UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Design and Develop Manually Operated Machine For The Preparation of Plastering Mortars by Using Waste Paper

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Manufacturing Engineering Technology (Process) with Honours.

by

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DECLARATION

I hereby, declared this report entitled "Design and Develop Manually Operated Machine For The Preparation of Plastering Mortars by Using Waste Paper" is the results of my own research except as cited in references.

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Date	:	……..

APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering Technology (Process) with Honours. The member of the supervisory is as follow:

……

(MR MOHD HIDAYAT BIN AB RAHMAN)

ABSTRAK

Tujuan projek ini adalah untuk membangunkan Penggunaann Kertas Buangan Berdasarkan Mesin Kisar Simen bagi mengurangkan pencemaran. Projek ini berkaitan reka bentuk dan pembangunan mesin kisar simen menggunakan kertas sebagai plaster dengan beroperasi secara manual. Projek ini khas di buat bagi sektor pembinaan bangunan bagi mengurangkan kos dan juga memudahkan kerja-kerja pendalian dinding. Proses dalam pembuatan projek ini termasuk reka bentuk mesin kisar manual dari segi ergonomik kepada pengguna tersebut. Setelah siap proses reka bentuk, product tersebut di transformasi kepada product asal dengan mengikut garis panduan yang disediakan. Projek ini juga tertakluk kepada keselamatan kepada pengguna bila-bila masa ia beroperasi. Kaedah dan proses yang terlibat dalam menghasikan projek ini ialah, membengkok, kimpalan, penggerudian, dan pemotongan. Projek ini terutamanya bagi menghasilkan idea baru dalam proses mengisar simen untuk mencepatkan kerja-kerja persiapan simen. Setelah lengkap semua proses dalam menghasilkan projek ini, mesin ini akan menolong kita bagi, memahami cara fabrikasi dan reka bentuk yang tertakluk semasa menghasilkan projek ini.

ABSTRACT

The study of manufacturing was very important in order to carried out this project to ensure that student understand on what are needs to do. This project is about Design and Develop Manually Operated Machine For The Preparation of Plastering Mortars by Using Waste Paper to make the job in building construction easier and fast action. This project involves the process of designing the manually operated machine and ergonomic factor for people to use. After the design has complete, it was transformed to its real product where the design is used for guideline. These projects also require ensuring the safety for indeed of publishing. Methods and process involve in this project for instance joining using bending, welding, drilling, and cutting process. This project is mainly about generating a new concept of plastering mortar mixture and process of mixing that would make easier to bring the product as portable part. After all process had been done, this machine may help us to understand the fabrication and designing process that involve in this project.

ACKNOWLEDGEMENT

I would like to return my gratitude and courtesy to all people that have assisted and encourage me in completing this project and report. A special thanks to my supervisor Mr. Mohd Hidayat Bin Ab Rahman for his support, critic and encouragement throughout the project. Also, thank to lecturers at the Department of Manufacturing Engineering Technology UTeM, for their valuable comments and knowledge on using machining at laboratory.

I would like to acknowledge my appreciation to my university for providing the laboratory to be used and also the library for supplying the relevant literatures.

My fellow classmates should be recognized for their support and help during testing my project. I would like to thank them for their encouragement, views and tips which were useful. Finally, I am grateful to my parents and family members for giving me the support and encouragement to complete this project.

DEDICATION

There are a number of people without whom this thesis might not have been written, and to whom I am greatly indebted. I owe my gratitude to all those people who have made this project possible and because of whom my graduate experience has been one that I will cherish forever. I dedicate my dissertation work to my family and many friends. A special feeling of gratitude to my loving parents, Subramaniam Velayutham and Susila Krishnan, whom have been my constant source of inspiration. They have given me the drive and discipline to tackle any task with enthusiasm and determination. Without their love and support this project would not have been made possible. My brother Aneesh Veloo Subramaniam have never left my side and are very special. My deepest gratitude is to my advisor, Mr. Mohd Hidayat Bin AB Rahman. I have been amazingly fortunate to have an advisor who gave me the freedom to explore on my own and at the same time the guidance to recover when my steps faltered. He taught me how to question thoughts and express ideas. His patience and support helped me overcome many crisis situations and finish this project. I hope that one day I would become as good an advisor to my students as he has been to me. Many friends have helped me through these difficult years. Their support and care helped me overcome setbacks and stay focused on my graduate study. I greatly value their friendship and I deeply appreciate their belief in me. Besides, I am also thankful to lecturers for numerous discussions on related topics that helped me improve my knowledge in the research area better. All of them have been my best cheerleaders.

