



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**Investigation of Voice of Customers on Hybrid Powered
Household Equipment**

This report submitted in accordance with requirement of the Universiti Teknikal
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(Management)

By

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BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

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Date : JUNE 2013

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 Management) (Hons.). The member of the supervisory is as follow:

.....

Project Supervisor

ABSTRACT

Customer Satisfaction has become an important thing of performance in the industries nowadays. By listening to the voice of the customer which has been embraced in marketing theory and manufacturing strategy and has been practiced for a long time, it is an important strategy to meet this objective. This project is about investigating hybrid-powered household equipment, clothes dryer. This project will investigate the differences between the dryer machines in the current market that is basically only spinning concept to remove moisture. The survey questionnaire will be distributed to 60 respondents. From the total sample population, 30 respondents are from residents of apartment and another 30 more are from customers at MYDIN hypermarket. All data will be used to analyze and choose the best concept design for our product. The particular strength of this study is providing the Pugh Method which it can calculate the concept design to fulfill the customer need in a short time.

ABSTRAK

Hari ini, kepuasan pelanggan telah menjadi kayu ukur kepada prestasi sesuatu syarikat. Oleh itu, dengan mendengar apa kehendak pelanggan dan suara mereka boleh menjadi strategi untuk pemasaran dan pembuatan di mana teori ini telah menjadi amalan untuk setiap syarikat untuk masa yang lama. Tujuan kajian ini adalah untuk mengkaji tentang peralatan rumah berkuasa hibrid. Soalan kaji selidik akan di agihkan kepada 60 orang responden mengambil. Daripada jumlah penduduk sampel, 30 responden daripada penduduk pangsapuri dan 30 lagi adalah daripada pelanggan di pasaraya MYDIN. Semua data akan digunakan untuk menganalisis dan memilih konsep reka bentuk yang terbaik untuk produk kami. Kekuatan tertentu kajian ini menyediakan Kaedah Pugh yang ia boleh mengira konsep yang direka untuk memenuhi keperluan pelanggan dalam masa yang singkat.

DEDICATION

They say that dedicating a book/research is one of the most exquisite acts of love one can perform. I would argue that it is even more beautiful to dedicate this one to Allah s.w.t for the love that given to me. I would like to dedicate this research to my loving family also for their continuous support, education and constant love through my life.

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LISTS OF ABBREVIATIONS SYMBOLS AND NOMENCLATURE

DC	-	Direct Current
AC	-	Alternating Current
PV	-	Photovoltaic Panels
MP3	-	Moving Picture Experts Group Layer-3 Audio
PDA	-	Personal Digital Assistant
GPS	-	Global Positioning System
UV	-	Ultraviolet
FIT	-	Feed-in Tariff
VOC	-	Voice of Customer
CG	-	Center of Gravity
CAD	-	Computer – Aided Drafting
3-D	-	Three Dimension
BOM	-	Bill of Material
AHP	-	Analytic Hierarchy Process

CHAPTER 1

INTRODUCTION

1.1 Background

Customer Satisfaction has become an important thing of performance in the industries nowadays. By listening to the voice of the customer which has been embraced in marketing theory and manufacturing strategy and has been practiced for a long time, it is an important strategy to meet this objective. This project is about investigating hybrid-powered household equipment, clothes dryer. This project will make the differences between the dryer machines in the current market that is basically only spinning concept to remove moisture. The survey questionnaire will be distributed to 60 respondents. From the total sample population, 30 respondents are from residents of apartment and another 30 more are from customers at MYDIN hypermarket. All data will be used to analyze and choose the best concept design for our product. The particular strength of this study is providing the Pugh Method which it can calculate the concept design to fulfill the customer need in a short time.

By this semester 1 12/13 Final Year Project will be invented using all the method that has been learn through the previous semester, that is include the subjects that have been learned. This Final Year Project must finish and achieve the target by the end of this semester 1. Besides that, this Final Year Project will be able to give the student a bunch of knowledge and skills in using the appropriate tools and techniques. Furthermore, this also can be the step of learning and also be able to know how to apply their understanding to solve the problem that appear.

