



## **UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

### **DESIGN AND DEVELOPMENT OF FLY – MOSQUITO TRAPPING DEVICE**

This report is submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Mechanical Engineering Technology (Maintenance) With Honours.

by

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## **APPROVAL**

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor Degree of Engineering Technology Bachelor of Mechanical Engineering Technology (Maintenance Technology) With Honours. The member of the supervisory is as follow:

.....

Mr Mohamed Saiful Firdaus Bin Hussin  
(Project Supervisor)

## ABSTRAK

*Perangkap lalat digunakan untuk memerangkap dan membunuh lalat dengan menggunakan pelbagai kaedah seperti perangkap cahaya, perangkap melekit dan perangkap umpan. Peranti elektrik penghalau nyamuk adalah alat yang menggunakan untuk menghalau nyamuk dengan cekap. Kebanyakan perangkap lalat di premis makanan menggunakan pembunuh lalat elektrik tetapi reka bentuk yang tidak sesuai kerana peranti ini digantung disebabkan ketidakselesaian kepada pelanggan apabila lalat mati akan jatuh di atas meja, lantai, dan makanan. Oleh kerana masalah reka bentuk perangkap lalat di premis makanan projek ini untuk membangunkan prototaip peranti perangkap lalat - nyamuk yang bermaksud untuk kegunaan yang pelbagai iaitu untuk membunuh lalat dan menghalau nyamuk pada satu peranti individu dengan penambahbaikan reka bentuk bagi mengatasi masalah yang ada di premis. Bagi mencapai objektif ini, reka bentuk peranti direka menggunakan perisian "Autodesk" dan konsep reka bentuk peranti perangkap lalat - nyamuk dilakukan dengan menggunakan kaedah PUGH. Dalam usaha untuk meneroka keperluan pelanggan kajian telah dilakukan melalui soal selidik dan temubual. Keputusan eksperimen apabila menguji pencemar bendalir yang berbeza untuk lalat yang terdiri daripada bahan kimia, madu dan gula sirup disusun di dalam jadual. Hasil kimia cecair mendapat 20, 25 dan 30 lalat selama 3 ujian uji, sedangkan madu mendapat 5, 4, dan 5 untuk 3 ujian uji. Terakhir untuk sirap gula mendapat 2, 3, dan 2 untuk 3 ujian uji. Keputusan untuk penghalau nyamuk dengan menggunakan penghalau nyamuk yang berbeza iaitu "Shieldtox violet mat", "Jumbo Q", dan Ridsect masing-masing 9 jam, 12 jam dan 8 jam. Hasil kajian menunjukkan bahawa kebanyakan orang bersetuju untuk membangunkan prototaip peranti perangkap lalat - nyamuk kerana ia adalah mudah untuk digunakan, fungsi*

*pelbagai guna dan sangat berkesan. Projek pembangunan prototaip peranti perangkap lalat - nyamuk berjaya dilakukan dengan jayanya.*

## **ABSTRACT**

The fly trap is used to trap and kill the flies by using variety of methods such as light trap, sticky trap and baited trap. The electric mosquito repellent device is a device that uses to repel the mosquitoes efficiently. Mostly the fly trap at the food premises use an electric fly killer but the design is not suitable because the device is hung caused discomfort to the customer as a dead fly will fall on the table, floor, and food. Due to the problem of the design of fly trap at the food premises this project to develop a prototype of fly – mosquito trapping device which means for multipurpose which are to kill flies and repel the mosquitoes at one individual device with improvement design to overcome the problem at the premises. To achieve this objective, the design of device is collaborated with Autodesk software and the design concept of fly – mosquito trapping device is done by using PUGH method. In order to explore the requirements of the customer the survey had been done through questionnaire and interview. The experiment result when testing the different fluid attractant for flies which are liquid chemical, honey and sugar syrup were tabulated in a table. The liquid chemical result got 20, 25 and 30 flies for 3 trials of testing, while the honey got 5, 4, and 5 for 3 trials of testing. Lastly for sugar syrup got 2, 3, and 2 for 3 trials of testing. The result for mosquito repellent by using different mat which are Shieldtox violet mat, Jumbo Q mat, and Ridsect mat were 9 hours, 12 hours and 8 hours respectively. The result shows that most of people agreed for the develop a prototype of fly – mosquito trapping device because it is easy to use, multipurpose function and very effective. The project development for the prototype of fly-mosquito trapping device was done successfully.

