DESIGN OF HYBRID POWER SUPPLY FOR HOME APPLIANCES

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APRIL 2008

"I hereby declared that I have read through this report and found that it has comply the partial fulfillment for awarding the degree of Bachelor of Electrical Engineering (Power Electronic & Drive)"

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(Power Electronic & Drive)

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For my beloved father and mother

Mohd Fuad Othman and Maisura Sani

For all supported and understanding.

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بِسْمِ ٱللَّهِ ٱلرَّحْمَٰنِ ٱلرَّحِيمِ

In the name of Allah, The Beneficent, The Merciful.

Alhamdulillah, all praise is to Allah that I have been able to complete my report for my "Projek Sarjana Muda 2" that is designed of hybrid power supply for home appliance

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ABSTRACT

In this project, a design of Hybrid Power Supply is proposed for home application. The motivation of this project is that the hybrid method is becoming more popular method for automation and robotic application. In the near future, the hybrid method will be a useful method, because it can save a lot of energy by using it. For the project hybrid fundamentals will be implemented to create a power supply. This power supply will have two sources that is a solar panel and also a normal supply that is a plug point supply (240V 50Hz). The power supply will supply an output of 12V and also can stand until 3Amp of current. In building this project there are 4 major part need to be built. There are solar panel controller circuit, low voltage detector circuit, switching circuit and a voltage regulator circuit. This project will provide a 12DC output because it purposely creates for an automation system. Usually the automation system are using electronic part and it need DC supply to make the circuit function.

ABSTRACT

Di dalam projek ini pembinaan sebuah system sumber kuasa bagi kegunaan rumah akan di bina dengan mengunakan kaedah 'Hybrid'.''Hybrid' adalah satu kaedah yang semakin popular dalam pengunaan automasi dan robotic. Pada masa akan datang pengunaan kaedah hybrid akan menjadi satu kaedah yang paling berguna kerana dapat menjimat pengunaan tenaga dengan mengunakannya. Kaedah hybrid akan digunakan dalam projek pembinaan sumber kuasa ini. Dalam pembinaan sumber kuasa yang mengunakan kaedah hybrid ini dua sumber tenaga akan digunakan iaitu sumber tenaga dari tenaga solar dan dari plug yang berada di rumah(240VAC, 50Hz). Sumber tenaga ini akan menghasilkan keluaran 12VDC dan boleh bertahan sehinga 3A arus.dalam pembinaan sistem kuasa ini 4 litar penting perlu di bina iaitu litar solar, litar pengubah,litar pengesan voltan rendah dan litar yang mengwal perubahan suis yang mengunakan relay. Sistem kuasa ini bina bagi tujuan untuuk mengeoperasikan sistem, automasi kerana sistem ini memerlukan arus terus seperti yang dibekalkan oleh sistem kuasa ini.

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CHAPTER I

INTRODUCTION

1.1 Project Overview

This Project is to build a power supply by using hybrid method. Hybrid in this project means that there will be two sources of power that will be combined to give only one out put. The power supply can choose rather to use a battery supply that charged by solar panel or to choose the normal supply that has be regulated to the desired value. The normal supply is from a plug point that is 240V, 50Hz. the propose of built this power supply is to give an energy saving in the supplying the power to the equipment, and in this project is to give an supply to the automation system that is a DC motor that will have an changing speed. To make this power supply that use and hybrid method there is a circuit need to be build, the circuit is voltage regulator circuit, low voltage detector circuit, solar panel control circuit and switching circuit.

Voltage regulator circuits need to be built because this circuit will regulate the supply from the plug point to the desired value. The switching circuit will act as a chooser rather to use a battery or a plug point supply that has been regulated. The low voltage detector circuit will function as a sensor to the battery and will a signal to the switching circuit rather to use battery supply or regulated supply. Solar panel control circuit function as a control circuit, this circuit will control the charging in the battery that charging by solar system. The block diagram of the a overall project can be seen in

the figure 1.after all circuit have been combine the analysis on the system need to be construct. The power supply will give and out put of 12V DC and can stand until 3Amps. This project will be calling Hybrid Power Supply.

