

---

**FACULTY OF ENGINEERING**

**DEPARTMENT OF MINING AND WATER RESOURCE ENGINEERING**

**DESIGN AND CONSTRUCTION OF A HAND DRIVEN SINGLE HOIST SYSTEM FOR  
ARTISANAL MINERS**

**(CASE STUDY; TIIRA PARISH)**

By;

AINOMUT SARAH

BU/UG/2012/1802

Tel: +256 784962265/ +256 756330886

EMAIL: [ainomuts@gmail.com](mailto:ainomuts@gmail.com)

Supervisor: Nasasira Hillary



A project proposal submitted to the Department of Mining and Water Resource Engineering in partial Fulfillment of the Requirement for the A ward of a Bachelor of Science Degree in Mining Engineering.

May 2016

## **ABSTRACT**

Artisanal mining in Uganda has seen a great rise in the last three years; this rise is currently boosting extraction of ore by majorly resuing mining method where their productivity is majorly affected by ore conveyance to the surface as majority uses the traditional methods of rope pulling, suck and basin carrying. Due to growth of technologies requested higher performance machine in order to fulfill human needs and market. This machine is implement to make human work easier besides can reduce the use of human power because of its potential application. Earlier on people would carry manually using basins, sucks and pull using the rope at a time and while returning it does not give any useful work. So with this disadvantage thought of attaching a bucket on the hoist operated by one crank shaft, when one bucket moves up with the ore and goes back empty without a person carrying it to pick more. The machine is based on the principle of lifting machine which can elevate a variety of bulk materials from light to heavy depending on the size, weight, and nature of the load to be moved.

Therefore this project is aimed at design and construction of a hand driven single hoisting system to improve on the productivity and Specific objectives are to design the various components of the proposed machine, assemble, test and evaluate the economic feasibility of the machine.

In this design, measurement and experimentation is to be considered, specifically on rock factors such as; average ore size. Experiments will be carried out on the single hoist system which will help in the rotation design. The prototype is to be constructed by welding and bolting with the provision of manual power unit, tested for its lifting efficiency, output capacity and cost benefit analysis

**Keywords:** Bucket conveyor, Material handling equipment

**DECLARATION**

I, Ainomut Sarah registration number BU/UG/2012/1802 hereby declare that this project work presented is my original work except where explicit citation has been made and it has not been presented to any institution of higher learning for any academic award.

Sign: ..... Sarah. ....

Date: ..... 19<sup>th</sup> / 05 / 2016 .....



**APPROVAL**

This is to certify that the project work under the title “Hand driven single hoist System” has been done under my supervision and is now ready for examination.

Mr. Nasasira Hillary

Supervision

Sign: .....

Date: .....

## ACKNOWLEDGEMENT

Great thanks go to the Almighty God for continuously sustaining me until this report work neatly emerges out.

I also extend my sincere appreciation to my family members. They have been there for me amidst all challenges. In scarcity of resources, they have sacrificed their time, spared their advice and the very last of their property for me. Surely, there is nothing I can give to pay them other than praying for God's providence and blessings upon them.

I extend my gratitude to all my Lecturers at the Faculty of Engineering, Department of Mining and Water resource Engineering, who have equipped me with academic knowledge that has guided me to succeed in my studies for the four academic years.

Great thanks go to my supervisors Mr. Nasasira Hillary, Mr. Mukiibi Ivan and Mr. Kilama George for their support and advise through the project, Mr. Nagyo, Mr. Oguuma, Mr. Okaude (workshop department) for their advice and hard work/support with the drawings of my project and hence design and construction of the prototype and finally the staff of the workshop for the knowledge and skills they have provided me with.

My fellow students in the struggle to achieve the project effectively and the spirit of team work and cooperation was their unique trait. Great thanks go to Opiyo Kennedy, Byiakatonda Marvine, Kintu Anthony, Erimu Ivan, Mwima Francis and Okerenyang Samuel.

## TABLE OF CONTENTS

DECLARATION .....	ii
APPROVAL .....	iii
ACKNOWLEDGEMENT .....	iv
TABLE OF CONTENTS .....	v
TABLE OF FIGURES .....	viii
CHAPTER ONE .....	1
1.0 INTRODUCTION .....	1
1.1 Background .....	1
1.2 Problem statement .....	2
1.3 Objective .....	2
1.3.1 Main objective .....	2
1.3.2 Specific objective .....	3
1.4 Justification .....	3
1.5 Significance .....	3
1.6 Scope of the study .....	3
CHAPTER TWO: LITERATURE REVIEW .....	4
2.0 LITERATURE REVIEW .....	4
2.1 Hoisting system .....	4
2.2 Review of the existing hoist system .....	6
2.2.1 Review of Existing winch Type .....	7
2.3 Lifting Machine .....	8
2.4 Constructional Features of the single hoist Machine .....	8
2.4.1 Electric Motor .....	8

2.4.2	Reduction Gear Box.....	9
2.4.3	Rope Drum.....	9
2.4.4	Ball Bearing .....	10
2.4.5	Plumber Block .....	10
2.4.6	Nut and Bolt.....	10
2.4.7	Hook.....	11
2.4.8	Belt and Pulley.....	11
2.4.9	Electric Switch.....	12
CHAPTER THREE: METHODOLOGY .....		13
3.0	METHODOLOGY .....	13
3.1	Assumptions.....	13
3.2	Designing of the various machine components.....	13
3.3	General Description of the Machine and working principles .....	13
3.4	Material selection.....	13
3.4.1	The prime mover.....	16
3.4.2	Design of the Chain Drive .....	16
3.4.3	Determining the Velocity Ratio of the Chain Drive .....	16
3.4.4	Selecting the minimum number of teeth on the smaller sprocket & determining the number of teeth on the larger sprocket .....	17
3.5	Determining the Design Power.....	18
3.5	Determining the pitch circle diameters and pitch line velocity of the smaller sprocket	20
3.5.1	Determining load exerted on the Chain .....	21
3.5.2	Determining the Factor of Safety.....	21
3.6	The main frame .....	23
3.7	Determining the design torque.....	24