## **DEDICATION**

To my husband,

My beloved family,

My supervisor,

and to all my friends,

Thanks for all support and ideas



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# TABLE OF CONTENT

|   |          |
|---|----------|
| ABSTRAK                                       | i        |
| ABSTRACT                                      | iii      |
| DEDICATION                                    | iv       |
| ACKNOWLEDGEMENT                               | xi       |
| TABLE OF CONTENT                              | vi       |
| LIST OF TABLES                                | x        |
| LIST OF FIGURES                               | xi       |
| LIST ABBREVIATIONS, SYMBOLS AND NOMENCLATURES | xiii     |
| <br>  |          |
| <b>CHAPTER 1: INTRODUCTION</b>                | <b>1</b> |
| 1.1 Background                                | 1        |
| 1.2 Problem Statement                         | 2        |
| 1.3 Objectives                                | 4        |
| 1.4 Scope                                     | 4        |
| <br>  |          |
| <b>CHAPTER 2: LITERATURE REVIEW</b>           | <b>6</b> |
| 2.1 Type of Fly Trap                          | 6        |
| 2.1.1 Light Traps                             | 6        |
| 2.1.2 Sticky Traps                            | 7        |
| 2.1.3 Baited Traps                            | 8        |
| 2.2 Types of Mosquito Repellent               | 8        |
| 2.2.1 Mosquito Coils                          | 9        |
| 2.2.2 Aerosol Mosquito Repellent              | 10       |
| 2.3 Types of Flies                            | 10       |
| 2.3.1 Horse Flies                             | 10       |
| 2.3.2 Green Bottle Fly                        | 11       |
| 2.3.3 House Fly or Musca Domestica            | 11       |
| 2.4 Types of Mosquitoes                       | 12       |

|       |   |    |
|-------|---|----|
| 2.4.1 | Anopheles   | 12 |
| 2.4.2 | Aedes   | 13 |
| 2.4.3 | The Dark Winged Fungus Gnat                         | 13 |
| 2.5   | Material Selection for Fly Mosquito Trapping Device | 14 |
| 2.5.1 | Stainless Steel                                     | 14 |
| 2.5.2 | Aluminum Alloy                                      | 15 |
| 2.5.3 | High Carbon Steel                                   | 15 |
| 2.5.4 | Copper  | 16 |
| 2.5.5 | Zinc  | 17 |
| 2.5.6 | Titanium Alloy                                      | 18 |
| 2.5.7 | Carbon Fibre  | 19 |
| 2.5.8 | Glass Fibre   | 19 |
| 2.6   | Engineering Design                                  | 20 |
| 2.6.1 | House of Quality                                    | 20 |
| 2.6.2 | Product Design Specification                        | 21 |
| 2.6.3 | Morphological Chart                                 | 22 |
| 2.6.4 | Concept Generation                                  | 23 |
| 2.6.5 | Pugh Method   | 24 |
| 2.6.6 | AutoCad   | 24 |
| 2.6.7 | Solid Works   | 26 |
| 2.6.8 | Autodesk  | 27 |
| 2.7   | Experimental Works                                  | 27 |
| 2.7.1 | Type of Manufacturing Process                       | 27 |
| 2.7.2 | Lathe Turning                                       | 28 |
| 2.7.3 | Drilling  | 31 |
| 2.7.4 | Milling   | 33 |
| 2.7.5 | Grinding  | 34 |
| 2.8   | Type of Welding                                     | 35 |
| 2.8.1 | GTAW or Tungsten Inert Gas                          | 35 |
| 2.8.2 | GMAW or Gas Metal Arc Welding                       | 35 |
| 2.9   | Electrical Parts                                    | 36 |
| 2.9.1 | Motor Ac  | 36 |

