

A STUDY OF WASTE MINIMIZATION AT FUJIKURA FEDERAL CABLES SDN.  
BHD

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## **ABSTRACT**

This study is divided into five chapters and each chapter talks about different contents which are aligned with the aims and objectives of the study. Chapter 1 explains the introduction of waste, research background of waste minimization in Malaysia, problem statement, project objectives, scope of project, and the importance of research. Chapter 2 presents a review of literature regarding the study. Chapter 3 discusses the methodology used in this study. The results and findings of the study are presented in Chapter 4. Finally, conclusion, problems, and recommendations for this study are covered in Chapter 5.

## **ABSTRAK**

Kajian ini dibahagikan kepada lima bab dan kandungannya berbeza antara satu sama lain. Kandungan adalah sejajar dengan tujuan dan objektif kajian ini. Bab 1 menerangkan pengenalan sisa, kawalan pembaziran penyelidikan latar belakang di Malaysia, pernyataan masalah, objektif projek, skop projek, dan kepentingan idea-idea yang penyelidikan. Bab 2 membentangkan kajian semula kesusasteraan mengenai kajian. Bab 3 membincangkan metodologi yang digunakan dalam kajian ini. Keputusan dan hasil kajian itu dibentangkan dalam Bab 4. Akhirnya, kesimpulan, masalah, dan cadangan untuk kajian ini dibincangkan dalam Bab 5.

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**LIST OF ABBREVIATIONS**

BPR	Business Process Reengineering
DoE	Department of Environment Malaysia
DPMO	Defects per million opportunities
DMAIC	Define, Measure, Analyze, Improve, and Control
DMADV	Define, Measure, Analyze, Design, and Verify
EQA 1974	Environmental Quality Act 1974
GE	General Electric
JIT	Just-In-Time
NSPSWM	National Strategic Plan for Solid Waste Management
PST	Pennsylvania Steel Technologies
3Rs	Reuse, reduction and recycling
9MP	9th Malaysia Plan

## **CHAPTER 1**

### **INTRODUCTION**

Waste minimization is an important element of sustainable development since it is concerned with the conservation of resources, protection of the environment and the reduction of production cost. During the manufacturing of any product, liquid, solid and gaseous waste materials can be generated. Apart from creating potential environmental problems, wastes not only represent losses from the production process, but also require significant investment in pollution control practices.

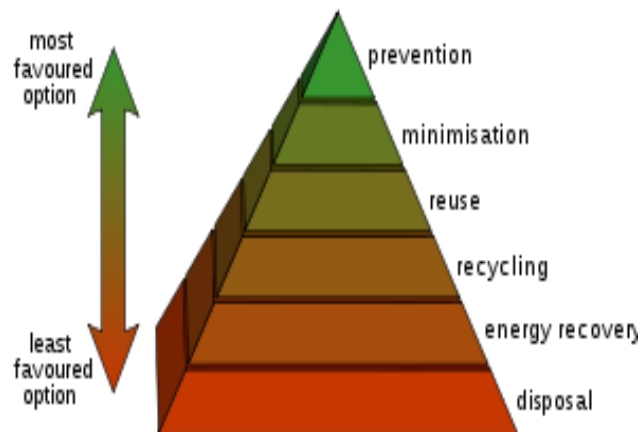
This chapter consists of eight parts which encompass an overview of waste minimization, problem statement, research objectives, research questions, project scope, significance of study, operational definition and expected result.

#### **1.1 AN OVERVIEW OF WASTE MINIMIZATION**

What is waste? Waste refers to anything that does not add value. Waste includes all items that people no longer have any use for. It can be categorized into seven types such as overproduction, over-processing, defective products, transportation, inventory, waiting time, and motion. These are the waste that usually associated with company operations. Waste can be defined as an unnecessary element associated with the activities of any industry. However, waste actually is a misplaced resource, existing at a wrong place and time. The fewer the number of materials being used, the lesser the amount of waste being produced. Moreover, waste is also known as the inefficient use of utilities such as electricity, water, and fuel, which are always considered as unavoidable overheads. The costs of these wastes are generally underestimated by

managers. In Malaysia, industrial wastes are classified as solid waste, toxic and hazardous waste. Solid waste includes waste produced during manufacturing process, or activity or by product.

