

**LEAN MANUFACTURING SYSTEM IMPLEMENTATION : A CASE STUDY  
IN FOOD PROCESSING COMPANY**

**UMI KALSOM BINTI OTHMAN**

**UNIVERSITY TECHNOLOGY MALAYSIA**

LEAN MANUFACTURING SYSTEM IMPLEMENTATION: A CASE STUDY IN  
FOOD PROCESSING COMPANY

UMI KALSOM BINTI OTHMAN

A project report submitted in partial fulfilment of the  
requirements for the award of the degree of  
Master of Engineering (Industrial Engineering)

Faculty of Mechanical Engineering  
University Technology Malaysia

JANUARY 2013

*Thank you Allah for making this happened. Thank you for giving me the strength.*

*Alhamdulillah.*

*Thank you to my beloved husband and lovely daughter. Special thanks also dedicated to my parents and my parents in-law. They bore me, raised me, supported me, taught me, and loved me. To them, I dedicate this thesis.*

## ACKNOWLEDGEMENT

I would like to thank Allah my lord for giving me the strength, patience, and guidance to go through this research. This research work is the product of mine which has been realized on Master Project I and II . This write up work enable me to apply and used Industrial Engineering tools that I've learned throughout the semester as well as interpretate the subject that I've learned into case study company. Alhamdulillah, with the guidance, unlimited support, direction, advice, and patience from Dr. Azanizawati Ma'ram as my Superior and advisor in this course, and Associate Professor Dr. Abdul Rahman as my co-supervisor, this research work manage to be compiled.

Most special acknowledge are given to my husband, for the time and morale support, to my lovely daughter , my family and my in-law family due to their understanding and fully morale support in order to complete the research work. My besties, and my colleague, thank you for your ideas and criticism in order for me to deliver the best that I could.

As a case study, I have took world-wide topic from my previous subject taken in Semester 2 which is Lean Manufacturing. The case study company has been known as PPNJ Poultry & Meat Sdn. Bhd. which is the one of the local largest Broiler Integrator company in Malaysia. In order to gather all the information and record, my special thanks went to En. Baharduddin Haji Azmi, Puan Hadija, Cik Baizura and the key people, En. Abdul Wahid for their assistance in data collection used in this research.

## ABSTRACT

This research identified the critical major Non Value Added activity (MUDA); Motion, Defects/Errors and Waiting waste that exist in the case study company. The case study will be conducted at one of the local biggest Broiler Integrator Food Processing Company namely PPNJ Poultry & Meat Sdn. Bhd. located in Machap, Johor. This case study will use some approaching way such as observation on day to day working task during GEMBA, interviewing a personnel face to face and some documentation and record review from respective department. The critical major Non-Value Added activity will be analyzed based on the outcome from Waste Walk assessment that will be conducted during GEMBA at processing floor. The analysis will follow through after all the methodology implemented. Cause and Effect diagram will be used in order to identify potential root cause contribute to the major waste. An effective problem solving tools; P-D-C-A tools will be used to plan for the improvement as well as giving the beneficial solution for the company. All the potential solutions that suggested can be beneficial to the company in terms of money and time savings. This idea will directly help the company to increase their productivity, producing good quality products as well as providing good environment to their employees. The new workstation design will help the company eliminates all major critical waste and create smooth and efficient production. Output from this real study will be used for establishments and development of Lean Manufacturing System in food processing industry. These guidelines can be used for implement effectiveness Lean Manufacturing System in all organizations.

## ABSTRAK

Kajian ini adalah bertujuan untuk mengesan aktiviti yang tidak mempunyai nilai (MUDA) seperti pergerakan yang tidak diperlukan, kerosakan atau kecacatan, dan pembaziran masa menunggu yang wujud dalam kajian kes syarikat. Kajian kes ini akan dilakukan di salah sebuah syarikat pemprosesan ayam daging iaitu PPNJ Poultry & Meat Sdn. Bhd. yang terletak di daerah Machap, Johor. Kajian kes ini akan menggunakan beberapa pendekatan seperti pemerhatian terhadap kerja-kerja seharian sewaktu melakukan GEMBA, menemubual individu secara bersemuka dan menyemak dokumen serta rekod daripada pelbagai jabatan yang terlibat dengan aktiviti pemprosesan ayam daging ini. Aktiviti yang tidak mempunyai nilai ini kemudian akan di analisa berdasarkan hasil keputusan daripada audit untuk mengesan pembaziran yang dijalankan semasa melakukan GEMBA di kawasan pemprosesan. Analisa akan dilakukan selepas semua kaedah untuk mengumpul data dilaksanakan. Gambarajah sebab dan akibat akan digunakan untuk mengesan punca sebenar yang menyumbang kepada pembaziran utama. Kaedah penyelesaian yang efektif iaitu PDCA akan digunakan untuk merancang penambahbaikan dan juga memberi cadangan yang bermanfaat kepada syarikat dalam bentuk duit dan penjimatan masa. Cadangan ini akan terus membantu syarikat untuk meningkatkan kadar produktiviti syarikat, menghasilkan produk yang berkualiti serta menyediakan persekitaran yang baik untuk pekerja mereka. Cadangan tempat kerja yang baru akan membantu syarikat menghapuskan semua pembaziran yang kritikal dan membentuk produksi yang lancar serta efisien. Hasil kajian akan di gunakan untuk membangunkan dan mengukuhkan 'Lean Manufacturing System' dalam industri pemprosesan makanan. Panduan ini boleh digunakan untuk mempraktikkan 'Lean Manufacturing System' yang efektif terhadap semua organisasi.

## TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	DECLARATION	ii
	DEDICATION	iii
	ACKNOWLEDGEMENT	iv
	ABSTRACT	v
	ABSTRAK	vi
	TABLE OF CONTENTS	vii
	LIST OF TABLES	x
	LIST OF FIGURES	xi
	LIST OF ABBREVIATIONS	xviii
1	INTRODUCTION	
	1.1 Introduction	1
	1.2 Background of the research	3
	1.3 Problem statement/Research problem	4
	1.4 Justification of the research	5
	1.5 Methodology	6
	1.6 Objectives	6
	1.7 Scopes	7
	1.8 Definition of terms	7
	1.9 Research contributions	9

1.10	Outline of the report	9
1.11	Conclusion	10

## **2 LITERATURE REVIEW**

2.1	Introduction	
2.2	Lean Manufacturing	
	2.2.1 Origin of Lean Manufacturing	13
	2.2.2 Lean Research History	16
	2.2.3 Lean Thinking	18
	2.2.4 Lean Benefits	19
2.3	Focus Area	
	2.3.1 Waste Elimination	21
	2.3.2 Types of Operation	21
	2.3.2.1 Value Added (VA)	22
	2.3.3.2 Non-Value Added (NVA)	22
	2.3.4.3 Necessary but non-value added (NNVA)	23
	2.3.3 'MUDA' Waste	23
	2.3.4 Kaizen (Continuous Improvement)	27
	2.3.5 5S Implementation (Quality Environment System)	29
	2.3.6 Employee Suggestion Scheme (ESS) Implementation	31
2.4	Techniques used	32
	2.4.1 Process Flow Chart	33
	2.4.3 Ishikawa diagram	34
	2.4.4 Why-Why Analysis	34
	2.4.5 P-D-C-A	35

## **3 METHODOLOGY**

3.1	Introduction	37
3.2	Justification of Methodology	37
3.3	Research Procedures	38
	3.3.1 Data Collection	40



3.3.2	Data Analysis	43
3.3.3	Data Validation	43
3.4	Company Introduction	44
3.5	Company Department's	46
3.5.1	Receiving and slaughtering area	46
3.5.2	Evisceration Area	49
3.5.3	Spin Chillers and Processing Area	53
3.5.4	Storage and Packaging Area	55
3.6	Conclusion	56

## **4 DATA COLLECTION AND ANALYSIS**

4.1	Introduction	57
4.2	Data collection	58
4.2.1	Receiving Area	59
4.2.2	Stunning	60
4.2.3	Slaughtering	61
4.2.4	Bleeding	62
4.2.5	Scalding	62
4.2.6	De-Feathering	63
4.2.7	Head Cutting	64
4.2.8	Leg Cutting	64
4.3	MUDA – 7 Waste Assessments	65
4.3.1	Waste Walk	66
4.4	Job Sequence Time study, Waste Summary Recording and Flow Process Chart	81
4.4.1	Job Sequence Time Study	81
4.4.2	Waste Summary Recording at Slaughtering process	85
4.4.3	Flow process chart for Slaughtering process [Before]	87
4.5	Data Analysis [Root Cause Identification]	88
4.5.1	Cause and Effect diagram	88
4.5	Conclusion	77

## 5

**PROPOSED SOLUTIONS AND ANALYSIS**

5.1	Introduction	120
5.2	Problem Solution Method- PDCA Cycle	121
	5.2.1 P-D-C-A Milestone Chart	121
5.3	Proposed Solutions	123
	5.3.1 Lean Manufacturing Framework	123
5.4	KAIZEN (Continuos Improvement)	126
	5.4.1 Motion Waste	126
	5.4.1.1 Proposed Layout	126
	5.4.1.2 Design and Operation	127
	5.4.1.3 Cost Benefit Analysis	129
	5.4.1.4 Design and operation	130
	5.4.2 Defects Waste	133
	5.4.2.1 Proposed Layouts	133
	5.4.2.2 Design and Operation	134
	5.4.2.3 Cost Benefit Analysis	136
	5.4.3 Waiting Waste	139
	5.4.3.1 Design and Operation	139
	5.4.3.3 Cost Benefit Analysis	140
	5.4.3.4 Alternatives solutions Waiting	140
5.5	Proposed Solutions: Other Lean Tools	143
	5.5.1 5S (Quality Environment System)	143
	5.5.1.1 5S implementation in PPNJ Poultry & Meat Sdn. Bhd.	144
	5.5.2 Employee Suggestion Scheme	144
5.6	Validation	152
	5.6.1 Comparison of Potential Cost and Time savings between before and after for each of critical waste	152
	5.6.2 Re-assessment of Waste Walk and produce 'After' Radar Chart	156

