Proceedings of the
International Conference on Mechanical Engineering and Renewable Energy 2011
(ICMERE2011) 22- 24 December 2011, Chittagong, Bangladesh

ICMERE2011-PI-097

POWER PRODUCTION AND STORING FROM THE MOTION OF A BI-CYCLE WHEEL: AN EMERGENCY BACKUP IN LOAD SHEDDING.

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Abstract- A renewable source of energy is generated from the motion of the bi-cycle during running. There occurred a conversion of mechanical energy into electrical energy. Mechanical energy produced by the paddle movement thereby the wheel rotation is converted to electrical energy which is stored in a rechargeable battery so that we can use this electrical energy for different purposes. Such as use energy saving bulb, charging mobile set etc. A typical rechargeable battery of 12 V is used which can be charged completely by the use of an AC dynamo in 3 hours driving. A bulb of capacity 5W is used which is found to be lightened 3.5 hours. In band switch if we move the button to the left than charging will start & if we move the button to the middle point then charging will be off and there will be connection with circuit, if we move to the right side then charging will off and disconnected from dynamo and connection between battery and circuit will occur and thus we get power supply. The electrical energy is stored in re-chargeable battery by bridge rectification. As there is a storage system is incorporated here the work distinguishes from the existing power backup system for bi-cycle in local markets. The product may be used as an emergency backup for load shedding. It is found that the cost of the product is in a reasonable range.

Keywords: Load shedding, Energy generation, Bi-cycle, Energy storage

1. INTRODUCTION

Electromechanical system is one kind of system where both electrical and mechanical concept is applied. Day by day this system gets popularity in all over the world. The concept of energy conversion is not new. Its wide application is available. If we apply this concept widely then more people can be benefitted. Here we think about the situation of electricity of our country. So we want to make such kind of system which convert mechanical energy into electrical energy then stores this electrical energy in a battery to use other purposes. We successfully applied this system in a bi-cycle. But this system is not only applicable for bi- cycle but also it can be applied for various vehicles such as rickshaw, auto-rickshaw etc .

2.1 THEORY

Mechanical energy is applied to drive a bi-cycle. If we attach an AC dynamo with the bi-cycle then this dynamo will convert the Mechanical energy into electrical energy. This electrical energy will be AC 12V & power will be 6W. This 12V,AC electrical energy is converted into DC voltage by using band switch & bridge rectification. For filtering the DC voltage a electrolytic capacitor of 2200μF/16V is used. Next the pure DC voltage is stored in a rechargeable battery . The capacity of this battery is 6V DC. If we drive the bi-cycle for 1.5 hour then the battery will be recharged completely. A LED is used to detect the charging process. If band switch remain to the right side then charging process will continue. If band switch remain to the middle position then there is no connection between the dynamo & electric circuit. When band switch remain to the left side then battery has no connection with the dynamo but there is a connection between the battery & electric circuit. As a result we obtain 180V AC output.

2.2 SPECIFICATION &WORKING PRINCIPLE OF ELECTRO- MECHANICAL COMPONENTS:

2.2.1 Electro- mechanical components:
dynamo specification:
Type: AC, Voltage: 12V, Power: 6W
Working principle of dynamo: Dynamo is a device which converts mechanical energy into electrical energy. The dynamo uses rotating coils of wire and magnetic fields to convert mechanical rotation into a pulsing alternating electric current through Faraday's law of induction. A dynamo machine consists of a stationary structure, called the stator, which provides a constant magnetic field, and a set of rotating windings called the armature which turn within that field. The motion of the wire within the magnetic field causes the field to push on the electrons in the metal, creating an electric current in the wire. On small machines the constant magnetic field may be provided by one or more permanent magnets; larger machines have the constant magnetic field provided by one or more electromagnets, which are usually called field coils.
From this dynamo 6V&12V AC is obtained, but we use 12V. Dynamo and battery are connected by BRB cable 14/76 wire to pass voltage from dynamo to battery.

Fig: AC Dynamo

2.2.2 SPECIFICATION &WORKING PRINCIPLE OF ELECTRICAL COMPONENTS:

DIODE:

Specification:D1=D2=D3=D4=IN 4007

Working principle of diode: A diode is a specialized electronic component with two electrodes called the anode and the cathode. Most diodes are made with semiconductor materials such as silicon, germanium, or selenium. Some diodes are comprised of metal electrodes in a chamber evacuated or filled with a pure elemental gas at low pressure. Diodes can be used as rectifiers, signal limiters, voltage regulators, switches, signal modulators, signal mixers, signal demodulators, and oscillators.
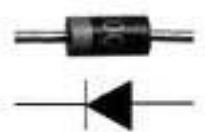

Fig.:- Diode

Resistance:

Specification:
 R1=560Ω/0.25Watt
R2=56Ω/0.5Watt

Working principle of resistance: Electrical resistance is a ratio of the degree to which an object opposes an electric current through it, measured in Ohms. Its reciprocal quantity is electrical conductance measured in Siemens. Assuming a uniform current density, an object's electrical resistance is a function of both its physical geometry and the resistivity of the material it is made from:

