



**BUSITEMA  
UNIVERSITY**  
*Pursuing Excellence*

**FACULTY OF ENGINEERING.**

**DEPARTMENT OF WATER RESOURCES**

**ENGINEERING.**

**FINAL YEAR PROJECT.**

**INVESTIGATING THE EFFECTIVENESS OF  
POLYPROPYLENE CEMENT BAGS IN REINFORCING  
CONCRETE.**

**BY**

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**(BU/UP/2018/3600)**

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Bachelor of Science degree in Water Resources Engineering*

**ABSTRACT.**

There has been use of Polypropylene (PP) for packing cement due high strength and high tear resistance. Due to these excellent properties the present study investigates the effectiveness of PP cement bags in reinforcing of concrete. parameters such as workability, compressive strength, splitting tensile strength and flexural strength were evaluated. Design of experiments using CCD in RSM in the Minitab software was used to obtain the number of runs with varying parameters such as thread length (30mm to 60mm) and thread content (0% to 3%). Concrete with and without PP threads with a characteristic compressive strength of 25 Mpa was designed. Concrete cubes, cylinder and prismatic specimens were cast and tested. The analysis of results (ANOVA) for all properties was used predict the fresh and hardened properties. surface, contour and optimization plots were used to obtain the optimum mix ratio. cost comparison was done based on unit cost method estimation. The Test results indicated the use of PP threads can significantly improve the flexural and splitting tensile strengths of concrete materials whereas it resulted a no significant change in compressive strength. The relative increase in split tensile was optimum at 1.5% dosage of 60mm thread length and flexural strength was optimum at 1.5% dosage of 45mm thread length ,though most of the specimens achieved the target strength of 31.56Mpa, decrease in compressive strength was observed and a mild decrease was 20.6% at 3% dosage of 45mm thread length at 28 days .The prediction model established by the RSM showed the correlation and predictability between the response and the factors, and the corresponding relationship equation between the factors and the response was obtained. Results of multi objective optimization indicated that the optimal of the two factors (thread length and thread content) was 1.6% and 56mm respectively with a 0.866 desirability.The use of pp cement bags in reinforcing concrete is economical in terms of cost and eliminates the problem of landfills, reducing the environmental risk, maintaining the ecological balance, which is very much required for our nation.The findings suggested that PP threads deriving from these waste cement bags are a feasible option for fiber-reinforced concrete productions.

**DECLARATION.**

I **AMOIT KEVIN** hereby declare that this report in this form, nature, organization and content is my own work and has never been presented to any other institution of learning for an academic award.

Signature .....

Date.....

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**APPROVAL.**

This project proposal report has been approved of by my supervisors mentioned below.

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**DEDICATION.**

I dedicate this project proposal report to my beloved parents Mr. NTALO FRIDAY PETER and NAKATO ALICE, my siblings and friends for their encouragement and financial support towards my academic struggle. May God bless them.