<b>6</b>	<b>CONCLUSIONS AND FUTURE WORKS</b>	
6.1	Introduction	157
6.2	Discussion	157
6.3	Conclusion	160
6.4	Research Implications And Contributions	161
6.5	Limitations	162
6.6	Future Work	163
	<b>REFERENCE</b>	<b>164</b>
	<b>APPENDIX</b>	<b>168</b>

## LIST OF TABLES

TABLE NO.	TITLE	PAGE
1.1	Definition of terms	7
2.1	Lean Manufacturing research from varied researcher	16
2.2	Key features of Kaizen	28
4.1	Overproduction Waste Assessment	68
4.2	Example of Overproduction Waste Activity	69
4.3	Inventory Waste Assessment	70
4.4	Example of Inventory waste during operation	70
4.5	Transport Waste Assessment	72
4.6	Example of transportation of offal waste to the offal room Manually by operator	71
4.7	Example of Defects/Errors Waste during the production	73
4.8	Defects/Errors Waste Assessment	74
4.9	Over processing Waste Assessment	75
4.10	Examples of over processing waste during production	71
4.11	Motion Waste Assessment	77
4.12	Example of Motion Waste Activity during operation	78
4.13	Waiting Waste Assessment	79
4.14	Example of waiting waste during breakdown	80
4.15	Job Sequence Activities Time Study	82
4.16	Waste Summary Recording at Slaughtering Process	85
4.17	Flow Process Chart for Broiler Process [Before]	87
4.18	Identification of possible causes [MAN, MACHINE, MATERIAL, and ENVIRONMENT] for Motion Waste	90
4.19	Verification of possible causes of [MAN, MACHINE,	

	MATERIAL, METHOD and ENVIRONMENT] for Motion Waste	92
4.20	Description of motion waste problem	95
4.21	Bleeding flow process chart	97
4.22	Total Manpower Cost for Motion Waste	99
4.23	Total Time Loss for Motion Waste	100
4.24	Description of small tank hole	101
4.25	Identification of possible causes [MAN, MACHINE, MATERIAL, METHOD and ENVIRONMENT] for Defect Waste	103
4.26	Verification of possible causes of [MAN, MACHINE, MATERIAL, METHOD and ENVIRONMENT] for Defect Waste	105
4.27	Problem description for Defect waste	108
4.28	Bucket Cleaning Activities	109
4.29	The data of Live Broiler Input from Jan-Dec 2012	110
4.30	The data of Live Broiler Mortality from Jan-Dec 2012	112
4.31	Identification of possible causes [MAN, MACHINE, MATERIAL, METHOD and ENVIRONMENT] for Waiting Waste	113
4.32	Verification of possible causes of [MAN, MACHINE, MATERIAL, METHOD and ENVIRONMENT] for Waiting Waste	115
4.33	Summary of Machine Breakdown in PPNJ Poultry & Meat Sdn. Bhd.	117
4.34	Total Breakdown of stunning motor	119
5.1	Technical specification for proposed Bleeding tank	128
5.2	Bleeding Tank Cost Analysis	129
5.3	Technical specification for proposed Blood Pump	131
5.4	Design benefits from Motion waste solutions	132
5.5	Technical specification for proposed 'L' Shape Roller Conveyer	135
5.6	Conveyer Cost Analysis	136
5.7	Manpower Cost Analysis	137
5.8	Design benefit for Defect waste solutions	138

5.9	Electrical Motor Cost Analysis	140
5.10	Total Productive Maintenance (TPM) descriptions	141
5.11	5S Audit Checklist (Based on E.J. Sweeny, 2003)	148
5.12	Potential savings of Motion waste	152
5.13	Potential savings of Defect waste	154
5.14	Potential savings of Waiting waste	155
6.1	Result Summary	158

## LIST OF FIGURES

<b>FIGURE NO.</b>	<b>TITLE</b>	<b>PAGE</b>
1.1	Flow of Report outline	10
2.1	The Three M's	14
2.2	The Key Principles of Lean Philosophy	15
2.3	Lean Enterprise Research Centre (LERC, 2004) at Cardiff Business School	19
2.4	Lean Typical Benefits	20
2.5	'MUDA' waste illustrations	23
2.6	The seven waste identified by Taiichi Ohno	24
2.7	5S Concept	30
2.8	Creating Flow and PDCA	36
3.1	Flow of Research Procedures	39
3.2	Research Methodology Category	40
3.3	Marketing Channels of Broiler in PPNJ	44
3.4	PPNJ Poultry & Meat Sdn. Bhd. products and brand	45
3.5	PPNJ Poultry & Meat Sdn. Bhd. main departments	46
3.6	Receiving and Slaughtering flow chart	47
3.7	Receiving and Loading Area	48
3.8	Slaughtering Area	48
3.9	Evisceration process flow chart	51
3.10	Evisceration Area	52
3.11	Spin Chillers and Processing Area	53
3.12	Spin Chillers and Processing flow chart	54

