



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

AUTOMATIC BOX PACKING DEVICE

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering (Robotic and Automation) with Honours.

by

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APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Robotic and Automation). The members of the supervisory committee are as follow:

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(Main Supervisor)

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(Co-Supervisor)

ABSTRACT

This report is mainly consists of a study, research, development, discussion and suggestion for the future of automatic box packing device. Packing is important process to make the product good in condition. The problems of packing come when company has a demand of the product higher than ordinary. So, the operators that work at packing section must finish before the due date. However, it will make problems like the product is broken or cannot use. Therefore, this project will try to help and improve the packing system to make the process run systematic and make the product good in condition. An automatic box packing device is use to closed the boxes. Before fabricating, the information is found from journals, books and website. It will be explained in chapter two. All the information is will use to fabricate the device. This project will use programming to make the system running step by step by using microC software. Then, the system will be transferred to the microcontroller to make the system run by following the program that is programmed into the microcontroller.

ABSTRAK

Laporan ini mengandungi satu kajian, penyelidikan, pembangunan, perbincangan serta cadangan untuk masa hadapan bagi “Automatic Box Packing Machine”. Pembungkusan adalah proses yang penting untuk memastikan produk berada dalam keadaan baik. Masalah yang timbul tentang pembungkusan ialah apabila sesebuah syarikat itu mendapat permintaan yang lebih tinggi daripada yang biasa. Jadi, pekerja-pekerja yang terlibat dalam proses pembungkusan ini perlu menyiapkannya sebelum tarikh yang telah ditetapkan. Bagaimanapun, bermacam-macam masalah akan berlaku seperti produk yang dibungkus pecah atau rosak. Oleh yang demikian, projek ini akan cuba membantu dan meningkatkan sistem pembungkusan untuk membuat perjalanan proses berjalan secara sistematik dan memastikan produk berada dalam keadaan baik. Projek ini digunakan untuk menutup kotak. Sebelum mereka cipta alat ini, maklumat-maklumat akan di cari daripada jurnal, buku-buku dan laman web. Semua maklumat itu akan digunakan untuk mendapatkan idea-idea untuk menyiapkan projek ini. Projek ini akan menggunakan program untuk menjadikan sistem ini bergerak daripada satu proses kepada satu proses yang lain dengan menggunakan perisian “microC”. Kemudian, sistem itu akan di pindahkan kepada “microcontroller” untuk menggerakkan alat ini mengikut proses yang telah di programkan.

DEDICATION

*Specially dedicated to
my beloved parents who have encouraged, guided and inspired me
throughout my journey of education*

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LIST OF ABBREVIATIONS

PLC	- Programmable Logic Controller
PC	- Personal Computer
PCB	- Printed Circuit Board
RPM	- Revolution per Minute

CHAPTER 1

INTRODUCTION

1.1 Background

In industrial nowadays, packaging is a stage that is important because to make a product safe and good in condition when delivering to customer as well as to both sellers and buyers of the products. Most commercial packaging serves two basic functions which are protecting the product from damage during shipping, and promoting the product to the ultimate consumer. Operators must pack the boxes carefully so the products still in good condition but it will take a time if the operators have a lot of boxes to package. Therefore, this project an automatic box packaging device will make the process become fast that replaces the operator for packaging the boxes. An automatic box packaging device will be adaptable to production-line speeds, increase the product's density, and satisfy legal requirements.

However, this machine not only for industrial or factory but it also can be used for anybody that wants to package their boxes. This project will used microcontroller and sensors to make it run systematically. This project also will use motor to move gear that is to control arms to close the boxes. This arm will move step by step by following the program in the microcontroller until the box was packaged.

There have a several benefits for the project with is the size of this machine is suitable to any places because it is in medium and can make easier for user to keep it. Moreover, it can package a various sizes of boxes and can make the process take only a few times.

1.2 Problem Statement

In industrial nowadays especially in Malaysia, many factories has used the packaging machine to package their product. However, there are only few factories using a box packaging machine. It is because they think it not important for their factory. Packaging machine nowadays is expensive because the component and the material that they use is of a high quality. Therefore, the prices make a factor to them to buy the machine. The sizes of the machine also take a lot space in the factory. So, they must arrange the component and equipment in the factory before buying the machine. Few factories are using operator or human to package the boxes. However, the problems that occur from operators is they will take a time to package a lot of boxes. So, the customer must waiting and order a few quantity of product it they want the product early.

1.3 Objectives

The objectives of this project are:

- a) To design and develop an automatic device that is easy to package various sizes of boxes.

1.4 Scope

In order for the project to complete successfully, the scope needed to ensure the completions of the project are as follow;

- a) Design mechanism of each part of this project.
- b) Construct a prototype of automatic box packaging device.
- c) Program microcontroller by using microcontroller software.
- d) Interface between sensor, and controller.
- e) Test and analysis.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter presents the literature review relevant to the project. This literature review is a critical look at the existing research that is significant to the works that are carrying out. This chapter is containing the summary the relevant research, vital that to evaluate this project, show the relationship between different works and show how it relates to the project. This chapter also contains historical issues, theoretical issues and methodological issues.

