UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DESIGN AND DEVELOPMENT OF AUTOMATED COUNTING MACHINE FOR INDUSTRIAL APPLICATION

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

MUHAMMAD FARIS B MD YUSUF

FACULTY OF MANUFACTURING ENGINEERING

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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) with Honours. The member of supervisor committee is as follow:

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Pensyarah
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ABSTRACT

This project describes and reviews various sensor technologies, particularly through beam sensor and retro reflective sensor, which is applicable to counting an object in industrial applications. Aspects of review include technical requirement, design and fabrication, and instrumentation procedures for the sensors. A comparative between two sensors on the relative merit and selection criteria is carried out through an analysis of advantage and disadvantage on real applications of sensors in counting method. Hence, a details drawing for each part components were prepared and will be check to fabricate and develop. Electrical component to control a machine were determined with its function. Some of analysis will be taken as consideration to achieve a target objective of project such as time productivity counting and type of product been used.

ABSTRAK

Projek ini dijalankan untuk membincangkan dan mengulas tentang kepelbagaian teknologi sensor khususnya sensor sinar penembus dan sensor pemantulan sinar, dimana ia boleh digunakan dalam membilang objek didalam aplikasi industri. Aspek yang dibincangkan adalah termasuk rekaan dan fabrikasi pembangunan mesin serta prosedur yang diperlukan semasa pemasangan sensor dan keperluan teknikal sensor tersebut. Perbandingan di antara dengan kelebihan setiap sensor dan kriteria yang diperlukan semasa membuat pemilihan sensor dibuat berpandukan kelebihan dan kekurangan dalam aplikasi sebenar penggunaan sensor dalam kaedah membilang objek. Justeru itu, gambarajah terperinci di lakukan seblum proses membangunkan di jalankan. Beberapa analisis dijalankan terhadap projek membangunkan mesin kira ini untuk mencapai objektif projek dari segi masa yang di ambil terhadap productivity dan jenis-jenis bahan yang sesuai digunakan untuk applikasi dalam projek ini.

DEDICATION

Special Dedicated to My Beloved Family

Md Yusuf Mahmud

Jawizah Mamat

Yusrizan Md Yusuf

Nor Fathilah Md Yusuf

Khairul Azli Md Yusuf

Al-Yani Md Yusuf

Nur Ashikin Md Yusuf

Ahmad Mokhzani Md Yusuf

Muhammad Asraf Md Yusuf

And

All my Friends

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INTRODUCTION

1.1 Background Study

Development of counting machine in industrial application has been chosen to fulfill PO and PEO in course Manufacturing Robotic and Automation. Nowadays, there's much manufacturing of machine in engineering field. The method and results of measuring the accuracy of a particle sizing and counting machine are described and compared with the results obtained when sizing with a microscope. Machine counting appears to be quicker and more consistent and accurate than counting by eye (Courshee, R. J. 1954).

A counting machine consists of feeding system in electrical and electronic component. For an example is vibratory bowl where it's the oldest method and still most common approach to the automated feeding (orienting) of industrial parts. Part feeders, which singulate and orient parts prior to packing and insertion are critical components of an automated assembly line. The oldest and still most common approach to automated feeding is the vibratory bowl feeder which consists of a bowl filled with parts surrounded by a helical metal track. An application of vibratory bowls are suitable for feeding components for subsequent operations on special machines in cosmetic, electrical, mechanical, pharmaceutical, optical, bearing and many other industries. The components can be plastic caps, spouts, capsules and electrical connectors, bearings as well as heavy parts such as anchor bolts, bearing races and metal sockets.

Sensing methods based on electrical capacitance, magnetic and eddy-current effects are extremely sensitive and fasting acting and are suitable in close proximity to the sensor. The capacitive probe senses dielectric other than air, such as glass and plastic parts. The magnetic pickup by induction responds to the motion of iron and nickel. The eddy-current sensor, by energy absorption detected nonmagnetic conductors. All are suitable for counting machine operations.