3.13	Storage and Packaging area flow chart	565
3.14	Storage and Packaging Area	56
4.1	The Broiler Slaughtering process flow at PPNJ Poultry & Meat Sdn. Bhd.	58
4.2	Layout of Broiler Slaughtering Plant	59
4.3	The Broiler Receiving process flow at PPNJ Poultry & Meat Sdn. Bhd.	60
4.4	The Broiler Stunning process flow at PPNJ Poultry & Meat Sdn. Bhd	60
4.5	The Broiler Slaughtering process flow at PPNJ Poultry & Meat Sdn. Bhd.	61
4.6	The Broiler Bleeding process flow at PPNJ Poultry & Meat Sdn. Bhd.	62
4.7	The Broiler Scalding process flow at PPNJ Poultry & Meat Sdn. Bhd.	63
4.8	The Broiler Defeathering process flow at PPNJ Poultry & Meat Sdn. Bhd.	63
4.9	The Broiler Head Cutting process flow at PPNJ Poultry & Meat Sdn. Bhd.	64
4.10	The Broiler Leg Cutting process flow at PPNJ Poultry & Meat Sdn. Bhd	65
4.11	MUDA – 7 Waste Assessment	81
4.12	Identified 7 Waste	81
4.13	Job Sequence Activities	84
4.14	Non Value Added and Value Added Activity Percentage	84
4.15	Priority and Ease to Correct matrix	86
4.16	Verification method	89
4.17	Cause and Effect diagram of Motion Waste	90
4.18	Slaughtering and blood process flow at slaughtering area	94
4.19	The bucket that used to transport blood	95
4.20	Bleeding process	96
4.21	Total collected blood from August until November 2012	98
4.22	Current size of bleeding tank hole	101
4.23	The operator perform the routine task at bleeding tank	102



4.24	Cause and Effect diagram of Defect Wast5	103
4.25	Current layouts of PPNJ Poultry & Meat Broiler Holding and Receiving Area	107
4.26	The Live broiler bucket	108
4.27	The operator perform the cleaning activity manually	109
4.28	Total input of live Broiler by KG and Pieces	110
4.29	Total input of live Broiler by KG and RM	110
4.30	Total Mortality of live Broiler by KG and Pieces	111
4.31	Total mortality of live Broiler by KG and RM	111
4.32	Cause and Effect diagram of Waiting Waste	113
4.33	The stunning motor and the effects machine during breakdown	
4.34	Type of machine defect	119
5.1	P-D-C-A Cycle concepts	121
5.2	P-D-C-A Milestone Charts	122
5.3	Lean Manufacturing Frameworks	123
5.4	Lean 9 Principles	124
5.5	Lean 9 Principles details	124
5.6	13 Initiatives of Lean	125
5.7	Proposed solutions category	125
5.8	Proposed of new bleeding tank	127
5.9	3-D Isometric design of bleeding tank	128
5.10	Bleeding Tank Cost Percentage	130
5.11	Dimension of Blood Pump design	131
5.12	Proposed layouts of PPNJ Poultry & Meat Broiler Holding and Receiving Area	133
5.13	New Roller Conveyer 'L' shape design	135
5.14	Conveyer Cost Percentage	137
5.15	New stunning electrical motor	139
5.16	Total Productive Maintenance framework	141
5.17	Step-by-step Autonomous Implementation	143
5.18	5S Benefits and Objectives	144
5.19	5S Definition	144
5.20	Example of Red tag (Fawaz Abdullah, 2003)	146
5.21	The Employee Suggestion Scheme flow chart and benefits	150

5.22	Employee Suggestion Process Flow	151
5.23	(a) Cost saving Before and After comparison for Motion waste	153
	(b) Time Saving Before and After comparison for Motion waste	
5.24	(a) Cost saving Before and After comparison for Defect waste	154
	(b) Time Saving Before and After comparison for Defect waste	
5.25	(a) Cost saving Before and After comparison for Waiting waste	154
	(b) Time Saving Before and After comparison for Waiting waste	
5.26	After Radar Chart (Re-Assessment of Waste Walk)	156
6.1	'After' Radar chart for waste re-assessment	160

## LIST OF ABBREVIATIONS

<b>PPNJPM</b>	-	<b>PPNJ POULTRY&amp;MEAT SDN. BHD.</b>
<b>NAFAS</b>	-	<b>National Farmers Organization</b>
<b>TPM</b>	-	<b>Total Productive Maintenance</b>
<b>NVA</b>	-	<b>Non Value Added activity</b>
<b>VA</b>	-	<b>Value Added Activity</b>
<b>TPS</b>	-	<b>Toyota Production System</b>
<b>ROI</b>	-	<b>Return on Investment</b>
<b>KG</b>	-	<b>Kilogram</b>
<b>RM</b>	-	<b>Ringgit Malaysia</b>
<b>FAMA</b>	-	<b>Federation of Malaysia Agriculture</b>
<b>MOA</b>	-	<b>Ministry of Agriculture</b>
<b>MARDI</b>	-	<b>Ministry Agriculture of Research and Development</b>
<b>DVS</b>	-	<b>Department of Veterinary Services</b>
<b>GLC</b>	-	<b>Government Link Company</b>
<b>FOA</b>	-	<b>Federation of Agriculture</b>
<b>NAFAS</b>	-	<b>National Farmers Organization</b>
<b>CP</b>	-	<b>Chaproen Pokhpand</b>
<b>MFM</b>	-	<b>Malaysia Flour Mills</b>
<b>JAIJ</b>	-	<b>Jabatan Agama Islam Johor</b>
<b>DOE</b>	-	<b>Department of Environment</b>
<b>VHM</b>	-	<b>Veterinary Health Mark</b>
<b>GMP</b>	-	<b>Good Manufacturing Practices</b>

