



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

AUTOMATIC PINEAPPLE PEELER MACHINE USING PLC

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

by

MAZALINDA BINTI MAZLAN

FACULTY OF MANUFACTURING ENGINEERING

2011



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: Automatic Pineapple Peeling Machine Using PLC

SESI PENGAJIAN: 2010/2011 Semester 2

Saya **MAZALINDA BINTI MAZLAN**

mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. **Sila tandakan (√)

SULIT


(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia yang termaktub di dalam AKTA RAHSIA RASMI 1972)

TERHAD

(Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)

TIDAK TERHAD

Disahkan oleh:





PENYELIA PSM

SYAMIMI BINTI SHAMSUDDIN
Pensyarah
Fakulti Kejuruteraan Pembuatan
Universiti Teknikal Malaysia Melaka

Alamat Tetap:

No2011, Blok1 Prkt 2,

Felda Air Tawar 5,

81920 Kota Tinggi, Johor.

Tarikh: 19 Mei 2011

Tarikh: 19 Mei 2011

** Jika Laporan PSM ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh laporan PSM ini perlu dikelaskan sebagai SULIT atau TERHAD.

APPROVAL

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

.....

Supervisor

DECLARATION

I hereby, declared this report entitled “Pineapple Peeler Machine using PLC” is the results of my own research except as cited in references.

Signature :

Author's Name :

Date :

ABSTRAK

Programming Logic Controller (PLC) merupakan pengawal di dalam projek ini. Ia digunakan untuk mengawal keseluruhan operasi di dalam Mesin Pemotong Kulit Nanas dan ianya merupakan komponen utama projek ini dan akan dihubungkan dengan motor untuk menggerakkan mesin. Mesin ini dilengkapi dengan sensor sebagai langkah keselamatan. Untuk memenuhi tugasannya, terdapat beberapa sasaran yang perlu dipenuhi. Sasaran utamanya adalah untuk mencipta and membangunkan struktur mekanikal yang sesuai dengan tugas mesin pemotong kulit nanas. Keyence merupakan software untuk PLC. Berdasarkan kepada kegunaannya, kajian yang terperinci perlu dijalankan untuk menentukan bahan, fabrikasi, actuator dan sensor yang terbaik. Setelah itu, carta aliran poses bagi menyiapkan tugas dan penentuan rekabentuk ditentukan.

ABSTRACT

The idea of this project came a couple of years ago as to why there are no peeling machine specifically to peel the pineapple skin in a short time. Hence, this project which is aimed to design and develop a machine that will peel pineapple skin automatically. The Keyence Programming Logic Controller (PLC) is the controller in this machine. It is used to control the whole operation in the Pineapple Peeler Machine and is interfaced with a motor to run the machine. The machine is equipped with sensor for safety. The PLC is programmed with Ladder Builder software to carry out the ladder diagram programming. Thorough research had been conducted to determine the best material, mechanical fabrication, actuator and sensor for this project. Critical aspects of this machine are the hygienic factor and the electrical and mechanical components. Best machine design of rectangular shape is chosen due to ease of assembly. Based on testing result, the project is successful because the machine can peel the pineapple peel smoothly 'eyes'.

ACKNOWLEDGEMENT

I would like to thank to Faculty of Manufacturing Engineering of UTeM for giving me an opportunity to undergo this final year project as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Robotic & Automation) with Honours.

A very special thank I dedicated to my supervisor, Pn Syamimi binti Shamsuddin, Lecturer of Faculty of Manufacturing Engineering (Robotic & Automation) who is supervised and guided me during the final year project. Not forgotten, to other Fakulti Kejuruteraan Pembuatan (FKP) lecture that give their support, co-operation and also shared knowledge with me on my Projek Sarjana Muda (PSM) title. I also want to express my appreciation to my panel, En. Khairol Anuar bin Rakiman for providing time to judge me for this project during the presentation session and giving me advices and comments to improve my skills and performance.