**Table of Contents**

ABSTRACT.....i

DECLARATION.....ii

APPROVAL.....iii

ACKNOWLEDGEMENT.....iv

DEDICATION.....v

LIST OF TABLES.....viii

LIST OF FIGURES.....viii

LIST OF ACRONYMS.....ix

CHAPTER ONE: INTRODUCTION..... 1

    1.0. Introduction..... 1

    1.1. Background of the study..... 1

    1.2. Problem statement..... 2

    1.3. study objectives..... 2

        1.3.1. Main objective..... 2

        1.3.2. Specific objectives..... 2

    1.4. Justification..... 2

    1.5. Scope of the study..... 2

        1.5.1. Conceptual scope..... 2

        1.5.2. Time scope..... 2

CHAPTER TWO: LITERATURE REVIEW..... 3

    2.0. Introduction..... 3

    2.1. Aggregates..... 3

        2.1.1. Properties of concrete..... 3

    2.2. polypropylene fibre..... 4

    2.3. Tests done on aggregates..... 5

        2.3.1. Grading (sieve analysis)..... 5

        2.3.2. Moisture content..... 5

    2.4. Tests done on concrete to determine its strength..... 6

        2.4.1. Slump test/test for workability..... 6

        2.4.2. Compressive strength..... 6

        2.4.3. Flexural strength..... 7

        2.4.4. Splitting Test..... 7

    2.5. Design of experiments (DOE) using Response surface methodology..... 8

        2.5.1. Interpretations of RSM..... 8

    2.6. Cost comparison analysis..... 9

CHAPTER THREE: METHODOLOGY. ....	10
3.0. Introduction.....	10
3.1. Sourcing of Materials.....	10
3.2. Preparation of Materials.....	10
3.3. To characterize the properties of materials. ....	11
3.3.1. Grading (Sieve analysis) test of aggregates .....	11
3.3.2. Flakiness Index. ....	12
3.3.3. Specific gravity and water absorption.....	12
3.3.4. Aggregates Impact Value.....	13
3.3.5. Moisture content. ....	14
3.3.6. Tensile strength of the pp cement bag.....	15
3.4. Effect of varying proportions of polypropylene on the properties of concrete. ....	15
3.4.1. Concrete mix designing (IS-10262 code 2009). ....	15
3.4.2. Workability/Slump Test.....	17
3.4.3. Casting and curing of specimens. ....	18
3.5.RSM modeling and optimization. ....	20
3.6. To carry out cost comparison analysis of the project.....	21
CHAPTER FOUR: RESULTS AND DISCUSSIONS. ....	22
4.0. Introduction.....	22
4.1. To determine the properties of materials. ....	22
4.1.1. Gradation /Particle size distribution (PSD) test. ....	22
4.1.2. Flakiness Index. ....	23
4.1.3. Aggregate Impact Value. ....	24
4.1.4. Specific gravity and water absorption tests.....	24
4.1.5. Moisture content test. ....	25
4.2. Determining the effect of varying proportions of polypropylene on the properties of concrete. ....	25
4.2.1. Slump test results. ....	25
4.2.3. Compressive strength test results. ....	26
4.2.4. Split tensile strength results. ....	27
4.3. optimum mix ratio.....	30
4.4. Cost comparison analysis of the project. ....	36
CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS. ....	40
5.1 CONCLUSIONS.....	40
5.2 RECOMMENDATIONS .....	40
APPENDIX.....	41
REFERENCES. ....	42



**LIST OF TABLES.**

Table 1:table showing degree of workability and slump value..... 6  
 Table 2:shows experimental factors..... 15  
 Table 3:shows sample mix proportions. .... 15  
 Table 4:shows volume of of material for molds. .... 17  
 Table 5:shows quantity of materials required for the project. .... 17  
 Table 6:shows the quantity of pp cement bags threads to be added in each trial mixes. .... 17  
 Table 7:shows results for sieve analysis of fine aggregates..... 22  
 Table 8:shows results for sieve analysis for coarse aggregates. .... 23  
 Table 9:shows results for flakiness index. .... 24  
 Table 10:shows results for aggregate impact value. .... 24  
 Table 11:shows results for specific gravity and water absorption. .... 25  
 Table 12:shows results for moisture content test. .... 25  
 Table 13:shows results for workability test of concrete..... 25  
 Table 14:shows results for compressive strength..... 27  
 Table 15:shows results for split tensile strength test..... 28  
 Table 16:shows flexural strength test results. .... 29  
 Table 17: Experimental design matrix. .... 30  
 Table 18: ANOVA for the responses..... 31  
 Table 19: cost of constituents per  $m^3$  of concrete reinforcement..... 38

