



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**DEVELOPMENT OF SEMI-AUTOMATIC MUSHROOM RESTING-  
CAP DEVICE**

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

by

**MUHAMMAD FARIS SYAUQI BIN AHMAD LOKMAN HAKIM OH**

**B071610208**

**940519-02-5299**

**FACULTY OF ELECTRIC & ELECTRONIC ENGINEERING TECHNOLOGY**

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## BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **DEVELOPMENT OF SEMI-AUTOMATIC RESTING-CAP DEVICE**

SESI PENGAJIAN: **2019/2020 SEMESTER 1**

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LOKMAN HAKIM OH

Date : .....

# APPROVAL

This report is submitted to the Faculty of Electric & Electronic Engineering Technology of UTeM as a partial fulfilment of the requirements for the degree of **Bachelor of Electronic Engineering Technology (Telecommunication) with Honours**. Supervisor of this project is as follow:

.....

Project Supervisor

(Ir Ts Mohd Syahrin Amri Bin Mohd Noh)

.....

Co-Supervisor

(Ammar Faiz Bin Zainal Abidin)

## **ABSTRACT**

This project is entitled Development of Semi-Automatic Mushroom Resting-cap Device. The purpose of this project is to provide solution for mushroom Agri-culturing process. This project is believed will solve the problems related to mushroom block resting cap. The objectives of this project are to build a semi-automatic device that capable of reducing the time taken for placing the resting-cap onto the mushroom-block necks and to reduce the labour workload by closing the resting-cap on the mushroom-block necks.

## **ABSTRAK**

Projek ini bertajuk Pembangunan Peranti Penutup Rehat Cendawan Semi-Automatik. Tujuan projek ini adalah untuk menyediakan penyelesaian untuk proses penanaman agrikultur. Projek ini dipercayai akan menyelesaikan masalah yang berkaitan dengan penutup rehat bongkah cendawan. Objektif projek ini adalah untuk membina peranti separa automatik yang akan memendekkan masa yang diambil untuk meletakkan penutup rehat di atas leher bongkah cendawan dan untuk mengurangkan beban kerja buruh dalam usaha untuk mengetatkan penutup rehat bongkah cendawan secara automatik.

## **DEDICATION**

This report is dedicated to my beloved parents who always supported and taught me throughout the process of doing this project. I am also wanting to express my highest appreciation to my supervisor, my co-supervisor and my fellow friends who have always encouraged, guided and inspired me to complete this final year project.



## **ACKNOWLEDGEMENT**

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# CHAPTER 1

## INTRODUCTION

### 1.0 INTRODUCTION

This chapter aim on creating the framework and introduces the brief idea of the project. It focused on the overview of the project, detailing the objectives, briefly the problem statement, scope and provide outcome of the project. Therefore, the structure of the whole project can be precisely visualized.

### 1.1 BACKGROUND STUDY



Figure 1.0: Official site visit at the mushroom enterprise

Recently, an official visit has been made to one of the mushroom enterprises, Sinar Syukrawie Enterprise (MA 0140985 P) which is located at LOT 762 Jalan Gadek, Ampang, Bt. Gadek, Alor Gajah, Melaka. The purpose of the visit was to learn about the mushroom harvesting processes. Therefore, after monitored several mushroom

harvesting processes, there were some problems arises from the processes, which these problems had gave ideas for the student for their Final Year Project (FYP).



Figure 1.1: Mushroom House at Sinar Syukrawie Enterprise

To begin with, mushroom cultivation has long existed in Malaysia and is traditionally and commercially cultivated. According to Malaysia Agricultural Research and Development Institute (MARDI), it has become one of the current popular economic growth in today's farming industry. The mushroom company's viability is measured using current net present value analysis, internal rate of return and benefits over costs.

Mushroom cultivation in Malaysia has many challenges especially the problem of obtaining quality mushroom seeds, increasingly expensive input materials and pest attacks. Therefore, government sector, specifically MARDI, has encourage people to engage mushroom cultivation with current or newer technology. This is to emphasize and to expose people with the latest knowledge or information of harvesting mushroom.

Mushroom house in Malaysia is usually being built by using wood and net and sometime is using steel frame and net. These types of materials are chosen because it will cost lesser than any other advance materials. Besides that, this type of house also having good air ventilation for harvesting mushroom. However, there are several mushroom companies that chose to build mushroom house by using cement or concrete. The concrete house can last longer, but it will cost higher.

Theoretically, according to Mohd Zafrie (2013)(Review, 2013), mushroom production activities practiced by entrepreneurs in Malaysia involved eight levels, which are the preparation of the mushroom block, packaging, mushroom steaming, injection of mushroom seeds, mushroom block seed maturity, production and collection of mushroom crops, pest and disease control and lastly, marketing process.