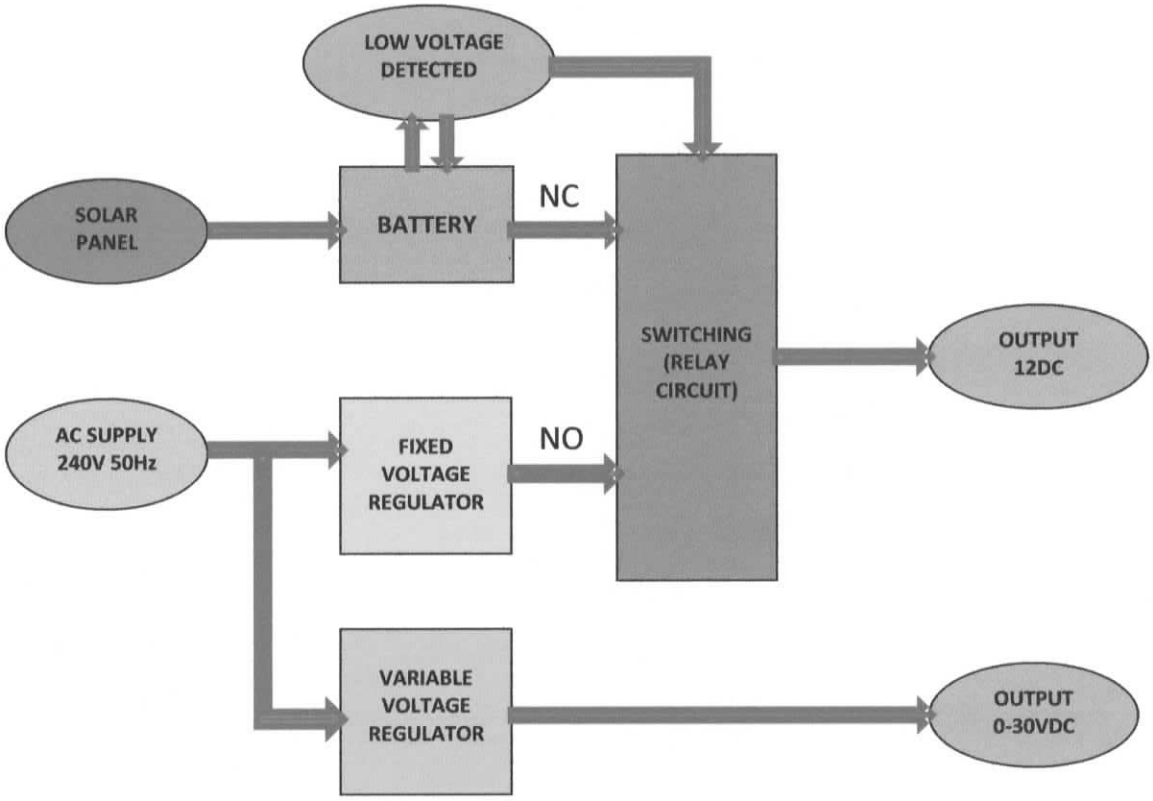

Figure1.1: The overall block diagram of the hybrid power supply

The block diagram in Figure 1.1 show the overall in roughly about the hybrid solar system that consist of two supply to that been attached to the switching circuit that function to switch rather want to use the solar panel supply that keep in the battery or to use the normal supply that is 240V 50Hz.

1.2 Objective Project

- To analyze on the hybrid power system
- To design the PV control circuit
- To design the voltage regulator to have a dc supply from ac supply.
- To design the switching circuit that will operate to choose the supply
- To build the Hybrid Power Supply for the automation @ home application

1.3 Problem Statement

Nowadays an electrical energy are so important for the human being it is because almost every equipment in this world are using an electrical to make it function. So the problem in energy is always occurring, with the high demanding usage in electrical energy. The prize will rise up and the quality of the energy will be decrees. So with this project it can help a lot in it. This project is to create a power supply that using hybrid method. Hybrid mean two kind of supply will be combining to be one. In this project the supply that has been choose is normal supply that is 240V with 50Hz in single phase will be combine with solar panel. Solar panel 'PV' that will charging a battery and the battery will produce output 12V DC. So with combining the supply the energy can be safe a lot because the main supply that will use in this project ais the solar system and the AC supply act as backup in this system.

