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OPTIMIZATION AND DEVELOPMENT OF MULTI - WAY HACKSAW MACHINE

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ABSTRACT:

In generally conventional hacksaw machine is use for the cutting of rods, plates or any circular parts. But the conventional hacksaw machine take more time to cut each individual part. And for reason we taking changes in conventional hack saw machine into multiway hacksaw machine. This machine is able to cut multiple element at a time with different strength. Due to optimization we taking it to improving quality and its performance in optimum sources. This machine very efficient to increase the rate cutting and reduce time required in conventional hacksaw machine.

Keywords: Multi-Way Hacksaw Machine, Cutting process, Gearbox, Motor(3phase AC)

I. INTRODUCTION

The main objective of our project is to perform cutting operations with the help of motor. For a developing industry the operation performed and the parts (or) components produced should have it minimum possible production cost, and then only industry runs profitability. In small-scale industry and some workshops, this increases the initial cost required, large area requirements and large number of machine is required. In our project the rod cutting operation is carried out by small arrangements and easy operations. There will be need to cut similar length of rods in industries such as construction, manufacturing etc. for this purpose industries employ two or more persons to measure the length and then cut the rod. Our project gives a solution for this there is no need to measure each and every rod for cutting.Today almost all the manufacturing is being atomized in order to achieve the high level of productivity. To achieve mass production , to reduce man power, To increase efficiency of plant, To reduce work load ,To reduce the production cost ,To reduce the production time, To reduce the material handling ,To reduce the fatigue of workers.

1.1 Problem Identification

The conventional hack saw machine are operated by human operators as mentioned, have the demerit of unloading and loading the work-piece many times. In mechanical industries need to cut no. of ideal parts. It is very difficult for operator to cut the individual parts. It takes more time for cutting. This can be achieve by using proposed machine at the place of conventional machine to cut different metal bar pieces with high rate of and accuracy to minimize an idle time.

1.2. Problem Definition

To minimize the cutting time in conventional machine and increase the rate production rate.

1.3 Objective

The most important objective function is to minimize the cost and overcome problems come into small industry for its rate of production.

II. REVIEW OF LITERATURE

- Prof. Kshirsagar Prashant R., Rathod Nayan J., Rahate Prashant P., Halaye Prashant P., Surve Sachin S. in their research paper "Theoretical Analysis of Multi-Way Power Hacksaw Machine" designed and developed a multi-way power hachsaw machine which converts converts rotary motion into the reciprocating motion for working of model. This machine is able to cut four pieces at same time which overcomes single piece cutting of conventional power hacksaw machine.[1]
- D.V.Sabarinanda, V.Siddhartha, T.Mohanraj in their paper "Design and Fabrication of Automated Hacksaw Machine" (April 2014) gives an idea about the various components required for fabrication of the proposed model. These components will help to get smooth working condition and future automation of different mechanical actions as well as linkages.[2]
- R. Subash, K. Samuel Jayakaran, (2014), In this paper author has designed Pedal operated hacksaw machine which can be used for industrial applications and Household needs in which no specific input energy or power is needed. This project consists of a sprocket arrangement, the crank and slider mechanism, the chain drive. In the mechanism, chain drive is directly connected to the hacksaw for the processing of cutting the wooden blocks. The objective of the paper is using the conventional mechanical process which plays a vital role. The main aim is to reduce the human effort for machining various materials such as wooden blocks, steel, PVC etc.[3]

III. WHAT IS OPTIZATION ???

Optimum selection of cutting conditions importantly contribute to the increase of productivity by minimization of production time and the associated costs, therefore utmost attention is paid to this problem in this contribution. Time is the most important parameter in any operation and all the manufacturing firms aim at producing a product in minimum time to reach the customer quickly and enhance the customer satisfaction. This can be achieved by using optimization techniques. The success of an optimization technique does not lie in its complexity but the time in which it provides a solution to the manufacturing firms.