TABLE OF CONTENT

Abstrak	i
Abstract	ii
Acknowledgement	iii
Table of Content	iv
List of Tables	vii
List of Figures	x
List of Abbreviations	xi
1. INTRODUCTION	1
1.1 Background and Overview	1
1.2 Problem Statement	4
1.3 Project Aim & Objectives	6
1.4 Scope	6
1.5 Project Planning	7
1.6 Expected Outcome	7
1.7 History of PLC	7
1.8 PLC Definition	11
1.9 Advantages of PLC	11
1.10 Disadvantages of PLC	12
1.11 Application of PLC	12
1.12 Chapter Conclusion	13
2. LITERATURE REVIEW	14
2.1 Introduction	14
2.2 Pineapple	14
2.2.1 Morris Pineapple	16
2.2.2 Maturity Index of Mauritius Pineapple	17
2.3 Removal of Pineapple Skin using Peeling and Coring Machine	18
2.4 Overall Project Components	20
2.5 Mechanical Structure	20

2.5.1	The Classes of Engineering Material	21
2.5.1.1	Aluminium	22
2.5.1.2	Stainless Steel	23
2.5.1.3	Acrylics	24
2.5.1.4	Comparison Table	24
2.6	Mechanical Fabrication	25
2.6.1	Mechanical Fastening	25
2.6.1.1	Screw Thread Fastener	26
2.6.1.2	Rivets	27
2.6.2	Welding	28
2.6.2.1	Gas Tungsten Arc Welding	28
2.6.2.2	Gas Metal Arc Welding	30
2.6.3	Machining	30
2.6.3.1	Drilling	31
2.6.3.2	Grinding	33
2.7	Actuator	35
2.7.1	Motor	36
2.7.1.1	Basic Principle of Electric Motor	36
2.7.2	Types of Motor	37
2.7.2.1	AC Motor	38
2.7.2.2	DC Motor	39
2.7.2.3	Stepper Motor	40
2.8	Sensor	41
2.8.1	Limit Switch	42
2.8.2	Push Button	42
2.8.3	Selector Switch	44
2.8.4	Photoelectric Sensor	44
2.8.5	Proximity Sensor	45
2.9	Controller	46
2.9.1	Programmable Logic Controller	46
2.9.2	PLC Architecture	47
2.9.2.1	Power Supply	48
2.9.2.2	Processor	49
2.9.2.3	Memory	49

2.9.2.4 Input and Output	50
2.9.2.5 Programming Device	51
2.9.3 Relay-Device Components	51
2.9.3.1 Switches	51
2.9.3.2 Relays	53
2.9.3.3 Timers	53
2.9.4 Types of Programming Language	54
2.9.4.1 Ladder Diagram	55
2.9.4.2 Function Block Diagram	56
2.9.4.3 Structured Text Language	57
2.9.5 Keyence PLC	58
2.9.5.1 Features of the Visual KV Series	58
2.10 Software for Project Development	60
2.10.1 Structural Design	60
2.10.1.1 Solid Works 2008	61
2.10.1.2 AutoCAD	62
2.10.1.3 Catia	63
2.10.2 PLC Programming using Keyence Software	63
2.10.2.1 Name and Function of Each Part of the Screen	65
2.11 Similar Past Project	66
2.12 Conclusion	67
3. METHODOLOGY	68
3.1 Introduction	68
3.2 Methodology Flow Chart	68
3.3 Methodology Section	69
3.4 Description of Methodology Flow Chart	69
3.4.1 Literature Review	70
3.4.2 Methodology	72
3.4.3 Design Consideration	72
3.4.3.1 Hardware	73
3.4.3.2 Software	73
3.4.4 Interfacing	74
3.4.5 Troubleshooting	74