**LIST OF APPENDICES**

- APPENDIX I : Chicken meat production in Asia**
- APPENDIX II : Chicken meat production ranking**
- APPENDIX III : Information of Area Farmers' Organization (AFO)  
2006-2011**
- APPENDIX IV : Malaysia : Output of Livestock Products, 2001-2011**
- APPENDIX V : Malaysia : Consumption of Livestock Products,  
2001-2011**
- APPENDIX VI : Malaysia : Per Capita Consumption of Livestock  
Products, 2001-2011**
- APPENDIX VII : Malaysia : Ex-Farm value of Livestock Products  
(RM Million), 2001-2011**
- APPENDIX VIII : Malaysia : Self-sufficiency in Livestock Products  
(%), 2001 - 2011**
- APPENDIX IX : Interview Questionnaires at PPNJ**
- APPENDIX X : List of Contract Farming Integrator in Malaysia**

## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Introduction**

Broiler Chicken is one of the most widely accepted muscle foods in the world. Its high-quality protein, relatively low fat content, new products, and generally low selling price because of favourable feed conversion make chicken a high-demand food in the marketplace. Furthermore, the absence of cultural or religious taboos allows increased chicken production and consumption worldwide (A J Maurer, 1993).

Poultry industry, in particular of the broiler production, is an important food sector of Malaysia agriculture. Malaysians do not just love to eat chicken but it is one of the cheapest sources of protein in the country. As per capita incomes rises, the demand of chicken meat will increase, and currently, Malaysians are among the world's highest poultry consumers with an average consumption of 37 kg/person/year. Due to the changes in Malaysian lifestyles and the availability of variety ready-to-cook chicken products, there is no stopping demand for chicken meat, and it is expected to increase further in the years to come. Therefore, in order to meet the increasing demand for chicken meat for the domestic and export markets,

local poultry integrators like Pertubuhan Peladang Negeri Johor (PPNJ) are investing in modern poultry farming as well as to keep abreast with present technological changes. As a food processing company, PPNJ Poultry & Meat Sdn. Bhd. which is fully owned by PPNJ have to stay competitive in order to compete with the others biggest players such as Leong Hup Industries, Chaproen Pokhpand (CP) and Malaysian Flour Mills Sdn. Bhd. (MFM) refer Appendix X. From the Broiler marketing chart in Chapter 4, the processing activity contributes to the highest operation cost. This operational cost sometimes contains unnecessary value activity that shouldn't be paid by the processor. On top of that, there is a need to develop and establish a method to identify and eliminates Non- value added activity. For that purpose, Lean Manufacturing System is introduced in order to overcome the highlighted issues.

This research addresses the application of lean manufacturing concepts to the continuous production or process sector with a focus on the food processing industry. After World War II, Japanese manufacturers, particularly in the automotive industry, were faced with the dilemma of shortages of material, financial, and human resources. Eiji Toyoda and Taiichi Ohno at the Toyota Motor Company in Japan pioneered the concept of the Toyota Production System, or what is known today in the US as "Lean Manufacturing." The basic idea behind the system is eliminating waste.

Waste is defined as anything that does not add value to the end product from the customer's perspective. The primary objective of lean manufacturing is to assist manufacturers who have a desire to improve their company's operations and become more competitive through the implementation of different lean manufacturing tools and techniques. Quickly following the success of lean manufacturing in Japan, other companies and industries, particularly in the US, copied this remarkable system. The term "lean" as Womack and Jones (1994) define it denotes a system that utilizes less, in terms of all inputs, to create the same outputs as those created by a traditional mass production system, while contributing increased varieties for the end customer. Lean is to manufacture only what is needed by the customer, when it is needed and in

the quantities ordered. The manufacture of goods is done in a way that minimizes the time taken to deliver the finished goods, the amount of labour required, and the floor-space required, and it is done with the highest quality, and usually, at the lowest cost.

## **1.2 Background of the Research**

In Malaysia, industry is rewarding poultry producers and expectations are high in broiler sectors. The objective of poultry producers until 2010 under the National Agricultural Policy is to maximize income through the optimal utilization of available resources. Various steps are being taken, such as the establishment of designated production areas for poultry production and developing, exploring Malaysia's potential as an International Halal Food Hub and to ensure high productivity in order produces maximum capacity of broiler chicken for locally usage as well as meet the market demand.

There are a lot of things can improve with the existing local Broiler processing plant in Malaysia. Most of the local Broiler processing plants are running their production with the lower capacity of broiler yearly. Even, with the lower capacity, still they produced a large number of defects (for example chicken mortality, disease, Non-HALAL and etc.). Automatically defect will happen due to quality problem and some causes by non-value added activities within the process and will dissatisfy the customer expectations. This resulted lower productivity. The repeatability of this problem soon will create a shortage in supply of Broiler chicken in the local market. This major problem is the chronic disease in every processing company and need to be solved immediately in order to be competitive with the established company. Yet, many of the Broiler processing companies still run their production without systematic manufacturing or processing system. The best solution to apply systematic system is with the implementation of Lean manufacturing system. The implementation of Lean is a must in automotive and services industry.

