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AUTOMATED TWO-WAY HACKSAW

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Abstract: Achieving KRA targets has currently been the main point of concern for the current government. However, this target has been centered upon the social and economic concern, which are key pillars of vision 2030 of the government of Kenya. Mass production of our innovations and produce has been the key point of generation of revenue for the country. Manufacturing is one of the key concerns of the Big 4 agenda. However, for it to be successive, it has to be implemented in large scale. However, large scale does not mean an increase in work force only. It means an increase in the rate of production. However, previous studies conducted indicate that hacksaws previously used have been cutting materials one-way. The effect of this is decrease in efficiency of production. Machines are meant to make work easier hence the pivot for this study. Therefore, this study sought to design and construct an automated two-way hacksaw that that could cut metal into various sizes and lengths using a hacksaw. The goal of this project was to reduce metal cutting labor and time to increase production. Automation now plays an important role in the global economy and in everyday industrial applications. The machine was put to use amongst many juakali artisans from Ogembo Omoringamu road, in Gucha town, Kisii County, Kenya in order to test the efficiency of this machine against the one-way hacksaw. This study analyzed data using descriptive and regression analysis. Where the work of other authors was used, due acknowledgement was done. The researcher obtained a research permit from St Angela Sengera Girls' High school and Kenya Science and Engineering Fair in order to enable collection of data. It was concluded that the efficiency of the automated two-way hacksaw is higher compared to the one-way hacksaw. This study recommends that the Juakali industry should adapt the double hacksaw to increase production in the industry that is currently a focus in achieving vision 2030.

Index Terms – Efficiency, Automation, Kenya Vision 2030

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

A hacksaw is a machine held with the hand and used for cutting plastic and metallic materials (Zoeb, 2020). Its cutting system is made of removable edges, which include sharp teeth along their external edge. As a rule, a hacksaw comprises of a metal casing that takes after a descending confronting. A handle of plastic, wood, or metal is regularly joined to one end of the casing. The edge's closures highlight customizable pegs that can

be fixed to anchor a sharp edge set up, and extricated to expel it. Hacksaw sharp edges are long, thin portions of solidified steel that element a line of teeth along their front line (Prashant, 2015).

Various hacksaws of different brands with different specifications are now offered for workshop use (Dharwa, 2013). These machines are so precise that they can cut metal bars made of many different materials in a short time, but they have one major drawback: they can only cut two bars at a time. Metal rods need to be cut at a rapid rate for industries to achieve mass production. As a result, traditional single-frame hacksaws are unreliable, requiring advances in technology and design (Sreejith, 2014).

Two metal bars can be cut simultaneously using this two-way hacksaw, resulting in high cutting speeds and mass production for maximum profit for the businesses involved (Linder & Armero, 2009). Due to its simple operation, this machine is also very useful for small businesses, as it eliminates all the limitations and disadvantages of a traditional hacksaw. To do this, we need to reduce downtime and machine time per unit. By reducing time per unit and increasing productivity, the two-way hacksaw improves on these factors (Leonel, Venturini, & Chateauneuf, 2011).

1.2 Statement of the problem

There are many electrically operated power hack saw machine of different configuration available for the use in machine shop. These machines can cut rods of different material precisely at very fast rate but they can cut rods of one material at a time, which means they cannot be able to cut dissimilar material at a same time. Now in industry, it is necessary to cut metal bars with very high rate to achieve mass production requirement. So there is need to move for a new technology which gives us a mass production with less time and less energy input. It is impossible to depend upon conventional hacksaw machine. By using this two way hack saw machine, two metal bars, pipes or rods can be cut simultaneously to achieve high speed cutting rate and mass production for maximum benefits in manufacturing industries.

1.3 Objectives of the study

1.3.1 General Objective of the study

To construct an automated two-way hacksaw that can cut dissimilar items simultaneously.

1.3.2 Specific Objectives of the study

i. To design and build an automatic two-way hacksaw that could cut metal into various sizes and lengths.

ii. To reduce metal cutting labor and time to increase production.