3.4.6	Testing	75
3.4.7	Result and Conclusion	75
3.5	Software Tools Selection	75
3.5.1	Solid Work 2009	76
3.5.2	Keyence Ladder Builder	76
3.6	Project Components	79
3.7	Material Selection	79
3.7.1	Mechanical Structure Selection	80
3.7.2	Motor Selection	80
3.8	Mechanical Fabrication Selection	81
3.8.1	Fastening Selection	81
3.8.2	Welding Selection	81
3.8.3	Machining Selection	82
3.9	Conclusion	82
4. DESIGN AND DEVELOPMENT		83
4.1	Introduction	83
4.2	Conceptual Design and Development	83
4.2.1	Design 1	84
4.2.2	Design 2	86
4.3	Quality Function Deployment	88
4.3.1	Pugh Concept Selection	88
4.3.2	Concept Selection	89
4.4	Development	90
4.4.1	Bill of Material	91
4.4.2	Mechanical Section	92
4.4.2.1	Body Frame	92
4.4.2.2	Cutter Blade	94
4.4.3	Electrical Section	95
4.4.4	Programming Flow Chart	95
4.4.5	PLC Ladder Diagram	97
4.4.6	Steps of Programming	98
4.4.6.1	Start-Stop programming	98

4.4.6.2 Automatic Programming	99
4.4.6.3 Manual Programming	99
4.5 Conclusion	100
5. RESULT AND DISCUSSION	101
5.1 Programming Ladder Diagram	101
5.1.1 Ladder Diagram Test	101
5.2 Performance Test	103
5.2.1 Speed Test	103
5.2.2 Time Test	104
5.3 Conclusion	104
6. CONCLUSION AND RECOMMENDATION	106
6.1 Conclusions	106
6.2 Recommendation	107
REFERENCES	108
APPENDICES	
A Design of paper cutter machine	
B Virtual Design and kinematic simulation for cutter of corn harvester	
C Integrated gripper and cutter in a mobile robotic system for harvesting Greenhouse product	

LIST OF TABLES

1.1	Gross domestic product by kind of economic activity for 2000-2009 (Journal of Department of Statistics Malaysia, Volume 2, 2009)	2
1.2	Pineapple statistic (Malaysia Pineapple Industry Board)	5
1.3	Gantt chart for PSM I	8
1.4	Gantt chart for PSM II	9
2.1	Comparison table	25
2.2	Programming Language (Groover 2008)	54
2.3	Keyence PLC function (Keyence User Manual)	60
3.1	Motor selection table	80
4.1	Simple QFD Diagram Characteristics (Chitale and Gupta 2007)	89
4.2	Pugh concept selection for design 1 and design 2	90
4.3	Bill of Material	91
4.4	Input and Output of PLC	98
5.1	Function of switches in PLC programming	102
5.2	Performance test result	103
5.3	Cycle time result	104

LIST OF FIGURES

1.1	Percentage distribution of establishment by sub-sector 2008 (Report on Census of Agricultural Establishment, Malaysia 2009).	3
1.2	A PLC system: CPU module and I/O rack (Chang, Wysk and Wang 2006)	10
1.3	The manufacturing process industry to produce consumables (Rockis and Mazur 2005)	13
2.1	Pineapple plantation (Malaysia Pineapple Industry Board)	15
2.2	Pineapple plant (Malaysia Pineapple Industry Board)	15
2.3	Morris pineapple	16
2.4	Hand sizing and coring machine (Muzium Nanas Johor)	19
2.5	Gigantic Machine (Muzium Nanas Johor)	19
2.6	The class of engineering material (Ashby 1999)	22
2.7	Mechanical assembly using (a) a screw, (b) a bolt, (c) a rivet, and (d) a snap-fit joint (Benhabib 2003)	26
2.8	Screw and bolt heads (Benhabib 2003)	27
2.9	Rivet geometries: (a) solid, (b) tubular, (c) compression, and (d) split (Benhabib 2003)	28
2.10	(a) The gas tungsten-arc welding process formerly known as tungsten inert welding. (b) Equipment for gas tungsten-arc welding operations (Kalpakjian and Schmid 2006)	29
2.11	(a) Schematic illustration of the gas metal-arc welding process or metal inert gas welding. (b) Basic equipment used in gas metal-arc welding operations (Kalpakjian and Schmid 2006)	31
2.12	(a) Chisel-point drill. (b) Crankshaft drill (Kalpakjian and Schmid 2006)	32
2.13	(a) Grinding wheel structure. (b) Material removal (Benhabib 2003)	33
2.14	Surface grinding with (a) a horizontal spindle. (b) a vertical spindle (Benhabib 2003)	34
2.15	Cylindrical (a) internal and (b) external grinding (Benhabib 2003)	34
2.16	Centerless (a) internal and (b) external grinding (Benhabib 2003)	35

