



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DESIGN AND DEVELOP AN ECO FLY KILLER IN UTeM's CAFETERIA

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

by

FATHULLAH FARID BIN ZAKARIA

B050810232

FACULTY OF MANUFACTURING ENGINEERING

2011



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: Design and Develop an Eco Fly Killer in UTeM's Cafeteria

SESI PENGAJIAN: 2010/11 Semester 2

Saya **FATHULLAH FARID BIN ZAKARIA**

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:

Alamat Tetap:

NO. 435 Jalan E9,

Taman Melawati,

53100 Kuala Lumpur.

Cop Rasmi:

** 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.

DECLARATION

I hereby, declared this report entitled “Design and Develop Eco Fly Killer in UTeM’s Cafateria” is the results of my own research except as cited in references.

Signature:

Name : FATHULLAH FARID BIN ZAKARIA

Date : 14th APRIL 2011

APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Manufacturing Design) with Honours. The members of the supervisory committee are as follow:

(Signature of Principal Supervisor)

.....

(Official Stamp of Principal Supervisor)

(Signature of Co-Supervisor)

.....

(Official Stamp of Co-Supervisor)

ABSTRAK

Pembunuh lalat adalah satu alat untuk mengawal populasi lalat pada sesuatu kawasan. Pelbagai jenis pembunuh lalat telah di hasilkan hingga ke hari ini kerana lalat di kategorikan sebagai haiwan perosak yang bermaksud serangga yang boleh membahayakan. Untuk memulakan projek pembunuh lalat, projek di mulakan dengan melakukan pemerhatian terhadap tahap keadaan di cafeteria UTeM. Selepas itu, ciri-ciri dan jenis lalat dikenalpasti untuk memudahkan menghasilkan alat pembunuh lalat dengan mengetahui kelemahan dan tarikan oleh lalat. Pelbagai pemahaman dijalankan pada alat pembunuh lalat yang sedia ada di cafeteria UTeM dan di pasaran untuk menambahkan pengetahuan. Melalui lukisan kasar daripada idea-idea yang ada, ia dapat memberi maklumat visual untuk mendapatkan pemahaman yang lebih pada penghasilan produk. Kemudian, kajian diteruskan dengan kaedah kajian di mana segala pemahaman mengenai lalat diterapkan. Kaedah kajian mengandungi pengumpulan maklumat, penghasilan produk, analisa dan keseluruhan kajian, bab kaedah kajian membincangkan mengenai cara kajian ini dijalankan. Seterusnya, kajian diteruskan dengan bab Konsep Produk di mana konsep untuk produk ini di ambil melalui kaedah pemilihan konsep. Kajian mengenai Eco Fly Killer menggunakan Product Design and Development (PDD) sebagai alat untuk menyiapkan kajian ini. Contoh PDD yang digunakan adalah seperti QFD, pemilihan konsep dan aturan cara kerja. Kesimpulannya, penggunaan PDD sangatlah berguna dan sesuai kerana kajian ini juga berkenaan dengan rekabentuk dan penghasilan produk.

ABSTRACT

Fly killer is a device for controlling the fly population at certain area. Many types of flies killer have been develop nowadays because fly been categorized as a pest which means the insect that dangerous and can harm the human being and living things. To start the research of fly killer, it begins with the observation of level of fly population at the cafeteria 1. Then, the characteristic and species of fly are study for easier to develop a killer device by knowing the attraction and weakness. Several studies have been conducted on the existing fly killer in the UTeM's cafeteria and market to gain knowledge. These studies would give the inspiration and ideas to create a new fly killer for cafeteria. Through a first sketching several ideas, it give visual information for better understanding of the product design. Next, the research will be continue with a research method which use based on the study. The methodology consist of data collection, product development, analysis and the overall experiment, methodology chapter discussed the process of this project done. Then, the project continued with Product Concept chapter where the concept of the product was identified by applying the concept selection method. The researches of eco fly killer use Product Design and Development (PDD) as a tool to complete this research. Example of PDD tool applied on this project is the QFD, the Concept Selection and the methodology. As the conclusion PDD is a convenience tool to used because the research based on design and development project.

