



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DEVELOPMENT OF UNINTERRUPTIBLE POWER SUPPLY
USING VARIABLE VOLTAGE REGULATOR FOR LOW
POWER DEVICES**

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor's Degree of Electronics Engineering Technology (Telecommunication) with Honours

by

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\

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfilment of the requirements for the degree of Bachelor of Electronics Engineering Technology (Telecommunications) with Honours. The member of the supervisory is as follow:

.....
(En. Mohd Anuar Bin Adip)

Project Supervisor

ABSTRAK

Bekalan kuasa tidak terganggu ialah salah satu alat yang mampu melindungi alatan anda apabila bekalan utama terputus. Alat ini mampu memberi tenaga kepada setiap alatan elektronik daripada rosak. Jadi projek ini ialah menghasilkan dan mencipta satu alatan yang sama dengan alat yang sedia ada bagi lebih interaktif dan lebih cekap berbanding dengan produk yang sedia ada. Projek ini akan mengeluarkan keluaran arus tetap (DC) berbanding produk yang sedia ada yang menyediakan arus ulang alik (AC) sebagai keluaran. Secara umumnya produk sedia ada di pasaran menggunakan lebih banyak proses penukaran arus dimana daripada AC-DC-AC-DC, tetapi daripada projek ini hanya memerlukan Direct Current sahaja. Kami menggunakan arus terus (DC) sahaja kerana untuk mempelajari dan menalisis kecekapan tenaga diantara produk yang sedia ada dan memilih sistem yang terbaik diantara kedua-dua sistem. Setiap data diambil dan akan dibandingkan dengan voltage berlawanan dengan masa yang diambil dan akan membandingkan kejatuhan voltan pada bateri.

ABSTRACT

Uninterruptible Power Supply is a device that can support and protect your devices when the main source is break down. So this device can supply the voltage source at your devices to prevent the devices and component from broken. So this project is developing or creating for this devices to more interactive and more efficient compared existing product. This project also will produce the Direct Current (DC) output compared the existing product that produce Alternative Current (AC) only. Basically the existing devices using more converting system process to produces the voltage such as AC-DC-AC-DC, but from this project we only produce the Direct Current (DC) only. We use the DC voltage only because to study and analyse the power efficient between two products and decide the best system and compared the power efficiency of both systems.

DEDICATION

To my beloved parents, the sacrifices you give will not be forgotten. As a human being knowledgeable of service and goodness you can not reply to me. It is also dedicated to my friends and supervisor of Universiti Teknikal Malaysia Melaka who involved directly or indirectly in assisting me during the course of this final year project and finishing this project report.

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CHAPTER 1

INTRODUCTION

1.0 Introduction

The first chapter introduces brief idea of the project. It focused on the overview of the project, detailing the objectives, the problem statement, scope and outcome of the project.

1.1 Background of Project

This project is about to improve efficiency of UPS by improve power efficiency for Alternative Current (AC) to Direct Current(DC) for low power device. This project using uninterruptible power supply devices. The existing devices using the inverter to convert from AC to DC and convert again to AC and from AC convert again to DC and finally connect to devices. In this project, convert from main source AC to DC and stable the voltage using variable voltage regulator and at the same time give the power efficiency. This project more focusing for low power devices such as modem, telephone, CCTV, DC motor and etc. the studies and tests will be process using existing UPS and UPS that have been modified. Data collection will be taken in various aspects such as energy consumption, long life and energy efficiency UPS.

1.2 Problem Statement

The common problem in existing UPS is the converting process at the output devices from DC to AC. In this project the last converting will be remove. So in this project is to create the simple circuit and collect the data to compare the between existing UPS and modified UPS whether this product efficient or not.

1.3 Objectives

To achieved this project, the objectives should be success:

- i. To improve the power efficiency of UPS
- ii. To develop UPS Direct Current (DC) output.
- iii. To develop variable output
- iv. Study for low power devices.

1.4 Scope project

This project using uninterruptible power supply for low power devices. This project to show the power efficiency when some part in UPS is removing. So, this project to check whether this product will be efficient compared the existing product.

1.5 Summary

This report is consisting with 3 chapter. Chapter 1 were including introduction of this project, problem statement, objective and scope of this project. Chapter 2 provides a literature review based on everything related of this project. This topic related on the power efficiency of uninterruptible power supply. Chapter 3 shows a methodology of this project in detail to achieve the objective successfully. It consists a flowchart of this project and all detail information

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

A Literature review is the summarization work related on the research on Uninterruptible power supply. Most of the information related is taken from journal, books, article, and also the relevant website. It also will summarize the usability of the hardware and research information that important to this project. Other than that, this chapter will discuss and summarize some past related research of the Uninterruptible power supply.