2.17	A rotating electric motor (Groover 2008)	36
2.18	The classification of motor (Petruzella 2010)	37
2.19	AC Motor parts (Rockis and Mazur 2005)	38
2.20	DC Motor parts (Rockis and Mazur 2005)	40
2.21	Stepper motor (Petruzella 2010)	41
2.22	Application of limit switch (Rockis and Mazur 2005)	43
2.23	Exploded view of push button (Rockis and Mazur 2005)	43
2.24	Selector switches (Rehg and Sartori 2007)	44
2.25	Photoelectric sensor (Rockis and Mazur 2005)	45
2.26	Proximity sensor sensing range (Petruzella 2010)	46
2.27	An Example of Bosch Programming Logic Controller (Rockis and Mazur 2005)	47
2.28	Components of PLC (Groover 2008)	48
2.29	Types of switches (Chang, Wysk and Wang 2006)	52
2.30	A relay (Chang, Wysk and Wang 2006)	53
2.31	A timer (Chang, Wysk and Wang 2006)	54
2.32	Ladder diagram and components (Chang, Wysk and Wang 2006)	56
2.33	Example FBD circuit (Rehg and Sartori 2007)	57
2.34	Keyence PLC part name (Keyence User Manual)	59
2.35	Solid Works 2008 interface	62
2.36	Catia interface	63
2.37	Ladder Builder interface (Keyence User Manual)	64
2.38	Sample of programming Ladder Builder	64
2.39	Name and function of Ladder Builder window	65
2.4	Name and function of each part of the screen	65
3.1	Methodology Flow Chart	71
3.2	Multi-file edits (Keyence Support Software)	77
3.3	Selection of instruction word and device (Keyence Support Software)	77
3.4	Selection of device by dragging and dropping (Keyence Support Software)	78
3.5	The three window (Keyence Support Software)	78
3.6	Project components	79

4.1	Design 1	85
4.2	Solid modeling for design 1	84
4.3	Design 2	87
4.4	Solid modeling for design 2	86
4.5	Body frame	92
4.6	Unfolded views of the sheet metal	93
4.7	Machining housing	94
4.8	Programming flow chart	96
4.9	PLC programming	97
4.10	Start-stop ladder diagram	98
4.11	Automatic mode ladder diagram	99
4.12	Manual mode ladder diagram	100
5.1	Successful cutting pineapple	103

LIST OF ABBREVIATIONS

PLC	-	Programmable Logic Controller
FKP	-	Fakulti Kejuruteraan Pembuatan
PSM	-	Projek Sarjana Muda
GDP	-	Gross Domestic Product
MPIB	-	Malaysia Pineapple Industry Board
MODICON	-	Modular Digital Controller
NEMA	-	National Electrical Manufacturing Association
AC	-	Alternating Current
DC	-	Direct Current
GTAW	-	Gas Tungsten Arc Welding
TIG	-	Tungsten Inert Gas
GMAW	-	Gas Metal-arc Welding
MIG	-	Metal Inert Gas
NO	-	Normally Open
NC	-	Normally Close
CPU	-	Central Processing Unit
ROM	-	Read-only memory
RAM	-	Random-access memory
PROM	-	Programmable read-only memory
EPROM	-	Erasable programmable read-only memory
EAPROM	-	Electronically alterable programmable read-only memory
PC	-	Personal Computer
LD	-	Ladder Diagram
FBD	-	Function Block Diagram
SFC	-	Sequential Function Chart
IL	-	Instruction List
ST	-	Structured Text
CAD	-	Computer Aided Design
QFD	-	Quality Function Deployment
TQM	-	Total Quality Management

CHAPTER 1

INTRODUCTION

This chapter cover the general information for the project title „Automatic Pineapple Peeler Machine using Programmable Logic Controller (PLC)“ likes background and overview of the project, problem statement, project aim and objectives, scope, project planning, and the expected outcome for this project.

