© 2018 IJSRSET | Volume 4 | Issue 6 | Print ISSN: 2395-1990 | Online ISSN : 2394-4099
Themed Section : Engineering and Technology

A Study of Multiple Hacksaw Machine

Kulye Rahul[1], Nipurte Mayur[1], Patil Tushar[1], Raut Krutik[1], Shelavale Devesh[1], Datta Pawase[2]
[1]Student, Vishwatmak Om Gurudev College of Engineering, Mohili, Maharashtra, India
[2]Professor,Vishwatmak Om Gurudev College of Engineering, Mohili, Maharashtra, India

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 : Advance Machining , Metal Cutting, Manufacturing, Tooling

I. INTRODUCTION

In present condition many electrically operated power hacksaw machines of different companies with different specifications are available for the use in shop floor. These machines are so precise that they can cut metal bars with minimum time made up of different materials but they have one and major disadvantage that those are able to cut single piece of bar at a time. For industries to achieve the mass production, it is necessary to cut metal bars with high rate. So it is impossible to depend upon conventional single frame power hacksaw machines and need the improvement in

technology and design of such machines. With the help of this multi-way power hacksaw machine the four metal bars can be cut simultaneously to get high speed cutting rate and to achieve mass production for maximum profit in related companies. As this machine overcomes all the limitations and drawbacks of conventional hacksaw machines, it is also helpful for small scale industries due to its simple working and operating conditions along with its compatibility, efficiency and affordable price.

II. LITERATURE REVIEW

The vast review of literature will help to understand the concepts, theorems and different factors affecting the performance of machine. R.S.Khurmi, J.K.Gupta in their book “Theory of machines” (Velocities in mechanisms) helps to find Velocity diagrams of slider crank mechanism.

- 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.
- 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.

- 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

Current scenario of industry focuses on the high production rate with less consumption of resources. To achieve this we need to minimize idle time and machine time per unit. The multi-way power hacksaw improves those factors by reducing time per unit to increase the production.

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

In present situation electrical as well as hydraulic operated machines are used but the output from them is not satisfactory as it has low cutting rate

III. REQUIRED COMPONENTS AND MATERIALS

Table 1

SR NO.	COMPONENTS	MATERIAL
1	Single Phase electric motor	-
2	Disc	MS
3	Hacksaw Blade	Bi-metallic
4	Hacksaw Frame	MS
5	Guide ways	MS
6	Universal joints	Alloy Steel
7	Connecting rods	MS
8	Bearings	High C-Cr Steel
9	Cooling pumps	-
10	Material holding vise	MS
11	Base	MS

3.1 Selection of Hacksaw Blades

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.

3.2 Different Types of Saw blades

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

Table 2

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

3.3 Material Selection of Saw blade

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

IV. EXPERIMENTAL SETUP

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

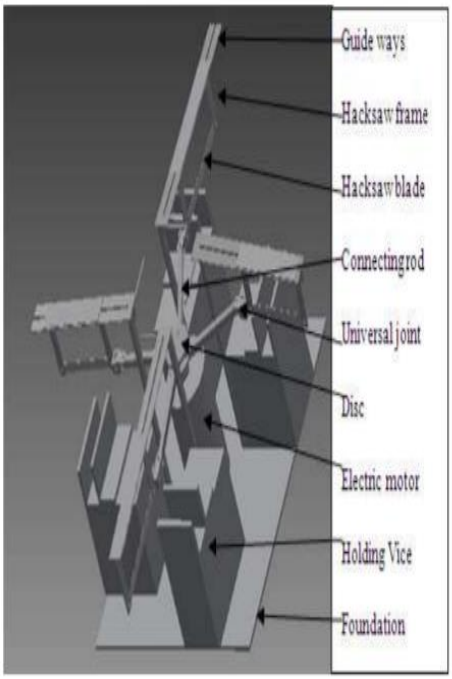

Figure 1. Experimental Sketch of Proposed Model

Proposed Methodology

This project consists of single phase vertical electric motor rigidly placed at the center of metallic foundation provided. The shaft of motor rotates at 90100 rpm with the power 2HP. The circular disc is mounted on the shaft of motor with the help of key and key slot arrangement. The eccentric point on the plane of disc is provided such that the desired cutting stroke is achieved (around 4-5 inches). One end of each connecting rod is pivoted at this eccentric point by the use of suitable bearing. Another end of each rod is connected to the hacksaw blade fame with the help of universal joint to get vertical and horizontal Degree of Freedom of rotation for the proper cutting operation. The hacksaw frame slides on the guide ways provided. When motor is ON and disc starts rotating, due to the reciprocating motion of hacksaw frame the metal rod is cut which is firmly fixed in vise. The automatic feeding of coolant is provided to reduce heat generated due to friction which also avoids the jerk.

