Faculty of Electrical and Electronic Engineering Technology

Energy Harvesting Of Weak Battery Power Using The Joule Thief Concept

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Bachelor of Electronics Engineering Technology with Honours

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DEDICATION

For the first time I am in a lonely situation facing a bachelor degree project it will certainly give challenges and stress peaceful challenging as it is a new beginning for me in succeeding or creating a project that benefits or facilities to society as it is the job of an engineer who always have a brilliant idea in creating a project in order to step into the era of the developed world. After 3 years of study, with the full knowledge that has been imparted, I feel ready and brave to face this situation. Before that, first thing first, a million thanks to the divine grace (Allah) for giving me the opportunity to continue my life and go to the realm of education (fardu kifayah) and meet great teaching staff and great competitors. First of all, high appreciation is expressed to my father, Encik Jamaluddin bin Wahudin and my mother's Puan Siti Roslina binti Misban for giving me a thousand confidence to continue my studies as a degree students and always give encouragement without feeling tired and tired. Not forgetting also to my supervisor, Encik Mohd Razali bin Mohamad Sapiee who is responsible and always cares about his students with every week there will be an online meeting to ask the latest upadate about the project so that his students do not miss ape ape about this bachelor degree project. In addition, my supervisors also always give very helpful opinions to do their respective projects. To my family, thank you for always being by my side when in trouble and always helping to give opinions on many things during the study period. In addition, appreciation to my family for the policy of trust in me for the tasks entrusted to me. For my comrades -in -arms, hopefully you are always enthusiastic in doing your job and never give up, if you fall and rise again with strength and perseverance and do not forget to express high appreciation for cooperating in helping each other and also always provide motivation that is based on physical and mental strength.

ABSTRACT

Renewable energy is useful energy that is collected from renewable resources, which are naturally replenished on a human timescale, including carbon neutral sources like sunlight, wind, rain, tides, waves, and geothermal heat.This type of energy source stands in contrast to fossil fuels, which are being used far more quickly than they are being replenished. Although most renewable energy is sustainable energy, some is not, for example some biomass is unsustainable. Renewable energy often provides energy in four important areas: electricity generation, air and water heating/cooling, transportation, and rural (off-grid) energy services. This energy as a daily life source. But it no same for the others country because of the position at the earth. Difference country will be produce the difference renewable energy such as Belanda more to wind turbine energy, Japan more to solar energy. Other than that, some of things can get the source of energy like kinetic energy can transfer to electrical energy or some waste things can produce the electrical energy. Like weak battery, its just weak battery and its has some volts of power to supply out but it can't support to electronic devices. So for this situation, it can be more things while can give or supply the electrical energy.

The journal also welcomes papers on other related subjects as such subjects lie within Renewable Energy's wider multidisciplinary scope. However, it should be noted that documents are only available if they deal with electricity generation and if the power is produced renewable or sustainable. For example, without measuring the energy that this new material will convert, a paper on the development and characterisation of the material for renewable energy is out of scope.

Renewable Energy accepts and reviews original research papers (the latter by invitation of theEditor-in-Chief only). Interested review authors need to send the review outline to the editorin-chief together with a short resume of the main writer before the paper is submitted.