1.4 Research Hypothesis

i. An automatic two-way hacksaw cuts metal into various sizes and length.

ii. An automatic two-way hacksaw reduce metal cutting labor and time.

1.5 Research question

i. Can an automatic two-way hacksaw cut metal into various sizes and length?

ii. Can an automatic two-way hacksaw reduce metal cutting labor and time?

1.6 Variables of the study

The independent variable in this study is the type of hacksaw while the dependent variable is the time and length of metal cut.

1.7 Merits of the study

i. It reduces the work of labor.

ii. Easy to make because of simple construction.

iii. High production rate.

iv. Maintenance is Easy and cost for it is less.

v. It withstand all atmospheric effects.

vi. Efficient operation

1.8 Scope of the Study

This study investigated the effectiveness of the automated double hacksaw in minimizing time wastage in production. The study was conducted from the month of May to December 2022 a period of seven months. The study concentrated on the Ogembo Sengera road in Gucha sub county, Kisii County, Kenya.

1.9 Organization of the study

The study is divided into five chapters. Chapter 1 brings out the introduction to this study. This chapter will include the background of the study, the statement of the problem, the research objectives, the hypothesis, the

significance, the scope and the limitations of the study. Chapter 2 will entail the Literature review of the study while Chapter three of the study will have the research methodology of this study. Chapter 4 will include the Data analysis and discussion while chapter 5 will entail the conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter is divided into three parts, which include the introduction, the empirical literature review, and a summary of the empirical literature review. A critical review of previous literature contributions by other scholars is also presented through the empirical literature review. A summary of the empirical literature reviewed is presented in tabular form in order for the research gaps to be unfolded, hence providing a knowledge gap for the current study.

2.2 Empirical Literature Review

Zoeb (2020) expressed that, Industries are essentially implied for generation of valuable merchandise and enterprises at low creation cost, Machinery cost and low stock cost. The author continues to argue that industries are the focal point of an economy and must therefore be able to have mass production. Therefore, modern automated production machines must be provided to ensure mass production is achieved. This study sought to boost mass production by constructing an automated two-way hacksaw.

Bahaley, Awate & Saharkar (2012) expressed that automated power hacksaw machine gives high efficiency compared with the ordinary power hacksaw machines. The real preferred standpoint of this machine is that the intercession of work is lessened to greatest level. In this fast developing modern economy, the utilization of the automated two-way Hacksaw machine is wide. Time and work is significant in maximizing production. The testing of hacksaw sharp edge in light of mechanical properties expressed that the suitable saw edge must be chosen for better activity and fine cutting by choosing number of teeth per inch. This study therefore sought to use the same number of teeth per inch to test the effectiveness of the ordinary hacksaw and the automated power hacksaw. This study also constructed an automated hacksaw which cuts two-way.