|   |  |           |
|---|--|-----------|
| 2.9.2   | LED light                              | 37        |
| 2.9.3   | Electric Shock Killing Nets            | 37        |
| 2.9.4   | Electric Mosquitoes Repellent Device   | 38        |
| 2.10  | Types of Fluid Attractant              | 38        |
| 2.10.1  | Fly Trap Liquid Chemical               | 38        |
| 2.10.2  | Honey                                  | 39        |
| 2.10.3  | Sugar Syrup                            | 39        |
| <br><b>CHAPTER 3: METHODOLOGY</b>             |  | <b>40</b> |
| 3.1   | Introduction                           | 40        |
| 3.2   | Flowchart                              | 40        |
| 3.3   | Data Collection                        | 41        |
| 3.4   | Research Analysis                      | 42        |
| 3.4.1   | House of Quality                       | 42        |
| 3.5   | Morphological Chart                    | 44        |
| 3.6   | Conceptual Design                      | 44        |
| 3.7   | Pugh Method                            | 45        |
| 3.8   | Selection of Types of Fluid Attractant | 46        |
| 3.8.1   | Fly Trap Liquid Chemical               | 46        |
| 3.8.2   | Honey                                  | 46        |
| 3.8.3   | Sugar Syrup                            | 46        |
| 3.9   | Material Selection                     | 46        |
| 3.10  | Expected Results                       | 47        |
| 3.10.1  | Expected Result for Flies              | 48        |
| 3.10.2  | Expected Result for Mosquito           | 49        |
| <br><b>CHAPTER 4: RESULT &amp; DISCUSSION</b> |  | <b>51</b> |
| 4.1   | Survey analysis                        | 51        |
| 4.2   | House of Quality                       | 62        |
| 4.3   | Morphological Chart                    | 65        |
| 4.4   | Conceptual Design                      | 66        |
| 4.5   | Pugh Method                            | 70        |

|     |   |           |
|-----|---|-----------|
| 4.6 | Design Operation                                | 71        |
| 4.7 | Prototype Design                                | 72        |
|     | 4.7.1 Prototype Design Drawing                  | 72        |
|     | 4.7.2 Exploded View                             | 73        |
|     | 4.7.3 Dimension Part Drawing                    | 75        |
|     | 4.7.3.1 Body device dimension                   | 75        |
|     | 4.7.3.2 Base dimension                          | 76        |
|     | 4.7.3.3 Barrier dimension                       | 77        |
|     | 4.7.3.4 Angle iron dimension                    | 78        |
|     | 4.7.3.5 Feed slot dimension                     | 79        |
|     | 4.7.3.6 Electric net dimension                  | 80        |
|     | 4.7.3.7 Cap dimension                           | 81        |
|     | 4.7.3.8 Body of bait dimension                  | 82        |
|     | 4.7.3.9 Sponge dimension                        | 83        |
|     | 4.7.3.10 Perspex                                | 84        |
|     | 4.7.3.11 Motor base dimension                   | 85        |
|     | 4.7.3.12 Triangle cone dimension                | 86        |
|     | 4.7.3.13 Top Perspex dimension                  | 87        |
|     | 4.7.3.14 Mosquito repellent box dimension       | 88        |
| 4.8 | Prototype Analysis Result                       | 89        |
|     | 4.8.1 Fly trap result                           | 89        |
|     | 4.8.2 Mosquito repellent result                 | 91        |
|     | <b>CHAPTER 5: CONCLUSION AND RECOMMENDATION</b> | <b>92</b> |
| 5.1 | Conclusion                                      | 92        |
| 5.2 | Recommendation                                  | 93        |
|     | <b>REFERENCES</b>                               | <b>94</b> |
|     | <b>APPENDIX</b>                                 | <b>97</b> |