1.1 Background and Overview

The wealth of a nation is commonly measured by its gross domestic product (GDP), or the per capita GDP of the nation. The GDP reflects the “standard of living” for industrial countries. The GDP includes contributions from both private industry and government. Private industry is divided into the categories of agriculture, mining of oil and gas, manufacturing, construction, trade or commerce, financial intermediation, real estate, and services.

All of these industry sectors contribute to the wealth of a nation. Malaysia Department of Statistic indicate that in 2009, manufacturing sector contributed RM172, 696 million at current prices to real GDP of the nation. It shows the highest percentage among others sector for consecutive ten years as shows in Table 1.1. The statistics seem to tell a story of a declining and ever-marginalized manufacturing sector. However, the statistics also send signal of urgency and of a need for infrastructure transformation.

Table 1.1 : Gross domestic product by kind of economic activity for 2000-2009 (Journal of Department of Statistics Malaysia, Volume 2, 2009)

Tahun	Pertanian, Ternakan, Perhutanan dan Perikanan		Perlombongan dan Kuari		Pembuatan		Pembinaan		Perkhidmatan Services										Tolak : FISIM yang tidak diagihkan		Campur : Duti Import		Keluaran Dalam Negeri Kasar (KDNK) pada Harga Pembeli			
									Utiliti		Perdagangan Borong dan Runcit, Hotel dan Restoran		Pengangkutan, Penyimpanan dan Komunikasi		Kewangan, Insurans, Hartanah dan Perkhidmatan Perniagaan		Perkhidmatan-perkhidmatan Lain								Perkhidmatan Kerajaan	
									Utilities		Wholesale and Retail Trade, Hotels and Restaurants		Transport, Storage and Communication		Finance, Insurance, Real Estate and Business Services		Other Services								Government Services	
									Harga Semasa	Harga Malar	Harga Semasa	Harga Malar	Harga Semasa	Harga Malar	Harga Semasa	Harga Malar	Harga Semasa	Harga Malar							Harga Semasa	Harga Malar
Current Prices	Constant Prices	Current Prices	Constant Prices	Current Prices	Constant Prices	Current Prices	Constant Prices	Current Prices	Constant Prices	Current Prices	Constant Prices	Current Prices	Constant Prices	Current Prices	Constant Prices	Current Prices	Constant Prices	Current Prices	Constant Prices	Current Prices	Constant Prices	Current Prices	Constant Prices			
2000	30,647	30,647	37,617	37,617	109,998	109,998	13,971	13,971	10,629	10,629	47,934	47,934	24,898	24,898	48,287	48,287	21,324	21,324	22,576	22,576	17,308	17,308	5,826	5,826	356,401	356,401
2001	28,245	30,594	33,945	36,980	103,434	105,301	14,241	14,427	11,281	11,062	49,201	48,974	26,488	26,409	50,987	50,570	22,594	22,223	24,104	23,583	17,594	17,505	5,653	5,629	352,579	358,246
2002	34,432	31,471	34,169	38,610	112,076	109,640	14,673	14,762	11,970	11,759	51,326	50,986	28,197	27,441	55,828	55,392	23,810	23,105	27,450	24,816	17,324	17,018	6,605	6,594	383,213	377,559
2003	38,971	33,369	41,918	40,959	125,332	119,687	15,200	15,031	12,607	12,282	53,062	51,965	30,172	28,621	57,914	58,011	24,891	23,996	29,569	26,693	17,374	17,654	6,507	6,453	418,769	399,414
2004	43,949	34,929	56,881	42,627	144,007	131,127	15,458	14,903	13,711	13,100	59,401	56,441	33,319	30,973	60,531	60,775	26,099	24,996	31,827	28,243	17,531	17,705	6,396	6,099	474,048	426,508
2005	43,854	35,835	75,062	42,472	154,657	137,940	15,680	14,685	14,327	13,851	66,535	61,346	35,978	32,870	65,328	65,541	27,542	26,064	34,426	30,371	17,314	17,742	6,372	6,017	522,445	449,250
2006	50,436	37,701	85,566	42,030	168,736	147,154	15,976	14,639	15,160	14,523	72,724	65,492	38,882	35,185	72,331	71,253	28,978	27,234	38,093	33,412	18,099	18,385	5,659	5,287	574,441	475,526
2007 ^a	65,032	38,224	92,402	42,881	178,705	151,789	17,645	15,332	16,014	15,106	83,328	73,390	42,588	38,137	81,895	80,672	30,819	28,593	44,231	35,004	18,853	19,730	5,969	5,521	639,776	504,919
2008 ^b	75,657	39,769	127,210	42,550	194,103	153,744	19,581	15,657	16,911	15,431	97,606	80,262	45,778	40,687	87,319	85,192	33,038	30,090	53,987	38,875	19,949	20,786	7,436	6,839	738,677	528,311
2009 ^b	64,651	39,929	87,722	40,926	172,696	139,448	21,165	16,548	17,711	15,489	96,939	81,403	46,115	41,326	90,584	88,343	35,159	31,403	55,596	40,031	21,085	22,270	7,181	6,642	674,434	519,218