2.3 DESCRIPTION OF COMPONENTS

2.3.1. Motor

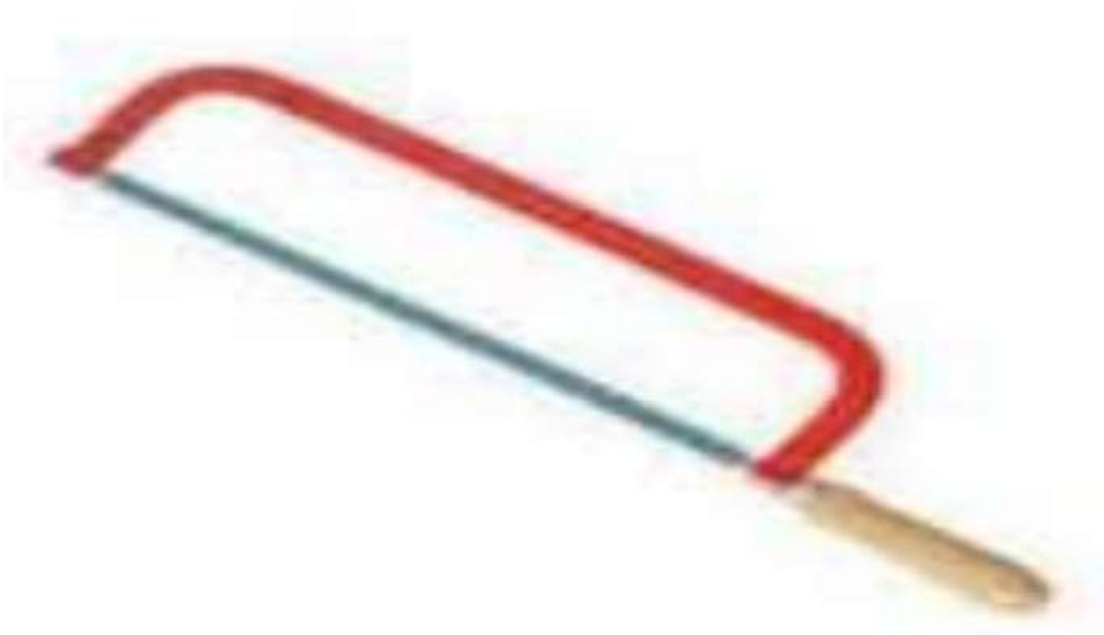
According to Dharwa (2013), the feedback motion of the hacksaw blade, due to which cutting occurs, is provided with the help of a motor, which acts by a principal component to change the rotation of the key in the switch. Feedback motion of the edge of the hacksaw. The motor is started after the workpiece has been permanently fixed in the pneumatic thrower. Motor torque is increased by transmitting power to the pulley by means of a belt drive.

Fig 2.1 Motor

2.3.2 Hacksaw Blade

According to Linder and Armero (2009), the edges of the Hacksaw are bimetallic. In a hacksaw like most box saws, the edge can be attached with the teeth pointing towards or away from the handle, resulting in a cut. It works on push or pull stroke. In typical use, the user cutting up and down using the hacksaw blade must adjust their standing or sitting positions to cope with the advances. Some box saws, including head saws and hole saws, have their sharp edges facing the handle because they are used for cutting by pulling on a flat surface, using a loaded tool.

Fig 2.2 Hacksaw



2.3.3 V-Belt

According to Leonel, Venturini, and Chateauneuf (2011), belt is a loop of flexible material used to mechanically connect two or more rotating shafts, usually parallel. Belts can be used as a source of motion, for efficient energy transfer, or for relative motion tracking. The belts are wound on the pulley and there can be twist between the pulleys and the shafts need not be parallel.

Fig 2.3 V-belt

2.3.4 Pulley

According to Sreejith (2014), a pulley is a wheel on an axle or shaft that is designed to help in motion and alternate path of a taut cable or belt, or switch of electricity among the shaft and cable or belt. In the case of a pulley supported via way of means of a body or shell that doesn't switch electricity to a shaft,

however is used to manual the cable or exert a force, the helping shell is known as a block, and the pulley can be known as a sheave.

Fig 2.4 Pulley

CHAPTER THREE

METHODOLOGY

3.1 Materials

- Motor
- Pulley
- Square tube
- Shaft
- V-Belt
- Nut bolt
- Circular plate
- Hacksaw
- Angle
- Fabrication

3.2 Costing of Equipment

Table 3.1 Costing of Equipment

MATERIAL	QUANTITY	COSTING
Motor	1	3000
Pulley	1	800
Square Tube	2	1500
Shaft	1	200
V Belt	1	300
Nut Bolt	20	100
Circular Plate	1	200
Hacksaw	2	400
Angle	2	500
Fabrication	-	3000
Total		10,000

