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Elimination of Idle Time in Choking Machine for Nut Module

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Abstract—The production rate of a machine in an industry is expected to be high as much as possible. Deviations in the rate of production due to any miscellaneous factors can be avoided. Obviously, human errors are unavoidable. At the same time necessary actions should be taken to minimise the deviations to the negligible level. Nyloc nut, a solid component is a special type of fastener. Nyloc nut production is essential in order to reduce the vibration during motion. The vibratory feeder in choking machine (SSNA 14) can be replaced with the help of appropriate mechanism to reduce the power loss due to vibration. To overcome this, a suggestion as design of a prototype has been made, which is simple in construction and produces less vibration and noise compared to the existing one. It also reduces the idle time of choking machine (SSNA 14), due to the misalignment of the components from the track. The section which combines both the nyloc and nut in the existing machine is fine. But a disturbance arises because of vibration in vibratory feeder. In this project, the replacement for the feeder is provided as a suggestion through a design.

Keywords— Nut module, Idle time, Vibration, Power loss, SSNA14, Nyloc nut.

I. INTRODUCTION

A Fastener is a hardware device that mechanically joins or affixes two or more objects together. In general, fasteners are used to create non-permanent joints; that is, joints that can be removed or dismantled without damaging the joining components. The industry in which we made a survey is a fastener producing industry that consist of various departments like raw material module, nut module, bolt module, heat treatment module. Among these we did our analysis in nut module. They produced various types of nuts with different diameters of metric grade. Nyloc nut is also one among them. It is a special type of nut, which looks different from other nuts in such a way that it cannot be handled easily by hands. Nyloc nuts are most probably stable than normal nuts. It composed of a plastic washer which is an important segment of nyloc nut. During dynamic motion between two objects, friction can be controlled upto the maximum level with the help of nyloc nuts. Fasteners are mostly useful in automotive industry to hold two metal plates or work pieces in the midst of vibration. These

nyloc nuts provide the necessary friction and help to withstand the vibration during the desired working.