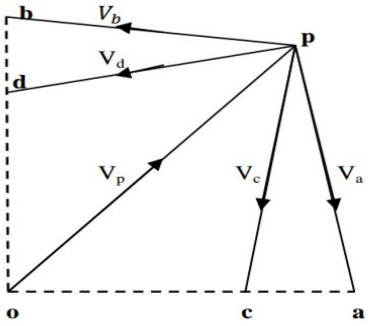

Figure 2. Velocity Diagram (Scale 0.588/=50mm)

From Velocity Diagram,

Considering cutting stroke length 5inches = 125mm (Value taken by referring hacksaw manufacturer's catalogue)

As we know l = 2; where r=crank radius

Therefore r = 2.5h = 62.5mm

The length of connecting rod = 300

Speed= N = 90 (as per catalogue)

So angular velocity $\omega = \frac{2\pi N}{60}$ = 9.424 rad / sec

Here OP =crank radius

OA = OB = OC= OD=connecting rod

ωpo = 9.42 rad/sec

since op=0.0625m

so velocity of p w.r.to

Vpo = Vp = 9.42 × 0.0625 = 0.588 m/sec

From velocity diagram, we get velocities of slider

Vap= 4.4 cm/sec = 0.44 m/sec

Vbp = 4.1 cm/sec = 0.41 m/sec

Vcp = 4.4 cm/sec = 0.44 m/sec

Vdp = 4.1 cm/sec = 0.41 m/sec

Required Torque

We know forces at A, B, C,D

FA = FB = FC = FD = 500N

Power output = To× ω po

= To × 9.42 Nm / sec

Power input = (fa×Va) + (Fb×Vb)+ (Fc×Vc) + (Fd×Vd)

=(500 × 0.44) + (500 × 0.41)+(500 × 0.44) + (500 × 0.41)

= 850 Nm/ sec

Neglecting losses power input is equal to power output

So,

To× 9.42 = 850 Nm/ sec

To= 90.23 Nm

Available Torque

P = 2πNT / 60 Where N = 90rpm

P= 2HP= 1492W

as 1HP = 746Watt

T = 158.30 N–m

Table 3. Cost Estimation

Sr. No.	COMPONENTS	COST IN (Rs.)
1.	Single phase electric motor	4500
2.	Disc	300
3.	Hacksaw frame	700
4.	Hacksaw blade	150
5.	Bearings	600
6.	Material holding vise	3000
7.	Base and frame	4000
8.	Connecting rod	1000
9.	Universal joint	1500
10.	Other	1500
	TOTAL	**17,250**

V. CONCLUSION

As per the above discussion 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

VI. REFERENCES

[1]. D.V.Sabarinanda, V.Siddhartha, B. Sushil Krishnana, T.Mohanraj , "Design and Fabrication of Automated Hacksaw Machine", International Journal of Innovative Research in Science, Engineering and Technology, ISSN (Online): 2319-8753, volume 3, April 2014.

[2]. Prof. Nitinchandra R. Patel, Mohammad A. Vasanwala, Balkrushna B. Jani, Ravi Thakkar, Miteshkumar D. Rathwa, "Material selection and testing of hacksaw blade based on mechanical properties", International Journal of Innovative Research in Science, Engineering and Technology, ISSN: 2319-8753, volume 2, Issue 6, June 2013.

[3]. O.Cakir, A. Yardimen, T. Ozben, "Selection of cutting fluids in machining processes", Journal of Achievements in Materials and Manufacturing Engineering, volume 25, Issue 2, December 2007.

[4]. R. Subhash, C.M. Meenakshi, K. Samuel Jayakaran, C. Venkateswaran, R. Sasidharan, "Fabrication pedal powered hacksaw using dual chain drive", International Journal of Engineering and Technology, ISSN: 220-223, volume 3, Issue 2,2014.

[5]. Dr. V.P. Singh, (2007)"Mechanical Vibration", Page no. 145-162 .

[6]. R.S.Khurmi, J.K.Guptal, (2012)"Theory of machines", Page no. 143-168

[7]. PSG College of Technology, (2007) "Design Data Book", Page no. 1.4-1.37

[8]. V.B.Bhandari, Design of machine elements, Year 2007, Page no. 5-7 & 20-39 [9Walter E. Burton, (1964), "Homemade Power hacksaw for less than $20", Popular science, Feb 1964.

[9]. Micro, Small and Medium Enterprises Development Institute, "Project profile on hacksaw blade manufacturing", NIC code: 28939, ASICC code:71303,2010-11.

[10]. Bradford Dittmer," Build a power hacksaw from washing machine parts