# LIST OF TABLES

|     |   |    |
|-----|---|----|
| 2.1 | Example of Morphological Chart Table                            | 23 |
| 3.1 | Morphological Chart   | 44 |
| 3.2 | Table of Pugh Method  | 45 |
| 3.3 | Table of Material Properties                                    | 47 |
| 3.4 | Table of Data for Fly Trap Liquid Chemical (Fluid Attractant 1) | 48 |
| 3.5 | Table of Data for Honey (Fluid Attractant 2)                    | 48 |
| 3.6 | Table of Data for Sugar Syrup (Fluid Attractant 3)              | 48 |
| 3.7 | Table of Data for Average Amount of Flies Killed                | 49 |
| 3.8 | Table of Data Types of Mat Mosquito Repellent                   | 50 |
| 4.1 | Morphological Chart and The Lines of the Design Concept         | 65 |
| 4.2 | Conceptual Design for Portable Fly-Mosquito Trapping Device     | 66 |
| 4.3 | Pugh Method   | 70 |
| 4.4 | Exploded View Labeling  | 74 |
| 4.5 | Table of Data for Fly Trap Liquid Chemical (Fluid Attractant 1) | 89 |
| 4.6 | Table of Data for Honey (Fluid Attractant 2)                    | 89 |
| 4.7 | Table of Data for Sugar Syrup (Fluid Attractant 3)              | 90 |
| 4.8 | Table of Data for Average Amount of Flies Killed                | 90 |
| 4.9 | Table of Data Types of Mat Mosquito Repellent                   | 91 |

## LIST OF FIGURES

|      |   |    |
|------|---|----|
| 1.1  | Fly Trap at The Cafeteria UTeM                              | 3  |
| 2.1  | Example of Light Trap                                       | 6  |
| 2.2  | Example of Sticky Trap                                      | 7  |
| 2.3  | Example of Baited Trap                                      | 8  |
| 2.4  | Example of Mosquito Coil                                    | 9  |
| 2.5  | Example of Aerosol Mosquito Repellent                       | 10 |
| 2.6  | Example of Horse Flies                                      | 10 |
| 2.7  | Example of Green Bottle Fly                                 | 11 |
| 2.8  | Example of House Fly or Musca Domestica                     | 12 |
| 2.9  | Example of Anopheles  | 12 |
| 2.10 | Example of Aedes  | 13 |
| 2.11 | Example of Dark Winged Fungus Gnat                          | 14 |
| 2.12 | Example of House of Quality                                 | 21 |
| 2.13 | Axial Depth Cut   | 30 |
| 2.14 | Radial Depth Cut  | 31 |
| 2.15 | A Cross Section of a Hole being Cut by a Common Twist Drill | 32 |

|      |  |    |
|------|--|----|
| 3.1  | Flow Chart   | 40 |
| 3.2  | House of Quality of Fly – Mosquito Device                                    | 42 |
| 3.3  | Example of Graph Amount of Flies Killed Versus Type of Fluid Attractant      | 49 |
| 3.4  | Example of Bar Graph of Lasting Hours Versus Types of Mat Mosquito Repellent | 50 |
| 4.1  | Ages of the Respondents  | 51 |
| 4.2  | Genders of the Respondents   | 51 |
| 4.3  | Percentage of the Respondents buy Food at Premises                           | 52 |
| 4.4  | Percentages of Respondents having Food Poisoning                             | 53 |
| 4.5  | Percentage of the place of Food Poisoning                                    | 53 |
| 4.6  | Effect of Flies to health and meal time                                      | 54 |
| 4.7  | Does the Fly Trap Important for Customer’s Comfort                           | 55 |
| 4.8  | Electrical Fly Trap  | 55 |
| 4.9  | Safety and Cleanliness of Electrical Fly Trap                                | 56 |
| 4.10 | Design of Fly Trap   | 57 |
| 4.11 | Place to put the Fly Trap  | 57 |
| 4.12 | Fly Trap at the Premises   | 58 |
| 4.13 | Multifunction Fly Trap   | 59 |
| 4.14 | Combination of Fly Trap and Mosquito Repellent Device                        | 59 |
| 4.15 | Portable Fly-Mosquito Trapping Device  | 61 |
| 4.16 | House of Quality   | 62 |



|      |   |    |
|------|---|----|
| 4.17 | Prototype Design of Device  | 72 |
| 4.18 | Exploded View   | 73 |
| 4.19 | Body Device dimension   | 75 |
| 4.20 | Base dimension  | 76 |
| 4.21 | Barrier dimension   | 77 |
| 4.22 | Angle iron dimension  | 78 |
| 4.23 | Feed slot dimension   | 79 |
| 4.24 | Electric net dimension  | 80 |
| 4.25 | Cap dimension   | 81 |
| 4.26 | Body of bait dimension  | 82 |
| 4.27 | Sponge dimension  | 83 |
| 4.28 | Perspex dimension   | 84 |
| 4.29 | Motor base dimension  | 85 |
| 4.30 | Triangle cone dimension   | 86 |
| 4.31 | Top Perspex dimension   | 87 |
| 4.32 | Mosquito repellent box dimension                                  | 88 |
| 4.33 | Graph Amount of Flies Killed Versus Types of Fluid Attractant     | 90 |
| 4.34 | Bar Graph of Lasting Hours versus Types of Mat Mosquito Repellent | 91 |