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TABLE OF CONTENT

CHAPTER 4: RESULT & DISCUSSION

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1
INTRODUCTION

1.0 Introduction

In modern producing firms, manufacturing engineers play a key role within the “realization" of merchandise, operating closely with alternative engineers and specialists in company management, finance, marketing, and packaging. Small maintenance field or in the field of improvement of the existing equipment is still operating conventional, and without any improvement. At present there are a variety of machines that are created for the purpose of simplifying and accelerating the production, installation and modification of materials

Paper is the most frequent type of waste found in almost all types of area and represents important source of cellulose fibers. In various forms (quality paper, mixed paper, newspaper and journals, undulated cardboard), paper represents about 40% of all household waste produced today.

The recycling technologies of paper waste in construction consists of the manufacture of products such as, plasterboard, cellulose fiber insulation and bricks made of paper fibers agglomerated with cement. Cellulose fiber insulation uses recycled newspaper as a raw material, from which raw fibers are extracted and treated with special additives for fire proofing. It can be used for the insulation of walls, floors as well as ceilings and roofs.

A recycling of waste paper is mainly targeted in the composition of plastering mortars. Paper fibers are agglomerated with cement are an inexpensive material, with good thermal insulating properties. This project covered in the design of a mechanical engineering machine which can be used efficiently to mix cement, sifted sand and papers for the output of plastering mortar.

1.1 Background of the Project

This project is to produce a prototype of plastering mortar mixing machine for small scale industry. These projects focus on green technology because the main material used is paper. The used paper can be converted to plaster material by well crushing the paper into a pulp. Appropriate method, technique and process will be used during development of this Plastering Mortar Making Machine.

1.2 Problem Statement

Most of the time papers are being dumped and aren't reused in many areas. Paper can be used as plaster agent in construction areas. Yet there isn't a efficient mechanical paper pulping process. Besides a machine is needed to make pulp in conjunction to add up as plastering mortar together with cement and sand. Alternative way to solve this problem is by producing a plaster mortar machine.

1.3 Aim

To access the usage and effectiveness of paper recycling in a small scale for plastering mortars agent.

1.4 Objective

In order to achieve the aim, the following were the objectives,

I. To design a manually operated machine for the preparation of plastering mortars.
II. To fabricate a prototype of manually operated paper recycling machine.
III. To prepare plastering mortar using waste paper which allows for use of non-polluting technology.

1.5 Scope

a. Product Design Development criteria been focused and used in designing the machine using SolidWork software.
b. Producing a machine to mix the waste paper, cement, sand and water for the plastering mortar.
c. The targeted outcome of this project is to produce a prototype of machine.

1.6 Organization of the Project

a. Chapter 1: Introduction

The 1st chapter here contains the introduction, problem statements, objectives, scopes of project and expected result. It introduces about the basic information of the project

b. Chapter 2: Literature Review

In this chapter we will see the relevant research about the selected project and the information that could be used for this project

c. Chapter 3: Methodology

In this chapter we will see the full information, study and future ideas which will be generated in the results.

d. Chapter 4: Results

This part will state out the result that be obtained.

e. Chapter 5: Discussions

This chapter will talk about the discussion of the result of the project.

f. Chapter 6: Conclusion

This chapter will discuss about the outcome of the research and the major recommendation that is suggested for the future use.

1.7 Expected Result

a. Development of this Plaster Mortar mixing machine will success.

b. Target every industry has this machine in order not to waste papers.

c. Commercial to the related industry.

1.8 Hypothesis

Paper recycling been only focused in the areas of large amount usage of papers. In the small scale areas example household, papers are not utilized or recycled well. The recycling process, aren't effective at reducing the problem of paper accumulation.

1.9 Rationale

It is necessary to carry out this project because the findings can be used or implement in the targeted areas. The result from the study can also be used in proposing ways of improving waste paper recycling and thus raise the quality of the environment. Recycling of both domestic and commercial waste paper would reduce the adverse impact of waste on the environment.

CHAPTER 2
LITERATURE REVIEW

2.0 Introduction

To produce a quality project, all aspects should take into consideration in order all the criteria can be used to solve problems that have been identified. Every aspect should be studied in depth for each instrument used for essential uses in the production of the project.

In producing a project, a literature review is an important aspect that should be considered in the production of the project. Literature study is one aspect which various methods used to select and specify materials or materials suitable for producing the project. The choice of material is much focused because it will determine the quality of a project. Selections of appropriate materials can produce a quality project and meet customer requirement. Therefore, the literature review should be done before a project is designed to determine the appropriate material for the project.