IV. COMPONENT REQUIREMENT:

COMPONENTS NEEDED FOR OPERATION

- Hacksaw blades
- Gear box (warm and warm type)
- Connecting rods
- Material holding vice

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- Bearings
- Drive spindle
- 3 phase AC motor of 1440 rmp
- Hacksaw Frame

4.1 Selection of Hacksaw Blade

A hacksaw is a fine-tooth saw with a blade under tension in a frame, used for cutting materials such as plastics, metals etc. The principle of metal cutting is working principle for hacksaw blade cutting operation. For cutting operation to be done the hacksaw blade should be of harder material than material to be cut. The well known power hacksaw machine is powered by electric motor. So the saw or saw blade is important component in consideration for high rates of cutting to be done.

4.2 Different Types of Saw blades

Following are the types of blades which are generally used material cutting.

material	HSS	Bi-Metallic Steel	Low Alloy Steel	High Carbon Steel
Hardness	Best	Better	Good	Fair

1. High Carbon Steel
2. Bi-Metallic Steel
3. High Speed Steel
4. Low Alloy Steel

4.3 Material Selection of Saw blade

From the table, high speed steel (HSS) its suitable material for hacksaw blades.

- **Wear Resistance Test of blade:**

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Table No. 4.3.1

Material	Mild Steel	Alluminium	Brass
High Speed Steel	Best	Fair	Good
Bi-Metallic Steel	Better	Good	Fair
Low Alloy Steel	Fair	Better	Best
High Carbon Steel	Good	best	Better

From the table, following conclusions are made on account of wear resistance

1. High Speed Steel has less wear working with Mild Steel.
2. Low Alloy Steel has good wear resistance working with Brass.
3. High Carbon Steel when working with Alluminium .

V. EXPERIMENTAL SETUP

Following figure is showing the basic structure of proposed model of multi-way hacksaw machine.

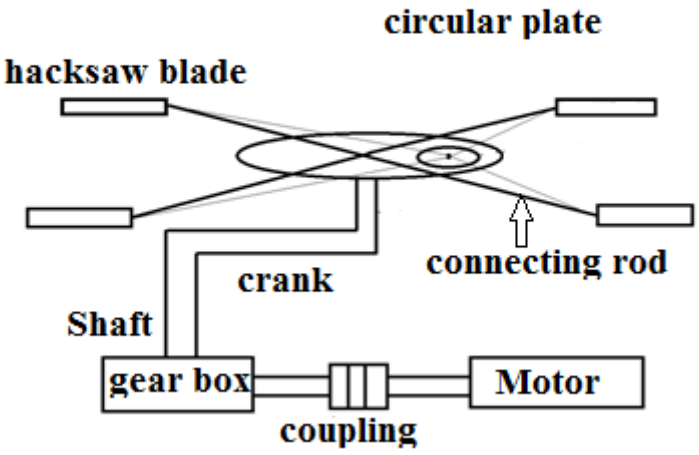

Figure 5.1: Experimental Sketch of Proposed Model.

VI. PROPOSED WORKING

As the 3 phase AC supply is given to electric motor which couple to worm and worm type gear box through coupling. Motor having 1440 rpm and to achieve optimum speed gear box is provided.

When the motor is starting it rotate the gear box with it.

The shaft of gearbox is connected to the circular plate through the crank. The crank rotates into the circular motion. There are four connecting rods are connected to the circular plate which give the rotation of 90° for

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every cutting stroke. Through connecting rod four hack saw cutters are connected at the end. When rotation of plate is done it moves blades for cutting and return stroke. And due this the cutting of metal is done.
Every rotation of plate gives two cutting strokes and two return strokes. Which helps to reduce working time of operation. And improve the production rate of cutting.

V. CONCLUSION

We concluded that to overcome problems in conventional hacksaw machines, due to high efficiency, easy to operate and affordable price the proposed model of multi-way power hacksaw machine is helpful and completes all the expectations needed in the mini industries. Future scope of proposed research work to increase the production rate cuts the metal bars easily. It can withstand the vibrations, no hazards from jerk, no special training required to operate it.

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