Waste can cause deterioration to quality and increasing of production time and costs if it does not be eliminated. The ways to minimize waste can be discussed through waste management hierarchy.



**Figure 1.1 : The Waste Management Hierarchy**

Figure 1.1 shows the waste management hierarchy provides a scale on the best ways to deal with waste. Waste management hierarchy is divided into six scales which can be categorized into prevention, minimization, reuse, recycling, energy recovery, and disposal. The most favoured option to manage waste is at the top of the scale and the least preferred option is at the bottom. Prevention or reduction minimizes the generation of waste at source. If these cannot be implemented then the waste should be reuse or recycle. Reuse gives the definition of using materials again without any structural modification in that material. The recovery of waste is the next most desirable option to manage waste. Recovery refers to activities such as material recycling, composting, and the recovery of value or energy from waste materials. Disposal is usually the last alternative and the least desirable waste management option where landfill or incineration is categorized under final disposal.

Waste minimization can be defined as systematically preventing and reducing the disposal of chemical waste or source. This can be achieved by understanding and changing processes to reduce and prevent waste. Besides that, waste minimization also includes the replacement of less environmentally harmful materials in production processes and the products design that have less environmental impact during their manufacture and use. Furthermore, waste minimization encompasses a wide range of activities such as prevention or reduction of waste generated; efficient use of raw materials and packaging; efficient use of fuel, electricity and water; improving the quality of waste generated to facilitate recycling and reduce hazard; as well as encouraging re-use, recycling and recovery.

There is no single definition of the term 'waste minimization' said by Philips, Read, Green, Bates (1999). A broader, US definition, used by Read et al. (1997) is "Prevention and: or reducing the generation of waste, improving the quality of waste generated, including reduction of hazard and encouraging re-use, recycling and recovery".

The concept is a relatively straightforward one; by using materials carefully so as to reduce the generation of wastes, pollution is reduced, resources are conserved and hence charges for disposal are minimized (Price, 1995). A wastes minimization programme for a given company would cover; raw material and ingredient use, product loss, water consumption and effluent generation, paper and packaging, factory and office consumables, energy consumption, all other solid, liquid and gaseous wastes, and wasted effort.

## 1.2 PROBLEM STATEMENT

As an integrative concept, waste minimization can be characterized by a collective set of key factors. These key factors include four practices which are critical for its implementation. They are product design, manufacturing process surveillance, resource optimization, and quality management. These four factors are the subjects of investigation in this research.

This research will be carried out at Fujikura Federal Cables Sdn Bhd. The purpose of this research is to examine the performance of waste minimization through product design, manufacturing process surveillance, resource optimization and improved quality management at Fujikura Federal Cables Sdn Bhd.

It is essential for us to find out the effect of the waste minimization approaches applied to eliminate waste. In the other words, this research is carried out to examine how waste is minimize through product design, manufacturing process surveillance, resource optimization, and quality management.

Besides that, discussion of how the employees contribute their efforts to the implementation of waste minimization techniques also will be carried out in this research. This is because the employees' commitment is significant to the successful implementation of waste minimization approaches.

### **1.3 RESEARCH OBJECTIVE**

The objectives of this project are:

- a) To identify the best practices of product design, resource optimization and manufacturing process surveillance in waste minimization at Fujikura Federal Cables Sdn Bhd.

### **1.4 RESEARCH QUESTION**

- I. What are the best practices Fujikura Federal Cables Sdn Bhd had implemented to reduce wastes for manufactured product?

### **1.5 PROJECT SCOPE**

The scope of this research is to identify the benefits of the waste minimization techniques of a manufacturing company and the employees' responses to the implementation of waste minimization approaches.

## 1.6 SIGNIFICANCE OF STUDY

The increasing volume of industrial wastes such as plastic, steel, wood, glass and paper produced during manufacturing process or packaging required a good management system and effective support of infrastructure in order to recover wastes for sustainable uses. This is because the waste generated have been discovered having significant values. Besides that, recovery of waste also is an alternative to decelerate the exhaustion of natural resources by producing alternative resources from waste. Furthermore, a lacking in landfill capacity to manage the increasing volume of waste is another reason for why the need to recover waste is so important. Therefore, industries now have developed a system and design to recover their products by recycling or reuse (ADEME 1999). High volume of waste generated by Malaysian industries for the past three decades has provided enough supply of wastes for recovery purposes (Azni et.al. 2004).