This chapter reviews the relevant literature about waste paper recycling for different kind of usage in the world. It looks at the definitions and materials used in papermaking, potential environmental impacts of continuous use of virgin wood pulp and also focus on economic viability and environmental quality of recycling. In most countries municipals and private refuse collection organization requires that bottles, cans, newspapers, cardboards and other recyclable materials be kept separately from other wastes. It also looks at recycling in third and developed countries and the

drawbacks faced in paper recycling and sorting by households. Lastly, it focuses at the technical way of pulping and work done on paper recycling in plastering basis.

2.1 Plastering Mortar

2.1.1 Levelling

Plastering mortars can be used on walls and ceilings for:

- Used for rough levelling of mineral based walls in the support of concrete, lightweight blocks and bricks
- The old rendered surfaces go through filling, levelling and undercoating
- When a very uneven surface is formed, levelling is done on the surface

2.1.2 Smoothing

Final treatment such as painting or wallpaper should always considered after the finishing of plastering mortars which is suitable for smoothing or fine smoothing walls and ceilings. Finish is also suitable for mineral based substrates such as gypsum boards or plaster surfaces. The suitable thickness for this application is between 0.1mm to 3mm, which can be used for small fillings during renovation work. For preparing substrates for painting or wallpaper treatment, the quality and the optimized workability of plastering mortars should be ideal.

2.1.3 Decorating

A good and neat plastering mortars provide designers or architects with infinite possibilities in creating indoor environments. Available in a wide range of colours, they assist with:

- Decorating the indoor environment

- Creating an indoor environment free of pollutants
- Saving energy in climate controlled environments

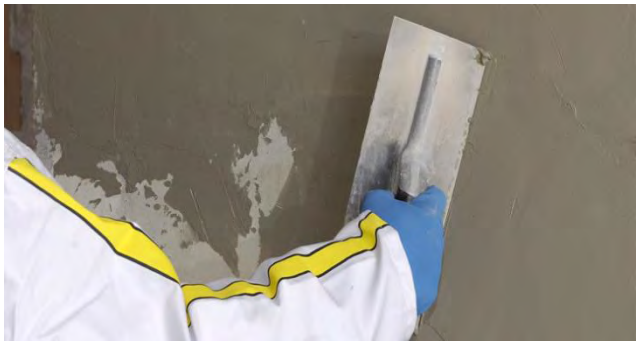

Figure 2.1: Plastering Mortar

2.2 Plastering Mortar Ingredients

2.2.1 Cement

A cement a binder substance which is used in construction field. It hardens and adheres to the materials which biding them together. A cement is rarely used solely, but it is used together with sand and gravel together. Cement is used with fine gravel to produce mortar for masonry or with sand to produce concrete.

Cements which are used in construction are usually inorganic compound which is lime of silicate contain and the character is either hydraulic or non-hydraulic and it depends upon the ability of cement to set in the presence of water.

Non-hydraulic cement will not set in wet conditions or underwater; rather, it sets as it dries and reacts with carbon dioxide in the air. It is resistant to attack by chemicals after setting.

Hydraulic cements (e.g., Portland cement) set and become adhesive due to a chemical reaction between the dry ingredients and water. The chemical reaction results in mineral hydrates that are not very water-soluble and so are quite durable in water and safe from chemical attack. This allows setting in wet

condition or underwater and further protects the hardened material from chemical attack. The chemical process for hydraulic cement found by ancient Romans used volcanic ash (pozzolana) with added lime (calcium oxide).

The word "cement" can be traced back to the Roman term *opus caementicium*, used to describe masonry resembling modern concrete that was made from crushed rock with burnt lime as binder. The volcanic ash and pulverized brick supplements that were added to the burnt lime, to obtain a hydraulic binder, were later referred to as *cementum*, *cimentum*, *cäment*, and *cement*. In modern times, organic polymers are sometimes used as cements in concrete.

Non-hydraulic cement, such as slaked lime (calcium hydroxide mixed with water), hardens by carbonation in the presence of carbon dioxide which is naturally present in the air. First calcium oxide (lime) is produced from calcium carbonate (limestone or chalk) by calcination at temperatures above 825 °C (1,517 °F) for about 10 hours at atmospheric pressure:

$$\mathbf{CaCO_3 \rightarrow CaO + CO_2}$$

The calcium oxide is then *spent* (slaked) mixing it with water to make slaked lime (calcium hydroxide):

$$\mathbf{CaO + H_2O \rightarrow Ca(OH)_2}$$

Once the excess water is completely evaporated (this process is technically called *setting*), the carbonation starts:

$$\mathbf{Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O}$$

This reaction takes a significant amount of time because the partial pressure of carbon dioxide in the air is low. The carbonation reaction requires the dry cement to be exposed to air, and for this reason the slaked lime is a non-hydraulic cement and cannot be used under water. This whole process is called the *lime cycle*.