## **LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE**

|                  |   |                                   |
|------------------|---|-----------------------------------|
| AC               | - | Alternating Current               |
| CFRP             | - | Carbon Fiber Reinforced Plastics  |
| CAD              | - | Computer Aided Design             |
| CAE              | - | Computer Aided Engineering        |
| CAM              | - | Computer Aided Manufacturing      |
| Cu               | - | Copper                            |
| CO <sub>2</sub>  | - | Carbon                            |
| CRs              | - | Customer Requirements             |
| ECs              | - | Engineering Characteristics       |
| FTK              | - | Faculty of Engineering Technology |
| GFRP             | - | Glass Fiber Reinforced Plastics   |
| GF               | - | Glass Fibre                       |
| GMAW             | - | Gas Metal Arc Welding             |
| GTAW             | - | Gas Tungsten Arc Welding          |
| H <sub>2</sub> O | - | Water                             |
| HOQ              | - | House Of Quality                  |
| IPM              | - | Integrated Pest Management        |
| LCDs             | - | Liquid Crystal Displays           |
| LED              | - | Light Emitting Diode              |
| Mn               | - | Manganese                         |
| M-Chart          | - | Morphology Chart                  |
| MPa              | - | Mega Pascal                       |
| °C               | - | Degree Celcius                    |
| PC               | - | Personal Computer                 |
| PDS              | - | Product Design Specification      |
| PVA              | - | Polyvinyl Acetate                 |
| PVB              | - | Polyvinyl butyral                 |
| PE               | - | Polyethylene                      |
| QFD              | - | Quality Function Deployment       |

|      |   |                                     |
|------|---|-------------------------------------|
| SFM  | - | Surface Feet Per Minute             |
| TIG  | - | Tungsten Inert Gas                  |
| UTeM | - | Universiti Teknikal Malaysia Melaka |
| Zn   | - | Zinc                                |

# CHAPTER 1

## INTRODUCTION

### 1.1 Background

Dengue has turned into an imperative general wellbeing concern everywhere throughout the world since 1950s. The disease is considered a vector-borne illness in terms of the number of human infections occur worldwide. South-East Asia and Western Pacific regions most truly affected by dengue. Tropical regions in Africa are vulnerable to persistent infection. Population at Malaysia with a 28.33 million and a populace density of 86 per square kilometer, dengue is currently a very endemic sickness. The increased number of dengue cases has consistently recorded at the country for each year since from 1980. The dengue disease has been announced as one of the dangerous health treat to the general population in Malaysia (Mia et al., 2013). Electronic mosquito repellents that are created to repel female mosquitoes to produce a loud noise almost inaudible to the human ear. Female Anopheles mosquitoes transmit malaria by sucking blood from people, and this device is planned to drive them out by evacuating high recurrence buzz practically quiet to the human ear. It can be utilized inside and outside and is asserted to repulse mosquitoes in the range up to 2.5 meters.

The counteractive action of food spoilage and sustenance harming pathogens is normally accomplished by utilization of compound additives which have negative effects including human wellbeing risks of the chemical applications, synthetic residues in sustenance and feed chains and acquisition of microbial resistance to the utilized chemicals ( Mostafa et al., 2017) .Because of such concerns, the necessity to find a potentially effective and a better way to prevent the food poison due to flies is a must. Mechanical control is another method that able to prevent the food poison due to flies. The oldest counter measure for control house flies falls under this

section – fly swatting. The modern mechanical control method have a different kinds of fly traps. Various types include traps baited fly traps, light traps and sticky traps. House flies need a best controlled with the use of integrated pest management (IPM) because the flies able to overcome the insecticide resistance and develop reproductive potential. IPM tactics commonly used include hygiene, pesticides, biological control agents, and fly trap. Electric insect killer is a tool or equipment to kill flying insects such as flies and mosquitoes. Electric fly-swatters is a safe device which eliminates insects and is used widely in many countries. House flies and mosquitoes have high touchy hairs which can detect the small changes in air pressure. This is the reason fly swatters, in general, have a open- design which makes the flies and mosquitoes do not identify the swatter until it is past the point where it is possible to get away from the webbing.