There are several reasons of why this research must be carried out. Firstly, it is essential for us to know the significance of waste elimination in manufacturing companies. The practice of waste minimization can result in decreased of production time and costs, and improved the quality of the product. Besides that, minimizing the production level of defective products will eliminate rework and scrap as it will reduce the production costs. Moreover, improving the overall quality of a company's manufacturing process as to reduce waste generation will increase the number of finished goods that is able to pass the quality inspection. Other reasons for implementing waste minimization are such as to reduce waste disposal costs, to save on the costs of raw materials such as paper by reuse and recycling and to eliminate the environment impact from unnecessary production and waste disposal activities.

Besides that, the next significance of this research is to identify the keys to successful implementation of waste minimization at manufacturing companies. Staff involvement, commitment from senior management, training, and staff awareness campaign are the important factors to ensure the successful implementation of waste minimization. Employees must be aware of the issues surrounding waste and at the same time they should be motivated and trained to prevent waste.



Thirdly, is to identify the benefits of the approaches used to minimize industrial wastes. Waste can be handled through a number of ways, but the most effective ways are by implementing Just-In-Time (JIT) manufacturing, 5S (seiri, seiton, seiso, seiketsu, and shitsuke), lean manufacturing, effective product design, efficient source reduction, quality management, good housekeeping, and by monitoring manufacturing process, as well as by following the waste hierarchy. The application of these waste minimization approaches has proven advantages to industry and the wider environment. For example, JIT manufacturing is focusing on reducing waste and lowering the costs as to increase profit.

## **1.7 OPERATIONAL DEFINITION**

The purpose of operational definition is used to define the important keyword and term in the research.

Waste → all items that people no longer use for.

Waste minimization → systematically preventing and reducing the disposal of chemical waste or source.

Product design → the process of making innovate of a product or new product.

Resource optimization → a methods to match the available resources to make a better decisions.

Surveillance → monitoring of the behavior, activities, or other changing information, for the purpose of influencing, managing, directing, or protecting.

## **1.8 EXPECTED RESULT**

The expected outcomes for this project are to reduce waste in product design, resource optimization and manufacturing process surveillance. It is essential for the companies to examine the design of their products and identify which part of the product can be replaced with a cheaper material and reduce the usage of raw materials. In addition, it is important to monitor the inputs of manufacturing process from time to time to ensure that manufacturing process always runs smoothly without any interruptions. Besides that, the resources can be eliminated either by increasing the useful life of a product, reuse it or recycle the materials from the products for other purpose. Moreover, the company would able to reduce wastes by implementing waste minimization techniques in their manufacturing process.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 INTRODUCTION**

This chapter reviews the literature on waste minimization in Malaysia, seven types of waste, techniques for good waste minimization practice, the implication of Lean manufacturing to waste minimization, waste minimization through Six Sigma and the benefits of Business Process Re-engineering (BPR) to minimize waste.

