Impact Factor (SJIF): 4.542

International Journal of Advance Research in Engineering, Science & Technology

e-ISSN: 2393-9877, p-ISSN: 2394-2444

Volume 4, Issue 3, March-2017

EXPRIMENTAL ANALYSIS OF MANUAL FOUR WAY HACKSAW CUTTING MACHINE FOR MASS PRODUCTION - A Review

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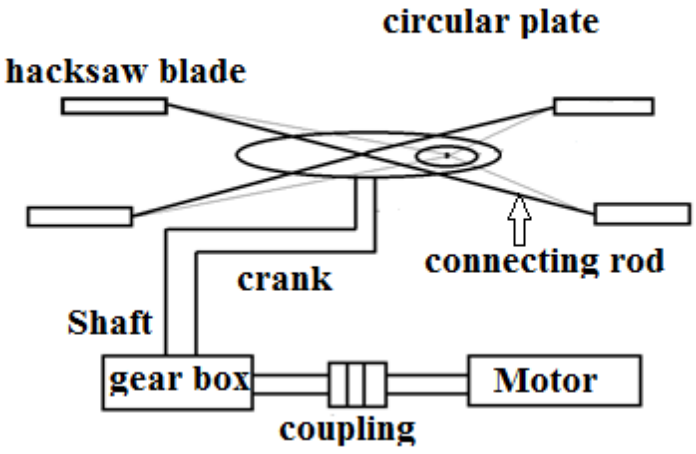
Abstract — *In this project work and effort has been made to develop a modernized four way hacksaw cutting machine and less stress full operation for cutting wood, metal and plastic materials. The aim of this work is to develop hacksaw machine that will use a less effort to produce uniform cutting PVC pipes, metals, wood. It is also done to show the performance difference between hand driven; pedal drive and four way hacksaw machines. This model implies a conversion of rotary motion of crank to reciprocating motion of hacksaw blades, which is done by using scotch yoke mechanism. This motion is used for hacksaw machine; in this model we can operate four hacksaws at same time. This model will overcome the traditional hacksaw machine which done cutting of single piece at particular time interval and also fulfills the need of more material cutting accounts to mass production. This machine works significantly with minimum vibration and jerks. This machine will also done cutting of different materials, hence the purpose models of hacksaw machines will be welcomed by many industries due to compactness and efficiency. To achieve this goal the four way hacksaw cutting machine is developed.*

INTRODUCTION

In present day many electrically operated power hacksaw machines of different companies with different specifications are available. They use them according their requirement. These machines are so precise that they can cut metal bars with minimum time. They can also cut different material bars. They have one major disadvantage that those are able to cut single piece of bar at a time.

So, it's production rate is slow. We need to achieve the mass production. For that we need to cut metal bars with higher rate. So it is impossible to depend upon convectional single frame hacksaw machine. We need to improvement in technology and design of such machines. With the help of four way hacksaw cutting machine we can cut four metal bars simultaneously. We can achieve higher production rate and mass production for maximum profit in related companies. As this machine overcomes all the limitations and drawback of convection hacksaw machines, it is also helpful for small industries due to simple working and operating conditions along with its compatibility, efficiency, and affordable price. There are many industries which used round bar or square bar to operate different machines to make machine component like shafts, bolts, screw etc.



For that we need to cut more and more number of pieces for mass production of those components. To achieve this goal four way hacksaw cutting machine is introduced. Four way hacksaw cutting machine is able to cut four pieces simultaneously with minimum jerk and vibration. This machine overcomes the limitations of convection hacksaw

machine which can cut single pieces at time. It can cut metal bar of different materials at same time and having advantage of less compatibility, reliability, and high efficiency. Now a day, industries focused on the high production rate and accuracy with less consumption of resources. To achieve this we need to minimize idle time and machine time per unit.The four way hacksaw machine overcomes all those factors by reducing time per unit and increase the production.In present day electrical as well as hydraulic operated machines are used but the output from them is not satisfactory as it has low cutting rate.

II. LITERATURE SURVEY

This paper was created by Shrikant U. Gunjal, Deshmukh Nilesh S, Musmade Sumit B, and Patil Samadhan D. The objective of this paper is to done analysis on Four-Way Hacksaw Machine and its Hacksaw blade. This paper implies conversion of rotary motion of crank to reciprocating motion of hacksaw blades, which is done by using Scotch Yoke Mechanism. This motion is used for hacksaw machine. In this model we can operate four hacksaws at the same time. This model will overcome the Traditional Hacksaw Machine which done material cutting of single piece at particular time interval and also fulfills the needs of more material cutting accounts to Mass Production. This machine works significantly with minimum vibrations and jerks. This machine will also done cutting of different kind of materials. Hence the proposed model of Hacksaw Machine will be welcomed by many industries due to compactness and improved efficiency.
They concluded that the proposed machine will aim on the limitations of single piece cutting of material at a instant of time by introducing four way cutting of material simultaneously. It is so compact that will be occupy less space, cost effective so usable in mini and large industries. As in cutting it will take less time of cutting per unit of workpiece, so machine idle time is also reduced which also encounters on improved efficiency, reliability. Also machine works on minimizing vibrations and jerks produced during cutting operation.