ACKNOWLEDGEMENTS

I have finally completed my final report semester one by having a great experience, without causing any major problems. First and foremost, a very grateful to ALLAH the Almighty to giving me strength and healthy body to get through my report to be done. Then to my supervisor, Mr. Saifudin Hafiz Yahya and co-supervisor Prof. Dr. Md Dan bin Palil who giving me a lot of advices and guidelines to finish my research report. They also show their willingness to comment the draft report and give a explanation every times I seen them. Therefore, I would to thank them for being my side and a deepest appreciation to them.

I also would like to express my gratitude to, my panel Mr. Taufik and Dr. Hambali bin Arep @ Ariff who helping and tutoring me in my research. From their blessing of helping I can improve my research and recover my mistake. A very appreciation to En. Fauzi and others UTeM's technician who give me a good cooperation during my project. To all my friends who give me strength to complete this project especially Mohd Faridzi, Mohd Aizat Merican and Mohd Zhafran. Finally, I would also like to thank my beloved family who always support me as directly or indirectly.

DEDICATION

For My Father and Mother – I am so grateful to have you as my parent there is no replacement for you to make. Thank you for always be on my side and taking care of me. You teaching how to be a good man and here I am standing with my Diploma and Degree. Now, I am healthy, happy and I love you two.

Thank you for everything.

TABLE OF CONTENTS

Abstrak	i
Abstract	ii
Acknowledgement	iii
Dedication	iv
Table of Contents	v
List of Figures	viii
List of Tables	x
List of Abbreviations	xi
List of Equations	xii
1. INTRODUCTION	1
1.1 Background	1
1.2 Problem Statement	2
1.3 Objectives	3
1.4 Research Scope	3
2. LITERATURE REVIEW	5
2.1 Introduction of Pest Management (IPM)	5
2.2 Reasons of using Ecological or Green Products	7
2.2.1 Need to Recycle	7
2.2.2 Need to Avoid Harmful Chemicals	7
2.2.3 Need to Save Money	8
2.2.4 Need to Save Energy	8
2.3 Benefits using Eco-friendly Product	8
2.3.1 Economic Benefits	8
2.3.2 Peace of Mind	9
2.3.3 Household Benefits	9
2.3.4 Environmental Benefits	9
2.4 Existing Fly Killer	10
2.4.1 Barriers	10

2.4.2	Swatter	11
2.4.2.1	Hand – held Swatter	11
2.4.2.2	Electric Fly Swatter	12
2.4.3	Tape	12
2.4.4	Fly Traps	13
2.4.5	Light Traps	14
2.4.6	Zappers	15
2.4.7	Fan Insect Killer	16
2.5	Eco Fly Killer	16
2.6	Quality Function Deployment	17
3.	RESEARCH METHODOLOGY	20
3.1	Overall Methodology of Project	20
3.2	Data Collection	21
3.2.1	Identify the Problem	22
3.2.2	Investigate the Situation	22
3.2.3	The Design Criteria Brief	23
3.2.4	Searching the Solution	23
3.3	Product Development	24
3.4	Analysis Procedure	26
3.4.1	Software	26
3.4.2	Prototype Analysis	27
4.0	PRODUCT CONCEPT	29
4.1	Concept Selection	29
4.1.1	Concept Selection for Existing Fly Killer	30
4.1.2	Concept Selection from Idea Generation	33
4.2	Product Design Concept	36
4.3	Parts and Function	39
4.3.1	Body Parts	39
4.3.1.1	Top Cap	39
4.3.1.2	Fan Holder	40

4.3.1.3	Tunnel	40
4.3.1.4	Fly Trap Outer	41
4.3.1.5	Fly Trap Inner	42
4.3.1.6	Cage	42
4.3.1.7	End Cap	43
4.3.2	Electric Parts and Electronics Circuit	44
4.3.2.1	Ultraviolet Light	44
4.3.2.2	Fan	44
4.3.2.3	Electronic Circuit	45
4.4	Specification of Product	47
4.5	The Operations	48
5.0	RESULT AND DISCUSSION	50
5.1	Air Flow Analysis	50
5.1.1	Velocity	50
5.1.2	Pressure	53
5.1.3	Temperature	54
5.1.4	Density	55
5.1.5	Mass Flow Rate	55
5.2	Target Area	56
5.3	Effectiveness	59
5.4	Factors of Effectiveness	63
5.5	Comparison to Other fly Killer	63
6.0	CONCLUSIONS AND RECOMMENDATION	65
	REFERENCES	67
	APPENDICES	71

