotary table. Then due to rotation of the plate attached inside which has slots made over the circumference of the plate which helps the grub screw to hold into position while rotating and to push the screw into the bent pipe so that it could transfer to further process.

3. When it comes from bent pipe it is transferred to the turn table attached below which again hold the grub screw into position while rotating. There is a cutter attached at upper position of the turn table .The height of the cutter can be adjusted with the help of the ball screw which is attached with the cutter.

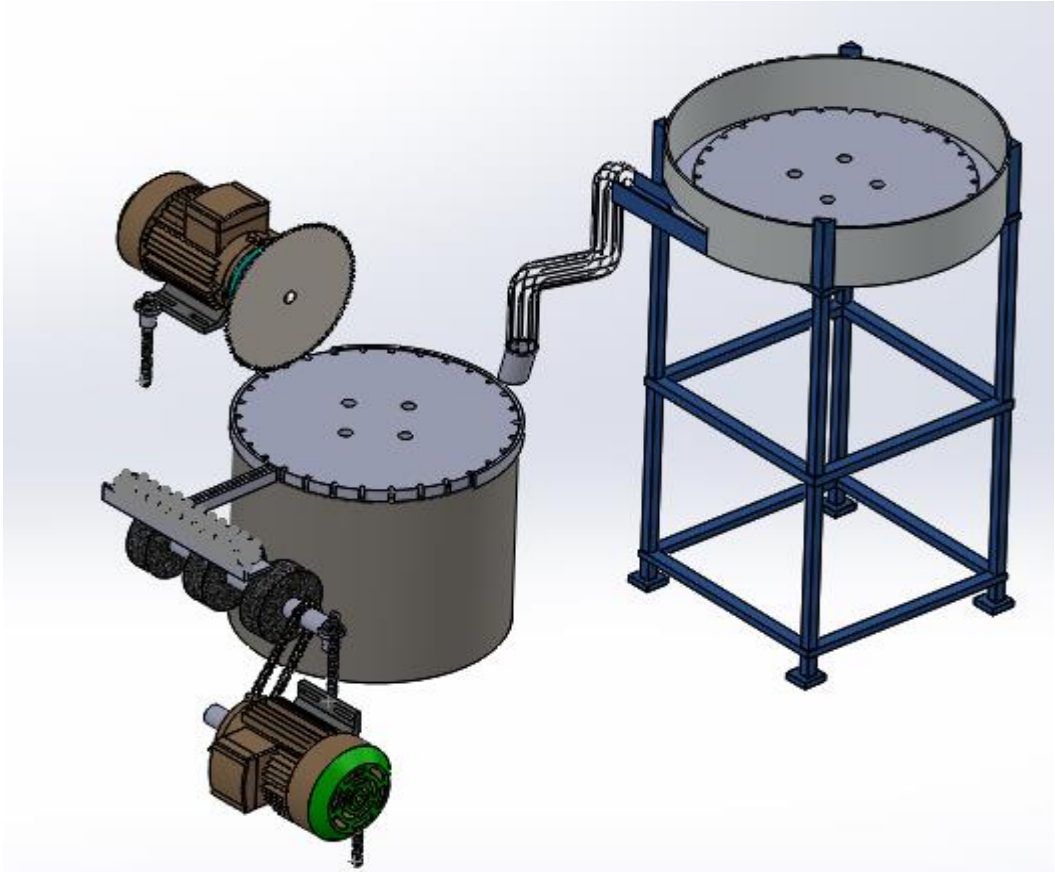
4. As soon as the Grub Screw comes below the cutter, screw moves with a constant speed and slots are created after a moment the turn table rotates further and the grub screw is moved further by the guide way provided in the tangent to the turn table which transfers the grub screw into a conveyor chain system which helps the Grub Screw to travel from cutter section to the grinding operation.

5. At the bottom part of the conveyor chain the grinders are attached. Due to which the grinding operation is done simultaneously. Supporting plate is provided to hold the screw in the position, So that the grinding operation can be done properly without slipping of the Grub Screw.

6. There are 3-Grinders attached at the bottom of the conveyor with the help of the ball screw, so that the feed of the grinder wheel can be adjusted with the help of ball screw mechanism.

7. After all these operations are complete the grub screw falls into the collector box provided below.

IV. FIGURES



1. Fig. Cad Model

V. CONCLUSION

After the said modification is done we can have new modified machines which can deliver maximum output with better quality and with minimum human interference. Various kinds of Process were discussed in this report. Based on the review a new machine will develop with available equipment's inside the Industry and the data acquired from the test of developed machine will be more reliable. This report will be more useful for researchers in the field of Grub Screw Manufacturing. The design analysis, fabrication and testing of Grub Screw manufacturing machine will be successfully carried out in this work.

This idea indicated will be a good prospect for the design and fabrication of small machines/equipment which will serve as a spring board for technological transfer and development of our country.

5.1 ADVANTAGES AND DISADVANTAGES

5.1.1 Advantages

- Increase in production rate
- Less labour cost
- Less time consuming

5.1.2 Disadvantages

- Space required for the setup is larger.

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