UNIVERSITI TEKNIKAL MALAYSIA MELAKA

MOTOR CONTROL AND TEMPERATURE MONITORING SYSTEM FOR DRYER MACHINE IN AGRICULTURE

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electrical Engineering Technology (Industrial Automation & Robotics) with Honours.

by

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FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING TECHNOLOGY

2018

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **MOTOR CONTROL AND TEMPERATURE MONITORING SYSTEM FOR DRYER MACHINE IN AGRICULTURE**

SESI PENGAJIAN: **2017/18 Semester 2**

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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 Electrical Engineering Technology (Industrial Automation & Robotics) with Honours. The member of the supervisory is as follow:

……

(Project Supervisor)

ABSTRAK

Mesin Pengering dalam industri sedia ada pada masa kini mengunakan kerosene sebagai bahan bakar utama, dimana bahan bakar ini memberikan kesan yang negatif pada alam sekitar. Dalam proses ini, pekerja yang ramai diperlukan untuk mengacau bahan-bahan yang hendak dikeringkan secara manual. Mesin pengering ini telah dilengkapi dengan sumber pemanas elektrik dimana haba dibahagikan secara seragam bagi mengeringkan bahan- bahan tersebut. Sistem mesin pengering sedia ada juga tidak mempunyai sistem pemantauan untuk memantau data serta hasil parameter yang terlibat dalam proses pengeringan. Perbezaan antara dua mesin ini adalah kelengkapan yang diperlukan dalam semua aspek bagi memenuhi syarat perusahaan dalam industri pertanian yang bertujuan untuk memudahkan proses pemantauan data dan mengehadkan proses kawalan mesin secara manual semasa proses pengeringan. Sistem pemantauan lazimnya digunakan untuk memudahkan proses pengambilan dan penyimpanan data seperti suhu di setiap zon semasa berlakunya proses pengeringan dengan memaparakan data-data pada paparan skrin sentuh LCD atau monitor bersiri di computer. Bagi mengehadkan kawalan proses pengeringan secara manual, keadaan beralih ke hadapan dan terbalik akan dilakukan secara automatic semasa proses pengeringan berlaku. Justeru, dengan terjadinya penambahbaikan terhadap mesin ini, masa yang diperlukan untuk mengeluarkan produk akan mencapai sasaran pemasaran. Secara konklusinya, proses penambahbaikan ini banyak memberikan kesan yang positif dalam industri agrikultur dan pertanian. Serta dapat membantu penyelidik lain dalam menambahbaikan dan memajukan produk mesin ini dalam industri pertanian

ABSTRACT

Dryer machines in the present-day industry use kerosene as a major fuel, where these fuels negatively affect the environment. In this process, large workers are required to stir the ingredients to be manually dried. This dryer has been equipped with an electric heating source where heat is divided uniformly to dry the materials. The existing dryer machine also has no system monitoring to monitor the data and parameters of the results involved in the drying process. The difference between these two machines is the equipment required in all aspects to qualify in the agricultural industry which aims to facilitate the process of data monitoring and to manually limit manual handling machines during the drying process. The monitoring system is typically used to facilitate the process of data retrieval and storage such as temperatures in each zone during the drying process by exhibiting data on the LCD touch screen or serial monitor on the computer. To limit the control of the drying process manually, the forward and reverse conditions will be performed automatically during the drying process. Hence, with the improvements to this machine, the time required to manufacture the product will reach the marketing target. In conclusion, this improvement process has a positive impact on the agricultural and agricultural industries. It can also help other researchers in improving and developing these machine products in the industry

DEDICATION

To my beloved parents, friends, lecturer and supervisor that helped me to complete this project.

ACKNOWLEDGEMENT

I would like to express my deepest appreciation to my respectful supervisor, Mr Mohd Firdaus Bin Mohd Ab Halim for providing me with a chance to pursue my studies here at Faculty of Engineering Technology, Universiti Teknikal Malaysia Melaka.

I would like to outspread my thankfulness to my classmate, especially who have provided me with valuable understanding, suggestion, information, and recommendations in order to complete this project. Their advice and tips are very useful and help a lot to make me more understanding about it. Also, a lot of thank to all my lecturer that give me guide lines in order to complete my study.

Last but not least, I would like to thanks to my beloved family for their support and encouragement. I am impressively thankful for them for their countless love and confident towards me.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.0 Introduction

In this chapter, the report will cover some of the topics that has been involved such as development of product, background of the project, objective, problem statement, scopes of the project, the expectation result at the end of this project and conclusion.

