

DESIGN AND DEVELOPMENT OF AN AUTOMATED
TEA PACKAGING MACHINE

THESIS

JOHN THADEUS L. REYES
RUDOLF ROY R. SIDOCON

College of Engineering and Information Technology

CAVITE STATE UNIVERSITY

Indang, Cavite

Cavite State University (Main Library)



T6642

THESIS/SP 620.0042 R33 2016

April 2016

S **DESIGN AND DEVELOPMENT OF AN AUTOMATED TEA PACKAGING MACHINE**

Undergraduate Thesis
Submitted to the Faculty of the
College of Engineering and Information Technology
Cavite State University
Indang, Cavite

In partial fulfillment
of the requirements for the degree
Bachelor of Science in Computer Engineering



00010747

*Design and development of an automated tea
packing machine*
620 0042 R33 2016
T-6642

JOHN THADEUS L. REYES
RUDOLF ROY R. SIDOCON
April 2016

ABSTRACT

SIDOCON, RUDOLF ROY R. and REYES, JOHN THADEUS L., Design and Development of an Automated Tea Packaging Machine. Undergraduate Design Project. Bachelor of Science in Computer Engineering. Cavite State University, Indang, Cavite. April, 2016. Adviser: Engr. Marivic G. Dizon.

The main objective of the study was to design and develop an automated tea packaging machine. Specifically, it aimed to (1) design and construct the control unit for the automated tea packaging machine; (2) develop a program that will control the system; (3) design and fabricate the machine; (4) test and evaluate the performance through pilot testing of the automated tea packaging machine; and (5) determine the cost computation.

The design project was composed of PIC16F877A microcontroller, photo-electric sensor for detecting the presence of leaves inside the volumetric tube, photo interrupter sensor for the alignment of turn table and volumetric filler, DC geared motor for the vibration of sieve for filtering, DC geared motor for controlling the rotation of volumetric filler, DC geared motors for the rotation of feeder, DC geared motor for controlling the rotation of the turn table, another DC geared motors for the movement of sealer and impulse sealer for sealing purpose. The microcontroller was responsible for the operation of the system of the automated tea packaging machine which depended on the data sent by the sensors.

The project was tested and evaluated at the faculty room of the Engineering Science building, Department of Computer and Electronics Engineering on March 2016 to determine number of tea bags sealed and packed within five, ten and fifteen minutes,

the efficiency of the sealer was also evaluated, and last, comparing the desired weight and actual weight from the weighing scale.

Based on the results of the evaluation, the machine can packaged and sealed grounded tea leaves; the software can control the whole performance of the machine and makes the packaging and sealing easier than manual method because of its continuous operation; the machine volumetric filler capability was designed to dispense only for variety of dry free-flowing substances. The weight of the packed and sealed tea bags was not accurate when different kind of materials sample were used; the design of sealer of the machine was 80.36 percent effective in sealing process; the power consumption of the machine when performing the operation was 92.4Wh or 0.0924KWh, while 22Wh or 0.022KWh when the machine was idle; and all materials were acquired and used for the development of the project and was utilized efficiently. The cost of all materials used in the study amounted to P 37,738.74.

TABLE OF CONTENTS

	Page
BIOGRAPHICAL DATA	iii
ACKNOWLEDGEMENT	v
ABSTRACT	viii
LIST OF TABLES	xii
LIST OF FIGURES	xiii
LIST OF APPENDIX FIGURES	xiv
LIST OF APPENDIX	xv
INTRODUCTION	1
Significance of the Study	2
Objectives of the Study	2
Time and Place of the Study	3
Scope and Limitation of the Study	3
Definition of Technical Terms	3
REVIEW OF RELATED LITERATURE	5
METHODOLOGY	37
Materials	37
Control Unit	37
Filtering Unit	37
Filling Unit	37
Packaging Unit	38

Methods	38
Design and construction of the control unit	38
Design and fabrication of the packaging unit	39
Software development	43
Testing and evaluation of the machine	47
Cost computation	48
RESULTS AND DISCUSSION	49
Presentation and Analysis of the System	49
Construction of the Control Unit	51
Software Development	53
Testing and Evaluation of the machine.....	58
Cost computation	65
SUMMARY, CONCLUSION AND RECOMMENDATIONS	67
Summary	67
Conclusions	68
Recommendations	69
REFERENCES	70
APPENDICES	74

LIST OF TABLES

Table		Page
1	Number of tea bags sealed and packed within five, ten and fifteen minutes	58
2	Efficiency of the sealer of the Automated Tea Packaging machine	59
3	Comparison of desired weight and actual weight of selected leaves from the weighing scale	63
4	Price list of materials for the Automated Tea Packaging machine	65

LIST OF FIGURES

Figure		Page
1	The pin configuration of the microcontroller	17
2	The volumetric filling process	18
3	The automated tea packaging machine	40
4	The strainer with the vibrate motor	40
5	The hopper with the hopper motor	41
6	The volumetric filler with the volumetric motor	41
7	The turn table with the DC geared motor	42
8	The sealer with the gripper motor and linear motor	42
9	The system flowchart of automated packaging machine	44
10	The block diagram of automated packaging machine	50
11	The schematic diagram of automated packaging machine	52
12	The program flowchart of automated packaging machine	54

LIST OF APPENDIX FIGURES

Appendix Figure		Page
1	Top view of the automated tea packaging machine	76
2	Side view of automated tea packaging machine	77
3	Control unit of automated tea packaging machine	77
4	Relays and wire connections of automated tea packaging machine	78
5	Filtration unit of automated tea packaging machine	78
6	Filling unit of automated tea packaging machine	79
7	Turn table of automated tea packaging machine	79
8	Sealed tea bags	80
9	Volumetric tubes.....	80

LIST OF APPENDIX

Appendix		Page
1	Appendix figures	75
2	Program listing	81
3	Evaluation form	88
4	Computation	95
5	User's manual	100
6	Certifications and letters.....	107

DESIGN AND DEVELOPMENT OF AN AUTOMATED TEA PACKAGING MACHINE

John Thadeus L. Reyes
Rudolf Roy R. Sidocon

An undergraduate design project submitted to the faculty of Department of Computer and Electronics Engineering, College of Engineering and Information Technology, Cavite State University, Indang, Cavite in partial fulfillment of the requirements for graduation with the degree of Bachelor of Science in Computer Engineering with Contribution No. CEIT-2015-16-2-076. Prepared under the supervision of Mrs. Marivic G. Dizon.

INTRODUCTION

Most Asian are accustomed to drinking all kinds of tea, but Filipinos having been colonized by Spaniards for nearly 400 years and the Americans for another 50 years are different. They have strong preference for coffee and soft drinks. (Entrepreneur Staff, 2015)

According to Patricia Go, URC marketing services and advertising director, “The Filipinos have long been coffee and soda drinkers but they noticed that the Filipinos were becoming more concerned with their well-being and were taking better care of themselves”.