However, in literature review and past research, the implementation of lean in food processing industry is very limited and marginal.

The processing of poultry results in additional waste materials, including the offal (feathers, entrails and organs of slaughtered birds), processing wastewater and bio solids.

### **1.3 Problem Statement / Research Problem**

This research is driven by the fact that while researchers and practitioners have widely used lean tools in the manufacturing and service industry, no research has systematically investigated how to apply lean tools and techniques to a food processing environments. In order to compete in today's global competitive market the continuous process industry also needs to look in several ways in order to gain the competitive edge.

The selected Food Processing Company in this study having difficulty visualizing the overall process flow in their production line. Besides that, there is an unnecessary workload is performed in certain areas. The company hasn't got certified and implement any production system that will produce an efficient working environment. There is no method to trace which process and section that contributed to the problem such as bottleneck and high percentage of waste. This has happened due to no Industrial Engineer is hired in response to those problems. The company is also facing poor workstation design and layout that contribute to the hidden waste occurred in the process. Therefore, this study is focused to identify the method to recognize various types of waste utilizing the Lean Manufacturing Method of Waste Walk and Waste Assessment. There are problem identification and solving tools that used in order to give opportunity for improvement. All root causes than are then



identified and analyze in order to generate better final proposed solution and give a high return on investment to the company.

#### **1.4 Justification of the Research**

This section describes justification of the research. This research is important and necessary contributes in providing efficient processing and slaughtering process for broiler chicken meat in Malaysia. The conducted study will benefit consumers in terms of better quality of food, healthy food, consistency pricing and fulfills the local demands of broiler meats in the market. The company will raise more profit due to the elimination and identification of non-value added that occurred in their current operations with the application of the 5S (Quality Environment) concept into their plant and operations processes. In this method, current and future radar chart of waste and 5S assessment will determine in order to produce efficient operations. Besides that, the company productivity will be increased as well as employee's satisfaction and morale.

The aim of this research is to adapt lean manufacturing tools in the food processing environment and to evaluate their benefits at a specific industrial concern. The research hypothesizes that there are big opportunities for improvement in the process industries if lean tools are utilized. The objective is to systematically demonstrate how lean manufacturing tools when used appropriately can help the process industry to eliminate waste, have better inventory control, better product quality, and better overall financial and operational procedures. In this research the food processing industry will be used to represent the continuous process industry, and case study will be carried out at an actual broiler slaughtering facility, whose identity is restricted and will be referred as PPNJ Poultry and Meat Sdn. Bhd.

## **1.5 Methodology**

This chapter describes the methodology of the research that consist the justification for the methodology used to complete this research. The justification stage covers the explanation on why the studied are conducted at PPNJ Poultry & Meat Sdn. Bhd. Several instrumentations have been used in order to obtain collection of data. Every single step in collecting data is described in detail in Chapter 3. From the data collection, deep analysis will be conducted in order to develop a new solution to the problem identified. All proposed solution must be validated before it can be used. Therefore, there is a need for validation or comparative study between before and after improvements . The details about the methodology will be discussed in Chapter 3.

## **1.6 Objectives**

In order to conduct this study which benefits to the industry and stakeholders , the following objectives need to be undertaken:

- a) To identify, analyze and eliminates the non value added waste at PPNJ Poultry Meat Sdn. Bhd. Slaughtering process.
- b) To identify the critical factors influencing the productivity of PPNJ Poultry& Meat Sdn. Bhd. Slaughtering process.
- c) To propose solution to the major problem at the PPNJ Poultry & Meat Sdn. Bhd. Slaughtering process

## 1.7 Scope

The broiler slaughtering processing plant consists of four main departments. The major critical area need improvement is at low risk a; ea;slaughtering process. The scopes of this research activity are limited to :

a) This study is limited to the following processes:

- Receiving and Holding Area
- Stunning
- Slaughtering
- Scalding
- De-feathering
- Leg Cutting
- Head Pulling

b) The proposed method and solution is not necessary to be implemented

## 1.8 DEFINITION OF TERMS

There are several terms that use in this research as listed in Table 1.1.

Table 1.1 Definition of terms

Poultry	Domestic fowls, such as chickens, turkeys, ducks, or geese, raised for meat or eggs.
Broiler Chicken	Broilers are chickens raised specifically for meat production. Modern commercial broilers, for example, Cornish crosses or Cornish-Rocks, are specially bred for large scale, efficient meat production and grow much faster than egg laying

	hens or traditional dual purpose breeds.
5S	A process to ensure work areas are systematically kept clean and organized, ensuring employee safety and providing the foundation on which to build a Lean Office.
Waste	Anything that adds cost or time without adding value
Root cause	The origin or source of the problem
Kaizen	“Kai” means to “take apart” and “zen” means to “make good”. Kaizen is synonymous with continuous improvement.
Slaughterhouse	a building area with special design and construction which meets certain techniques and hygiene requirements, is used as a chicken slaughterhouse for public consumption’s purpose.
Carcass	is a part of chicken’s body after slaughtering, plucking, and eviscerating, either with or without head-neck, and/or feet starting from tarsus and/or air sack and kidney
Chicken Meat	is the slaughtered part of chicken that is edible for human, including the skin.
Viscera	are the chicken’s liver (after the gallstone is removed), heart, colon and other organs located in chest and stomach abdominal which are edible after passing the cleaning and washing procedure.
seven muda	Ohno’s original seven types of waste found in production: Transportation, Inventory, Motion, Waiting, Over-Processing, Over-Production, and Defects 5S – A process to ensure work areas are systematically kept clean and organized, ensuring employee safety and providing the foundation on which to build a Lean Office.