LIST OF FIGURES

2.1a	Fly curtain	10
2.1b	Fly Screen	10
2.1c	Door Strip Blind	10
2.2	Hand held swatter	11
2.3	Electric fly swatter.	12
2.4	Paper stick.	13
2.5	Fly Trap	13
2.6	Light Trap	14
2.7	Zappers.	15
2.8	Fan Insect Killer	16
3.1	Flow chart of Overall Methodology of Project	21
3.2	Flow chart of Data Collection	23
3.3	Flow chart of Product Development	25
3.4	Flow chart of Software Analysis	26
3.5	Flow chart of Prototype Analysis	28
4.1a	Fly Trap	36
4.1b	Fan Insect Killer	36
4.2	Isometric view of Eco Fly Killer	37
4.3	Exploded view of Eco Fly Killer	38
4.4	Top Cap	39
4.5	Fan Holder	40
4.6	Tunnel	41
4.7	Fly Trap Outer	41
4.8	Fly Trap Inner	42
4.9	Cage	42
4.10	End Cap	43
4.11	Ultraviolet Light	44
4.12	Fan	45

4.13	Electronic Circuit	46
4.14	The air flow	49
5.1	Velocity of air flow	51
5.2	Graph of velocity in the tunnel	52
5.3	Pressure of air flow	53
5.4	Graph of pressure in the tunnel	53
5.5	Fluid Temperature of air flow	54
5.6	Graph of density in the tunnel	55
5.7	Graph of mass flow rate in the tunnel	56
5.8	Pie chart of earlier Experiment	57
5.9	Histogram chart of the experiment using prototype	59
5.10	Map of UTeM's cafeteria 1	61
5.11	Map of UTeM's cafeteria 1 with prototype	62

LIST OF TABLES

2.1	Quality Function Deployment	19
4.1	The concept screening matrix for existing fly killer	31
4.2	The concept scoring matrix for existing fly killer	32
4.3	The concept screening matrix from idea generation	34
4.4	The concept scoring matrix from idea generation	35
4.5	Specification of each parts	47
5.1	Earlier Experiment in UTeM's cafeteria	57
5.2	Experiment using the prototype at UTeM's cafeteria	58
5.3	The comparison between existing fly killer and eco fly killer	60

LIST OF ABBREVIATIONS

AC	-	Alternate Current
C	-	Celsius
DC	-	Direct Current
K	-	Kelvin
LED	-	Light Emitting Diode
Max.	-	Maximum
Min.	-	Minimum
PCB	-	Printed Circuit Board
PDD	-	Product Design and Development
QFD	-	Quality Function Deployment
UTeM	-	Universiti Teknikal Malaysia Melaka

LIST OF EQUATIONS

5.1	Area of Round Shape	50
5.2	Area of Inlet	51
5.3	Area of Outlet	51
5.4	Celsius to Kelvin	54
5.5	Mass Flow Rate	55

CHAPTER 1

INTRODUCTION

1.1 Background

Flies are members of the order Diptera, which means „two winged insect“ with about 80,000 species throughout the world, including Antarctica. However, it is in warm, moist climates that they are most abundant. The adult fly has three distinct body regions, the head, thorax and abdomen. They have large of compound eyes, one pair of antennae, sponging and rasping or sucking mouth parts. The mesothorax or middle section of the thorax, is much larger than the first and second sections. The size of the mesothorax is necessary for the powerful wing muscles used by the fly in flight. Fly go through complete metamorphosis. The larva feed differently and has a different habitat from the adult. The pupas are usually quiet and often enclosed in a heavy puparium.

Housefly is one of flies species and can be called as a cosmopolitan insect because housefly found very closely to human activities. The housefly population can be spread fast and widely, it can be found in abundance in areas such as poultry farming, dairy and cattle farms, the area planted with vegetables and garbage disposal areas. House fly life cycle involves 4 levels which is egg, larva, pupa, or chrysalis, and adult flies. The suitable weather for housefly and other species of flies for breeding is hot and wet and usually the time for the fly to complete life cycle to become an adult is between 7 to 10 days.

