

DESIGN AND DEVELOPMENT OF AN AUTOMATED
NUT PROCESSOR

Design Project

CELINE FLOREIN Q. ALANO

AIZLE Q. AUSTRIA

College of Engineering and Information Technology

CAVITE STATE UNIVERSITY

Indang, Cavite

Cavite State University (Main Library)



DP544

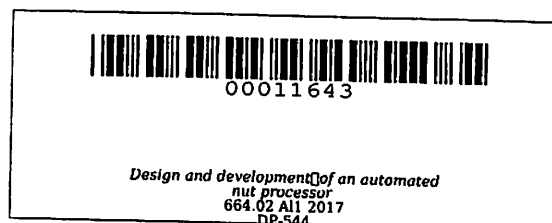
DP 664.02 A11 2017

July 2017

DESIGN AND DEVELOPMENT OF AN AUTOMATED NUT PROCESSOR

**Undergraduate Design Project
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**



**CELINE FLOREIN Q. ALANO
AIZLE O. AUSTRIA**

July 2017

ABSTRACT

ALANO, CELINE FLOREIN Q. and AUSTRIA, AIZLE O., Design and Development of an Automated Nut Processor. Undergraduate Thesis. Bachelor of Science in Computer Engineering. Cavite State University, Indang, Cavite. May, 2017. Adviser: Prof. Marivic G. Dizon.

A study was conducted to design and develop an automated nut processor. It aimed to help the entrepreneurs to automate the processing of nut with the help of the machine developed. The general objective of the study was to design and develop an automated nut processor. The study specifically aimed to: design and fabricate an automated nut processor; construct a microcontroller circuit; develop a program for the system; test and evaluate the device's performance according to: amount of the nuts dispensed by the hopper, amount of sugar dispensed by the hopper, amount of oil dispensed by the dosing pump; conduct a cost consumption of the system. The automated nut processor was designed and developed to roast and flavoring the nuts.

The materials that were used in the study were: microcontroller unit, induction cooker, Geared motors, relays, load cell controller, dosing pump and photo-interrupter sensors. The machine used Arduino AT Mega as microcontroller which executes the program to control the relays, motors, and sensor at the same time.

Result of the evaluation showed, based from the evaluated efficiency, the automated nut processor was considered desirable and effective to business firms and entrepreneur companies.

The study was proven effective on its capability to meet its objectives. The automated nut processor had a total cost of P 44, 500.00.

TABLE OF CONTENTS

	Page
APPROVAL SHEET	i
BIOGRAPHICAL DATA	ii
ACKNOWLEDGMENT	iv
ABSTRACT	viii
LIST OF TABLES	x
LIST OF FIGURES	xi
LIST OF APPENDIX TABLES	xii
LIST OF APPENDIX FIGURES	xv
LIST OF APPENDICES	xvi
INTRODUCTION	1
Statement of the Study.....	2
Objectives of the Study.....	2
Significance of the Study.....	2
Scope and Limitation of the Study.....	3
Definition of Technical Terms.....	5
REVIEW OF RELATED LITERATURE	7
METHODOLOGY	30
Materials.....	30
Arduino Mega.....	30

Power Supply	30
Induction cooker	30
A.C Geared motor.....	30
Liquid Crystal Display.....	30
Keypad.....	31
Solid State Relay	31
Load Cell Controller	31
Photo-Interrupter.....	31
Dosing Pump.....	31
CPT Converter.....	31
Piezo Buzzer.....	31
Methods.....	32
Design and fabrication of an automated nut processor.....	32
Design and development of microcontroller circuit of the system.....	33
Development of the software to the system.....	35
Testing and Evaluation.....	42
Cost Consumption.....	43
RESULTS AND DISCUSSION.....	44
Principle of Operation.....	44
Description of the Casing of the machine.....	44
Control Unit for Automated Nut Processor.....	46

Software Description of the System.....	48
Testing and Evaluation of the System.....	50
Cost Computation	62
SUMMARY, CONCLUSION, AND RECOMMENDATIONS.....	63
Summary.....	63
Conclusion.....	64
Recommendations.....	65
REFERENCES.....	66
APPENDICES.....	68

LIST OF TABLES

Table		Page
1	The weight of raw materials dispensed during the preset setting using $\frac{1}{4}$ kilogram	51
2	The weight of raw materials dispensed during the preset setting using $\frac{1}{2}$ kilogram	52
3	The weight of raw materials dispensed during the preset setting using 1 kilo.....	53
4	The weight of raw materials dispensed during the customize setting	54
5	The summary of percentage error of the raw materials in each load	54
6	Comparison of the manual cooking to the machine	55
7	The power consumption of automated nut processor	55
8	Total cost computation of an automated nut processor	62