ABSTRAK

Tenaga yang boleh diperbaharui adalah tenaga berguna yang dikumpulkan dari sumber yang boleh diperbaharui, yang secara semula jadi diisi semula pada skala waktu manusia, termasuk sumber karbon yang neutral seperti cahaya matahari, angin, hujan, air pasang, gelombang, dan panas bumi. Sumber tenaga jenis ini berbeza dengan fosil bahan bakar, yang digunakan lebih cepat daripada yang diisi semula. Walaupun kebanyakan tenaga boleh diperbaharui adalah tenaga lestari, ada yang tidak, contohnya sebilangan biomas tidak berkelanjutan. Tenaga boleh diperbaharui sering memberikan tenaga dalam empat bidang penting: penjanaan elektrik, pemanasan / penyejukan udara dan air, pengangkutan, dan perkhidmatan tenaga luar bandar (luar talian). Tenaga ini sebagai sumber kehidupan seharian. Tetapi tidak sama dengan negara lain kerana kedudukan di bumi. Perbezaan negara akan menghasilkan perbezaan tenaga yang dapat diperbaharui seperti Belanda lebih banyak untuk tenaga turbin angin, Jepun lebih banyak untuk tenaga suria. Selain daripada itu, beberapa perkara boleh mendapatkan sumber tenaga seperti tenaga kinetik dapat berpindah ke tenaga elektrik atau beberapa bahan buangan dapat menghasilkan tenaga elektrik. Seperti bateri lemah, baterinya lemah dan mempunyai kuasa voltan untuk dibekalkan tetapi tidak dapat menyokong peranti elektronik. Jadi untuk keadaan ini, boleh menjadi lebih banyak perkara yang dapat memberi atau membekalkan tenaga elektrik.

Jurnal ini juga mengalu-alukan makalah mengenai mata pelajaran lain yang berkaitan kerana mata pelajaran tersebut berada dalam skop multidisiplin Tenaga Diperbaharui yang lebih luas. Walau bagaimanapun, perlu diingat bahawa dokumen hanya tersedia jika berkaitan dengan penjanaan elektrik dan jika kuasa itu dihasilkan boleh diperbaharui atau berkelanjutan. Sebagai contoh, tanpa mengukur tenaga yang akan ditukarkan oleh bahan baru ini, kertas mengenai pengembangan dan pencirian bahan untuk tenaga yang boleh diperbaharui adalah di luar ruang lingkup.

Tenaga Diperbaharui menerima dan mengkaji kertas penyelidikan asli (yang terakhir hanya dengan jemputan Ketua Pengarang sahaja). Penulis ulasan yang berminat perlu menghantar garis besar ulasan kepada ketua pengarang bersama dengan resume ringkas penulis utama sebelum makalah dihantar.

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δ	-	Voltage angle
D	-	Time through inductor
L	-	Inductance
I	-	Current

LIST OF ABBREVIATIONS

V	-	Voltage
P	-	Power
IEC	-	International Electrotecnhical Commision
ANSI	-	Amerian National Standard Institude
JIS	-	Japan Institude Standard
BMS	-	Building Management System
RF	-	Radio Frequency
LED	-	Lighting Emitting Diode
NPN	-	Negative-Positive-Negative
LCD	-	Liquid Crystal Display

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CHAPTER 1

INTRODUCTION

1.1 Background

This system is a power distribution system consisting of the concept of a weak battery fully discharged to avoid wastage or some consider it unusable. With this system the wasted battery will be fully discharged and all remaining power distributed with the joule thief concept circuit to a power storage tank, so when little by little energy can be distributed then a group of power can be stored and this energy will be able to reduce the use of electrical energy and only use this equipment to be applied to electrical devices such as telephone charges. This system is very good impact and quality to the community because it is a concept of recycling materials for reuse and can save electricity.

1.2 Problem Statement

Normally weak batteries are thrown away when they are no more able to power up electrical device although they are still having some low energies. A device should be developed so that the remaining energies can still be utilized by sucking the remaining energies from the weak batteries and accumulated the energies in a power bank. The device should also be able to harvest renewable energy from the surrounding. The accumulated energy can be then be channeled and utilized to power low power electrical devices.

1.3 Project Objective

The main aim of this project is to discharging a weak battery or a discarded battery but there is still residual energy to 100% empty of the battery, in addition to solar energy and wind energy as generating can also to some extent produce energy even a little.

a) To design a circuit and project that can be usable for our society in used of battery in daily life for 100% and fully discharge.

b) To implement a system using Arduino and joule thief circuit which can detect the source energy, storage capacity and can absorb from all the types of battery which the battery that had still balance.

c) To develop the system that give more benefit to the battery user that can fully used and can apply the renewable energy for the system.

