UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF PROCESS FLOW AND STANDARD OPERATING PROCEDURES FOR MADEENA SYRUP PROCESS CONTROLS

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

by

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2011

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **Development Of Process Flow And Standard Operating Procedures For Madeena Syrup Process Controls.**

SESI PENGAJIAN: 20010/11 Semester 2

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Date	:	18 MEI 2011

APPROVAL

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

……

Supervisor

ABSTRAK

Projek ini merupakan suatu projek bagi membangunkan atau meningkatkan aliran proses dan prosedur operasi standard untuk proses kawalan sirap Madeena. Projek ini memerlukan kami untuk membina sebuah mesin yang akan menapis sirap untuk meingkatkan kualiti sirap tersebut dengan mengurangkan bendasing atau bahan kimia didalamnya. Projek dimulakan dengan kajian tentang bendalir, dan prosedur operasi bagi sesuatu proses. Selain itu, litar elektrik untuk mesin ini juga perlu dibina bagi membolehkan mesin ini beroperasi seperti apa yang dirancangkan. Beberapa proses terlibat dalam membina mesin ini seperti menggergaji, menggerudi, menyambung permukaan-permukaan, serta proses mewarnakan mesin menggunakan cat. Litar elektrik yang dibina diuji menggunakan perisian computer iaitu "Automation Studio". Apabila mesin siap dibina, ianya diuji terlebih dahulu menggunakan air sebanyak beberapa kali bagi mengenalpasti samaada mesin itu boleh berfungsi sepenuhnya dan tiada sebarang kebocoran disepanjang sambungan. Kemudian, mesin diuji lagi dengan menggunakan sirap dan data direkod bagi membandingkan kadar kelajuan diantara air dan sirap. Apabila semua data telah direkodkan dan semua bocoran telah dibaiki maka mesin sudah siap dibina. Langkah terakhir adalah menyediakan prosedur operasi penggunaan mesin untuk rujukan para pekerja bagi mengendalikan mesin dengan betul dan selamat.

ABSATRACT

This project presents the development of process flow and standard operating procedures for madeena syrup process controls. This project is need for build a machine that will filter the syrup liquid in order to improve their quality by removing the contaminants. The development starts with the study about fluid, pump, feed rate and also the standard operating procedure (SOP). In this development also, the study about the circuit and simulation on them are also required since we want it operates according what has been planned. The machine is build by undergo a few process such as wiring, welding, sawing, and also finishing process. Then, the circuit is test using Automation Studio by simulate them. When the machine is complete, the first test using water is run and the data is recorded. Second test is using the syrup liquid that is the objective of this project. All the record data of the feed rate, quality, process flow and operating procedure is analyzed and documented. Thus, the machine is complete and also included with the SOP that very useful for the operator to operate machine rightly.

ACKNOWLEDGEMENT

Bimillahirrahmanirrahim…

I wish to express my sincere thanks to Universiti Teknikal Malaysia Melaka (UTeM) as a university that I've already been through about 4 years as a student in degree and I really grateful to have been here as a student that always determining to succeed in the future. I also would like to extend my very special thanks to my beloved parents, Mr. Samsudin Bin Sueet and Mrs. Norshalimar Bte Mohd Ali for their full support and their guidance that really makes me stronger and stronger each day, each week, each month and each year to surpass all the barriers in life to succeed in the future. Without their prayer and blessing, I would possibly give up with my studies. As the most important and respected man that always support me in this project, Mr. Ahmad Yusiri Bin Bani Hashim, I would like to thank for his excellent supervised, giving good suggestion and criticism to the process of the work and motivates me in a good way which makes me improve myself in life or in studies. My appreciation also give to the technicians which help me built the machine according to the given period of time. They have teach me a lot in build the machine and also teach me how to do a few manufacturing process.

