



FACULTY OF ENGINEERING

DEPARTMENT OF MINING & WATER RESOURCES ENGINEERING

FINAL YEAR PROJECT

**DESIGN AND FABRICATION OF AN ELECTRIC POWERED ACTIVATED CARBON  
THERMAL REGENERATION KILN FOR SMALL SCALE GOLD MINERS.**

*(CASE STUDY: GREENSTONE RESOURCES LIMITED, TIIRA SUB-COUNTY, BUSIA  
DISTRICT)*

**BY**

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**A final year project report submitted to the Department of mining engineering in partial fulfillment for the award of the Bachelor of Science in Mining Engineering degree at Busitema University.**

**ABSTRACT.**

Granular activated carbon methods that purify water or recover precious metals depend on the carbon's ability to be reused in numerous adsorption regeneration cycles in order to be economically viable. To revive the activity of a used-up (exhausted) activated carbon, various methods, both chemical and physical, have been employed and developed.

When only one or a few specific adsorbates need to be removed or recovered from spent carbon, a variety of chemical techniques can successfully restore its activity. In these situations, the proper solvents and/or chemicals are applied to specifically desorb the in-question adsorbates. Biochemical regeneration, however, can only partially activate carbon that has been loaded with a heterogeneous combination of adsorbates, like those that are typically 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.

In Uganda, thermal regeneration is too expensive, making it difficult for small-scale gold processors to use it. At the moment, no facility in Uganda is entirely dedicated to the thermal regeneration of used activated carbon for gold processing industries despite its proved high efficiency. These people have used crude regeneration techniques in this instance. These procedures take a lot of time, are completely ineffective, and are risky for the operators.

In order to address the issue that has impeded Uganda's gold production, this project will be restricted to designing and building an electric powered activated carbon thermal regeneration kiln that is effective, affordable, clean, and time-friendly.

**KEY WORDS: granular activated carbon, exhaustion, thermal regeneration, electric kiln**

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**DECLARATION.**

I **ATHIENO OLIVE FLORENCE**, 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

.....

**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.

.....

Date

...../...../.....

**DEDICATION**

I dedicate this work to my loving family; my parents and siblings; Peter, Beatrice, Francis, Kevin and Pius. I also in a special way dedicate it to my best friend, Eng. Jacob Egau.

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## 1.0 CHAPTER ONE.

This chapter contains the background of the study, problem statement, objectives of the study, justification and scope of the study.

### 1.1 BACKGROUND.

#### Globally

In many parts of the world, artisanal or small-scale mining (ASM) activities are as important as large-scale mining activities, particularly in terms of the numbers of people employed.

Irrespective of one's perspective of whether or not the sector is a net contributor to sustainable development, the fact remains that small-scale and artisanal mining activities will continue for at least as long as poverty continues to necessitate them. It is therefore essential that effort be made to maximize, the benefits brought and enabled by small-scale mining, and to mitigate the cost. (Mining et al., 2019)

According to a recent survey carried out by ILO and MMSD, at present we can reckon with around 13 million people working directly in small mines throughout the world, mainly in developing countries. A large percentage of these miners are women, and regrettably, also children. (Hentschel, 2021)

The international development community is discussing the ASM sector now for about 30 years. Many changes and progress in issues and research have occurred since then. In the last 10 years the international donor agencies have recognized the close relation of ASM to poverty and the ASM sector are gaining more and more attention. ASM is now in agendas of many national governments and of bilateral and multilateral donor organizations and different assistance programs have been or are carried out.

#### Uganda

In Uganda, artisanal and small-scale gold mining is expanding and getting better every day. It is mostly a coping strategy for those who are now involved in the mining industry. (MEMD, 2011).

Recovering gold which is one of the precious metals in solution form by cyanidation method is slowly being adopted by the small-scale miners in preference to the amalgamation method during ore processing activities. It is a more productive because unlike amalgamation method, it even recovers gold attached on gangue particles. (Hylander et al., 2007). In order to recover non-refractory gold, the gold cyanide complex (pregnant solution) is treated using either zinc dust

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