## **1.2 Problem statement**

The problem that faced in this project is the design of a fly trap that exist which is hung caused discomfort to the customer as a dead fly will fall on the table, floor, and food. When this issue occurs, the food will be unclean and polluted. Food poisoning is considered as one of the most common causes of diseases and death in developing countries. Most of the food poisoning reports are related to the bacterial contamination especially members of negative bacteria such as Salmonella typhi, Escherichia coli and Pseudomonas aeruginosa (White, 2011). Other positive bacteria including Staphylococcus aureus and Bacillus cereus have been also identified as the agents of foodborne diseases or food spoilage (Mostafa et al., 2017). Prevention of food spoilage and their etiological agent is traditionally achieved by the use of chemical preservatives (Mishra et al., 2017).



Figure 1.1: Example of Problematic Fly Trap

The housefly, *Musca domestica*, is an aggravation bothers as well as goes about as a vital mechanical vector for heaps of pathogenic microorganism specialists, including microscopic organisms, protozoa, worms, growths and infections among people and creatures. The number of inhabitants in houseflies transmits the infection operators by methods for various parts of their bodies (hairs body, members, and mouthparts) and discharges (feces). House-flies enter a few spots including polluted premises as the place where the flies can get some food and it is also its biologic habits for feeding. The propensities for house fly support the spread of microbes and other sickness bringing about life forms. Therefore, housefly, for example, can spread sicknesses, for example, food poisoning and many more (Vazirianzadeh et al., 2008). Mosquito bites are round and severely itchy. With regards to getting a charge out of the outside exercises, mosquito bites appear to be something that cannot be evaded. While honey bees and wasps infuse venom when sting, mosquitoes just bite to feed upon your blood. Bumps and itching that comes from mosquito inject to prevent blood from clotting, which can cause mild allergic reactions which is red bumps. The dengue occurrence is pervasive all through the nation with the highest rate among the most developed and thickly populated regions and states. All age group is influenced with the most defenseless among the school going kids and young adults. Every

single ethnic group is in danger of being infected. Changes in atmosphere factor, for example, temperature rising, expanded precipitation, and relative dampness is the most compelling main impetus of dengue transmission in Malaysia. Amid Malaysia fast industrialization and financial development in the previous a few decades, enormous infrastructure improvement resulted in the spread of the disease (Mia et al. 2013). Up to now, there are a lot of device trap for fly and mosquitoes that are widely used in other countries but a combination of these two device has yet to be designed and manufactured. In fact, it is verifiable that the use of the combination of these two device will solve two problems at one time.

### **1.3 Objective**

Based on the problem statement discussed above, the objectives of this project are listed below:

1. To conduct a survey on portable fly – mosquito trapping device in obtaining customers' needs.
2. To design the concept of fly – mosquito trapping device by using PUGH method.
3. To develop a prototype of fly – mosquito trapping device.

### **1.4 Scope**

The research project will be a focus on to conduct a survey on portable fly – mosquito trapping device for the food premises owner in 5 different districts in Malaysia. Each district should interview 10 different food premises for designing purpose. The survey is done by distributing a questionnaire to the 50 persons of food premises owner which is consists of 20 questions. The fly – mosquito trapping device design will be selected by analyzing the best-selected design concept by using Pugh method. Selection of Pugh method is a quantitative method. It is used to

evaluate a set of multi – dimensional alternative options. It is much of the time utilized as a part of building for settling on design decisions, however, can likewise be used to rank venture alternatives, vendor options, product choices or any other arrangement of multidimensional substances. In order to achieve the third objective of this project, a desirable prototype unit of fly – mosquito trapping device will be developed for 2 main functions which are to expel the mosquitoes and kill the flies.