BUSITEMA UNIVERSITY

Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF POLYMER, TEXTILE AND INDUSTRIAL ENGINEERING

FINAL YEAR PROJECT

APPLICATION OF RESPONSE SURFACE METHODOLOGY FOR OPTIMIZATION OF POLYTHENE BAG WASTE UTILISATION IN ROAD PAVEMENT USING THE DRY PROCESS

BY

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ABSTRACT

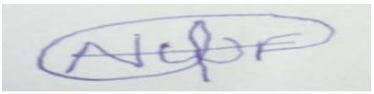
Disposal of waste materials including plastic waste has become a serious problem in Uganda and plastic wastes burnt for apparent disposal cause environmental pollution. These wastes are non-biodegradable in nature causing environmental pollution and hygiene problems. Research conducted at various institutions across the world indicates that plastic waste can be used in asphalting of roads. In this research, Plastic waste was coated around aggregate and mixed with bitumen to produce asphalt with plastic waste. The samples were subjected to various tests in the laboratory to determine their properties. The results of the research indicate that utilization of LDPE wastes is propitious in enhancing the the major properties of bitumen. 4% by the weight of total aggregate mix was found to be the optimum bitumen content to be added into aggregate mix and 5% by the weight of optimum bitumen content was found to be the optimum amount of LDPE waste content that should be mixed with bitumen.

Keywords: Plastic waste, Bitumen, Aggregates, Plastic Asphalt mix

DECLARATION

We Najjemba Winnifred and Musamba Mahad solemnly declare that the work in this final year project report is as a result of our research and effort and it has never been published or presented to any College, University, or any other Institution for an academic award.

Name: NAJJEMBA WINNIFRED

Signature: …… 

Date: …….27/09/2023

Name: MUSAMBA MAHAD

Signature: …… 

Date: ……27/09/2023

DEDICATION

We dedicate this final year project report to our dear parents in appreciation for their parental support and selfless care provided to us since childhood and for the mentorship of hard work and determination delivered to us and lastly to everyone else that contributed towards making our research project.

APPROVAL

This final year project report is submitted to the Department of Polymer, Textile and Industrial Engineering in the partial fulfillment of the award of a bachelor's degree of science in Polymer, Textile and Industrial Engineering with the approval of the Project supervisors:

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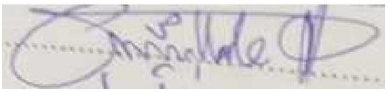
Signature…….  Date…*05th October 2023*

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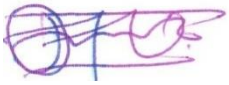
Signature……  Date…*27th September 2023*

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ABBREVIATIONS

PET:	Polyethylene therephalate
PE:	Polyethene
LDPE:	Low density polyethylene
HDPE:	High density polyethylene
RSM:	Response surface methodology
D.O.E:	Design of experiment software
Eqn	Equation
SS	Sum of Squares
df	Degree of freedom
MS	Mean Square
P-Value	Probability Value

CHAPTER ONE: INTRODUCTION

1.1 Background.

In recent years, the world has experienced an increase in plastic waste disposal; linked to urbanization, and rapid population growth among others. Globally, Asia has dominated plastic production with 51% of which China accounting for 31% of all global output. Asia is then followed by North America with 18%, Europe 17%, and the others 14% others (Jhunjhunwala, 2020). Since the invention of plastic, 8.3 billion tonnes of plastic materials have been produced for consumer use in industry, along with 6.3 billion tonnes of plastic waste, of which 9% have been recycled, 12% have been destroyed by burning, and 79% have been dumped into landfills. Due to the exceptional chemical properties of plastic materials, which are not biodegradable, it takes the environment approximately 4500 years to degrade.(Gidigbi et al., 2020). Plastic bags, also known as polyethylene bags, are polymeric materials that are lightweight, strong, flexible, and waterproof. They also cost little, which has led to their widespread use. Grocery stores, markets, and other retailers are the primary places to find them, with markets serving as the primary source (Nabila et al., 2020). Due to the industrial revolution and a drop in the price of plastic bags, today's usage and disposal of plastic bags has expanded at a very high pace as indicated by those that are found hanging from tree branches, floating through the air on windy days, settling in bushes, sewage lines, and also in rivers. This has led to issues with human and plant health as well as a decline in environmental benefit. (Rajneesh Kumar & Maaz Allah Khan, 2020).

In Africa according to (Sadan & de Kock, 2021), With 5% output and 4% of the world's plastic volume used, plastic manufacturing has been rising dramatically. 2015 saw a production of 19 million tonnes, of which 17 million tonnes were improperly managed and ended up in landfills and rivers. By 2060, it is anticipated that the 60-99 million tonnes of improperly disposed plastic garbage generated worldwide in 2015 will have tripled (Sadan & de Kock, 2021). Numerous African nations set up legislation to enforce the prohibition on the use, production, and import of plastic bags in 2018 as a result of the harm posed by excessive plastic bag use. This regulation's enforcement faced challenges when being put into effect in African nations, but was successful when put into effect in Rwanda(Sadan & de Kock, 2021).

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