2.2 Introduction of Packaging

Packaging is the science and technology of enclosing or protecting products for distribution, storage, sale, and use. Packaging also refers to the process of design, evaluation and production of packages. Packaging contains, protects, preserves, transports, informs, and sells. It is fully integrated into government, business, institutional, industry, and personal use. (<http://www.123foodscience.com>)

It is sometimes make easy to categorize packages into three functions which are primary, secondary and tertiary.

- a) Primary packaging is the material that first envelops the product and holds it. This usually is the smallest unit of distribution or use and is the package which is in direct contact with the contents.
- b) Secondary packaging is outside the primary packaging – perhaps used to group primary packages together.
- c) Tertiary packaging is used for bulk handling, warehouse storage and transport shipping. The most common form is a palletized unit load that packs tightly into containers.

Depending on the use, primary packing such as shrink wrap used when applied directed to the product, secondary packaging when combining smaller packages, and tertiary packaging on some distribution packs.

According to the article from Kenneth (2000), he state that from the very earliest times, humans consumed food where it was found. To make sure the product in good condition, families and villages need for packaging of goods, either for storage or transportation. When containers were needed, nature provided gourds, shells, and leaves. Later, containers were fashioned from natural materials, such as hollowed logs, woven grasses and animal organs.

For each product's needs, there are good packaging solutions. Though packages are often take easy, they are the result of many years of innovation in some cases accidental. A brief review of the more popular packaging developments is included in this fact sheet. There are some types of material packaging which is paper, glass, metals and plastics.

Kenneth (2000) found that the first material packaging is paper. One way of placing packages into categories is to describe them as flexible, semi-flexible, or rigid. The example of flexible packaging includes the paper sacks that dog food comes in, the plastic bags that hold potato chips and the paper or plastic sacks in which we carry home

our purchases. An example of semi-flexible packaging is the paperboard boxes that cereal, many other food products, small household items, and many toys are packaged in. For many non-food items, the packaging is made more rigid by formed packing materials that slip inside the box and hold the product and its accessories or components in place. Forms of rigid packaging include crates, glass bottles, and metal cans.

In 20th century, paper and paperboard packaging increased in popularity. Then with appear of plastics as a significant player in packaging, paper and its related products were replaced in many uses. Lately that trend has slowed as designers have tried to respond to the perception that plastic is environmentally unfriendly. The fact is that decreasing that amount of material in packaging is usually more important than the composition of the package to get the most environmentally friendly form of packaging.

2.2.1 Package Development Considerations

An integral part of the new product development process is often by package design and development. Moreover, development of a package can be a separate process, but must be linked closely with the product to be packaged. Package design starts with the identification of all the requirements like structural design, marketing, shelf life, quality assurance, logistics, legal, regulatory, graphic design, end-use, and environmental. The design criteria, time targets, resources, and cost constraints need to be established and agreed upon.



Figure 2.1: Palletized and unitized load and express air shipment of mixed parcels. (<http://www.newworldencyclopedia.org>)

Logistics system of transport packaging needs to be matched to transport packaging. Packages designed for controlled shipments of uniform pallet loads may not be suited to mixed shipments with express carriers. An example of how package design is affected by other factors is the relationship to logistics. When the distribution system includes individual shipments by a small parcel carrier, handling, and mixed stacking make severe demands on the strength and protective ability of the transport package. If the logistics system consists of uniform palletized unit loads, the structural design of the package can be designed to those specific needs like vertical stacking, perhaps for a longer time frame. A package designed for one mode of shipment may not be suited for another.

2.2.2 Packaging Machines

A choice of packaging machinery includes technical capabilities, labor requirements, worker safety, maintainability, serviceability, and reliability, ability to integrate into the packaging line, capital cost, floor space, flexibility, energy usage, and quality of outgoing packages, qualifications, throughput, efficiency, productivity, and ergonomics. (<http://www.newworldencyclopedia.org>)

There is much type of packaging machines. Some of the types are following below:

- a) Blister, Skin, and Vacuum Packaging Machines
- b) Capping, Over-Capping, Lidding, Closing, Seaming, and Sealing Machines
- c) Case and Tray Forming, Packing, Unpacking, Closing, and Sealing Machines
- d) Cleaning, Sterilizing, Cooling, and Drying Machines
- e) Feeding, Orienting, Placing (and related) Machines
- f) Filling Machines: Handling liquid and powdered products
- g) Package Filling and Closing Machines
- h) Inspecting, Detecting, and Checkweighing Machines
- i) Palletizing, Depalletizing, Pallet Unitizing Machines
- j) Product Identification: Labeling, marking,



Figure 2.2: Vertical cartoners (http://www.ima.it/Vertima_2110c86f295m.asp)

This machine is suitable for high quality cream jars, lotions and perfumes' in bottle. It also can be used for feeding system for liner, sachets, spatulas, protection ring, tool-free fast changeover, PLC Siemens and steel-it finishing.



Figure 2.3: Automatic Filling & Closing Machine for Sterile Powder (<http://www.tradeindia.com>)

This machine can be directly integrated to the out feed of a sterilizing tunnel and it also continuously moving vials thereby higher speeds.