1.2 Problem Statement

The development of the counter sensor technologies makes the choice of sensor in market higher. It sometime makes the engineer difficult to make the decision making in other to choose the best sensor that suitable for the counting part. Sometimes wrong decision will make the thing even worse. So that, this research is developed to identify the technology itself, technical requirement, and instrumentation and make the engineer or other bodies that involves can compare the differential between many types of sensor and make them can used it in correct condition.

Error-proofing is an industry term that relates to the implementation of mechanisms to prevent product defects. Also known as Poka Yoke from the Japanese ‘poke’ (inadvertent errors) and ‘yoke’ (to avoid), error-proofing is a common-sense concept developed and popularized in that country. Based on the philosophy, even the smallest number of defects is unacceptable. Poka Yoke maintains that the best way to eliminate defects is to prevent them from happening in the first place. Awareness involves the acknowledgement of breakdowns in the manufacturing/assembly process and employing training, audio-visual aids and general assistance for personnel to combat those issues. Detection introduces manual or automated inspection techniques to filter out defects. Prevention which includes process improvements or automation to ensure no errors are (or can be) made.

The primary issues are limited range and sensitivity to sensors. There need to increase the sensing range, reduce cost, and expand capabilities led to the development of photoelectric sensors optimized for detecting clear objects. Initially, ultrasonic sensors were more dependable and accurate at identifying targets, but over the last few year improvements in photoelectric sensors have made them the primary choice for sensing clear objects (better edge detection, increased resolution, indifference to size, shape, or temperature of target).

1.3 Objective of Project

Objectives that have to be achieved at the end of this project are design and development of an automated counting machine.

1.4 Scope of Project

The scope should be identified and planned to achieve the objectives of the project successfully on the time. Scope of this project is concentrate on how a counting device works for count an object or particle. Hence, analyses on automated counting machine such as test and accuracy of counting device to count an object.

Table 1.1: Gantt chart of PSM.

CHAPTER /WEEK	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CHAPTER 1: INTRODUCTION														
CHAPTER 2: LITERITURE REVIEW														
CHAPTER 3: METHODOLOGY														
CHAPTER 4: DESIGN AND DEVELOPMENT PLANNING														
CHAPTER 5 : DESIGN AND DEVELOPMENT PROGRESS														
CHAPTER 6 : RESULT														
CHAPTER 7: DISCUSSION														
CHAPTER 8 : CONCLUSION PSM														

CHAPTER 2

LITERATURE REVIEW

2.1 Historical Development of Counting Machine For Industrial Application

2.1.1 What is counting?

From Wikipedia Encyclopedia, count is a mathematical process for an object where it as be set aside with desired of number objects to repeatedly action to adding or subtracting. Hence, counting also can be involved more than one for example; counting by a two (2, 4, 6, 8….). From the archeological, they have found that a counting has been used last 500,000 year.

2.1.2 Historical Counting Device

On 500 B.C to 1300A.C, Babylon culture is the one who made up a first counting device called Abacus. The Abacus is used to calculate an arithmetic process and it's also act as a calculating tool on that time. After hundreds year, a counting board have been develop by Roman where it's called the hand of abacus. Year per year, a counting machine device have been continuous develop until an era of computer been arrived on 1950's.

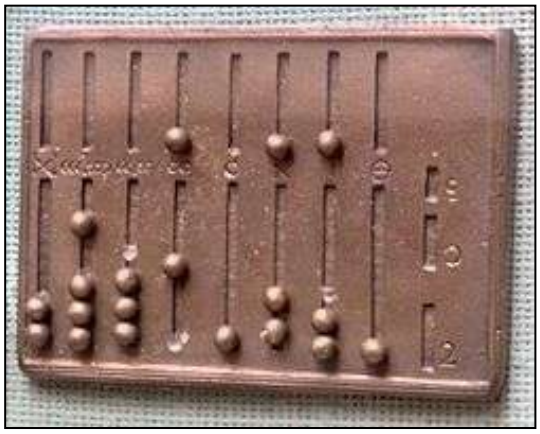

Figure 2.1: A Roman Abacus (Illustrated from Wikipedia Encyclopedia).

