FACULTY OF ENGINEERING DEPARTMENT OF POLYMER, TEXTILE AND INDUSTRIAL ENGINEERING FINAL YEAR PROJECT REPORT DESIGN AND FABRICATION OF A MINI EXTRUDER FOR RECYCLYING POLYPROPYLENE WASTE BAGS TO PRODUCE POLYPROPYLENE POLYMER PELLETS BY

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This final year project report is submitted to the faculty of engineering in the partial fulfillment of the requirement for the award of the degree of bachelors of Polymer, Textile and Industrial Engineering of Busitema University.

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and Mr. Ssebagala Ivan for the endless support and guidance throughout the whole fabrication process. May God richly bless you

ABSTRACT

Tones of plastics produced and used by the human beings eventually end up in the nature causing harm to living beings and the environment. The amount of plastic recycled than the plastics produced is very much less and the requirement of plastic recycling and up cycling is now an essential task. This project is about the design and fabrication process of plastic extrusion machine which can address plastic recycling. This mini extruder is just a small step in recycling the huge plastic products. The initial design consists of different components like hopper, screw, barrel, die and motor system. The plastic pellets are fed through hopper which are moved forward using the rotating screw driven by suitable sized motor. The friction between the pellets and barrel surface along with the external heat given by the band heaters melt the plastic pellets and pump through the die. If the temperature is not enough then the product is not good and fine as expected and the melt get pasted in the barrel and when different type of plastic pellet is used in extrusion it results in the mixture of two types of plastics. So, temperature maintenance is very important. This prototype is designed in such a way that any people interested to make plastic extrusion machine can follow the procedure mentioned in this report.

DECLARATION

We declare that the report submitted is entirely our work for the project done of developing a functional mini-extruder that can efficiently recycle polypropylene (PP) waste plastic bags into plastic pellets in fulfilment of a requirement to attain our bachelor's degree in polymer textile and industrial engineering. It also involved inquiries and sharing ideas from groupmates and supervisors.

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APPROVAL

This project report was compiled and submitted to the department of Polymer Textile and Industrial Engineering under the supervision of the following supervisors.

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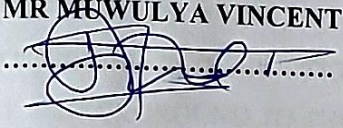

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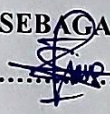

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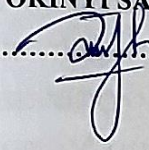

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CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND TO THE STUDY.

Globally plastics production reached 407 million tones per annum (Mtpa), making it more than the production of paper (400 Mtpa), and aluminum (57 Mtpa)(World bank, 2012). If production continues to grow at similar rates, plastics production will reach 1 600 Mtpa in 2050. In Uganda about 600tones of plastic wastes are generated daily according to NEMA (Daily monitor 2022). Polypropylene (PP) is currently one of the most abundantly used plastic types, and it constitutes 16% of the global plastic production. Nearly 55 million tons of PP were produced in 2015, and these numbers are growing rapidly owing to its versatile applications (Bora et al., 2020). Polypropylene (PP) is an inexpensive thermoplastic polymer with exceptional properties like fire resistance, simplicity, high heat distortion temperature, and dimensional solidity (Alsabri et al., 2022). PP is a widely used plastic to make end products for customers, such as plastic packaging which accounts for its dominancy among manufacturers in Uganda. According to Alsabri et al., (2022), the increasing usage of polypropylene plastics has increased substantial environmental pollution burden on both land and water habitats. Plastics are non-biodegradable with a very low degrading rate of about 500 years thus taking up large space in the landfills since they're being discarded without any treatment. Therefore, the best way to get rid of plastics is by recycling. There is great interest in waste plastic recycling all over the globe because of its negative environmental impact. Plastic recycling is the process of recovering scraps of waste plastics for useful product. Mechanical recycling is the most common technique for reducing waste polymer, and its use has increased due to economic and environmental benefits (Jubinville, D.; Esmizadeh, E.; Saikrishnan, S.; Tzoganakis, C.; Mekonnen, 2020). This mechanical recycling consists of collecting and sorting the waste, grinding the waste, and then reprocessing the waste. Hence, the need for efficient, available and cost-effective waste polypropylene recycle machine becomes necessary. The design and fabrication of plastic waste recycle extrusion molding machine has been studied. However, these machines are not easily accessible for efficient application locally. Therefore, this research focuses on the design, fabrication of a low cost, easily accessible and operated polypropylene pelletizing machine that could mold waste polypropylene materials efficiently to form pellets and later produce electric conduits

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