## **1.9 Research Contributions**

At the end of the study, a framework of Lean manufacturing tools will be proposed in order to identify waste at the company. There are several familiar tools such as Waste Walk Assessment, 5S, Employee Suggestion Scheme (ESS) used to help the company identify hidden waste at the food processing company. The problem solving method such as P-D-C-A Cycle (Plan-Do-Check-Action) can be used to identify waste easily. The Lean Manufacturing framework will be the guidance in order to propose re-designs of the work station and job task at broiler slaughtering process area. The proposed design will help the company to eliminate or reduce the non-value added activities that appears in slaughtering process. This will directly give the company opportunities to reduce their operation cost. Hopefully, a similar operations company can benchmark this company as a first step to implement Lean Manufacturing System.

This qualitative case study will give good input to the case study Company as well as to the government bodies or private company in similar operations. The output of the study will encourage further research in the area of facility design, Lean production system, 5S and Kaizen. This qualitative case study is important to identify issues and challenges faced by the food processing company. The analysis conducted is importance to be highlighted and the proposed solution should be considered in order to achieve high productivity.

## **1.10 Outline of the report**

The structure of thesis is arranged as the followings. Chapter 1 discusses an overview of the research problem, objectives, scopes and research methodology. Chapter 2 accounts for the literature review on Lean production system in general,

seven wastes (MUDA), 5S and Kaizen. Chapter 3 discusses the methodology that specifically employ in the research. The methods of conducting this research are described in detail in Chapter 3. All gathered data collection from respective case study company are analyzed and compiled in chapter 4. The deep analysis will lead to proposed solution that describe in Chapter 5. Finally Chapter 6 concludes and discusses about the policy recommendations based on the empirical findings. The flow of the thesis is illustrated in Figure 1.1.

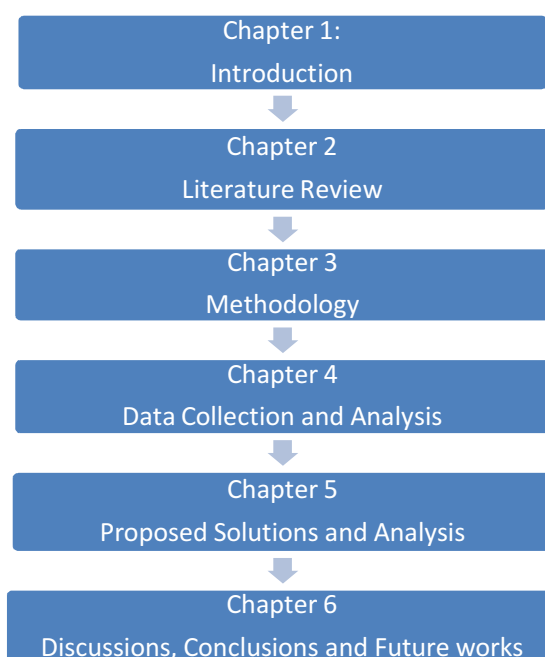


Figure 1.1 Flow of Report outline

## 1.11 Conclusion

This chapter describes introduction to the project which include background of the project. This study is problem solving oriented, whereby problem is identified, analyzed and potential solutions will be proposed. This chapter also presents the importance of Lean application in the food processing industry in order

to result high productivity. The Kaizen method is the best solution that helps the company to improve their workstation and working environment.

## REFERENCE

1. Womack, J.; D. Jones; and D. Roos. 1990. *The Machine that Changed the World – The History of Lean Production*, Harper Perennial, New York.
2. Womack, J. and D. Jones. 1996. *Lean Thinking – Banish Waste and Create Wealth in your Corporation*, Simon & Schuster, New York.
3. Rother, M. and J. Shook. 1999. *Learning to See: Value Stream Mapping to Add Value and Eliminate Muda*, Lean Enterprise Institute, Brookline, MA.
4. McDonald, T.; E. Van Aken; and R. Butler. 2000. “Integration of Simulation and Value Stream Mapping in Transformation to Lean Production”, IIE Annual Conference.
5. Abbett, D., and V. Payne, “Gulfstream V Value Stream Tour,” (Presentation at 1999 Lean Summit), 1999.
7. Billesbach, J.T., “Applying Lean Production Principles To A Process Facility,” *Production and Inventory Management Journal* , Third Quarter, 1994, PP. 40-44..
8. Brunt, D., “From Current State to Future State: Mapping the Steel to Component Supply chain,” *International Journal of Logistics: Research and Applications* , Vol. 3, No. 3, 2000, PP. 259-271.
9. Cleland, D.I., and B. Bidanda, *The Automated Factory Handbook: Technology and Management*, (Blue Ridge Summit, PA,1990).
10. Cox, A., “ Radically Eliminating Waste,” *World Mining Equipment*, January-February, 2002.
11. Dennis, Roger Daina, “Defining Production and Inventory Management Systems for Process Industries” (Ph.D. Dissertation, University of Cincinnati, 1993).