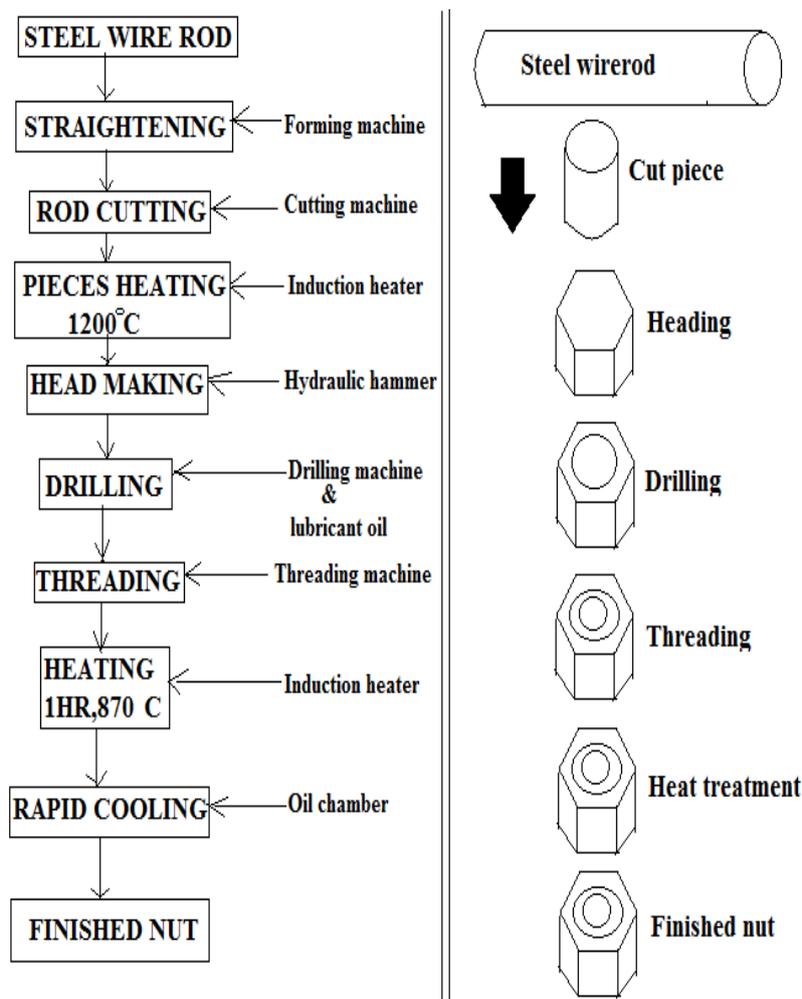


Figure 1. Formation of nut by forging

After the production of nuts with desired metric grade it is sent to choking machine. It is a type of machine which is used to produce nyloc nuts. The nyloc washer is assembled with the nut with the help of punch which is activated using pneumatic cylinder.

II. PROBLEM IDENTIFICATION

As previously said, nyloc nut is used to avoid friction during its motion period. Choking machine gets the washers on one side and nuts will be dropped manually into the round shaped hopper on the other side. The round shaped hopper vibrates and due to the vibration of the hopper, the nuts dropped into the hopper rise to the spiral shaped lines which is surrounded inside the hopper. Thus each and every nut reaches the desired pathway and at last only one nut reaches the narrow zone. On the other side, using the same vibration feeding system, the washers (nyloc) are dropped into another round shaped hopper. The nuts that enter the narrow zone is made to reach the round shaped disc. The slow speed rotating round disc fetches the nuts from the narrow zone one by one and combine it with the nyloc. Finally the nyloc nut is transferred to the ladle.



Figure 2. Misalignment of washer

III. IDLE TIME

Choking machine during its working stage is stopped by the operator due to improper feeding of nyloc into the required zone. Sometimes the machine is not desired to run, because the nyloc is not properly inserted into the nut. But, the former one occurs often.

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Based on the observation, it is found that for every 1.5 minutes to 2 minutes i.e. choking machine is stopped by the operator manually. This is entirely due to the ejection of nyloc from its desired pathway. Also the vibration produced by the machine is damn high. So the power consumption to provide the necessary vibration is high.

Vibration in the vibratory feeder is the main reason for misalignment of nut and washer from its desired path. It results in the stoppage of machine, which leads to the deduction in the production rate of nyloc nut. Human intervention is inappropriate in an automatic machine. So every time when there is a human intervention, the process which are programmed to be automatic should be stopped from its normal working condition. And after when the machine is verified as it is suitable for its working condition, it is switched on. Thus every time when there is a restriction in the passage of nut as well as washer, the choking machine is stopped to eliminate the obstacle.

IV. SOLUTION SUGGESTED

The existing machine contains vibratory feeder in which nuts are dropped manually by the operator. The feeder produces undesirable vibrations which can be neglected. By replacing the feeder with our suggested design, the ideal time of the machine can be eliminated. Prototype designed is mounted on the choking machine with the replacement of vibratory feeder.

V. METHODOLOGY

Nuts are dropped in the Y- shaped hopper which is connected to a cam and follower. The hopper is initially in zero degree state. When the cam rotates roller follower which is in contact with the cam

undergoes a linear motion in a vertical motion. A shaft is being used to connect hopper and follower. The linear motion of the follower makes the hopper to move in a inclined path approximately *30 degree. Number of nuts dropped in the hopper are made to move through a converging section to control the flow rate of nuts. A small separator is used to flip the nuts in same direction. The out coming nuts are collected and made to follow in a single track. On the other hand same procedure is followed for the nyloc washer. An indexing mechanism is used to move and place the washer on nut. A punch is used to insert the nyloc into the nut. At the same time the succeeding washer is held by the punch. Finally the nuts are collected in the trolley.