Based on the facts, agriculture provides infrastructure transformation. It is so because agriculture produced 9.59% of the GDP. It's a potential sector to be transformed. Farming meant using animal power to plow the fields. Nowadays, riding on air-conditioned machinery guided by a global positioning system, farmer can farm thousands of acres of land and produce a high yield. Improved crops, the precise delivery of fertilizer and insecticide, better weather forecasting, specialized farm equipment, and more made all that possible.

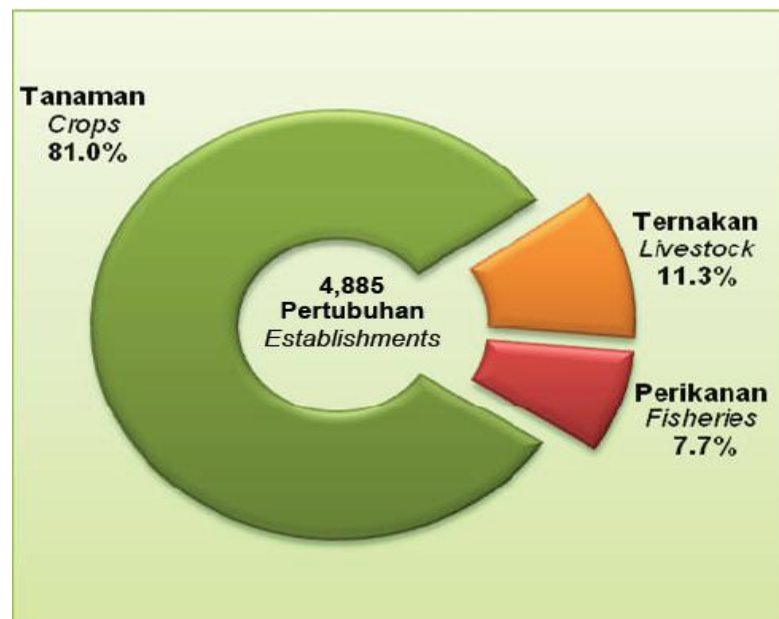


Figure 1.1: Percentage distribution of establishment by sub-sector 2008 (Report on Census of Agricultural Establishment, Malaysia 2009).

The product from agriculture mainly used in food industry. In Malaysia, the food industry is dominated by small and medium scale companies. The major sub-sector is fish and fish products, livestock and livestock products, and crops and crops products (Figure 1.1). In the crops sector, besides mango, star fruits and papaya, the cultivation of pineapple is gaining interest among farmer. Most of these pineapples cater for the domestic market. The major locations pineapple cultivation is in Pekan Nanas, Johor.

The manufacture of pineapple in 2008 had reached 173,832 metric ton, which 156,111 ton metric come from fresh pineapple and the balance come from canned pineapple (Table 1.2). Malaysia's export earnings from fresh and canned pineapples in 2008 had reached RM488 million. RM455 million in export earnings was from

fresh pineapples and RM33 million through the canned product. Canned pineapple contributes a great amount of that profit.