**LIST OF FIGURES.**

Figure 1.showing types of slumps..... 6  
 Figure 2:shows sourcing of materials to be used for the project..... 10  
 Figure 3:a)shows cutting of the bag into small threads b) shows threads cut into different lengths. ... 11  
 Figure 4: a) shows quartered aggregates. b) shows separating of aggregates after sieving. .... 11  
 Figure 6: a) shows sieving of aggregates. b) shows passing of aggregates through the sieve gauges.. 12  
 Figure 7: a) shows weighing of wet aggregates. b) shows weighing pycnometer filled with water.  
 C)shows weighing of pycnometer filled with aggregates and water. .... 13  
 Figure 8: a) shows preparation of aggregates for AIV. b) shows performing of AIV by releasing.  
 C)shows sieving of aggregates on a 2.36mm..... 14  
 Figure 9: a)shows weighing of sand before oven drying. b)shows removing of aggregates after oven  
 drying. .... 14  
 Figure 10:shows performing of tensile strength test of the cement bag..... 15  
 Figure 11: a) shows compacting of concrete. b) shows levelling of concrete in the slump cone.  
 C)shows measuring of the difference in height. .... 18  
 Figure 12:a)shows concrete mixing. b)shows casting of concrete.c)shows curing of specimens..... 18  
 Figure 13: a) shows compressive strength test set up. b) shows compressive strength testing. C)shows  
 readings of compressive strength..... 19  
 Figure 14:shows tensile strength test. b) shows specimen split at failure. c)shows the results. .... 20  
 Figure 15:shows tensile strength test. .... 41  
 Figure 16:shows specific gravity test..... 41  
 Figure 19:shows concrete mixing. .... 41  
 Figure 20:shows performing of workability. .... 41  
 Figure 21:shows weighing of specimen..... 41  
 Figure 22:shows placing samples in the curing tank. .... 41

**LIST OF ACRONYMS.**

ASTM.....	American Society of Testing and Materials
RA.....	Recycled aggregates
BS .....	British Standard
OPC.....	Ordinary Portland cement
NC.....	normal concrete
PP.....	Polypropylene.
% .....	Percentage
W% .....	Percentage of water content
OMC.....	optimum moisture content
CCD.....	central composite design
RSM.....	Response Surface Methodology.
Tl.....	thread length.
Tc.....	thread content.

# CHAPTER ONE: INTRODUCTION.

## 1.0. Introduction.

This chapter presents the background information of the project in details, factors limiting its re use in construction and what has been done to improve its applicability. It also explains various alternatives available and also presents the problem statement, the objectives, research questions and the scope of the study with the justification.

## 1.1. Background of the study.

Concrete is a buildings material made from a mixture of cement, sand, broken stone or gravel, and water(Purwandito, n.d.). Plain concrete is inherently in brittle nature and have some dramatic disadvantages such as poor deformability and weak crack resistance in the practical usage. In addition, their tensile strength and flexural strength is relatively low compared to their compressive strength(Al-Kubaisy & Zamin Jumaat, 2000). Many attempts have been done to convert cementitious system to a structural material with desirable physical and mechanical properties(Irwan et al., 2013). Improving the brittleness of these materials is the key point to make them suitable as structural material with desirable physical and mechanical properties(Qin et al., 2019). The reuse of plastic wastes plays an important role in sustainable solid waste management. From different points of view, it helps to save natural resources that are not replenished, it decreases the pollution of the environment and it also helps to save and recycle energy production processes(Ghernouti et al., 2015). Numerous studies have been conducted to find the optimum content of these materials in concrete that does not negatively influence the engineering properties of concrete (Chen et al., 2015). By embedding conventional steel bars in the concrete and to some extent by addition of sufficient volume of certain fibers, the tensile strength of concrete can be overcome (Jan et al., 2018). Waste materials such as plastics, which present environmental hazards and are often landfilled, can be used in concrete for different applications. Compared to other materials, plastics have lower cost, a higher strength-to-weight ratio, are more durable (resistant to deterioration), easy to work and shape and have a low density(Abousnina et al., 2021). Incorporating plastics in concrete will not only provide safe disposal but may also improve the concrete properties including tensile strength, chemical resistance, drying shrinkage and creep(Murali et al., 2012). The global market value for polypropylene (pp) woven bags is estimated at 31798.8 million dollars by 2026. The significant applications of pp bags are packaging of cement, chemicals, fertilizers, grains, animal feeds, and pet products. The market segments indicates that pp cement packaging is the largest end-user and account for 26% of the global sales of polypropylene bags. Uganda produces about 6,800,000 metric tonnes of cement annually. PP bags are on high demand because of these reasons; easy availability, strong, durable, long lasting, impermeable to water, tear resistance, chemical resistance, weather proof, light weight, easy to stack(Chourasia et al., 2019). Reducing, recycling and reuse is becoming a world-renowned proverb nowadays. To prolong the shelf life of the packed products, woven fabric used for packing cement normally has high strength and tear resistance. Thus, it is expected that mixing PP threads in concrete would provide an excellent resistance to stress and cracking. The purpose of this study is to reinforce plain

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