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LIST OF ABBREVIATIONS

SOP	-	Standard Operating Procedure
RO	-	Reverse Osmosis
DI	-	Deionization
TCE	-	Trichloroethylene
TDS	-	Total Dissolve Solids
ONTARIO	-	Ministry of Agriculture Food and Rural Affairs, France
D.E.	-	Diatomaceous Earth

CHAPTER 1
INTRODUCTION

1.1 Background

Madeena Enterprise is a company that produce Syrup. This syrup is made from herbs. This company was established nearly four years. The owner of this company is Haji Jaafar Bin Yacob where he say that this syrup actually is the royal drink that used by the Johor royal family a long time ago until nowadays. At the beginning, he continues produce this syrup herb by commercialize it to the people at Johor. After the products received favorable response from the people, he starts to commercialize it to the other country.

Figure 1.1: The product of the Madeena Enterprise.

From the time passes, he realized that his process in making the syrup, need to be improve because of a few factors. First factor is about the work need to be done by the worker. The existing process requires high labor. This is because they have to fill in the plastic or glass bottle manually. So, if the reservation is high, they have to work hard in order to achieve the target in the period of time that has been given.

Figure 1.2: The pot that use to cook he syrup.

Furthermore, the time taken from the beginning of the process until it is filled up into the bottle is too long. According to Mr. Jaafar (the owner), he said that the time taken for them cooked for one big pot is 3 days. In order to filled up the bottle, the hot syrup need to be cooled first. If not it will affect the bottle and also the syrup itself. So, time taken to cool the syrup is too long (8 hours). In between the process of cooling, they will took out the roots that are unravel, in order to make sure only the syrup liquid in the pot.

Figure 1.3: The bottle use to fill the syrup.

Figure 1.4: Bottles that already full with syrup.

Thus, this factor has effect to the production itself. Besides that, the way they filled up the bottle also has become one of the problems. The bottle is filled up by using the small jug. So, they need to fill up carefully and slowly in order to avoid the syrup

run out from the track or goes out from the bottle. Not only wasting time but also wasting the syrup itself.

So, this project disscusses the development of process flow as well as the standard operating procedure(SOP) for the syrup process controls. The processes that involve are the filtering process and bottling process. The current process which has been use is they cooked the herbs in the big pot until it is boiled. Then, it is cooled before filtered into the bottle manually by the operator. Thus this project involve the construction of the filtration machine and also analyse the process flow in the machine.

1.2 Problem Statements

The owner claim that their process flow in making the juice is poor where the workers need to wait for the hot juice that has been boiled to cooled before it is filtered manually into the juice bootle. This is not only wasting in time but they also loss in production of their juice. Furtheremore, their juice is not totally juice without contaminants although they filtered the juice before it is filled into the botle.

The development of process flow control is needed in order to improve Madeena bottling system in order to solve the problems. Research on fluid mechanics is needed because this project involved the flow of liquid. This is the early step that should be done together with the design of the machine.

1.3 Objectives of the Project

The objectives of the project are as follows:

1) To study the production rate of the herbal juice.
2) To study the quality of the herbal juice.
3) To document the process flow
4) To document standard operating procedure (SOP)

1.4 Scope of the Project

The scopes of this project are as follows:

1) Determination of process flow of the juice in the machine.
2) The capabilities of motor in order to push the juice into the tank.
3) The standard operation of the machine.
4) The production rate of he herbal juice

CHAPTER 2
LITERATURE REVIEW

This chapter discusses about the introduction to fluid mechanic, definition of fluid, and Bernoulli's Principle. Besides, this chapter also discusses about the basic equation in analyzing the problem of fluid mechanics problem, pump, filtration of liquid, filtration methodes, types of filtration and the research that have been done about filtration of syrup liquid. Futhermore, since this project is build a filtration machine, the informations about Standard Operating Procedure(SOP) is also included in this chapter.

