



**BUSITEMA
UNIVERSITY**
Pursuing Excellence

FACULTY OF ENGINEERING

**DEPARTMENT OF MINING & WATER RESOURCES
ENGINEERING**

FINAL YEAR PROJECT

**DESIGN AND CONSTRUCTION OF AN ACTIVATED CARBON THERMAL
REGENERATION KILN FOR SMALL SCALE GOLD OPERATORS.**

(CASE STUDY: OPTIMA MINES AND MINERALS LIMITED, KITUMBI SUB-COUNTY, KASSANDA DISTRICT)

BY

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A final year project proposal 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 at Busitema University.

ABSTRACT.

The economic feasibility of processes using granular activated carbon for the recovery of precious metals or the purification of water and waste-water is contingent upon re-use of the carbon in multiple adsorption regeneration cycles. Different techniques, both chemical and physical have been used and developed to restore the activity of a spent (exhausted) activated carbon.

Various chemical methods can effectively restore the activity of spent carbon from which only single or defined adsorbates need to be removed or recovered. In such cases, appropriate solvents and/or chemicals are used to specifically desorb the adsorbates in question. However, chemical regeneration can restore only partial activity to carbon that is loaded with a heterogeneous mixture of adsorbates such as those normally present in industrial process streams or effluents.

(Rogans & Director, 2012) have pointed out that, while chemical regeneration may restore sufficient activity to the carbon for a few cycles of effective operation, comprehensive thermal regeneration must be applied at regular intervals to restore complete activity. Thermal regeneration effectively restores the activity of carbons loaded with organic adsorbates.

Thermal regeneration is very expensive in Uganda, making it hard for small scale gold processing operators to access it. Currently in Uganda, there is no facility that is totally committed to regeneration of exhausted activated carbon for gold processing companies. In this case, these people have resorted to rudimentary ways of regeneration. These methods are totally inefficient, time consuming and unsafe to the operators.

This project will be limited designing and constructing an exhausted activated carbon thermal regeneration kiln that is efficient, cheap, clean and time friendly so as to solve this problem that has hindered gold production in Uganda.

ACKNOWLEDGEMENTS.

I would like to extend my sincere thanks to the almighty GOD who has gifted me with life and has enabled me to reach this academic height as he has been the provider of all the necessary requirements. Great thanks go to my beloved family, my father Dr. STANLEY BALUKU, my mum RUTH KAHWA, my brother STACEY BWAMBALE, my sisters BIIRA SERENA, MUHINDO SHEILA, AGABA JUDITH, BIIRA MERESI and KABUGHO ESTHER. Let me convey my heartfelt appreciation to my supervisor, Mr. EDSON NUWAREEBA for his advice as well as his guidance during the preparation of this paper (FINAL PRESENTATION STAGE). As well I convey my sincere appreciations to the management of OPTIMA MINES AND MINERALS LIMITED for granting me access to the mine plant so as to carry away the spent exhausted carbon for purposes of research.

DECLARATION.

I **KAMBERE COMFORT STUART**, declare that all the material portrayed in this final project report is original and has never been submitted in for award of any Degree, certificate, or diploma to any university or institution of higher learning.

DATE

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SIGNATURE

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APPROVAL.

This is to certify that the final project report has been carried out under my supervision and this report is ready for submission to the Board of examiners and senate of Busitema University.

Mr. NUWAREEBA EDSON

Signature.

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Date

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CHAPTER ONE.

This chapter elaborates the relevant information about the background of the project, problem statement, justification, objectives, significance and the scope of the design.

BACKGROUND OF THE PROJECT.

Small-scale mining is often used interchangeably with artisanal mining, with acceptance that there is no consistent global definition for the terms. Broadly, small scale mining refers to the exploitation of marginal or small deposits of minerals by individuals, groups or organizations with minimal or no mechanization. Small scale mining (SSM) is one of the emerging economic activities providing alternative livelihoods globally with more than 13 million artisanal and small-scale miners and about 150 million people indirectly reliant on it.

Mining is an important economic activity that underpins the livelihoods of many people worldwide. In Sub-Saharan Africa, Uganda inclusive the focus has traditionally been on largescale mining of oil, gas and mineral resources that have tended to benefit the elite, often adding very little value to the sustainable growth of economies.(Nabaasa & Ngaka, 2012)

In Uganda, Artisanal and Small-Scale Gold Mining is on the increase and is largely a poverty-driven activity used as a coping mechanism with thousands of local communities currently engaged in the mining practice (MEMD, 2011). The communities in the mining sites live in deplorable sanitary conditions, use toxic chemicals such as mercury in the gold extraction and have severely degraded fragile ecosystems that support their livelihoods.(National Environment Management Authority, 2012)

Gold recovery by cyanidation is increasingly becoming popular among small scale gold processing operators in Uganda. It is a more productive because unlike amalgamation method, it even recovers gold attached on gangue particles.(Hylander et al., 2007)The gold cyanide complex (pregnant solution) formed is processed by either using zinc dust or activated carbon to recover non refractory gold.

Optima mines and mineral has adopted the gold recovery by cyanidation through employing the Carbon in Pulp (CIP) method. This is the major gold recovery system at the plant. However effective the system is, it still has short comings like maximum usage of electrical power, constant need for fresh activated carbon and high material handling costs.

But, activated carbon eventually loses its adsorption properties after being used for quite a number of times (exhaustion). This calls for thermal regeneration of the Granular Activated Carbon.(Guo & Du, 2012). For a longtime this has been a tricky part in small scale gold processing in Uganda because it's both very expensive to regenerate and to buy fresh un used activated carbon. However, some operators have come up with rudimental methods of regenerating by either burning the carbon in an inert environment using a hard steel container or by roasting the carbon granules on a steel tray at 800⁰c. The later method leads to severe carbon loss due to the presence air that leads to the formation ash. Currently in Uganda there is no facility that is dedicated to commercial regeneration of exhausted carbon for small scale gold mine operators.

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