2.1 Previous Project Analysis

Previous project analysis was a part of research task where it is based on the previous project or research that had been found either in journal, paper, or project thesis. This analysis is an important part in order to develop this project because it can be reference or guideline in order to complete the project. Hence in this chapter, related project in UPS system including important component that been used will be elaborate.

2.2 Project Description and Related Project

2.2.1 Integration of Smart Hybrid Uninterruptible Power Supply

Hamdan Islam, 2015, the main from this journal is to utilize the renewable resources to provide uninterruptible power supply (UPS). The related from this project is this project using the same devices. So, from this project can get the more information about the UPS either this project more design the suppling the source of UPS. in this undertaking we focused especially on sunlight based and hydro vitality. The vitality created from these sources would be utilized to charge batteries. At that point the DC voltage would be changed over to AC voltage utilizing an inverter. Since we are proposing to give uninterruptible power, so as to do this the inverter would be combined with the fundamental supply such that at whatever point the primary supply falls flat the inverter would give energy to the heap. Besides, a GSM module will be incorporated also. This module will kill on or the UPS physically utilizing short message benefit (SMS) when the batteries are completely charged or released. Potential advantage of such undertaking is that the wellspring of vitality is free on the grounds that sustainable assets are utilized.

2.2.2 Three-Phase On-line Uninterruptible Power Supply with Isolated Battery Charger

Nima Tashakor, Ehsan Bagheri Ebrahim Farjah, Teymoor Ghanbarid. 2016, this journal more focusing the isolated battery charger but it also helpful from this project because this project also using the battery and the battery very important to supply the voltage into the devices. In most online UPS frameworks, the batteries are charged amid typical operation from the network and released amid crisis circumstances. Since a standout amongst the most imperative segments in an UPS is the battery framework, for wellbeing issues, numerous battery chargers are required to have electrical segregation. In this paper a three-stage on-line UPS framework with separated bidirectional battery charger is proposed. A reasonable double criticism control technique is created for the inverter to diminish matrix voltage vacillations. Secluded battery charger would build UPS adaptability and guarantees required wellbeing issues.

2.2.3 Ripple Current Reduction for Fuel Cell Powered Single-Phase Uninterruptible Power Supplies

Nanjun Lu, 2016. This journal studying between energy units and power converters, looks at the energy unit voltage reactions to a progression of current sinusoidal irritations and distinguished a recognizable hysteresis at around 100 Hz solely. Another paper investigates the impacts of current swell on energy component's execution, the outcome affirms both the nearness of hysteric wonder and the closeness of swell recurrence to the power device's cut-off recurrence can be figured into extra misfortunes of the yield influence. In addition, power module's sturdiness and life expectancy can likewise be injured because of the low recurrence sinusoidal unsettling influences. Moreover, the low recurrence current swells are as of late observed to be a noteworthy reason for debasement in the energy unit's cathode impetus, which is another risk to framework execution and dependability.

2.2.4 Next-Generation Multi-Functional Modular Intelligent UPS System for Smart Grid

Biao Zhao, Biao Zhao, 2013. This paper analyzed the development trend of uninterruptible power supply (UPS) and presented a multi-functional modular intelligent UPS system for smart grid, which is composed of four identical H-bridge converters. It not exclusively can understand all the essential elements of the conventional UPS framework, yet additionally can understand the cyclic utilization of the electrical power between the power matrix and capacity battery. In addition, because of the measured development, it can without much of a stretch change into different power converters for different applications. The topology setup and working guideline of the proposed UPS framework are broke down, and an appropriated control administration procedure and a circulated rationale control calculation are proposed. Finally, exploratory outcomes confirm the legitimacy and adequacy of the proposed framework and its control methodology. The investigation of this examination could give some important references to the plan of cutting edge electrical hardware in savvy matrix.