1.4 Scope of the Project

- To study the hybrid method
- To design the circuit and combine it to create power supply by using hybrid method
  - ✓ Regulator circuit
  - ✓ Solar control circuit
  - ✓ Low voltage detector circuit
  - ✓ Switching circuit
- To do analysis and experiment on the circuit
- To make a full report.

1.5 Project Methodology

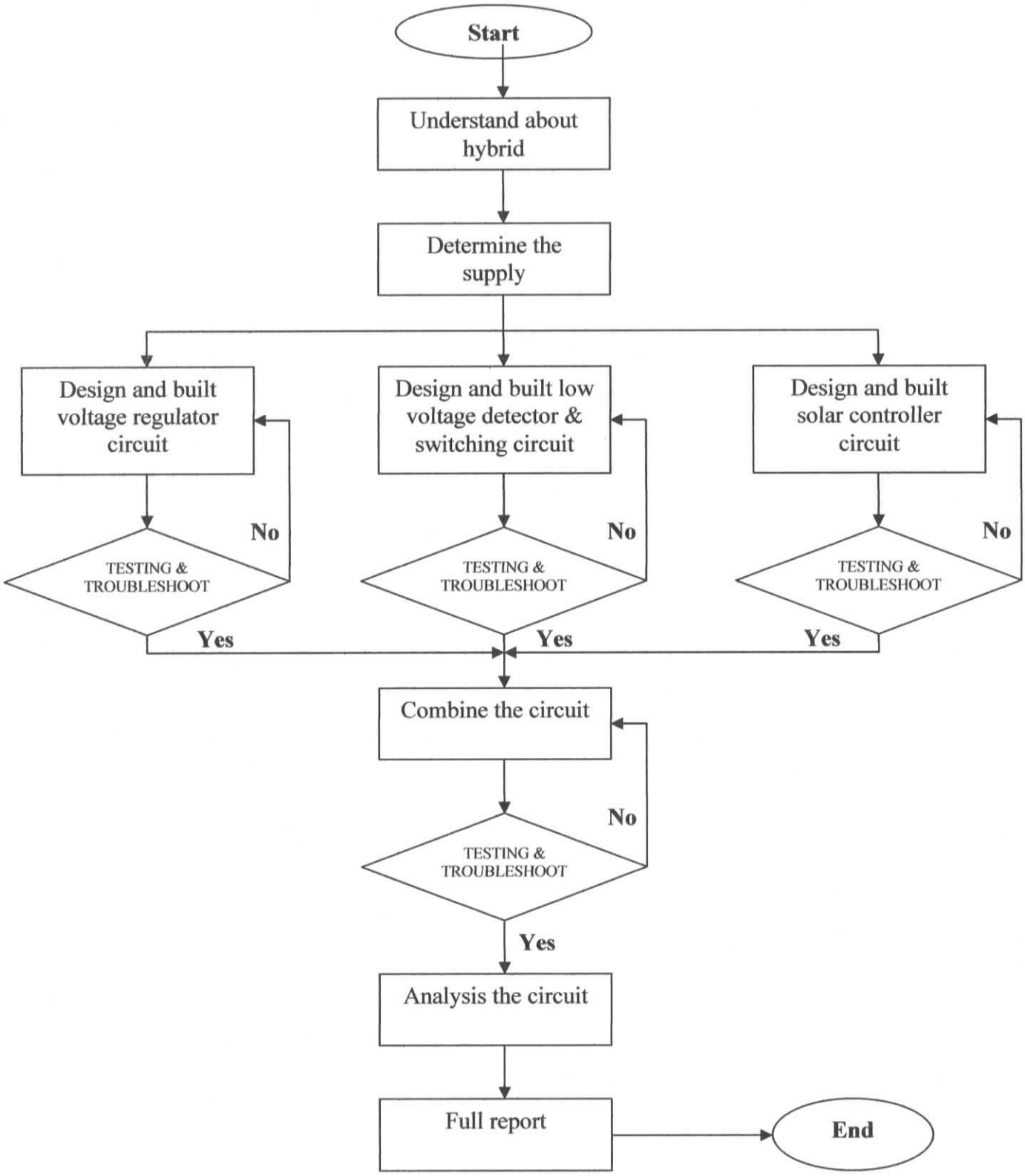

Figure1.2: The methodology of work flow

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

This chapter will discuss the literature review according the backup supply system that usually use in the industrial Uninterruptible Power Supply (UPS), basic concept of UPS including the theory and definition of UPS, in this lecturer review the difference also will be discus to show the function of the hybrid and the UPS system has a different although the method is like similar.