1.4 Scope of Project

The project's scope is as follows:

a) The project consists in generating new energies with low and discarded energies, collecting this energy in a storehouse and generating electricity for electricity.

b) The device can also display energy status information via the Arduino LCD display.

c) The project also supports the production of small electric power from a small solar panel and a small windmill.

d) The function Arduino is to display the energy tank capacity.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this day and age, the use of electrical energy is a daily use and as another term is a very important use. In this modern era, there are too many concepts, systems and tools that can be applied in various forms or inventions to produce electricity. Other than renewable energy sources or non -renewable energy buckets there are other types of energy that can be converted to electrical energy such as from human movement can be converted to electrical energy or from the frequency of sound can be converted to electrical energy. Here are many ways to save electricity. In addition, the battery can also apply electrical energy to low voltage electrical devices. Wasted batteries or weak batteries can also be recycled by discharging and storing them in an energy storage tank, and the energy can be reused. The amount of battery wasted is not small effective manner.

Batteries are a collection of one or more cells which produce the electron flow within a circuit through their chemical reactions. Every battery consists of three basic components: a (-) side, a cathode (+) side, and an electrolyte of some sort (a substance that chemically reacts with the anode and cathode). The chemical reaction between the anode and the electrolyte happens when a battery's anode and cathode are connected to the circuit. This reaction causes electrons to flow back to the cathode through the circuit and into which another chemical reaction occurs. The battery is unable to generate electricity if the material in cathode or anode is consumed or cannot be used in the reaction. Your battery is "dead" at this point. Batteries to be discarded after use are called primary batteries. Secondary batteries are called which can be recharged. To optimize the utilization of the energy inside the battery, a battery management system is used to minimize the risk of damage to the battery. This is done through battery charging and discharging monitoring and control, combined with working temperature. The function of a BMS can be separated into the tasks below.

RF power collection has a promising future to generate small quantities of electrical power in wireless electronics systems to power partial circuits. This paper provides an overview and progress on RF energy collection. A modified form is presented for the current CMOS voltage duplication circuit to achieve an increase in output power of 160 percent compared to traditional circuits at an input of 0 dBm. Practical results and simulations are also used to study a schottky diode-based power harvesting system performance.

A joule thief is a small, affordable, and easy to build auto-oscillating voltage booster typically used to drive small loads. This circuit is also called oscillator blocker, jelled ringer, vampire torch. In a single-cell electric battery, it can utilize nearly every power, even below the voltage, where other circuits regard the battery as fully discharged (or "dead"); therefore the name implies the notion that the circuit is stolen by energy or "joules" – the term 'joule thief' is a jigsaw.' The circuit is an unregulated voltage boost converter variant of the obstruction oscillator at the cost of the higher current draw, the output voltage is increased at the input, but the integrated (average) output current is reduced and luminosity is reduced.

2.2 The source and the concept of circuit

Figure 2.1 Triple A Battery

Table 2.1 Characteristics Battery

Chemistry	IEC name	ANSI/NEDA name	Nominal voltage (V)	Typical capacity (mAh)	Typical capacity (Wh)	Rechargeable
Zinc–carbon	R03	24D	1.5	540	0.81	No
Alkaline	LR03	24A	1.5	860–1,200[6]	1.3–1.8	Some
Li-FeS_2	FR03	24LF	1.5	1,200	1.8	No
NiMH	½ AAA 10.4mm 22.7mm	GP35AAAH	1.2	~350[7]	0.42	Yes
Li-ion	⅓ AAA	10180	3.7	~100	0.4	Yes
Li-ion	⅔ AAA	10280	3.7	~200	0.8	Yes
Li-ion	AAA	10440	3.7	~350	1.3	Yes
NiCd	KR03	24K	1.25	300–500	0.38–0.63	Yes
NiMH	HR03	24H	1.25	600–1,250[8]	0.75–1.6	Yes

A standard sized dry-cell battery is a AAA or triple-A battery that is commonly used in mobile, low-drain devices. The IEC designation is R03 and ANSI C18.1, 24 for an old JIS norm, and UM-4 for another manufacturer and battery with zinc-carbon in this size. Domestic standard designations which vary with cell chemistry. The American Ever Ready Company first introduced this size in 1911.