1.2 Problem Statement

The problems that usually face in current time is based on the customer need. Although this Final Year Project is not willing to compete with the product nowadays but it apply our skill to develop machine that can fulfill the needed. Usually the issues that always been claims such as the residents of apartment and condominium is not advisable dry their clothes by putting up the hanger outside their balcony because this view is nasty and get spoiled to especially the apartment and condominium estate like Putra Jaya and other big city that crucial nice scenery and cleanliness. In order to resolve the clothes drying problem, they install the electric clothes dryer in their apartment. The cost of maintaining the drier is high. This research is to find alternative measure to reduce the cost by introducing the drying system using merely a solar energy as a source of energy to run the dryer to dry the clothes, or alternatively will provide the user to have a hybrid electric-solar clothes dryer.

1.3 Objectives of the Study

1. To study the existing product of clothes dryers on their variety and features.
2. To study the design and mechanism of present solar energy system to be incorporated it to clothes dryer.
3. To design an integrated clothes dryer with solar energy system and choose a best design using Pugh Method.

1.4 Scope of the Study

This project focuses on hybrid household clothes dryer for apartment or condominium. The work is limited to surveying the aspects of features needed by user by help of voice of customer.

Secondly, the research is extended to only best system to use and finally providing a design concept for preparation for product development in future work of research and development for this project.

1.5 Layout of Study

In order to understand the flow of this study, here is the outline given so that the reader can understand the progress of this study.

- a) The first chapter will introduce the introduction, the objective, scope of the study and problem statement.
- b) The second chapter is about literature review.
- c) The third will explain and show all the methods and methodology of study.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

According to MartynShuttleworth (2009), a literature review can be a precursor in the introduction of a research paper, or it can be an entire paper in itself, often the first stage of large research projects, allowing the supervisor to determine that the student is on the correct path. The review should describe, summarize, evaluate and clarify this literature. It should give a theoretical base for the research and help the author determine the nature of your research. Works which are irrelevant should be discarded and those which are peripheral should be looked at critically. A literature review is a critical and in depth evaluation of previous research. It is a summary and synopsis of a particular area of research, allowing anybody reading the paper to establish why you are pursuing this particular research program. A good literature review expands upon the reasons behind selecting a particular research question.

The project is about investigating and develops hybrid-powered household equipment, clothes dryer. This project will make the differences between the dryer machines in the current market that is basically only spinning concept to remove moisture. Hybrid power systems combine the superb energy density of a fuel cell power source with the outstanding power density of modem batteries. A hybrid power source with an integral power distribution and charge management system was designed and built using standard miniature power regulator integrated circuits with appropriate modifications to implement the necessary controls. (M.J. Blackwelder and R.A. Dougal et al, 2004

The resulting converter not only allows the interconnection of fuel cell systems and batteries having dissimilar operating voltages, but it also imposes a power sharing strategy that elicits peak performance from each part of the device. The resulting hybrid power source can supply 70% greater peak power, with only a 6% increase in weight, and no increase in volume, compared to the as-packaged fuel cell power source on which the hybrid source was based.(M.J. Blackwelder and R.A. Dougal et al, 2004).

2.2 Hybrid Power

Hybrid energy system is an excellent solution for electrification of remote rural areas where the grid extension is difficult and not economical. Such system incorporates a combination of one or several renewable energy sources such as solar photovoltaic, wind energy, micro-hydro and may be conventional generators for backup. It becomes necessary to take up electrification of remote villages through non-conventional energy sources such as solar, micro-hydro and wind systems. A system using a combination of these different sources has the advantage of balance and stability that offers the strengths of each type of sources that complement one another. Hybrid energy systems are pollution free, takes low cost and less gestation period, user and social friendly. Hybrid systems can provide electricity at a comparatively economic price in many areas. (S. Ashok et al, 2006).