3.3 Design

Fig 3.1 Motor Design

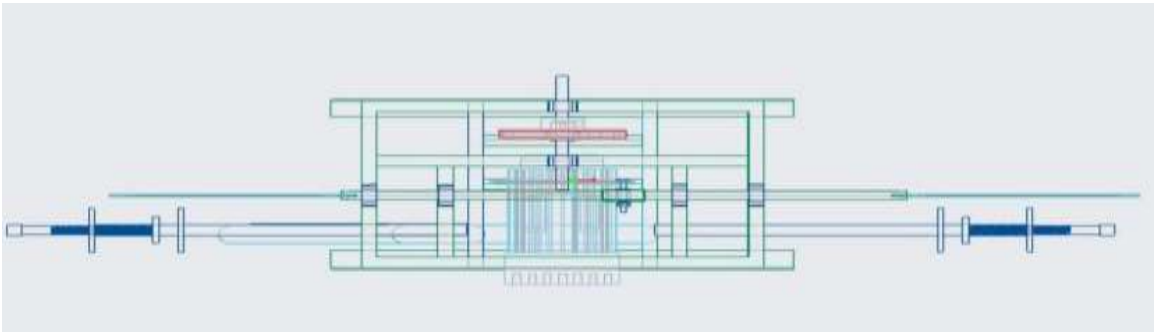


Fig 3.2 Motor Design

3.4 Construction

The machine has the main motor at the bottom of the machine. The pulley is attached to the body at the top and bottom of the side section. The pulley is connected to the disc type plate. The pulley and disc have separate connections with a small metal rod through the bushings. The motor and the pulley are connected by a V-belt. The clamp is fixed to the disc and to the ends of the two shafts. Saw connected to each shaft at the end.

Fig 3.3 During construction

3.5 After construction

Fig 3.4 After construction

3.6 Precautions

i. Use safety goggles, a visor, or a face shield when working.

ii. Ensure the plastic or metal you are cutting is firmly in place.

3.7 Limitations and constraints

- Does not work without power.
- Measures can be put in place to have a battery to act as a substitute in case of power loss.
- Produces a lot of noise, hence should be used in an outside environment.

3.8 Effects of change on parameters

The hacksaw is designed to cut metals of equal lengths at one time. However, the user may wish to have the two metals to be cut to have different lengths. The microcontroller AT89C51 can get cut work-bits of various lengths in a single cycle itself.

CHAPTER FOUR

DATA AND DATA DISCUSSION

4.1 Data collection

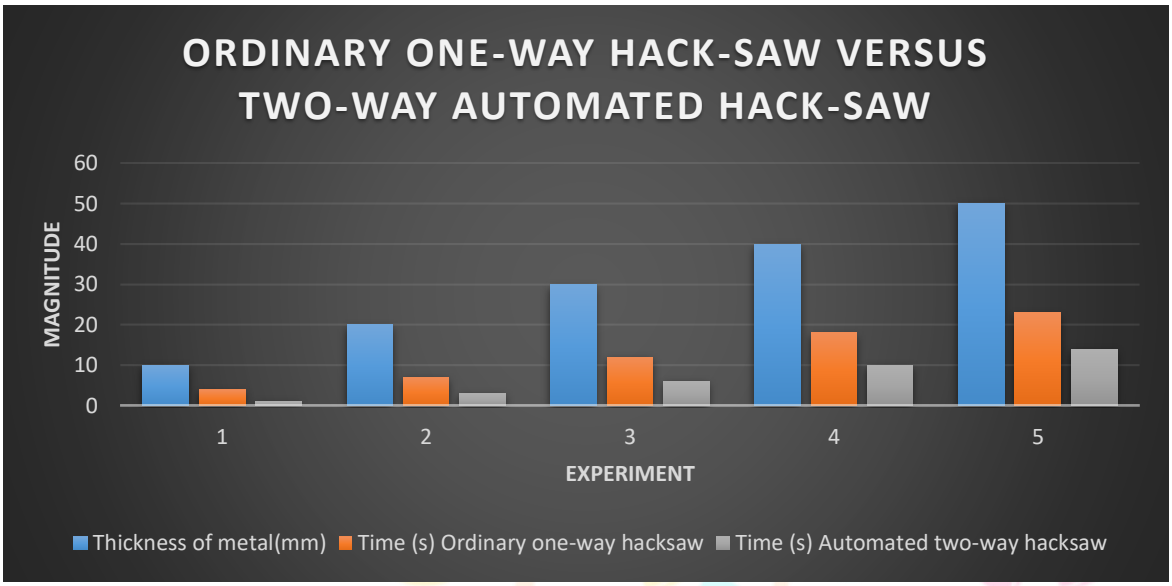
This chapter discusses the methods that were used in the data collection process. This involved a case study of five different sizes of metals that were cut by the ordinary hacksaw and the automated two-way hacksaw.