2.1 Fluid Mechanic

2.1.1 Introduction to Fluid Mechanic

The study at rest or in motion is called fluid mechanics. This area of physics is divided into fluid statics, the study of the behavior of stationary fluids, and fluid dynamics, the study of the behavior of moving, or flowing, fluids. Fluid dynamics is further divided into hydrodynamics, or the study of water flow, and aerodynamics, the study of airflow.

The application of fluid mechanics is many such as the design of canal, levee, and dam systems; the design of pumps, compressors, and piping and ducting used in water and air conditioning systems of homes and businesses, as well as the piping systems needed in chemical plants; the aerodynamics of automobiles and supersonic airplanes; and development of many different flow measurement devices such as gas pump meters. It is truly a "high-tech" or "hot discipline, and many exciting areas have develop in last quater century although these are still important areas(witness,

for example, the current emphasis on automobile streamlining and the levee failure in New Orleans). The scope of fluid mechanics is large such an example is:

Environmental and Energy Issues

- Containing oil slicks
- Large scale wind turbines
- Energy generation from ocean waves
- The aerodynamics of large buildings
- Fluid mechanics of the atmosphere and ocean
- Phenomena such as tornadoes, hurricanes and tsunamis

Biomechanics

- Artifial hearts and valve
- Understanding of fluid mechanics of blood
- Synovial fluid in joints
- Rrespirotory system
- Circulatory system
- Urinary System

Sport

- Design of bicycle and bicycle helmet
- Skis
- Sprinting and swimming clothing
- Aerodynamics of the golf, tennis and soccer ball.

Smart Fluid

- In automobile suspension systems to optimize motion under all terrain conditions
- Millitary uniform containing a fluid layer is “thin” until combat, where it can stiffenend to give the soldier strenght and protection
- Fluid lenses with humanlike properties for use in cameras and all cell phones Microfluids
- For extremely precise administration of medications

2.1.2 Definition of fluid

Fluid is used as opposed to the solid where it tend to flow when we interact with them such as we stiring our morning coffee. But for the solid, it tend to deform or bend such as when we type on keyboard, the spring under the button compress. So, as what has been conclude that, fluid is a substance that deforms continously under the application of shear (tangential) stresses no matter how small the shear stress may be. The other definition of the fluid is a substance that cannot sustain a shear stress at rest. This is because, the fluid motion continous under the application of shear stress. So, only two phases or form that fluid can take that are liquid and gases. The difference between solid and fluid behavior in Figure 1 below.

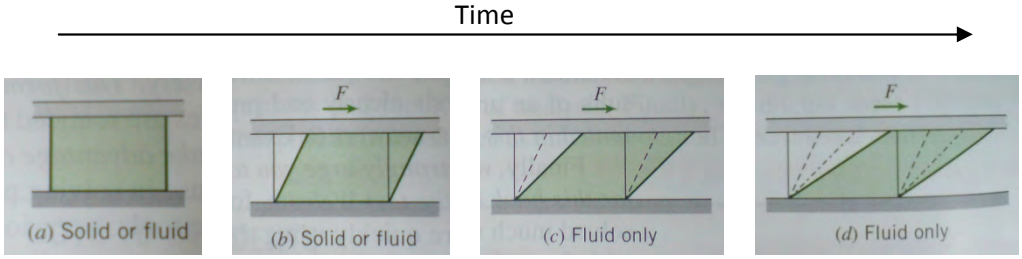

Figure 2.1: Difference in behavior of solid and a fluid due to shear force.

When, a specimen or substance is added between two plates (Figure 2.1a) and then a shearing force is applied to the plate, the substance will initially deform. But, the solid will then be at rest where the force is not beyond the elastic limit and the fluid will still continue to deform as long as the force is appllied. The rate of the deformation of the fluids depends on the fluid's viscosity, μ. The solid is considered as being elastic and fluid as being viscous.

2.1.3 Bernoulli's Principle

Long year ago, there are two people tha known as Archimedes and Pascal. They are contributed greatly to what became known as fluid statics, but the father of fluid mechanics, as a larger realm of study, was the Swiss mathematician and physicist