Hybrid power filters have been developed to solve the problems of passive power filters and active power filters. A hybrid power filter consists of a passive power filter and a power converter. In operation, the passive power filter can reduce the capacity of the power converter while the power converter is used to improve the filter characteristics of the passive power filter. Advantageously, a small-capacity power converter can solve the problems of resonance and neighboring harmonic current injection of passive power filters. Consequently, hybrid power filters are suitable for nonlinear loads with larger capacity. (Jinn-Chang Wu, Hurng-LiahngJou, Kuen-Der, and WuHsin-HsingHsiaoet at, 2012)

Hybrid power filters, as shown in Figure 2.1, can be divided into the series-linked type. The series-linked type hybrid power filter shown in Figure 2.1(a). The power converter is connected between the utility and the load through a linked transformer and the passive power filter is parallel with the load. The voltage drop on the power converter is low so as to reduce the DC bus voltage. However, the current of the power converter, including the fundamental current of the load and fundamental reactive current of the passive power filter, is still large. As seen in Figure 2.1(b), the power converter of the shunt type hybrid power filter is connected to the passive power filter in series and then connected to the load in parallel.

The major part of the utility voltage will drop on the passive power filter. In this way, the DC bus voltage and voltage rating of the power converter can be reduced significantly. However, the current of the power converter, including the harmonic current of the load and the fundamental reactive current of the passive power filter, is not diminished. (Jinn-Chang Wu, Hurng-LiahngJou, Kuen-Der, and WuHsin-HsingHsiao et al, 2012)

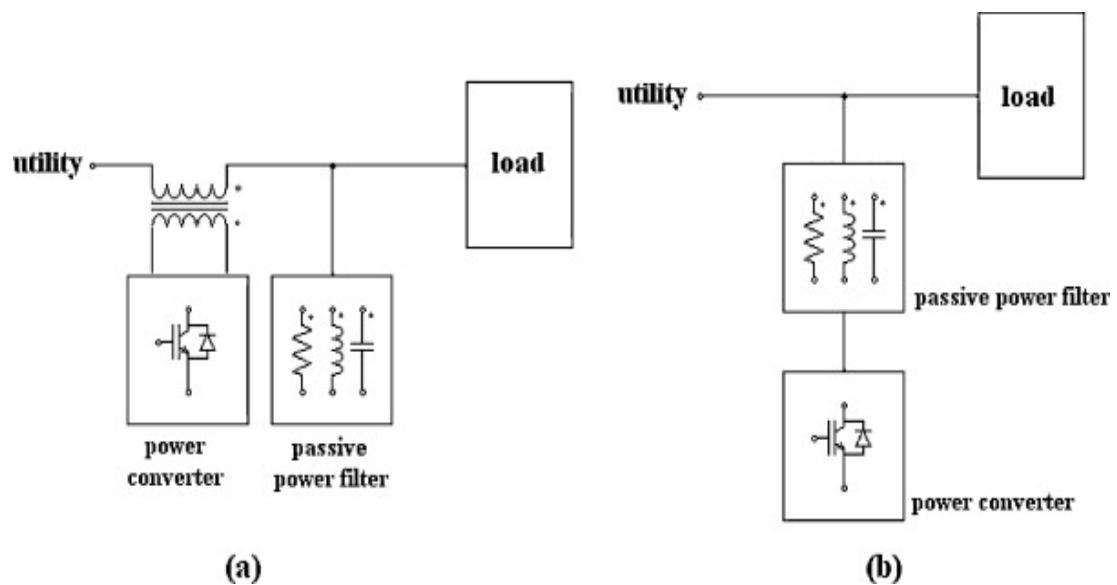


Figure 2.1: Figure shows Hybrid power filters. (Jinn-Chang Wu, Hurng-LiahngJou, Kuen-Der, and WuHsin-HsingHsiao et al, 2012)

2.2.1 Hybrid Solar Energy

Hybrid solar cells are the combination of advantages of both organic and inorganic semiconductors. The hybrid photovoltaic's have organic materials that consist of materials polymers which could absorb light as the donor and transport holes. Inorganic materials in hybrid cells are used as the acceptor and electron transporter in the structure. The hybrid photovoltaic devices have a potential to reduce cost and not only low-cost by its processing but also for reasonable solar power conversion. People often do hybrid on the technique that look at on the type of energy it is converted into such heat or electricity. By combining any solar technologies or energy method, will produce more efficient and practicable energy power besides the priority on its energy saving and reduce cost on deployments.