#### **2.2 WASTE MINIMIZATION IN MALAYSIA**

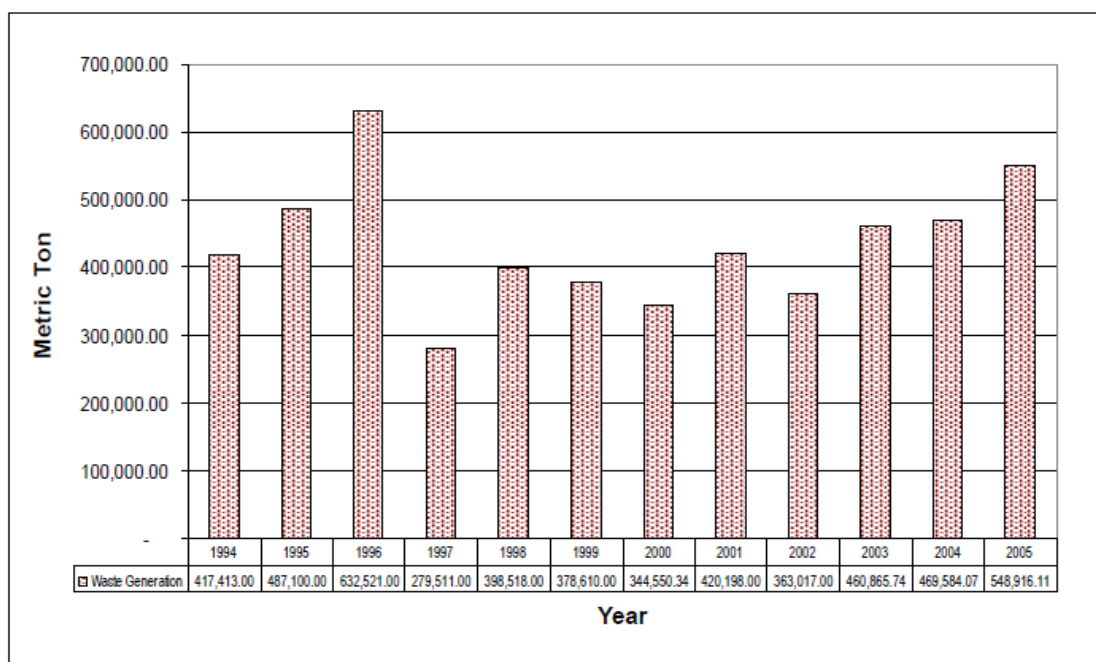
In the past 50 centuries, industries in Malaysia are only focusing on maximizing the productivity in order to generate high profits. They are lack of concern to environmental problems like water pollution. However, in 60 centuries, industries began to practice end-of-pipe approach in order to manage the waste generated during manufacturing process. End-of-pipe approach is a system that emphasizing on treatment and disposals. In 80 centuries, the waste generation is treated through several ways. These include production of cleaner products, utilization of cleaner technology, implementation of awareness campaigns among consumers and industries and the application of approaches focusing on ecosystem sustainability.

In local industrial, wastes are divided into two types such as solid waste and toxic or hazardous waste. As reported in 9<sup>th</sup> Malaysia Plan, the amount of solid waste generated in Peninsular Malaysia increased from 16,200 tonnes per day in 2001 to 19,100 tonnes in 2005 or an average of 0.8 kg per capita per day. Assuming a 3.6 % growth, the amount is expected to be 31,000 tonnes per day in 2020. Moreover, it has

estimated that about 45% of solid waste in Malaysia is made up of food waste, 24.0% plastic, 7.0% paper, 6.0% iron, and 3.0% glass and others made of the rest. Although the National Campaign on Recycling has been implemented in order to promote reuse, reduction and recycling (3Rs) of materials, the amount of solid waste recycled remained at less than 5.0% of total waste disposed.

Furthermore, the 9<sup>th</sup> Malaysia Plan also reported that there is an average of 430,000 tonnes of hazardous waste was generated per annum. In 2004, of the total waste generated, it has estimated that about 18.8% was treated and disposed in the toxic waste treatment and disposal facility in Bukit Nanas, Negeri Sembilan; 58.0% was recycled and recovered at licensed premises; 19.7% was treated and stored within the premises of generators; 0.7% was exported for recycling and 2.7% was disposed at clinical waste incinerators. Generally, the recycling and material recovery from toxic waste was increased from 29.0% in 2001 to 58.0% in 2004. Therefore, the toxic waste treated and stored within premises was reduced from 59.9% in 2001 to 19.7% in 2004.

**Figure 2.1 : Toxic and Hazardous Waste Generation Malaysia 1994 – 2005**



**Source: Department of Environment Malaysia (DoE) 1995, 2003, 2006.**

In addition, a series of National Strategic Plan for Solid Waste Management (NSPSWM) will be implemented under the 9th Malaysia Plan (9MP) in order to control solid waste. The National Strategic Plan for Solid Waste Management (NSPSWM) will focus on the upgrading of unsanitary landfills as well as the construction of new sanitary landfills and transfer stations with integrated material recovery facilities. Besides that, NSPSWM also emphasizes on reduce, reuse, recover and recycle waste as well as greater use of environmentally-friendly materials such as bio-plastics. In order to facilitate the implementation of the strategies and measures in the Strategic Plan, legislation to streamline solid waste management will be enacted. Moreover, awareness-raising campaigns and activities will be implemented to educate the public on the advantages of performing sustainable consumption, the requirements to have proper waste management infrastructures, the costs associated with the provision of such services and the role of the public in waste minimization programmes. Furthermore, a solid waste department under the Ministry of Housing and Local Government will be established to implement these measures and to govern solid waste policy, planning and management. (refer Table 1.1 for a list of industrial waste management stakeholders in Malaysia)