The main ingredients of mushroom block are rubber wood dust, rice bran, agricultural lime and water. Firstly, the ingredients are mixed together with the ratio of 100:10:1 by using mixer machine. Then, it will be mixed with 75% water before being packed with 6cm X 13cm plastic bag. Later, the mixture is being compressed by using PVC band or set net cover-cap and cotton. After that, the block is being steamed for at least 6 hours at temperature of 95°C before being cool down for about 2 days and 1 night. Mushroom block that has been steamed and cooled down then will be injected with 7 – 10 mushroom seeds (mycelium). Mycelium is a spore or seed which physically mild.



Figure 1.2: Mushroom blocks that have been prepared

This project is focusing on mushroom seed maturity process. The purpose for this project is to build a resting-cap system for mushroom house. The purposes of this

system are to shorten or to reduce the process and the time taken for placing the resting-cap onto the mushroom-block necks and to complete the process of closing the mushroom-block necks. Therefore, this system is expected to help or to make these mushroom seeds maturity process become much easier.

Regarding the seed process, the mushroom block is initially has been injected with the seeds. Then the block will be kept in the mushroom house. The purpose of the seed process is to activate the mycelium or the spore. Activated spore can be noticed when the mushroom block is already changed its colour from dark chocolate into white. Usually, this process will take place about 40 – 50 days. The net cover-cap of the mushroom block that has been entirely filled with mycelium (full maturity) will be removed and be replaced with the tissue layer and rubber band as to ensure that the mushroom will grow smoothly without any force caused by the net cover-cap.



Figure 1.3: Mushroom blocks is kept inside the harvesting house

Normally, the process of changing the net cover-cap with the tissue layer and rubber band will be done traditionally by human resource. Tissue layer is used as the precaution to avoid any pest from getting into the mushroom block while rubber band is used to fasten it. Pest such as ants and flies are really attracted in eating up the rice bran inside the block. This process will take about 105 seconds (average) to change the cap for each block.



Figure 1.4: Image showing the physical diagram *net cover cap* that will be removed once the seed is matured.

Therefore, semi-automatic mushroom resting-cap device will be built and be used in this process as to replace human force and as to shorten the time taken for this process. The system will be implied as an integrated automation system which can perform the task semi-automatically; applying the designated cap onto the mushroom-blocks neck and closing the designated cap for 3 blocks simultaneously. This is belief can shorten the average time for a minimum of 3 mushroom blocks. The expected average time taken will be only 2 seconds for every 3 blocks. This device will use a pallet to hold and keep 3 mushroom blocks together, then the holder will be put into the device manually, then the process of putting the cap will be done by the device automatically and the cap will be tighten up by using the servo. Lastly, the pallet will be taken out and put back into the mushroom house.



Figure 1.5: Image showing the *traditional way of cap* used to wrap up the mushroom block (tissue + rubber band).

## 1.2 PROBLEM STATEMENT

Mushroom-block harvesting issues usually occurs the most at the resting-cap of the mushroom-block, which it takes about five minutes for each mushroom-block to be completely cleaned, whereby removing the barley seeds, disinfect by using Dettol, place the tissue-cover, fasten by using rubber band and put back onto the rack. Before that, the standard common processes that are being conducted by most of the mushroom entrepreneurs require self-removing the initial cap of the mushroom-block, followed by placing the tissue layer onto the mushroom-block neck and closing the mushroom-block neck by using rubber band. Therefore, in order to overcome these problems, a Semi-Automatic Mushroom Resting-Cap Device will be developed as to encounter these both problems.

## 1.3 OBJECTIVES

This project is implemented in order to achieve these following objectives, which are:

- i) To shorten the time taken for resting-cap processes from manual to semi-automatic.
- ii) To reduce the labour workload for the resting-cap processes.

## 1.4 SCOPE OF PROJECT

The scope of this project are to study the basic of automation concept by using palletization from several published papers and books as well as to study the code used to create an innovation of the Arduino-based to control the semi-automatic mushroom resting-cap device in order to achieve the objectives as stated above.

### 1.4.1 The basic concept of palletization

In this project, palletization concept will be used to hold multiple mushroom blocks in one palette. By having this concept, it will benefit the user as the time taken to handle the mushroom blocks will be shorten as well as the number of mushroom blocks which are being handled are also increased. Generally, the palettization system is also known as a part of the logistic automation. It means that the logistic automation is the application of computer software and/or automated machinery to increase the efficiency of the logistic operation. There are several advantages that can be obtained by implementing this system into this project, which are better palletizing system means a high profitability that be gained, the damaged caused when handling the mushroom blocks also will decrease as well as the safety and accuracy by palletizing with integrated centring device.



Figure 1.6: The basic idea concept of palletization.