VI. DESIGN

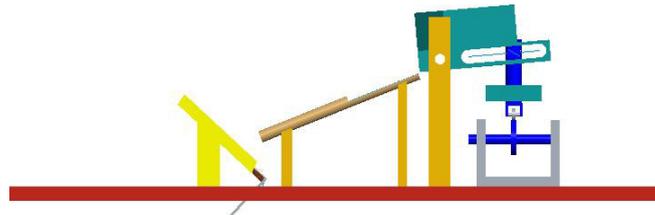


Figure 3. Front view

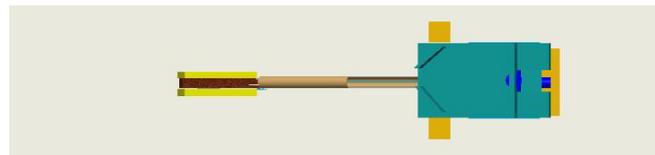


Figure 4. Top view

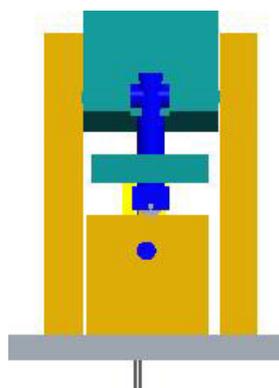


Figure 5. Side view

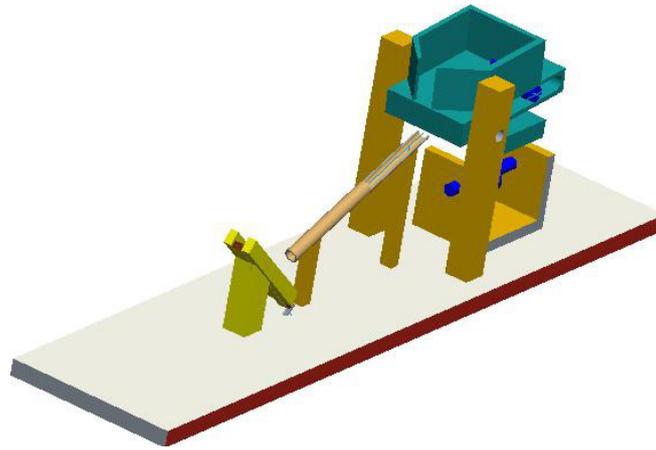


Figure 6. Isometric view

Green coloured part in the picture depicts the hopper setup where the nuts will be loaded from the ladle.

Yellow coloured part depicts the roller path of nut which makes the nut to move in the same direction.

Silver white coloured part indicates the base part on which the entire setup is mounted.

Blue coloured part represents the cam and follower. The individual part diagrams of cam and follower are shown below:

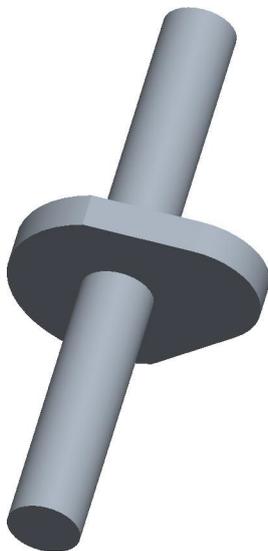


Figure 7. Cam

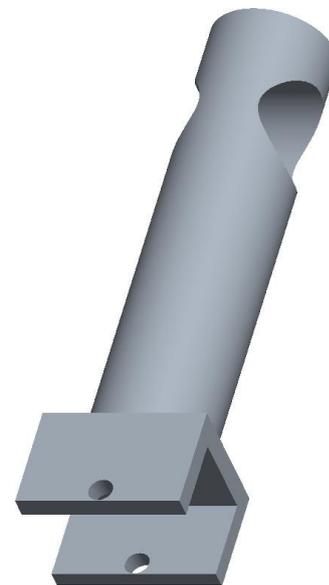


Figure 8. Follower

VII. CONCLUSION

This project has been completed and the idea analysed has been suggested. The entire project was carried out based on the extensive learning from the literature survey and also from the input obtained from the operators. During the design, greater care has been put to avoid hiccups at final stage. The entire design carried out was positive and the results were recommended. The recommendations were assured to be implemented on a small scale for test purposes. The alternate for existing machine was

designed, so that, it does not affect the machine. Suggestions were also given to the operators for continuous production.

VIII. REFERENCES

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