2.2 The UPS Theory

Power back-up system is essential and has been used by industries all over the world to ensure their machines or equipments operation running smoothly without having the effect of power disruption. Therefore, the power back-up system is very important to make sure that the overall system work properly. There are often cases that the power back-up system do not work properly when needed and this failure caused losses in term of time and money to industries. A system that be able to monitor this power back-up system can detect any abnormal activities occurred to the system. In addition, the system can prevent any fault that may affect the whole operations. UPS systems have enabled the improvement of power source quality, providing clean and uninterruptible power to critical loads such as industrial process controls, computers,

medical equipment, data communication systems and protection against power supply disturbances or interruptions. The block diagram is like in Figure 2.1.

BLOCK DIAGRAM OF ONLINE UPS

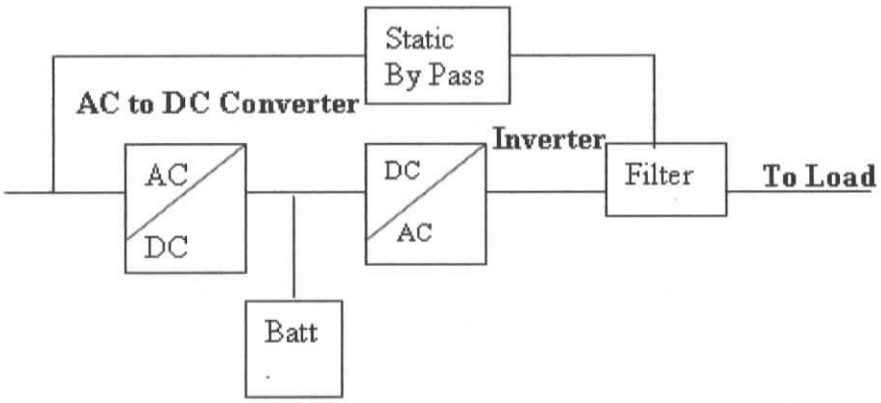

Figure 2.1: UPS block diagram online system [8]

UPS provides stable supply to the system in the present or absence of the input supply. It is important for the UPS system to be able to take over immediately that full load in power outage or out-of-tolerance situation to avoid any data loss, uncontrolled system shut-down or malfunctioning of the device. Commonly, the UPS topology can be classified as off-line UPS, line interactive UPS and online UPS. The three topologies were discussed in details in. This study presented on-line UPS monitoring system with visual basic. The on-line consists of a rectifier, charger, battery and static transfer switch. Under normal line conditions, the load is directly supplied from the live line as shown in Figure 2.1. After power failure, a battery continues supplying power to the load. Batteries are also available charged, as necessary when line power is available.

2.3 The Differences in Hybrid Power Supply and UPS System

In this project the power supply will be built is a hybrid method and it can be say like an inverse engineering method where in the UPS the battery will be as a backup but in this project a hybrid method will be implant where the battery that charge by photovoltaics 'PV' will be the main supply and the backup is the source that came from

the plug point. The purpose of this project is opposite from the ups where this project will try to be implement it the house not in the industrial sector, because it use a solar system as a main supply. The project also will be a project that can save energy not like the ups system that use battery as a backup.

- The ups system has battery as a backup
- The hybrid power supply use a battery as a primary source
- The power supply system battery are charge by the PV
- The UPS system battery charge by the alternating current 'AC' incoming and convert to direct current 'DC'
- The AC supply act as a backup supply in the hybrid power supply
- The AC source is a main supply in the UPS system
- The UPS are use in the industrial
- The propose of the hybrid power supply is to use in home appliance