Housefly eggs are white with 1.2 millimeters long in size. A female housefly can produce up to five 500 eggs during a period of 4 to 5 day or 75 to 150 eggs for each day. The eggs will be took a away from sunlight in order to make the eggs still moist;

these eggs then will hatch into larvae or maggot in the period from 8 to 20 hours in hot temperature. The size of larva is about three to 9 mm and it is always white-yellow in colour, at this level the larva will eat garbage or chicken waste at their breeding places before it change to dark brown pupa in 4 - 7 day ($\pm 30 - 35^{\circ}\text{C}$). When housefly become a pupa they will go to the dry place, then these houseflies will hatch from their pupa then become an adult flies between 4 – 5 days depending on the dryness of that place.

When adult came out from pupa, it must wait around 1 – 15 hour (depend on weather) for the wing become dry, strong and expand. Normally the adult flies will fly between one to 2 km but the adult flies are also able to fly up to 20km in 24 hours, but mostly just 1 – 5 km from breed area, in other situation it can fly over 50km. Female and male housefly will make after they can fly, in 4 – 20 day after they become a fly, female can produce an eggs. Adult flies usually live for 15 to 25 days. These flies are not active at night and usually perch on a wall or ceiling, on the branches of wood or animal cages. They will active at around 32°C and die if exceed 45°C at temperature.

Housefly carry and spread a number of potentially deadly diseases including typhoid fever, salmonella, tuberculosis, conjunctivitis, leprosy and cholera, as well as intestinal worms and the bacteria responsible for dysentery. They feed and reproduce on garbage, feces and rotting flesh. And then, after picking up millions of microorganisms, they fly into our homes and land on our food, bodies and personal belongings, leaving behind the same germs. This will cause a disease to us after the bacteria are inside of our body.

1.2 Problem Statement

The purpose of this project is to design and develop an eco fly killer to control population housefly in cafeteria. The existing fly killer in cafeteria not very effective to control and kill housefly population. The housefly travel from the nearest chicken farm in Durian Tunggal and it lived since UTeM's main campus was develop. Since this fly lived in UTeM's main campus they give a problem to people in university

especially in cafeteria where the source of food can be found for its survival. When the housefly lives in among us it may cause diseases besides disturbing people to eat and rest in peace. To overcome this problem, new designs of fly killer need to be developed. The research will cover on the different system based on ecological.

1.3 Objectives

This project is focused on the fly and the fly killer machine. The overall objectives of this project are:-

- i. To apply the product design methodology in designing an eco fly killer.
- ii. To design and develop a device to kill and control the fly population on UTeM's cafeteria by applying ecological friendly.

1.4 Research Scope

The research scope will be contained about the how to improve the existing fly killer on UTeM's cafeteria 1 base on ecological friendly in environment application. In order to design a new fly killer in UTeM's cafeteria, the characteristic of housefly and mechanism of existing fly killer need to be understood.

The literature review will be covered about the information of eco fly killer. Ecological meaning is discuss on the beginning of the chapter, then it continue to further understanding with the advantages and reason using the ecological concept or green product. The chapter also explain the information about existing fly killer in the market. Finally, the literature review chapter ended with the discussion about the design criteria of the customer requirement and design requirement of the product.

In methodology, this chapter discuss about the flow of entire process. The flow of this project is consists of data collection, product development, analysis and overall methodology. The data collection explain the flow of collecting information the problem from observation and interviewing. Then, the product development

continued by specify the best concept of killing flies that fulfilling with the ecological concept. The discussion also discussing about the flow of the design using analysis and experiment.

Next chapter of this project is Product Concept. Product concept explained about the selecting of the best concept by using the screening and scoring method. Method further discuss also with the new concept developing after using selection method. This discussion consists of the specification of every parts include the material, quantity, function and cost.

Result and discussion is the next chapter of this project. In this chapter, the analysis and the experiment are discussed in details. The process of handling and requirement of the analysis and experiment explained in this chapter. The discussions are based on the result of the analysis regarding to ecological concept. Finally, the conclusion and recommendation will be presented according to the finding gained. Several recommendation are suggested before development especially product and method of research.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction of Ecology

Many of different environmental issues directly affecting the world we live in. Globalisation and the earth's own natural evolutionary processes are transforming localised problems into larger international issues which already have an impact on the way we live today. Today's globalization issues include Global Warming, Acid Rain, Hazardous Waste, Air Pollution, Ozone Depletion, Smog, Water Pollution, Overpopulation and Rain Forest Destruction become part of our life.