4.2 Data analysis

Table 4.1 Time taken to cut metals

Thickness of metal (mm)	Time (s) Ordinary one-way hacksaw	Time (s) Automated two-way hacksaw
10	4	1
20	7	3
30	12	6
40	18	10
50	23	14

Fig 4.1 Time taken to cut metals



4.3 Data Discussion

From the results obtained in Table 4.1 and Fig 4.1, the time taken to cut the metals reduces when the two-way automated hack-saw is used compared to when the ordinary one-way hack-saw is used . These results indicate that the automated hacksaw is more efficient compared to the ordinary one-way hacksaw.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

From the results observed in chapter IV above, the two-way hacksaw can endure the vibrations, no dangers from jerk, no exceptional preparation expected to work it. Other hacksaw machines can cut each part in turn however; this machine can cut two sections all at once. This hacksaw machine has lighter weight contrast with other machine. The cost of the machine is less and the construction is simple and reasonable for all business. With this data, the study has proved the hypothesis, answered all the research questions and achieved all the specific objectives.

5.2 Recommendations

This study recommends that the Jua kali industry should adapt this model in large-scale production to ensure there is large-scale production of equipment because of fast cutting as enhanced by the automated two-way hacksaw.

5.3 Future directions

The study will in future include progressed microcontroller AT89C51, which ought to have high programmable memory. The microcontroller AT89C51 can get cut work-bits of various lengths in a single cycle itself. This implies the user needs to indicate the quantity of workpieces that must be cut in every one of the distinctive length esteems determined.

REFERENCES

Zoeb K., (2020), "*Design and Fabrication of Human Powered Wood Cutting machine*" ,International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169 Volume: 3 Issue: 2072– 074.

Kshirsagar P.R., (2015), "*Theoretical Analysis of Multi-Way Power Hacksaw Machine*", International Journal of Research in Advent Technology, Vol.3, No.4, April E-ISSN: 2321-9637.

Sreejith K., (2014), "*Experimental Investigation of Pedal Driven Hacksaw*", Research Inventory: International Journal of Engineering And Science Vol.4, Issue 7, PP 01-05 Issn (e): 2278-4721, Issn (p):2319- 6483 [8]

Dharwa C.K., (2013), "*designed and developed a multipurpose machine which does not require electricity for several operations like cutting, grinding*", International Journal for Technological Research in Engineering (Vol.1, Issue.1, ISSN: 2347-4718).

Bahaley, S.G., Awate, A.U., & Saharkar, S.V., (2012) "*Performance Analysis of Pedal Powered Multipurpose Machine*", International Journal of Engineering Research and Development (IJERD) (Vol.1, Issue.5,ISSN:2278-0181).

Leonel, E.D., Venturini, W.S., & Chateauneuf, A., (2011). *A BEM model applied to failure analysis of multi-fractured structures*. Eng. Fail. Anal. 18, 1538–1549 [20]

Linder, C., & Armero, F., (2009). *Finite elements with embedded branching*. Finite Elem. Anal. Des. 45 (4), 280–293

APPENDICES

APPENDIX I: LETTER TO THE RESPONDENT

Dear Respondent,

I am currently a teacher at St Angela Sengera Girls' High School, Kenya. My Science club students are currently carrying out a research study on a project whose topic is:

"AUTOMATED TWO-WAY HACKSAW".

I therefore request for your information and cooperation in this exercise. All information will be treated with confidentiality.

Yours with regard

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