1.1 Project Background

The Malaysia Agriculture is an important sector to develop Malaysia economy up to 12% and provide 16% of employment to the population. It has been characterized by two distinct sectors plantation sector and the small holders sector. The main crops planted are paddy, oil palm, coconut and rubber.

In Agriculture industry, crop drying is refer to the removal of moisture or is the phase of post-harvest system that causes the product dried quickly until it reach the requirement level of moisture. This process plays a vital role in obtaining premium output because it is use to lower the moisture content in order to pledge a good condition for storage and for the further processing of the crop.

In the past, crop are usually dried directly using solar energy or sun. This method quite popular among the farmer but it has its limitation because relate with weather condition and crop drying hardly works. In order to overcome of this problem, the dryer machine is invented by using kerosene as machines main fuel source. The

overall process to drying the crop take at least one day to complete with limitation of specific amount of weight set in a day. Moreover, the machine process is manually operated and being monitor by an operator or the worker.

In existing technology the product is exposed directly to sun cause the solar radiation to be absorbed by the material. Hence, the required heat for the process not accurate and not fulfilled the quality of standards. The data and result of various types of material cannot be observed and obtained.

This project will discuss about the development of the drying machine through the temperature monitoring system and drum speed regulation.

1.2 Problem Statement

The existing dryer machine using kerosene fuel as it heat sources. Furthermore, the process of drying required an operator or worker because the process is manually stir to remove the moisture from the material. Uses of kerosene may harmful to environment. The existing machine design and known as commercial dryer box which take at least one day to complete the process of drying. It also depend on the material to be dried because each material does not have same requirement time to dry and they have different type of moisture level.

1.3 Objective

i. To improve the temperature monitoring system of the agriculture of drying machine using LCD touch screen display

ii. To improve the switching method of drum spinning direction in the dryer machine

1.4 Work Scope

The scopes of this undertaking are to actualize the checking framework to watch the execution of the parameter that engaged with the drying procedure, conduct of the sorts of sensor and the conduct of the execution machine. Also, these changes of certain component, for example, monitoring system and the execution direction of dryer machine, are actualized to meet execution quality in industry. The change must be executed to have great exhibitions quality on the grounds that the current performance of the machine is low. This undertaking will contribute an advantage and give the imperative data to the customer and analyst about the conduct of this drying machine. In conclusion, the scope of this venture can accomplish and meet the objectives of this project.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

In this chapter, all the information and features of each element and material used will be further discussed in this chapter. The previous studies will also be discussed in this chapter for a deeper understanding.

2.1 Moisture Content

Soil moisture content is very important to plants as all physiological processes are affected by temperature. High moisture content of soil will cause difficulty in the storage process due to the presence of insects and fungal problems, respiration and growth. Naturally, the plants require high soil moisture in the process of growth but when it comes to maturity, soil moisture content will also decrease.

In the process of respiration, the factors most strongly influencing crop yield, particularly grain yield, are soil moisture, the former of which depends on rainfall and its distribution during the growing season (Cooper et al., 1987). The rain farming system was widely used in the past because it was easy and efficient.

Moisture content is available in various methods such as oven drying method, rapid oven method, the salt-jar method, and moisture meters. Each substantial hygroscopic has its own humidity and water vapor levels, it is known as moisture content of equilibrium.

Table 2.0: Equilibrium Moisture Content Values at 25°C

Grain	Relative Humidity (%) 30	40	50	60	70	80	90	100
	Equilibrium Moisture Content (%wb*) at 25°C							
Barley	8.5	9.7	10.8	12.1	13.5	15.8	19.5	26.8
Shelled Maize	8.3	9.8	11.2	12.9	14.0	15.6	19.6	23.8
Paddy	7.9	9.4	10.8	12.2	13.4	14.8	16.7	-
Milled Rice	9.0	10.3	11.5	12.6	12.8	15.4	18.1	23.6
Sorghum	8.6	9.8	11.0	12.0	13.8	15.8	18.8	21.9
Wheat	8.6	9.7	10.9	11.9	13.6	15.7	19.7	25.6

* wet basis

Source: Brooker *et al.* (1974)

Olaniayan and Alabi (2014) arranged, fabricated and attempted a model segment dryer for paddy rice, compactness and financial status of little small scale rice farmer and processors. The dryer can dry paddy rice to a moisture content substance of 13.37% which is reasonable to store it.