Generally, hazardous waste can be generated in the form of solid, liquid or gas that could harm human health or the environment. At local, the industrial hazardous waste is managed under the Environmental Quality Act 1974, the Local Government Act 1976, and the Customs and Excise Act. Recently, there are 107 categories of scheduled wastes listed under these regulations. The Environmental Quality (Scheduled Wastes) Regulations 1989 stated that, “scheduled wastes are required to be handled properly and as far as is practical, be rendered innocuous before disposal. These categories of wastes shall be disposed off at prescribed premises only and be treated at prescribed premises or treatment facilities only.” (refer Table 1.1 for a list of Legislative Instruments in Malaysia)

Besides that, there are several strategies was recommended under the 9<sup>th</sup> Malaysia Plan in order to improve and strengthen the management of industrial hazardous waste. Firstly, the implementation of a global harmonized system for the registration of imports, transportation and safe handling of chemical and hazardous

substances will be launched in order to strengthen the institutional capacity of the relevant agencies which were given responsibilities to manage toxic and hazardous. Secondly, a particular effort will place on intensify the approaches to control the indiscriminate use of chemicals, especially in agricultural practices. Thirdly, the government also will draw up guidelines on the utilization of methods and technologies in order to address and transform toxic waste into resources for reuse.

**Table 2.1 : Industrial Waste Management Stakeholders and Legislative Instruments in Malaysia**

Agency	Legislations	Scope
<ul style="list-style-type: none"> <li>• Ministry of Natural Resources and Environment</li> <li>• Department of Environment (DoE)</li> </ul> <p>Enforcement measures are shared with:</p> <ul style="list-style-type: none"> <li>✓ Ministry of Trade and Industry</li> <li>✓ Ministry of Agriculture with the support of               <ul style="list-style-type: none"> <li>➤ Department of Agriculture</li> <li>➤ Department of Fisheries</li> </ul> </li> </ul>	<p>Environmental Quality Act 1974</p> <p>(From this Act, there are at least five Regulations that can be linked directly and nine indirectly)</p>	<ul style="list-style-type: none"> <li>• Prevention, abatement and control of pollution</li> <li>• Regulation to recover wastes and resources under EQA 1974 Part IV Regulations provided for industrial activities such as:               <ul style="list-style-type: none"> <li>✓ Crude Palm Oil</li> <li>✓ Raw Natural Rubber</li> <li>✓ Scheduled Wastes, Treatment and Disposal Facilities</li> <li>✓ Marine Pollution</li> </ul> </li> <li>• Use of controlled substances in soap, synthetic and other cleaning agents</li> </ul>
<ul style="list-style-type: none"> <li>• Ministry of Housing</li> </ul>	<ul style="list-style-type: none"> <li>• Solid Waste</li> </ul>	The National Strategic

<p>and Local Government</p> <ul style="list-style-type: none"> <li>• Department of National Solid Waste Management</li> <li>• Department of Local Government</li> </ul>	<p>Management and Public Cleansing Act 2007.</p> <ul style="list-style-type: none"> <li>• Local Government Act 1976 and local governments' by laws. Street, Drainage and Building Act, 1974 and Town and Country Planning Act</li> </ul>	<p>Plan for Solid Waste Management emphasizes waste recovery.</p>
<p>Ministry of Agriculture</p>	<p>Pesticides Act 1974</p>	<p>Control of pesticides for use, sale and import of, and production</p>
<ul style="list-style-type: none"> <li>• Ministry of Home Affairs</li> <li>• Department of Royal Customs and Excise</li> </ul>	<ul style="list-style-type: none"> <li>• Control of Supplies Act 1961</li> <li>• Environmental Quality Act 1974</li> <li>• Pesticides Act 1974</li> </ul>	<ul style="list-style-type: none"> <li>• Control and rationing of controlled articles / items</li> <li>• Control of import and export</li> </ul>
<p>Ministry of Human Resource Development</p>	<p>Occupational Safety and Health</p>	<p>Health, safety and welfare of workers</p>

**Source : Ahmad Fariz Mohamed (2008)**