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FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF POLYMER, TEXTILE AND INDUSTRIAL ENGINEERING

DEVELOPMENT OF A WATER-REPELLENT FLOOR TILE FROM RICE HUSKS AND SAWDUST

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This report is submitted to the faculty of engineering in partial fulfillment of the requirement for the award of the Degree of Bachelor of Polymer, Textile and Industrial Engineering (PTI) of Busitema University.

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FINAL YEAR PROJECT REPORT.

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ABSTRACT

The study investigates the creation of environmentally friendly bio-composite floor tiles by reinforcing poly-lactic acid (PLA) bio-polymer with agricultural waste materials including sawdust and rice husks. To increase the materials' compatibility with PLA, the study looks into how treating sawdust and rice husks with sodium hydroxide affects their characteristics. The ratio of these bio-fillers to PLA is then optimized using a design of experiment (DOE) technique to produce bio-composite floor tiles with a balance of mechanical strength, water resistance, and density. Lastly, the study assesses the bio-composite floor tiles' mechanical (flexural strength and impact value) and physical (water absorption and bulk density) qualities. The results encourage waste assessment in the construction industry and aid in the development of sustainable building materials.

DECLARATION

We, MWEBAZA JOEL, MBEIZA GLORIA, and KWARISIIMA SADIYA, jointly declare that this research work titled "Development of water repellent floor tile from rice husks and sawdust" is our original work and it has not been submitted for any other academic award, and all contributions from others have been appropriately credited. All the sources used and references are duly acknowledged. We understand that any act of plagiarism or academic dishonesty may result in serious consequences.

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Date.....20th/06/2024.....

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DEDICATION

This research is dedicated to those who strive for sustainable and environmentally conscious solutions in the construction industry. May the outcomes of this study contribute to a greener future for our communities and inspire others to explore innovative approaches to building materials.

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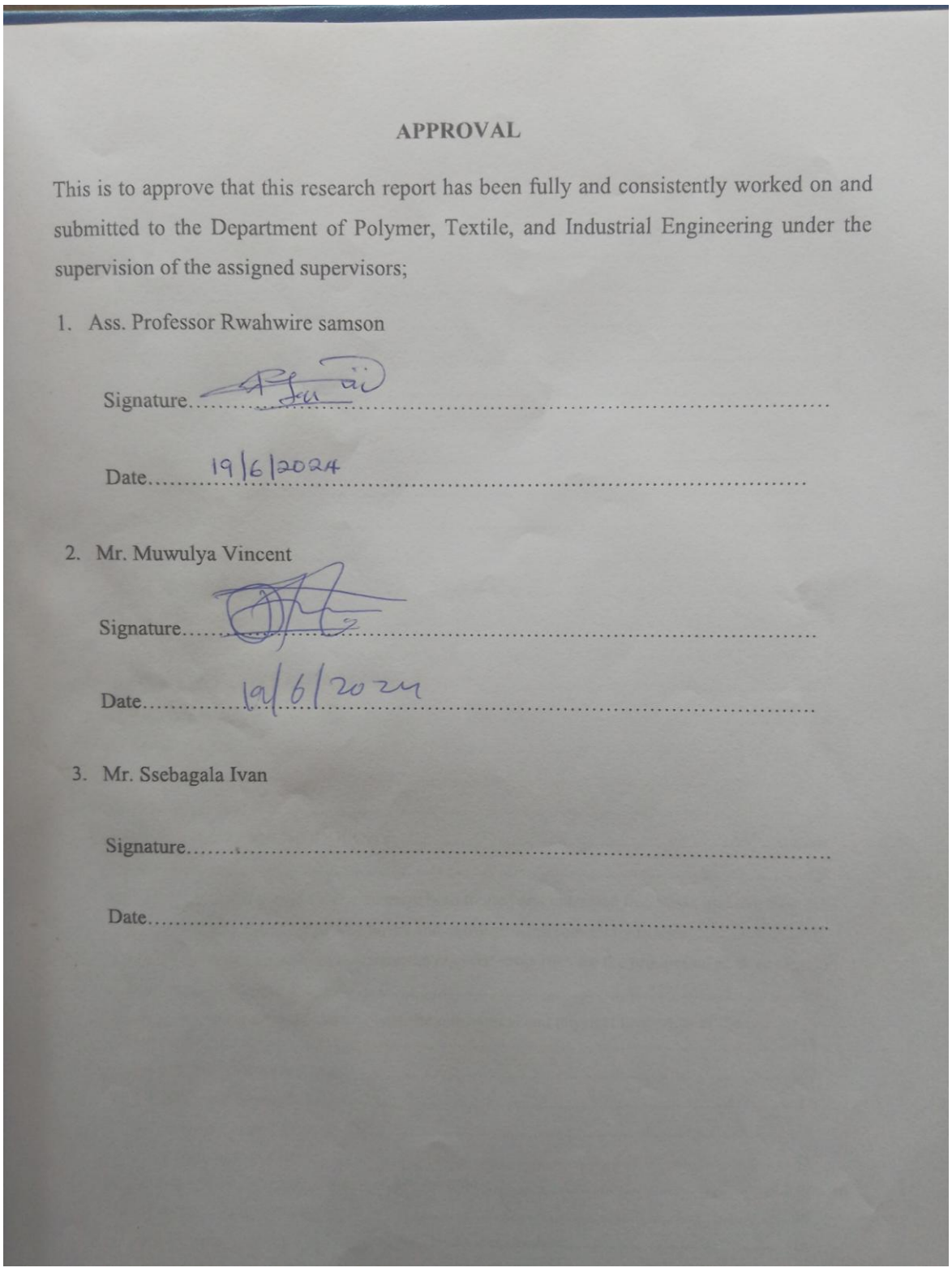
APPROVAL