LIST OF FIGURES

Figure		Page
1	The front view of automated nut processor	32
2	The isometric view of automated nut processor.....	33
3	The block diagram of an automated nut processor.....	34
4	PCB layout of an automated nut processor.....	35
5	The system flowchart of an automated nut processor machine.....	36
6	The photographic side view of automated nut processor.....	45
7	The photographic isometric view of automated nut processor.....	45
8	Pin configuration of an automated nut processor.....	47
9	The photographic view of the circuit wirings.....	48
10	The photographic view of LCD when the controller was switched on	49
11	The photographic view for the selection of user's input	49
12	The photographic view of cooking process and the remaing time	50
13	The photographic view of LCD when the Process is finish	50

LIST OF APPENDIX TABLES

Table	Page
1 The weight of raw materials dispensed during the preset setting using $\frac{1}{4}$ kilo.....	68
2 The weight of raw materials dispensed during the preset setting using $\frac{1}{2}$ kilo.....	68
3 The weight of raw materials dispensed during the preset setting using 1 kilo.....	68
4 The weight of raw materials dispensed during the customize setting.....	69
5 The summary of percentage error of the raw material in each load	69
6 Comparison of the manual cooking to the machine	69
7 The power consumption of automated nut processor	70
8 Total cost computation of an automated nut processor	70
9 The weight of raw materials dispensed during the preset setting using $\frac{1}{4}$ kilo.....	71
10 The weight of raw materials dispensed during the preset setting using $\frac{1}{2}$ kilo.....	71
11 The weight of raw materials dispensed during the preset setting using 1 kilo.....	72
12 The weight of the peanut dispensed during the customize setting	72
13 The amount of cashew nut dispensed during the customize setting	72
14 The amount of salt dispensed during customize setting.....	72
15 The amount of sugar dispensed during customize setting.....	72

16	The amount of oil dispensed during customize setting.....	73
17	The percentage error in terms of weight of the peanut using $\frac{1}{4}$ kilo.....	73
18	The percentage error in terms of weight of the peanut using $\frac{1}{2}$ kilo.....	73
19	The percentage error in terms of weight of the peanut using 1 kilo.....	74
20	The percentage error in terms of weight of the sugar in preset setting.....	74
21	The percentage error in terms of weight of the sugar in preset setting.....	74
22	The percentage error in terms of weight of the sugar in preset setting.....	74
23	The percentage error in terms of weight of the salt in preset setting.....	75
24	The percentage error in terms of weight of the salt in preset setting.....	75
25	The percentage error in terms of weight of the salt in customize setting.....	75
26	The percentage error in terms of weight of the salt in customize setting.....	76
27	The percentage error in terms of weight of the sugar in customize setting	76
28	The percentage error in terms of weight of the sugar in customize setting	76
29	The percentage error in terms of weight of the sugar in customize setting	77
30	The percentage error in terms of weight of the oil in customize setting	77

31	The percentage error in terms of weight of the oil in customize setting	77
32	The percentage error in terms of weight of the oil in customize setting	77

LIST OF APPENDIX FIGURES

Figure		Page
1	The front view of automated nut processor.....	80
2	The isometric view of automated nut processor.....	80
3	The block diagram of an automated nut processor.....	81
4	PCB layout of an automated nut processor.....	82
5	The system flowchart of an automated nut processor machine.....	83
6	The photographic side view of automated nut processor.....	89
7	The photographic isometric view of automated nut processor.....	89
8	Pin configuration of an automated nut processor.....	90

LIST OF APPENDICES

Appendix		Page
1	Testing and Evaluation Data.....	68
2	Diagrams.....	80
3	Program Codes.....	92
4	Computation.....	110
5	Certifications.....	114

LIST OF TABLES

Table	Page
1 Total cost computation of an automated nut processor	44
2 The weight of raw materials dispensed during the preset setting using $\frac{1}{4}$ kilogram	52
3 The weight of raw materials dispensed during the preset setting using $\frac{1}{2}$ kilogram	52
4 The weight of raw materials dispensed during the preset setting using 1 kilo.....	53
5 The weight of raw materials dispensed during the customize setting	54
6 Comparison of the manual cooking to the machine for $\frac{1}{4}$ kilo of peanut.....	55
7 Comparison of the manual cooking to the machine for $\frac{1}{2}$ kilo of peanut.....	55
8 Comparison of the manual cooking to the machine for 1 kilogram of peanut	55
9 The power consumption of automated nut processor.....	56

