

www.busitema.ac.ug



FACULTY OF ENGINEERING

DEPARTMENT OF MINING AND WATER RESOURCES ENGINEERING

ANALYSING DIRECT SMELTING AS AN ALTERNATIVE TO AMALGAMATION METHOD OF GOLD EXTRACTION.

(Case study: Syanyonja, Busia District)

BY

ATUHEIRE VICTOR

REG. NO: BU/UG/2015/33

EMAIL: atuhevic33@gmail.com

TEL: 0773720470

SUPERVISOR: MR. NASASIRA MICHEAL BAKAMA

A final year project report submitted to the department of water resources and mining engineering in partial fulfillment for the award of the Bachelor of science in mining engineering degree of Busitema University

DECLARATION

I, ATUHEIRE VICTOR BU/UG/2015/33, hereby declare that this report is the work of my
hands and this research has never been presented by any person or institution for an academic
award.
Signature:
Date:/

APPROVAL
This work has been compiled with the guidance and consultation from my supervisor.
Supervisor
Mr. NASASIRA MICHAEL BAKAAMA
Signature

Date...../....

DEDICATION

I dedicate this report to my family for the tireless efforts to see me reach this level. May the good lord reward you abundantly.

ACKNOWLEDGEMENT

I am very grateful to the Almighty God for the guidance and good health he has provided to me and for enabling me reach this year of study.

Sincerely appreciations to my supervisor Mr. Nasasira Michael for his continuous effort in guiding me through final year project report writing. May the good Lord bless you.

I would like to thank the staff in the department of Mining and Water Resources engineering Busitema University especially for their guidance and support during my study and thesis writing.

I would also like to thank my parents, brothers, sisters and friends for their financial, emotional support during this period. May the Lord reward you.

I would also like to appreciate my classmates at large for their guidance and cooperation throughout proposal writing. May the Almighty God bless you and reward you all.

Table of Contents

D	ECL	ARAT	TION	i		
A	PPRO	OVAL	<i></i>	ii		
D	EDIC	CATIO	ON	iii		
A	CKN	OWL	EDGEMENT	iv		
T	Γable of figures.					
1	C1	НАРТ	TER ONE.	4		
	1.1	Bac	kground	4		
	1.2	Pro	blem statement	6		
	1.	2.1	Specific objectives.	7		
	1.3	Sig	nificance of study Error! Bookmark not defin	ed.		
	1.4	Just	tification of study	7		
	1.5	Sco	ppe of the study.	7		
	1.	5.1	Conceptual scope.	7		
	1.	5.2	Geographical scope	7		
	1.	5.3	Time scope	7		
2	LITERATURE REVIEW			8		
	2.1	Art	isanal and small-scale mining.	8		
	2.2	Me	rcury	8		
	2.3	The	amalgamation/heating/smelting process.	8		
	2.4	The	e Direct Smelting Technique	. 10		
	2.5	Pre	treatment of concentrates	. 10		
	2.6	Fie	ld trials on direct smelting	. 11		
	Resu	ılts an	d discussion.	. 12		
	Fuel	s used	l in direct smelting	. 13		
	Sr	neltin	g of Sulphidic concentrates	. 14		
	E	conon	nic considerations	. 15		
3	C1	НАРТ	TER THREE	. 16		
	3.1	ME	THODOLOGY	. 16		
	3.	1.1	Data collection methods	. 16		
	3.	1.2	Materials and equipment.	. 16		
	3.	1.3	Methodology for objective one.	. 17		

	3.1.4	Methodology for objective two	17
	3.1.5	Methodology for objective three.	21
4	RESUI	LTS AND DISCUSSION	22
	4.1 Re	sults	22
	4.1.1	Assessment of the current processing techniques	22
	4.1.2	Results for the amalgamation and direct smelting process	
	4.1.3	Comparison of recovery and time taken.	
	4.1.4	Economic analysis	
5	Conclu	sions and recommendations	25
	5.1 Co	nclusions	25
	5.2 Re	commendations	25
6		RENCES	

Table of figures.

Figure 1:The amalgamation process showing (a) the clean gold concentrate (b) vigorous				
nixing after addition of mercury (c) separation of amalgam from sands (d) ball of				
amalgam	9			
Figure 2: Gold particles glued together by mercury (Styles et al., 2010)	9			
Figure 3: Photomicrographs showing the conversion of pyrite to hematite during	roasting			
(a) pyrite particle in the concentrate (b) partially oxidized pyrite with a boundary	y of			
hematite (reddish) after 5 min roasting (c) pyrite in an advanced stage of convers	ion to			
hematite after roasting for 10 min (d) hematite produced after 20 min.	11			
Figure 4 A picture of the sika bukyia (Amankwah et al., 2010)	11			
Figure 5 Temperature profiles for both charcoal and palm kernel shells	14			