FINAL YEAR PROJECT REPORT

(Microcontroller Based UPS)

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(Microcontroller Based UPS)

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Abstract

UPS stands for Uninterruptible Power Supply. It is an instrument connected between the electric grid and the consumer, comprising of electric hardware and rechargeable batteries. The aim of the instrument is to supply continuous undisturbed and conditioned power to the critical load. The energy for powering the load comes from the utility, or from the battery upon mains outage.

Uninterruptible Power Supply (UPS) are widely used to provide emergency power to critical loads in case of utility mains failure, and as such constitutes an essential element in providing back-up power for computer networks, communication links, biomedical equipment, and industrial processes, among others. For a microcontroller-based UPS, a full hardware-based UPS are gradually being replaced by microprocessor or microcontroller-based counterparts, with significant improvement in ease of design, flexibility of the control software and overall reduction in development cost. Since a UPS incorporates a relatively large number of detection, protection and control functions, it is important to develop an organized approach to the identification and implementation of these requirements. The purpose of his project is to provide an efficient time management for users to continue their work with personal computer even though an outage had occurred. Since this project involves hardware-software co-design, so that knowledge from a number of engineering disciplines is necessary for arriving at a workable solution.

This microcontroller-based Uninterruptible Power Supply will enable the users to monitor their current battery level. One of the advantages applying microcontroller for the Uninterruptible Power Supply is that the system is more reliable in functions compares to the conventional Uninterruptible Power Supply available in the market.

Dedicated to Our Beloved Parents

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Chapter I. Introduction

1. Introduction:

UPS stands for Uninterruptible Power Supply. It is an instrument connected between the electric grid and the consumer, comprising of electric hardware and rechargeable batteries. The aim of the instrument is to supply continuous undisturbed and conditioned power to the critical load. The energy for powering the load comes from the utility, or from the battery upon mains outage.

At times, power from a wall socket is neither clean nor uninterruptible. Many abnormalities such as blackouts, brownouts, spikes, surges, and noise can occur. Under the best conditions, power interruptions can be an inconvenience. At their worst, they can cause loss of data in computer systems or damage to electronic equipment. It is the function of an Uninterruptible Power Supply (UPS) to act as a buffer and provide clean, reliable power to vulnerable electronic equipment. The basic concept of a UPS is to store energy during normal operation (through battery charging) and release energy (through DC to AC conversion) during a power failure. UPS systems are traditionally designed using analog components. Today these systems can integrate a microcontroller with AC sine wave generation, offering the many benefits.

As the general population continues to grow, there is an ever-increasing demand for electricity placed on the world's power-generation and distribution facilities. Although significant measures are taken to ensure a reliable supply of electric power, the significant demand for power increases the likelihood that power outages and other electrical disruptions such as brownouts will occur. UPS that currently existed offer users extended periods of backup power during which they can continue to use electronic equipment such as a personal computer. However, this UPS only provide a minimal voltage regulation and filtering for disturbance occurred. Further, most UPS equipped with microcontroller for monitoring and display are much expensive than the standard available UPS in the market as the application of microcontroller will provide a wide range of application in term of programming and hardware controls. The purpose of this project is to design a UPS that manages to act as an emergency power supply to critical load and also equipped with microcontroller programming for UPS monitoring system.

Mobility and versatility have become a must for the fast-paced society today. People can no longer afford to be tied down to a fixed power source location when using their equipments. Overcoming the obstacle of fixed power has led to the invention of DC/AC power inverters. While the position of power inverter in the market is relatively well established, there are several features that can be improved upon. A comparison analysis of the different power inverter has been compiled. Aside from the differences in power wattage, cost per wattage, efficiency and harmonic contend, power inverters can be categorized into three groups: square wave, modified sine wave, and pure sine wave. A cost analysis of the different types of inverter shows that sine

wave power inverter, though has the best power quality performance, and has a big spike in cost per unit power. Another feature which can be improved is the efficiency of the inverter. The standard sine wave in the market has an average efficiency of 85-90%. Power dissipated due to efficiency flaws will be dissipated as heat and the 10-15% power lost in the will shorten operational life span of inverters. The quality of the output power could also be improved. It is imperative that the output signal be as clean as possible. Distortion in the output signal leads to a less efficient output and in the case of a square wave, which has a lot of unwanted harmonics; it will damage some sensitive equipments.