In order to give the great views on the efficiencies of hybrid solar solution provides in both financial and environmental terms, there are most technologies possible used for hybrid solution are Photovoltaic panels (PV) with the Solar thermal collectors. The Photovoltaic panels (PV) is an electricity-producing panels have been available for several years. When photovoltaic cells make electricity from sunlight, they collect a lot of heat along the way. And they don't work as well warm as they do cold. One little-mentioned drawback with PV is that as the surface temperature of the panel rises, the output drops. Meanwhile the conventional solar thermal installations is basically will collect the sun's heat and convert this into hot water for example.

A major drawback situation sometime is that when the sun was less hot then the water will less hot. Through combining the two technologies, it was able to remedy one of the fundamental problems facing in photovoltaic cells solar.



Figure2.2: Figure shows Solio Universal Hybrid Solar Charger(<http://www.solio.com/chargers/>)

Figure 2.2 shows the example of hybrid products using solar energy was Solio Universal Hybrid Solar Charger and it was a universal hybrid solar battery charger with internal battery for charging portable electronics. Internal battery absorbs energy from 4 hours in the wall socket or 8 to 10 hours of direct sunlight. This portable charge for iPods, cell phones, MP3 players, PDAs, game players, GPS units, or digital cameras. This product combined solar systems with life battery energy. It available with 3 blades spread out to absorb maximum sunlight.



Figure2.3: Figure shows Hybrid Solar car with Charger stations (<http://www.designboom.com/technology/toyota-solar-charging-stations/>)

Solar energy and hybrid electric vehicles would be effective in achieving emission reductions both from transportation and electricity generation. Solar-powered charging stations, as illustrated in Figure2.3 above, for cars that run on electricity are already popping up around the country. With hybrid vehicles

becoming ever more popular in future, and even all electric cars entering the market, transportation related oil usage will be reduced. In order to avoid replacing gasoline carbon dioxide emissions with conventional electricity carbon dioxide emissions, an electric or hybrid car battery could utilize solar electricity .The conventional wisdom likely to raise objections against solar electricity charging stations is that solar energy is just too expensive but the photovoltaic (PV) technology prices have been falling since 2008 at extraordinary rates. Then it would be great opportunity to continue producing this future cars using hybrid solar energy.

As illustrated in Figure2.4 below, the hybrid solar cooking oven, whereby the electric backup system is energy efficient using less electrical energy than your standard in-house oven. Tulsii-Hybrid solar can cook beef roasts, whole chickens or cakes, pies and breads. It'll bake heat up to 400 degrees, hard black coated for UV heat absorption. Energy source use hybrid Solar with electric power for backup.



**Figure 2.4:Figure showsTulsii Hybrid Solar Cooking oven
(<http://store.sundancesolar.com/tusocoov.html>)**

Many different solar drying techniques exist to carry out the drying of food products, such as traditional open sun drying, natural convection solar drying and forced convection solar drying. However, especially in humid tropical regions, where some crops have to be dried during rainy season, adequate care must be taken into account. In 2010, the new hybrid solar technology was invented and constructed

using direct solar energy and a heat exchanger called Hybrid Solar Drying System for food as shown in Figure 2.5 below. The drying chamber was located directly under the solar collector.

The dryer was operated during normal sunny days as a solar dryer, and during cloudy day as a hybrid solar dryer. Drying was also used at night with stored heat energy in water which was collected during the time of sun-shine and with electric heaters located at water tank. The solar dryer was tested for drying of ripe banana slices. The color, aroma and texture of the solar dried products were better than the sun drying products.



Figure 2.5: Figure shows Hybrid Solar Food Dryer (<http://www.seia.org/>)

Dyson-branded design (2008) is proposed a new hybrid prototype that a wind and solar clothing rack concept stems called Air-line. The Air-line uses solar panels as presented in Figure 2.6, to power fans which push air past the clothing until a sensor detects that the clothing are dry, depends which the solar panels revert to charging batteries so that the rack can be used at night. This amazing innovation, when a wind-up mechanism which is set when the clothes are laid out helps the rack to track the sun, optimizing the solar panel efficiency. This invention was overcoming the need to struggle for your right to dry; the Air-line utilizes the board to bring the sun's rays onto the clothing while preventing unsightly views for the neighbors. The panel easily tucks out of the way when not in use.