2.1.3 Historical counting machine

2.1.3.1 Cremer Company

On 1949, Cremer Company has built up a counting machine in packaging and counting line logistics. This company preferred supplier for counting machine and packaging solution on pharmacy, confectionery, bakery and frozen foods, packed snack food, hardware, medical supplies, flower bulbs, etc. A customer of this company in this world wide used counting and packaging machine are Nestle, Cadbury, Frito Lay, Kraft Foods, Glaxo, General Mills, Masterfoods, ConAgra, Chupa Chups, De la Rosa, Sabritas, Philips, Bayer, Wyeth Ayerst, Pfizer and Boehringer, Eli Lillyand and Dr. Oetker.

In 1982, Cremer introduced the first linear tablet and capsule counting machine. Ever since, the CF model has been renowned worldwide for its 100% accuracy, high capacity, simple cleaning and operation, high reliability and durability. The Cremer CF counting machine is a high-speed tablet and capsule counting machine for pharmaceutical and pharma industries - medicines, vitamins, food supplements, health products etc.

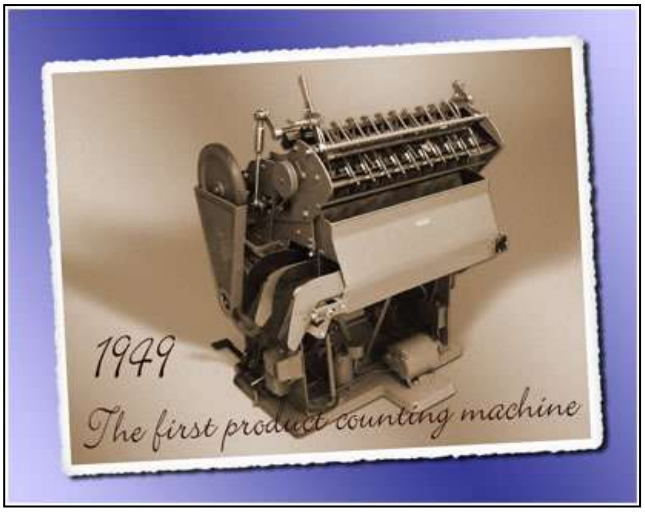

Figure 2.2: First counting machine (Illustrated from Cremer Company).

2.1.3.2 Cremer's Method

A line principle is used on all counting machine in Cremer Vibratory plates to separation of products before falling through detector channel. Cremer's method on count products is products are cascaded down through a Memory flap see Figure 2.3. Hence, the correct quantity is discharged into a bucket elevator or packaging machine.

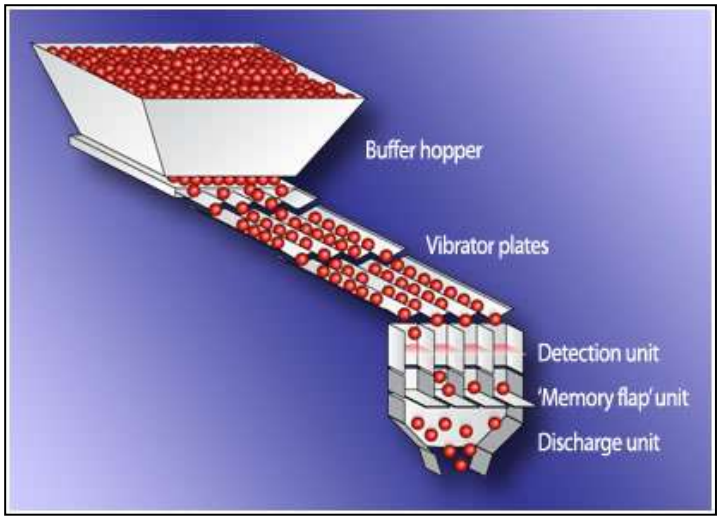

Figure 2.3: Cremer's counting principle (Illustrated from Cremer Company).