12. Detty, R.B., and J.C. Yingling, "Quantifying Benefits of Conversion to Lean Manufacturing with Discrete Event Simulation: a case study," *International Journal of Production Research*, Vol. 38, No. 2, 2000, PP. 429-445.
13. Dimancescu, D., P. Hines, and N. Rich, *The Lean Enterprise*, (American Management Association, 1997).
14. Fled, M.W., *Lean Manufacturing: Tools, Techniques, and how to use them* (Boca Raton, London: The St. Lucie Press, 2000).
15. Galbraith, J., C.R. Standridge, "Analysis in Manufacturing Systems Simulation: A case study," *Simulation*, Vol. 63, 1994, PP. 368-375.
16. Groover, M.P., *Automation, Production Systems, and Computer-Aided Manufacturing* (Prentice-Hall, INC., Englewood Cliffs, New Jersey, 1980).
17. Gunasekaran, A., "Just-In-Time Purchasing: An Investigation For Research and Applications," *International Journal of Production Economics* , Vol.59, 1999, PP. 77-84.
18. Hays, R.H., and K.B. Clark, "Why some factories are more productive than others," *Harvard Business Review* , September-October 1986, PP. 66-73.
19. Hines, P., N. Rich, and A. Esain, "Creating a Lean Supplier Network: a distribution case," *European Journal of Purchasing & Supply Management* , Vol. 4, 1998, PP.235-246.
20. Hines, P., and D. Taylor, *Going Lean*, Lean Enterprise research center, Cardiff Business School, 2000.
21. Imai, G., *Gemba Kaizen* (McGraw-Hill, New York, NY, 1997).
22. Karlsson, C., and A. Par, "Assessing changes towards lean production," *International Journal of Operation & Production Management*, Vol. 16, No.2,

1996, PP. 24-41.

24. Lankford, Jr., W.T, N.L. Samways, R.F. Craven, and H.F McGannon, *The Making, Shaping and Treating of Steel* (10th edition; Herbick& Held, Pittsburgh, PA, 1985).
25. Law, A.M, and W.D. Kelton, *Simulation Modeling & Analysis* (2<sup>nd</sup> edition;McGRAWHill, Inc.,1991).
27. Levy, D.L., “Lean Production in an International Supply Chain,” *Sloan Management Review*, winter 1997, PP. 94-102.
28. Maintenance-TV, 5S, (ABB company, December 2000), unpublished. [Available <http://Maintenance-TV.com>].
32. Monden, Y., *Toyota Production System-An Integrated Approach to Just-in-time* (3rd edition; Norcross, Georgia: Engineering & Management Press, 1998).
33. Monden, Y., *Toyota Production System*, (Norcross, Georgia: Industrial Engineering and Management Press, 1993).
34. Moore, R., “Combining TPM and Reliability-Focused Maintenance,” *Plant Engineering*, June 1997.
35. Nahmias, S., *Production and Operations Analysis* (Third Edition, 1997).
36. Nakajima, S., *TPM Development Program: Implementing Total Productive Maintenance* (Productivity Press, Cambridge, MA, 1989).
38. Ohno, T., *Toyota Production System: Beyond large-scale production* 1997.
39. Panizzolo, R., “Applying the lessons learned from 27 lean manufacturers-The relevance of relationships management,” *International Journal of Production Economics* , Vol.55, 1998, PP. 223-240.

40. Quinn, J.B., and F.G. Hilmer, "Strategic Outsourcing," Sloan Management Review, summer 1994, PP. 43-55.
43. Emiliani, Bob; Stec, David; Grasso, Lawrence; Stodder, James (2007). *Better thinking, better results: case study and analysis of an enterprise-wide lean transformation* (2nd ed.). Kensington, Conn: Center for Lean Business Management.
45. Toyota Production System, Ohno, Taiichi, 1988, Productivity Press
46. Liker (2004) - The Toyota Way (p.28)
47. A study of the Toyota Production System, Shigeo Shingo, Productivity Press, 1989,
48. HMS Manual System, DRB Hicom 2008 Food Act 1983 and Food Regulations 1985, Malaysia.
49. Malaysian Standard MS 1480:1999. Food Safety According to Hazard Analysis and Critical Control Point (HACCP) System. Department of Standards Malaysia. (1999)
50. Codex Basic Food Hygiene Texts/Annex to CAC/RCP 1-1969, Rev.3. Codex Alimentarius. (1997).
51. Guidance on Regulatory Assessment of HACCP Report of a Joint FAO/WHO Consultation on the Role of Government Agencies in Assessing HACCP, Geneva (1998).
52. PPNJ Poultry & Meat Sdn. Bhd. Standard Operating Procedure, latest version 2012