However, there still a lot of insufficient factor that effects the canned production line. One of the major problems in canned production line is how to peel the pineapples. The idea to design an automatic pineapple peeler machine using Programming Logic Controller (PLC) came up based on that circumstance. Automation is an answer to produce better product at lower cost and high quality because manufacturing is an activity that is traditionally labor intensive.

To compete in the global market and still maintain the standard of living of this country, the importance of developing and deploying new manufacturing technology must not ignored.

1.2 Problem Statement

In canned pineapple manufacturing in Malaysia, pineapple skin is removed using “Kwong Nam” machine (Malaysia Pineapple Industry Board, MPIB). However, the machine is not accurate because after the machining process, the pineapple still needs to be manually peeled by workers to remove the balance of the peel and the eyes. This increases process time and cost. It is also not effective. Critical hygiene factor also plays a big role in this type of production because it involves food processing. The machine that being used in the factory usually is big and are difficult to clean up and the cleanliness of the machine are often doubted.

Another issue is related to the small and medium scale pineapple canned industries. Most of the manufactures are not affordable to buy a large and expensive machine to peel the pineapples. A simple and smaller machine to peel the pineapple is needed for this purpose.

Table 1.2 : Pineapple statistic (Malaysia Pineapple Industry Board, 2008)

TAHUN	PENGELUARAN			EKSPORT NANAS KALENG				
	BUAH NANAS TAN METRIK	NANAS KALENG		PETI PIAWAI	T/METRIK	NILAI (RM)	HARGA F.O.B. (RM)	
		PETI PIAWAI	TAN METRIK				1 PETI PIAWAI	1 TAN METRIK
1970	308,400	3,521,000	71,891	3,223,600	65,819	51,782,800	16.06	786.7
1971	301,400	3,356,700	68,536	2,881,000	58,824	46,232,500	16.05	786.0
1972	288,100	2,990,600	61,061	3,039,900	62,068	49,262,500	16.21	793.7
1973	262,700	2,830,700	57,797	2,671,100	54,538	46,203,700	17.30	847.2
1974	257,600	2,884,000	58,885	2,532,500	51,708	61,357,400	24.23	1,186.6
1975	211,800	2,055,800	41,975	2,041,800	41,689	53,801,300	26.35	1,290.5
1976	201,000	2,255,200	46,046	2,367,300	48,335	64,884,000	27.41	1,342.4
1977	200,200	2,384,800	48,692	2,321,100	47,392	68,085,400	29.33	1,436.7
1978	195,700	2,330,400	47,582	2,090,100	42,675	65,888,300	31.52	1,544.0
1979	200,800	2,202,700	44,974	1,710,400	34,923	53,561,500	31.32	1,533.7
1980	185,300	2,243,000	44,873	1,800,600	36,022	51,454,200	28.58	1,428.4
1981	153,600	1,878,500	37,581	2,043,700	40,886	51,840,500	25.37	1,267.9
1982	153,000	1,968,600	39,383	2,081,600	41,644	56,061,500	26.93	1,346.2
1983	148,200	1,999,800	40,007	1,930,300	38,655	58,054,500	30.08	1,501.9
1984	144,300	2,172,000	43,452	2,136,900	42,750	69,368,200	32.46	1,622.6
1985	151,600	2,172,200	43,456	1,674,100	33,491	55,583,000	33.20	1,659.6
1986	144,400	1,942,100	38,853	2,097,500	41,963	56,448,500	26.91	1,345.2
1987	150,200	2,032,300	40,657	2,028,900	40,589	58,819,700	28.99	1,449.1
1988	163,600	2,110,200	42,216	1,908,300	38,177	57,992,100	30.39	1,519.0
1989	179,600	2,469,400	49,402	2,129,700	42,606	63,015,400	29.59	1,479.0
1990	168,275	2,308,446	46,182	2,463,570	49,285	79,474,932	32.26	1,612.5
1991	189,679	2,704,648	54,108	2,465,134	49,317	95,385,852	38.69	1,934.1
1992	189,344	2,575,007	51,515	2,155,571	43,124	81,202,518	37.67	1,883.0
1993	161,130	2,282,945	45,672	2,236,327	44,739	69,523,285	31.09	1,554.0
1994	156,189	2,327,446	46,562	2,137,434	42,761	65,169,027	30.49	1,524.0
1995	140,369	2,142,942	42,871	1,963,424	39,280	61,048,701	31.09	1,554.2
1996	121,915	1,934,543	38,702	1,707,167	34,153	62,908,251	36.85	1,842.0
1997	119,825	1,732,516	34,660	1,563,292	31,275	60,197,687	38.51	1,924.8
1998	92,035	1,381,055	27,629	1,147,949	22,965	60,733,943	52.91	2,644.6
1999	82,571	1,256,863	25,144	1,017,674	20,359	56,568,609	55.59	2,778.5
2000	71,043	1,080,506	21,616	815,031	16,305	38,418,071	47.14	2,356.2
2001	65,048	1,032,828	20,662	819,200	16,389	34,512,710	42.13	2,105.9
2002	70,052	1,149,101	22,989	961,121	19,228	39,752,953	41.36	2,067.5
2003	72,997	1,141,891	22,844	1,122,021	22,447	51,905,416	46.26	2,312.4
2004	81,618	1,083,013	21,666	991,585	19,837	48,723,020	49.14	2,456.1
2005	86,740	1,112,552	22,257	883,529	17,676	43,891,995	49.68	2,483.2
2006	85,902	1,224,630	24,500	877,079	17,547	43,291,535	49.36	2,467.2
2007	69,607	894,739	17,900	1,082,617	21,658	48,119,146	44.45	2,221.7
2008	156,111	885,801	17,721	576,403	11,531	33,612,807	58.31	2,914.9