2.2.5 Impact of temperature on the efficiency of double-conversion UPS

L Giuntini,2014.. This journal discusses the impact of temperature on the efficiency of double-conversion UPS, by presenting experimental measurements from a set of high power UPS featuring various topologies and different technologies. Uninterruptible Power Supplies (UPS) give control molding and reinforcement to delicate burdens. Their ordinary application is its assurance gear in server farm establishments, for which twofold change is the favored UPS topology. While giving prevalent insurance, twofold transformation UPS commonly offer restricted proficiency, and effectiveness is perpetually frequently a basic foundation while choosing an UPS arrangement. In actuality, proficiency is basic in vitality escalated applications, for example, server farms. In these offices, the power and cooling framework is a noteworthy client of vitality, and numerous associations are searching for answers for decrease their vitality impression. Especially, server farms are regularly bringing the room temperature up with a specific end goal to enhance the cooling framework effectiveness. So as to assess the UPS productivity in the objective application, the effect of temperature on the proficiency of twofold transformation UPS might be considered. Up until this point, examine focused on describing UPS effectiveness under shifting burden and mains conditions. This paper expands on existing examination regarding the matter, intending to supplement it by talking about the effect of temperature on the productivity of twofold transformation UPS. Especially, unique UPS models and advances are displayed, each of which is assessed and tentatively measured as far as effectiveness under fluctuating temperature. To be noticed that with regards to this paper the vitality stockpiling is thought to be outside to the UPS and not considered in the examination. Most UPS frameworks highlight a Valve-Regulated Lead Acid (VRLA) battery framework as their vitality stockpiling.

2.2.6 Double-conversion UPS efficiency under varying mains conditions

Lorenzo Giuntini, Andrea Mannuccini, 2013. This paper focuses on the impact of mains supply on double-conversion UPS efficiency. As the mains supply for the most part influences the rectifier area, the outcomes additionally give a reference on the effect of mains supply on rectifier effectiveness. Uninterruptible Power Supplies (UPS) give control molding and reinforcement to basic loads, and twofold change is frequently the favored topology. Truth be told, this topology rules the US showcase for UPS appraised 5kVA or more. While giving ideal insurance, twofold transformation UPS ordinarily give constrained effectiveness. In inheritance establishments, UPS misfortunes may really represent 10% of the site vitality utilize. This is especially basic in vitality concentrated applications, for example, its insurance hardware in server farm establishments. In these offices, the power and cooling framework is a noteworthy client of vitality. The effectiveness of the UPS framework is in this way presented to expanded consideration and investigation. Indeed, productivity is perpetually regularly a principal paradigm while choosing an UPS arrangement. As a matter of fact, the UPS effectiveness ought to be assessed in the objective application. In this specific circumstance, examine has so far focused on describing UPS effectiveness under shifting burden conditions. This paper intends to supplement existing examination by concentrating on the effect of the mains supply as soon as possible change UPS proficiency. Especially, voltage size, adjust and recurrence variety has been considered, and the effect of such variety has been tentatively measured on various twofold transformation UPS advances. As the mains supply is generally influencing the rectifier area of the UPS, different well known rectifier topologies are considered. Along these lines, this paper likewise gives a reference while evaluating the effect of mains supply minor departure from rectifier productivity.

2.2.7 A Voltage Regulator for Power Quality Improvement in Low-Voltage Distribution Grids

Rubens Tadeu Hock Jr. 2016. This journal presents a voltage-controlled DSTATCOM-based voltage regulator for low voltage distribution grids. The voltage controller is intended to incidentally meet the framework code, putting off impromptu speculations while a conclusive arrangement could be wanted to tackle direction issues. The power arrange is made out of a three-stage four-wire Voltage Source Inverter (VSI) and a moment arrange low-pass channel. The control methodology has three yield voltage circles with dynamic damping and two dc transport voltage circles. What's more, two circles are incorporated to the proposed control methodology: the idea of Minimum Power Point Tracking (mPPT) and the recurrence circle. The mPPT enables the voltage controller to work at the Minimum Power Point (mPP), keeping away from the course of superfluous receptive remuneration.

2.2.8 Step-up AC Voltage Regulators with High-Frequency Link

Daolian Chen. 2013. A circuit setup and a circuit topological group of advance up air conditioning voltage controllers with high-recurrence connect are proposed. This sort of circuit topology is made out of info LC channel, vitality stockpiling inductor, input cycloconverter, high-recurrence transformer, yield cycloconverter and yield sifting capacitor. The controllers can change over an insecure sinusoidal voltage with high THD to a stable sinusoidal voltage with a similar recurrence and low twisting. Working rule, standardized yield qualities, stage moving control methodology, strategies to stifle attractive immersion of the vitality stockpiling inductor at start-up, and voltage spike caused by the high-recurrence HF transformer spillage inductance are proposed and completely explored. The outcomes from hypothetical examination and rule analyze demonstrate that the proposed controllers have points of interest of high-recurrence galvanic separation, basic topology, two-organize control transformations, bidirectional power stream, high change productivity, and high unwavering quality amid hamper of the heap.