This paper was made by Prof. Nitinchandra R. Patel , Mohammed A. Vasanwala , Balkrushna B. Jani, Miteshkumar D. Rathwa , Ravi A. Thakkar. It state that Testing of different material blades like High Carbon Steel, Low Alloy Steel, Bi-metallic blade, High speed Steel blades for their hardness, Cutting time performance, Wear Resistance, Tensile Strength and performance under buckling. Experiment of Rockwell Hardness tester for getting Hardness Number on C-Scale for all different types of blades, so their relative hardness of teeth of different blade blades can be compared. For Cutting Performance test, Cutting of same diameter (25mm) job of different materials like Aluminium, Brass, Copper by all blades and their cutting time is noted and compared. For Wear Resistance ability, Profiles of blades-before and after cutting are developed with the help of profile projector and compared. For figuring out Tensile Strength , we carried out Tension test on Universal Testing Machine (UTM), by finding out Modulus of Elasticity (E) value and further analytical calculation can be done for finding Maximum Permissible deflection. Here, we have found out the better blade material for different materials under different mechanical consideration.
Finally, they concluded that concluded that High speed steel (HSS) has overall good properties compared to other materials of blade. Furthermore, Cutting Performance is indicated that Bi-Metallic Strip is good to cut the Alluminium& Mild steel, High Carbon Steel is good to cut Brass material. Beside this, Wear Resistance is indicated that High Carbon Steel experiences less wear for Alluminium, like Alloy steel for Brass and HSS for Mild steel.

This paper was presented by D.V.Sabariananda1 , V.Siddhartha , B.Sushil Krishnana , T.Mohanraj. The objective of this work is to automate the conventional power hacksaw machine in order to achieve high productivity of work-pieces than the power hacksaw machine using Microcontroller. The automated machine acquires two inputs from the user namely the number of pieces to be cut and the length of each piece that is required to be cut. The inputs are given by the user with the help of a keypad and an LCD display, which will help the user to verify the data given by him. The operator need not measure the length of the work-piece that is to be cut and to load and unload the work-piece from the chuck each time after a piece has been cut. After acquiring the two inputs from the user, the machine automatically feeds the given length of work-piece in to a chuck and starts to cut till the given number of work-pieces has been cut. The machine feeds the work-piece with the help of a conveyor, which is driven by a DC motor and an IR sensor ensures that the feeding stops when the specified length has been reached. A pneumatic cylinder is used for holding the work-piece when cutting operation is done. An AC motor is used to bring about the reciprocating motion required for cutting the work-pieces. There is a self-weight attached with the reciprocating mechanism to provide the necessary downward force required for penetration of hacksaw blade in to the work-piece. When a single piece has been cut, a limit switch will get triggered by the self-weight mechanism, which is sensed by the microcontroller to start the cyclic operation again provided if the specified number of work-pieces has not been cut.
Finally, they concluded that the automated hacksaw machine can be made use of at any of the industries like pump manufacturing industries that involve bulk amount of shafts that have to be cut frequently. The range of size of work-pieces that can be cut using the automated hacksaw machine can be varied by changing the blade size. Currently, the

machine uses 12 inch blade for cutting. An another advancement that can be implemented in automated hacksaw machines is that the user can also get cut work-pieces of different lengths in one cycle itself. This means that the user has to specify the number of work pieces that have to be cut in each of the different length values specified. This will be possible with the help of an advanced microcontroller than AT89C51, which should have high programmable memory.

This paper was presented by Rishi Anand, Ankit Kumar Mishra, Shubham Singh, Alok Verma. this paper presents the fabrication and concept of four way hacksaw blade machine mainly carried out for production based industries. Industries are basically meant for production of useful goods and services at low production cost, Machinery cost and low inventory cost. This project consists of a crank and slider mechanism, linear bushing .Today in this world every task have been made quicker and fast due to technology advancement but this advancement also demands huge investment and expenditure, every industry desires to make high productivity rate maintaining the quality and standard of the product at low average cost. We have developed a prototype model, we have decided to use almost 1/10 th of the scale for the system. These machines can be used in remote places where electricity is regular. It is designed as a portable one which can be used for cutting in various places. It can be used for operating on materials like thin metals, wood.
At last, they commented that a low cost and simple design four way hacksaw blade machine reduces the human effort and hence we don't need spend too much time to cut the material logs. This simple design of conventional design which can enhance day today household needs and daily day to day purposes and it can be also used in for industrial applications to make high productivity.

This paper was made by Stephen, Tambari , Dan Orawari Gloria. , Oruene W. Diabi , Ayejah Victor. The aim of this work is to develop a modernized and less stressful operation for cutting wood, metals and plastic materials. It is very useful for cutting PVC materials (pipes) and can be used widely in lather and in furniture making industries. This work can also serve as an exercising machine for fitness while cutting, it uses the principle of a slider crank mechanism which converts the rotary motion of the flywheel to the reciprocating motion of the hacksaw during pedaling. The machine was tested and continued to be very efficient with an ideal mechanical Advantage of 0.5 (less than 1), velocity ratio of 0.65 (less than 1), a power output of 5.72KW and an efficiency of 76.9%, which makes it very adequate and capable for cutting.
They tested machine for three different materials (mild steel pipes, wood and plastic pipes). The ideal mechanical advantage of 0.5, power output of 5.72KW and efficiency of 76.9% makes it very adequate and efficient as a useful machine for exercise and as a cutting machined compared to the existing ones.

III.CONCLUSION

Increasing the productivity is one of the main requirements of production engineering in any kind of manufacturing industry. Either by reducing the operation time or by improving the capability of the machine to produce the components in an increased number at the same time is very essential for an industry to achieve the same. This project employs the Scotch yoke mechanism which enables it to cut four jobs simultaneously at a time thereby improving the productivity.

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