APPROVAL

This is to approve that this research report has been fully and consistently worked on and submitted to the Department of Polymer, Textile, and Industrial Engineering under the supervision of the assigned supervisors;

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LIST OF ACRONYMS

ISO - International Organization of Standards

GSM - Grams per Square Meter

DOE - Design of Experiment

FTIR - Fourier Transform Infrared Spectroscopy

SDGs - Sustainable Development Goals

PLA - Polylactic acid

CHAPTER ONE: INTRODUCTION

1.1 Background.

Building materials derived from agricultural and industrial waste are becoming more attractive in civil engineering and architectural applications because of their sustainability and lower environmental impact (Muthuraj et al., 2019). In this regard, there has been growing interest in developing sustainable thermal insulation materials from renewable resources and industrial wastes. Composites derived from natural resources have great potential because they have low density, less environmental impact, and good thermal properties and over recent years there has been a significant incurrence in the use of composite materials (Muthuraj et al., 2019). Generally, composites are a combination of two or more distinct materials blended as separate phases and confined to form the desired structure. Bio-composites derived from recycled waste materials like sawdust, rice husk, and straw have a better strength-to-weight ratio than steel and are also significantly cheaper to fabricate. Natural fiber composites are also emerging as an alternative to glass-reinforced composites (Singh & Singh, 2019).

Additionally, traditional flooring materials have been known to come from a ternary blend of clay-quartz-feldspar. These natural raw materials have had challenges of being non-renewable and can be harmful to the environment when not disposed of properly. Furthermore, these materials are expensive and susceptible to damage. Abundant agricultural waste materials like rice husks and sawdust offer a sustainable and environmentally friendly alternative(Safiki et al., 2021).

According to (Islam et al., 2019), Rice husks, the outer shell of the grain consists of lignocellulose and silica making it strong and durable. Worldwide, rice production has risen over the last years from 660 million tons to 7567 million. The reasons behind the use of Rice Husk in the construction industry are its high availability, low bulk density (90-150kg/m3), toughness, abrasive in nature, resistance to weathering, and unique composition. The main components in rice husks are silica, cellulose, and lignin (Asha, 2017).

According to (Asha, 2017), Rice husk contains a high concentration of silica in amorphous and crystalline (quartz) forms where amorphous silica determines the pozzolanic effect of Rice husks. The pozzolanic effect exhibits cementitious properties that increase the rate at which the material gains strength. Despite the potential benefits associated with rice husk,

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6 APPENDICES