2.2.9 THE INFLUENCE OF PARASITIC SUBSTRATE DIODES ON LOAD TRANSIENT RESPONSE OF THREE-TERMINAL ADJUSTABLE VOLTAGE REGULATORS

Adrian Bajenaru¹, Liviu Radoias, Gheorghe Dilimot, Gheorghe Brezeanu.2012. This journal presents a detailed analysis of the influence of parasitic substrate diodes on the load transient response of three-terminal adjustable voltage regulators with the substrate connected to the output. Two straightforward answers for enhancing the transient conduct are then exhibited. A 1A voltage controller was actualized in a solitary metal layer BCD innovation. Utilizing no extra chip territory, the undershoot has been decreased from 250mV to under 30mV, for a yield voltage of 5V. The span of the undershoot is as needs be diminished This paper the transient reaction of the flexible voltage controller design and shows two basic answers for enhance the transient conduct and lessen the undershoot caused by the parasitic substrate diodes.

2.3 Hardware Review

2.3.1 Uninterruptible Power Supply

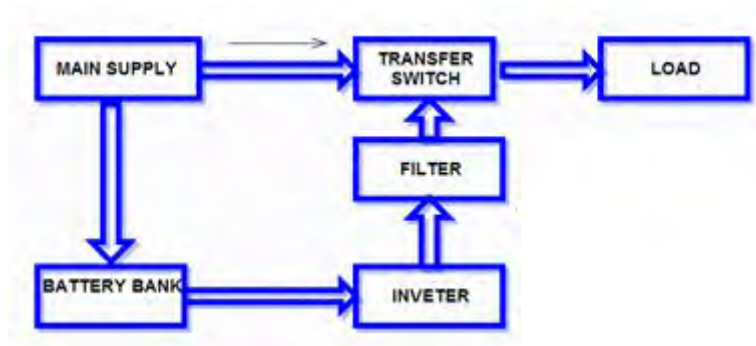


Figure 2.1: Block diagram

Uninterruptible Power Supply(UPS) is maintains a continuous supply of electric power to connected equipment by supplying power from a separate source when utility power is not available. It varies from an assistant power supply or standby generator, which does not give moment assurance from a transient power intrusion.

2.3.2 Elements of UPS

The elements of UPS had divided 6 elements which is:

- Input
- Rectifier/battery charger
- Dc system
- Inverter
- Output
- Static Bypass

2.3.3 The static bypass

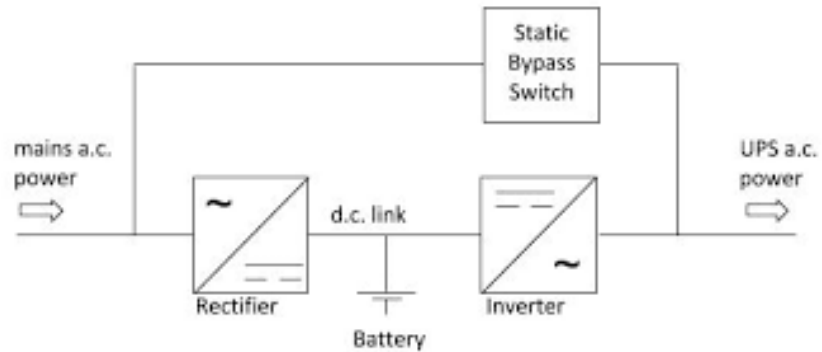


Figure 2.2: simple block diagram of UPS

Figure 2.2 shows the simple block diagram for online UPS. In case of a framework disappointment, the static sidestep consequently shuts the circuit and enables the approaching energy to occupy around the rectifier, batteries and the inverter to supply utility review control (unconditioned) straightforwardly to your heap. In spite of the fact that this isn't adapted power, it enables your frameworks to keep working regardless of whether the UPS's inside segments come up short.

2.3.4 Rectifier

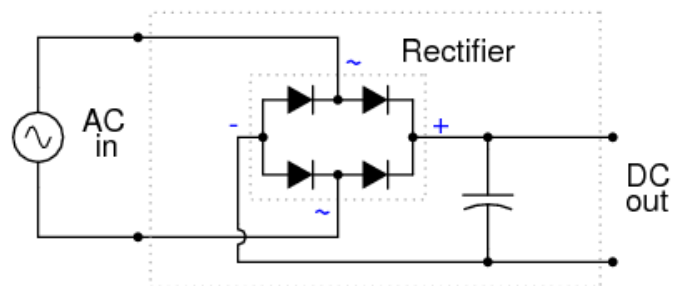


Figure 2.3: Circuit of rectifier