In designing any type of power supply, it is important to examine the intended market and place the product in a particular market. Our market will be to design a 300 watts power inverter that will provide optimum pure sine wave performance with minimal cost. In meeting the design requirements, there are several technical challenges that must be overcome. Our single, most difficult constraint will be to produce power at a lower power per unit cost than exists in the market. Our efficiency will be greater than 90 percent. This insures that, with a maximum load, less than 10% of power will be dissipated as heat. The total harmonic distortion will be less than 5 percent

1.1. Basic steps in simple UPS

1. Dc to Ac converter

2. Ac to Dc converter

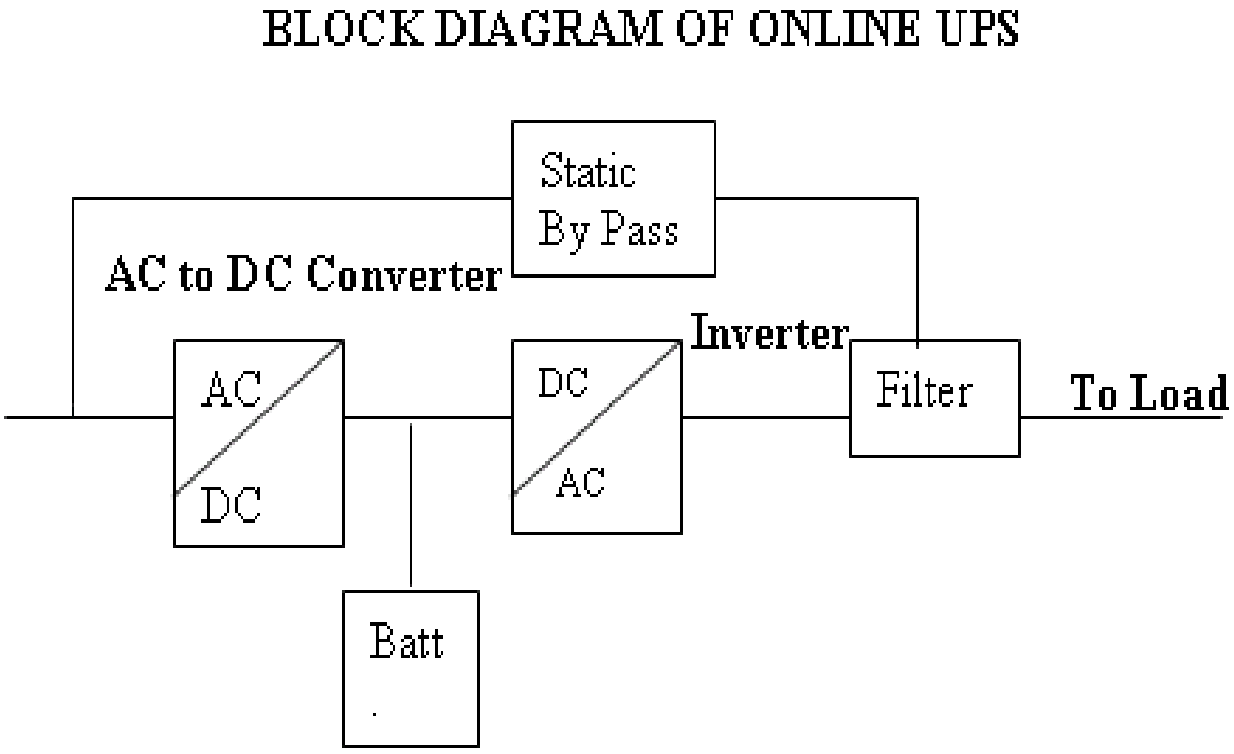

Fig # 1.1

The main important component is inverter, which converts the Dc stored in Battery back into Ac. So by improving the inverter we can improve the efficiency of UPS. There are few problems in inverters available in market, so we will try to overcome these problems, to increase the efficiency of ups.

1.2. COMPONENTS OF UPS

Mainly UPS consists of

- DC/DC CONVERTER
- VOLTAGE SOURCE INVERTER (VSI)
- BATTERY CHARGER