2.2 Drying Process

Drying is a very important and it is a main process used in food processing as dried products store and to preserve much better than fresh products. Furthermore, drying process is a procedure of convection in which the dampness in a harvests is removed.it has their own particular rate of periods and it is separated into three classes which are steady rate period, first falling rate period, and second falling rate period. For steady rate period the dampness relocation rate from within item to its surface is equivalent to the rate of vanishing of water from surface. This period persistent till basic dampness content is come to and this period is short for agricultural products. Drying of sand and washed seeds occur in steady rate period.

In the meantime, for the principal falling rate period is the place an unsaturated surface drying and drying rate diminishes as a result of the decline in wet surfaces territory. Part of wet surface reductions to zero, where initially falling rate closes. The last one is second falling rate is the place the sub surface dissipation happen and it proceeds until the point when the balance dampness content is come to.

Drying of harvest, is basic for safeguarding item quality and accomplishing a capacity life of 1-3 years , however this is a standout among the most vitality escalated forms related with farming assembling. All yields required considerably troubles the nature of the item.

Normal drying process is one of conventional systems that utilized by the farmer. This procedure is isolated in three principle strategies which are drying in the field, drying on the surface that prevent the moisture from the ground and drying on a structure that is open sides to allow the air movement through the mass of the crops.

These days, normal drying process have transformed into new advancement where the procedure utilizing sun powered vitality yet at the same time uncovered the material on a tray to permit air movement. Solar air heaters are simple devices to heat air by utilizing solar energy applications expecting low to direct temperature underneath 80°C, for example, crop drying and space heating (Kurtbas and Turgut, 2006).

2.3 Type of Dryer

This sub will explained the type of dryer used and other type of dryer.

2.3.1 Solar Dryer

The sun dryer with box was developed utilizing the material that are effectively obtain from the nearby market. The planning of the drying chamber relies upon numerous variables, for example, the item to be dried, the required temperature and speed of the air to dry nourishment material, the amount of the dried item and the humidity of the air passing over the food material (Gatea, 2011).

In drying process, heat is need to evaporate moisture from the material and a flow of air helps in carrying away the evaporated moisture. There are two basic mechanisms engaged with drying process. Firstly, the movement of moisture from the interior of an individual material to the surface, and secondly the evaporation of moisture from the surface to the surrounding air (Youcef-Ali et al.,2001).

Ikejiofor and Okonkwo (2010) composed and built up a dynamic sun based dryer with movable wind current rates for farming items. The main part that involve in the dryer are the solar collector, heat storage unit, drying chamber, air outlet unit, and a suction fan. Test result show that, the drying time take about 8-11 hours was acquired by utilizing the sunlight based dryer in conjunction with the suction fan at 27.29 m 3/s suction rate. It was accounted that the dryer performed very well compared to drying time of 42-50 hours got from utilizing open sun drying method.

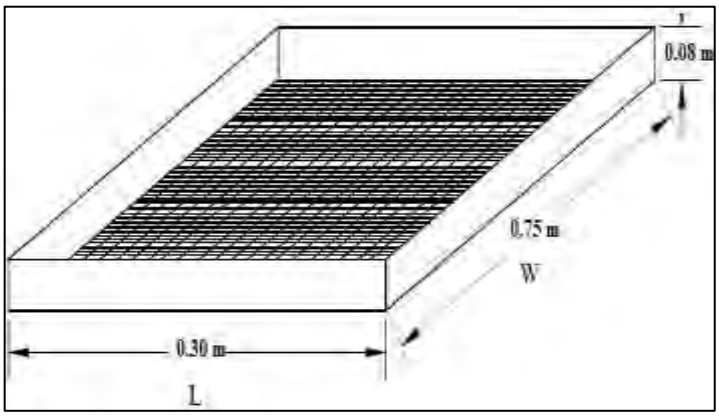

Figure 2.0 Tray in Drying Chamber

2.3.2 Charcoal-Fired Dryer

The dryer (Figure 2.1) comprises of four noteworthy functional units which include: combustion chamber, warm exchanger, suction unit, and drying chamber. In task, the strong fuel (charcoal) is let go in the burning chamber; the warmed air at that point goes through the heat exchanger/conserver where it is separated with the guide of the suction unit; and the warmed air is passed on to the drying chamber. In the drying chamber, as the heated air ignores the items on the drying tray, drying happens by heat and mass transfer and the residual/exhaust air exits through the chimney (Olaniyan, 2014).

Among the considerations factor involve is stability of dryer structure and strong support for the dryer; a fan having enough power to counter the back-pressure caused by the trays that contain the products during the process occur. It must consider that the fact, the speed of air stream through the trays must not be too high as to make the items be brushed off the drying plate.