Ecology came from word of Greek oikos, "household" and logos, "knowledge" which means the scientific study of the distribution and abundance of life and the interactions between organisms and their environment. (James,1981) The environment of an organism includes physical properties, which can be described as the sum of local abiotic factors such as insolation (sunlight), climate, and geology, and biotic factors, which are other organisms that share its habitat.

The eco-friendly term is used to describe the activities which are good to the environment. It is actually the shortening of "ecologically friendly" or sometimes people call it "environment friendly" or green. There are a range of ways in which activities can be eco-friendly, ranging from products which are constructed in an environmentally friendly to change the lifestyle which are designed to give benefit the environment.

The term ecology or oekologie was coined by the German biologist Ernst Haeckel in 1866, when he defined it as “the comprehensive science of the relationship of the organism to the environment.” Haeckel did not elaborate on the concept, and the first significant textbook on the subject (together with the first university course) was written by the Danish botanist, Eugenius Warming. For this early work, Warming is often identified as the founder of ecology.

Environmentally friendly (eco-friendly and nature friendly) are synonyms used to refer to goods and services considered to inflict minimal or no harm on the environment. To make consumers aware, environmentally friendly goods and services often are marked with eco-labels. But because there is no single international standard for this concept, the International Organization for Standardization considers such labels too vague to be meaningful.

People engage in eco-friendly activities because they are concerned about the health of the environment. Environmental issues were first pushed to the forefront of the collective consciousness in the late 1900s, when people realized that their activities were having a negative impact on the environment. Pollution, rampant use of natural resources, and other activities were questioned in light of information about how these activities hurt the environment, and people began to look into more eco-friendly ways of living and doing business.

Investing in green product developments are valuable and would pay off, these have been realized by many savvy companies, and lines of eco-friendly products can be found in many regions of the world today as a result. These products are usually made in factories which are environmentally friendly, such as facilities built from recycled materials which use solar panels for power, and they are made from components which are also good for the environment, like plant-sourced ingredients for soaps, or recycled metal for electronics. Product packaging, advertisements, and other materials may also be eco-friendly.

The impact of eco-friendly products reduced drastically compared to conventionally produced product. In some cases, eco-friendly products may even have a positive benefit, depending on how the company does business. Many such products are also

aimed at lifestyle changes which benefit the environment, so even if the product itself is not totally neutral, the actions undertaken by the consumer after buying the product are beneficial. For example, eco-friendly light bulbs require energy and resources to make, but they save energy once they are installed in a home.

The ecological are not only for the products, activities also can be friendly to the environment, as in the case of things like carpooling, gardening, composting, and recycling. Some people think that eco-friendly products are only the first step, and that people who are really committed to the environment also need to modify their lifestyles, reducing the amount of resources they use by living more efficiently.

2.2 Reasons of using Ecological or Green products

There are many reasons why green products should be use. Some of these reasons are as follows:

2.2.1 Need to Recycle.

People will throw away stuffs that they used once, but then they will be surprised one day they made a pile of garbage. Combine this with all the other piles of garbage around the world and it make them shocked because they just created a poison to the environment.

2.2.2 Need to Avoid Harmful Chemicals.

People who using hair sprays, colognes, and even insecticides, they are a contributor to air pollution. These products contain chemicals that can harm the ozone layer.

2.2.3 Need to Save Money.

The green products are cheap and reusable rather than non-green product. Therefore, the earth is also saving cash from not spending too much on solutions to environmental problems.

2.2.4 Need to Save Energy.

It is not only cash are saving when using these products, but also energy. By saving energy, companies will no longer produce goods that require high amounts of energy if its people will just be using products that are reliable and are manufactured using simple methods.

2.3 Benefits using Eco-friendly Product

Eco-friendly products are becoming increasingly popular as consumers become more aware of the hazards of chemicals and toxins in their food, their households and their outdoor environment. As the profile of ecologically sustainable products becomes more prominent in the economic world, there is more and more incentive for businesses to supply consumers with what they want.

2.3.1 Economic Benefits

Although many green products are more expensive than conventional products, largely due to the economics of scale, it still useful to buy them for long term used. When a consumer purchases a green product, it functions as a vote for a green economy. As more green products and fewer toxic products are sold, the overall economy is slowly transformed into an economy that more sustainable and earth-friendly. In addition, as green economies grow, the costs of individual items will come down, due to the increased efficiency of larger production runs.