LIST OF FIGURES

Figure		Page
1	The front view of automated nut processor	33
2	The isometric view of automated nut processor.....	34
3	The block diagram of an automated nut processor.....	35
4	PCB layout of an automated nut processor.....	36
5	The system flowchart of an automated nut processor machine.....	37
6	The photographic side view of automated nut processor.....	46
7	The photographic isometric view of automated nut processor.....	46
8	Pin configuration of an automated nut processor.....	48
9	The photographic view of the circuit wirings.....	50

LIST OF APPENDIX TABLES

Table	Page
1 Total cost computation of an automated nut processor.....	70
2 The weight of raw materials dispensed during the preset setting using $\frac{1}{4}$ kilo.....	71
3 The weight of raw materials dispensed during the preset setting using $\frac{1}{2}$ kilo.....	71
4 The weight of raw materials dispensed during the preset setting using 1 kilo.....	71
5 The weight of raw materials dispensed during the customize setting.....	72
6 Comparison of the manual cooking to the machine for $\frac{1}{4}$ kilo of peanut.....	72
7 Comparison of the manual cooking to the machine for $\frac{1}{2}$ kilo of peanut.....	72
8 Comparison of the manual cooking to the machine for 1 kilo of peanut.....	72
9 The power consumption of automated nut processor.....	73
10 The weight of raw materials dispensed during the preset setting using $\frac{1}{4}$ kilo.....	73
11 The weight of raw materials dispensed during the preset setting using $\frac{1}{2}$ kilo.....	73
12 The weight of raw materials dispensed during the preset setting using 1 kilo.....	73
13 The amount of peanut dispensed during customize setting.....	74
14 The amount of cashew nut dispensed during customize setting.....	74
15 The amount of salt dispensed during customize setting.....	74
16 The amount of sugar dispensed during customize setting.....	74

17	The amount of oil dispensed during customize setting.....	75
18	The percentage error in terms of weight of the peanut using $\frac{1}{4}$ kilo.....	75
19	The percentage error in terms of weight of the peanut using $\frac{1}{2}$ kilo.....	75
20	The percentage error in terms of weight of the peanut using 1 kilo.....	76
21	The percentage error in terms of weight of the sugar in preset setting.....	76
22	The percentage error in terms of weight of the sugar in preset setting.....	76
23	The percentage error in terms of weight of the sugar in preset setting.....	77
24	The percentage error in terms of weight of the salt in preset setting.....	77
25	The percentage error in terms of weight of the salt in preset setting.....	77
26	The percentage error in terms of weight of the salt in customize setting.....	78
27	The percentage error in terms of weight of the salt in customize setting.....	78
28	The percentage error in terms of weight of the sugar in customize setting	78
29	The percentage error in terms of weight of the sugar in customize setting	79
30	The percentage error in terms of weight of the sugar in customize setting	79
31	The percentage error in terms of weight of the oil in customize setting	79

32 The percentage error in terms of weight of the
oil in customize setting 80

LIST OF APPENDIX FIGURES

Figure		Page
1	The front view of automated nut processor.....	83
2	The isometric view of automated nut processor.....	83
3	The block diagram of an automated nut processor.....	84
4	PCB layout of an automated nut processor.....	85
5	The system flowchart of an automated nut processor machine.....	86
6	The photographic side view of automated nut processor.....	92
7	The photographic isometric view of automated nut processor.....	93
8	Pin configuration of an automated nut processor.....	94

LIST OF APPENDICES

Appendix		Page
1	Testing and Evaluation Data.....	69
2	Diagrams.....	80
3	Program Codes.....	98
4	Computation.....	116
5	Certifications.....	120

DESIGN AND DEVELOPMENT OF AN AUTOMATED NUT PROCESSOR

Celine Florein Q. Alano
Aizle O. Austria

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 (BSCoE). No.CEIT-2016-17-SUM-006. Prepared under the supervision of Prof. Marivic G. Dizon

INTRODUCTION

Nut has been a popular crop in the Philippines. It is also one of the major field legumes grown by farmers but its production has been low and erratic. In the Philippines, nuts can be grown throughout the year provided production inputs, especially the water requirement, are adequately available (PCARR, 1978).

In general, Nut processors indicated that the lack of good quality nuts in adequate volume was a major constraint in the expansion of markets for nut products. It was indicated by other sectors that farmers were discouraged from planting nuts due to lack of profitable markets. An evaluation of the post-harvest handling practices for nuts indicated that there was inadequate capability among producers of nuts to convert newly harvested produce into clean, dry, sorted, and graded nuts, or into the form required by processors. Nuts produced deteriorated in quality, lost profitable markets, and could not compete with imports.