1.3 Project Aims & Objectives

This project aims to produce an efficient and accurate automatic pineapple peeler machine using Keyence PLC as its controller.

To fulfil the project aim, three objectives have been lined up and must be achieved:

- a) To design and develop the mechanical structure suitable for the machine task of pineapple peeling and the mounting of sensors and motor.
- b) To develop the electrical circuits and program the Keyence PLC to achieve the project task.
- c) To interface between the hardware and programming software in order to for the machine to successfully carry out its task.

1.4 Scope

A PLC system will be used in this automatic pineapple peeler machine to make the machine operate automatically by using motor and a push button. Both the PLC system and the machine will communicate using a push button. This machine will include with push button which is the start button. The machine also include with a door as a passage to put a pineapple into the machine. When user activates the push button, the PLC will get the input and transfer it to the motor to move the cutter to cut the pineapple peel. It also included with sensor which is limit switch to act as safety mechanism to the system. The limit switch is attached at the door. When the door of the machine is close, the switch will triggered and the motor will function. Once the door of the machine is open, the motor will stop although the button is push. It designed to avoid injury and accident.

The PLC system is used to control the motor in the machine. The motor is attached with the cutter. When the button is push, the motor will trigger and moving down the cutter to cut the skin. After certain time, the motor will bring up the cutter again. A sensor which is limit switch is used to determine the limit level of the cutter to make sure that the cutter not crashes with the body of the machine. Another sensor is used

to determine whether the safety door is in open or close position for safety precautions.

1.5 Project Planning

The planning for this project starts with title selection for “Projek Sarjana Muda” (PSM) and a proposal preparation. In the report, details information and graphics for the machine will be discussed. The report covers the introduction, literature review, methodology, conceptual design, project development, results, discussion, and conclusion. The planning for the entire semester are list and shows in the Gantt chart in Table 1.3 and Table 1.4. Table 1.3 shows about the planning horizon for PSM I and Table 1.4 shows the planning for PSM II.

1.6 Expected Outcome

The expected outcome for this project is a fully functional an automatic pineapple peeler machine using PLC. The machine is designed for use in the small and medium scale industries. The expected cost for the machine will not exceed RM1000. The machine that will be produced must peel the pineapple skin automatically without leaving behind any single piece of the skin.

1.7 History of PLC

In the mid-1960s, Richard Morley, a partner in consulting firm specializing in control systems in England was involved in replacing relays with minicomputers in machine tool controls. In January 1968, Morley devised the notion and wrote the specifications for the first programmable controller. It would overcome some of the limitations of conventional computers used for process control at the time.