3.8	Determine the force required to hoist the ore.....	24
3.9	Suck.....	25
3.10	Bearing selection.....	26
3.11	Shaft Design Consideration.....	27
3.12	Fabrication of the machine components.....	29
3.12.1	Testing the efficiency of the machine.....	30
3.15	Determining capacity of the machine.....	31
3.13	To carry out the economic feasibility of the machine.....	31
4.0	RESULTS AND DISCUSSIONS.....	33
5.0	CONCLUSION AND RECOMMENDATION.....	34
5.1	Conclusion.....	34
5.2	Recommendations machine is suit.....	34
	REFERENCES.....	35



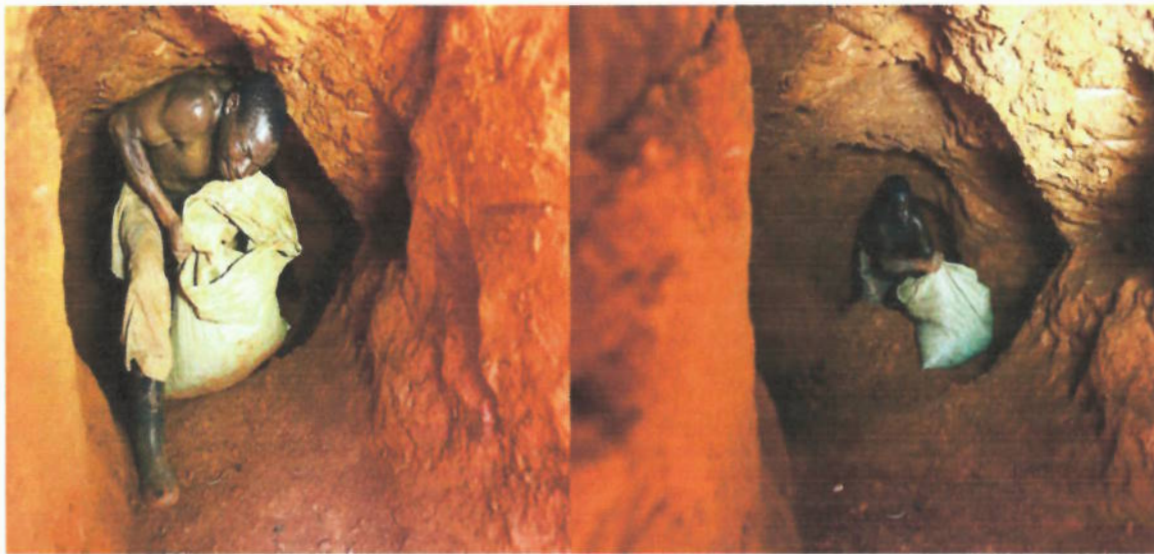
## TABLE OF FIGURES

Figure 1: showing ore conveying to the surface using sacks in Tiira parish.....	2
Figure 2: Single acting winch type elevator (Piezo-energy 2015).....	7
Figure 3: Electric motor (Piezo-energy 2015) .....	9
Figure 4: Reduction gear box (Piezo-energy 2015).....	9
Figure 5: Rope drum (Piezo-energy 2015) .....	9
Figure 6: Ball bearing (Piezo-energy 2015).....	10
Figure 7: Plumber block (Piezo-energy 2015).....	10
Figure 8: Nut and bolt (Piezo-energy 2015) .....	10
Figure 9: Wire rope (Piezo-energy 2015) .....	11
Figure 10: Hook (Piezo-energy 2015) .....	11
Figure 11: Belt and pulley (Piezo-energy 2015).....	12
Figure 12: Electric switch (Piezo-energy 2015) .....	12
Figure 13: Design of the chain Drive.....	16
Figure 14: A free body diagram represent a shaft supported by bearings at the ends .....	28
Figure 15: Fabrication of a hand driven single hoist system .....	30

## LIST OF TABLES

Table 1: Shows the physical properties of selected metals.....	14
Table 2: Number of teeth on smaller sprocket.....	18
Table 3: Power rating (Kw) of simple roller chain.....	19
Table 4: Characteristics of roller chains according to IS: 2403-1991 .....	20
Table 5: Factor of safety (n) for bush roller and silent chains .....	22
Table 6: Mechanical properties of steel used for shaft .....	27
Table 7: Results for determination of time taken to lift ore.....	33

The reasons that many unemployed youth and individuals are migrating to the gold rich district in search of a 'golden' opportunity or enter ASM are varied and include both push and pull factors. In Africa, increased participation in ASM has been linked to a decline in the viability of agriculture, poverty, conflicts, natural disasters and economic crisis. (Banchirigah, S.M. and G. Hilson, 2010). Pull factors that encourage people to enter this sector include the potential for high profits or gold-rush type situations. (Hruschka, F. and C. Echavarria, 2011)



**Figure 1: showing ore conveying to the surface using sacks in Tiira parish**

## **1.2 Problem statement**

The artisanal miners have tried to extract the gold with rudimentary methods of conveying ore to the surface but end up with low productivity and drudgery.

## **1.3 Objective**

### **1.3.1 Main objective**

To design and construct a hand driven single hoist system for artisanal miners