Figure 2.2 9V Battery

Table 2.2 Type of Battery

Type		IEC name[10]	ANSI/NEDA name[11]	Typical capacity in mAh	Nominal voltages
Primary (disposable)	Alkaline	6LR61	1604A	550	9
		6LP3146[12]	1604A	550	9
	Zinc–carbon	6F22	1604D	400	9
	Lithium		1604LC	1200	9
Rechargeable	NiCd	6KR61	11604	120	7.2, 8.4
	NiMH	6HR61	7.2H5	175-300	7.2, 8.4, 9.6
	Lithium polymer			520	7.4
	Lithium-ion			620	7.4
	Lithium iron phosphate			200-320	9.6

The 9V battery or 9V battery is a common battery size introduced for early transistor radios. It has a rounded edge rectangular prism shape and a polarized snapshot connector on top. Smoke sensors, gas sensors, clocks, walkie-talks, electric guitars and effects units commonly use this type.

The 9-volt batteries format are commonly used in primary carbon zinc and alkaline chemistry, primary lithium iron disulfide and nickel-cadmium, nickel-metal and lithium-ion in rechargeable form. This format, once common, mercury-oxide batteries were not made in many years because of their mercury content. NEDA 1604 and IEC 6F22 (for zinc carbon) or MN1604 6LR61 are included in this format (for alkaline).

Figure 2.3 Solar

The solar panel is actually a solar (or photovoltaic) cell collection that can be used as a photovoltaic effect to generate electricity. These cells are arranged on the surface of solar panels in a grid-like pattern. It can therefore also be described as a set of photovoltaic modules, mounted on a supporting structure. A photovoltaic (PV) module consists of 6 solar cell packaged and connected assemblies. These panels are very hardy when it comes to wear and tear. Wear out solar panels extremely slowly. In a year, its efficiency decreases by only 1 to 2 percent (at times, even lesser). Most solar panels are composed of crystalline solar silicone cells. Installation of sun panels in households helps fight harmful greenhouse gas emissions and thus contributes to reducing global warming. Solar panels are clean and do not cause any form of pollution. They also reduce our dependence on (limited) fossil fuels and traditional sources of power. Solar panels are currently being used in large-scale electronic equipment such as calculators, which work as long as the sun is available. The only major drawback of solar panels, however, is that they are very expensive. Solar panels are also installed outside since sunlight is required to be charged.

Figure 2.4 Motor For Wind Turbin

An electric motor is a device that turns electrical energy into mechanical power. The interplay of the engine's magnetic field and the electric power in the wire winding leads the majority of electric motors to generate force as torque delivered to the motor's shaft. As electrical engines, direct current (DC) sources such as batteries or rectifiers, or alternating current (AC) sources such as power grids, inverters, or electrical generators, can be employed. Mechanically, an electric generator is identical to an electric motor, but it is powered by reversed power flows that transform mechanical energy into electricity.

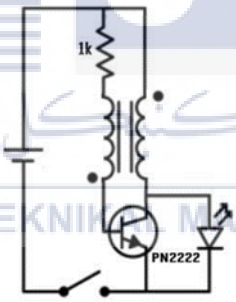

Figure 2.5 Joule Thief Circuit

This circuit is a modified "Joule Thief" circuit that was utilised in this project. A Joule Thief is an autoscillating voltage enhancer. It converts a low-voltage steady signal into a higher-voltage sequence of high-frequency pulses. This is a step-by-step tutorial for making a rudimentary Joule Thief. At first, the transistor is turned off. A little quantity of power is sent through the resistor and the first coil to the transistor base. Part of the collector-emitter channel is open. Electricity may now flow through the second coil and the collector-emitter channel of the transistor.