Fig: Resistance

2.2.3 Light Emitting Diode (Led):

Working principle of LED: The term "LED" refers to Semiconductor diode that emits light when voltage   is applied; used in electric lighting, alphanumeric displays, on digital watches, etc. Light emitting diode is a P-N junction diode that emits light when properly biased. As the name implies, the light emitting diode that gives off visible or invisible light when energized. In any forward biased P-N junction there is, within the structure and primarily close to the junction, a recombination of holes and electrons. This recombination requires that the energy possessed by the unbound free electrons be transferred to another state. In all semiconductor P-N junctions some of this energy is given off in the form of heat and some in the form of photons.
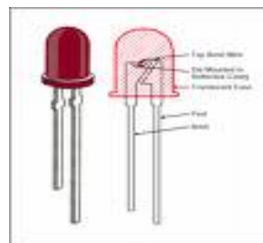

Fig: Light Emitting Diode

2.2.4 Capacitor:

Specification:
C1= 2200μF/16V
C2= 104 PF
C3= 880 PF

Working principle of capacitor: A capacitor is a passive electronic component that stores energy in the form of an electrostatic field. In its simplest form, a capacitor consists of two conducting plates separated by an insulating material called the dielectric. The capacitance is directly proportional to the surface areas of the plates, ands inversely proportional to the separation between the plates. Capacitance also depends on the dielectric constant of the substance separating the plates.

Fig: Capacitor (C1, C2, C3) Respectively

2.2.5 Transistor:

Specification:
TR1=TR2=880 (NPN)

Working principle of Transistor: Transistor is devise which is P-N junction A transistor is a specialized electronic component with three electrodes called the Emitter, Collector and Base. Transistor is made with semiconductor materials such as silicon, germanium, or selenium. Transistor can be used in various purposes such as electric key, amplifier etc. In our project it is used to amplify the voltage .For N-P-N transistor emitter and base has forward bias condition .As a result emitter negative electron is passing through the positive base and collector and base junction is reversed biased .For this reason collector region is more negative and negative electron of emitter is more affected to collector and collector is collected negative electron.

Fig.:- Transistor   **Fig: Inverter transformer**

2.2.6 Transformer:

Working principle of band transformer: Transformer is a devise which convert high voltage to low voltage or convert into low voltage to high voltage .Transformers are two type one is step-up other is step-down .In our project we are used a inverter type transformer .Which action is receive input low voltage DC but output voltage is high voltage AC .

2.2.7 Inductor:

Input Voltage:12V/DC

Working principle of inductor: Inductor is a parts which made of insulating copper wire .It is wrapped over the plastic forma. There is a ferrite rod inside the forma . It keeps current constant and change the frequency of sound wave in DC current but behaves as a resistance in AC current . In our project Inductor is used to keep the value of current constant .

Fig.:- Inductor

2.2.8 Band switch:

Name: Stereo Band switch

Working principle of band switch: In our project a stereo band switch is used .There are three terminals in every side of the band switch .When band switch remain in the right side then middle and right terminals are connected. When band switch remain in the middle position then left and right terminals are disconnected.

Fig.:- Band switch

2.2.9 Energy Saving Bulb:

Type: energy saving
Voltage: 220V/AC
Power: 7W

Working principle of Bulb: Typical Fluorescent tube is filled with inert gas and a small amount of mercury that creates vapor .Generating florescent light occur in two stages .First, electron is emitted from cathode create an electrical are through mercury vapor .Then resulting ultra-violet radiation strives phosphor coating which then gives off visible light .

Fig: Energy saving bulb

2.2.10 Rechargeable Battery:

Type: DC
Voltage: 6V
Name: Sunka

Working principle Rechargeable battery (Lead-acid storage cell): When the battery is charged with the help of dynamo then the mixture of water and sulphuric ($H_2SO_4+H_2O$) acid is disintegrated and produced oxygen and hydrogen ion .O_2 ion create in positive plate $PbSO_4$ into PbO_2 convert and H_2 ion is negative plate $PbSo_4$ into Pb convert . Finished of charged positive plate is oxidization acts $PbO2$ layer is create and negative plate is reduction Pb layer .This oxidization and reduction acts the density and specific gravity is increased of sulphuric acid ($H2SO4$) .The specific gravity of $H2SO4$ until up to 1.2 to1.3 the battery is charged .Now the cell like submerged of acid and it is act a simple volt cell .

Fig: Rechargeable Battery

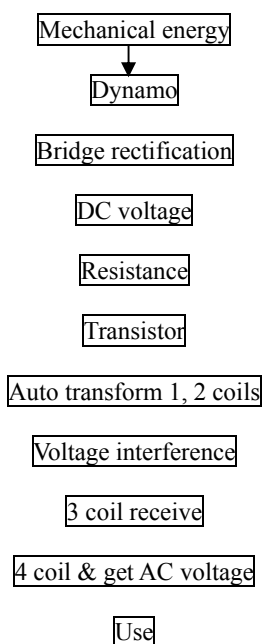### 2.3 Specification &Working principle of Mechanical Components:

Bi-cycle:

Type: Ranger

Working principle of Bi-cycle: When a driver is rotated the bi-cycle gear then the gear is connected a pinion gear with the help of chain drive .Then the wheel of bi-cycle is rotated and created mechanical energy that energy is converted into electric power with the help of an AC dynamo .


Fig: A bi-cycle

2.4 Flow diagram of the energy conversion & storing:

Mechanical energy

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Dynamo

Bridge rectification

DC voltage

Resistance

Transistor

Auto transform 1, 2 coils

Voltage interference

3 coil receive

4 coil & get AC voltage

Use

At first mechanical energy converted electrical energy (AC) by dynamo. Then using bridge rectification AC voltage turns DC voltage. Then using filtering process DC voltage stored in rechargeable battery.

2.4 CIRCUIT DIAGRAM
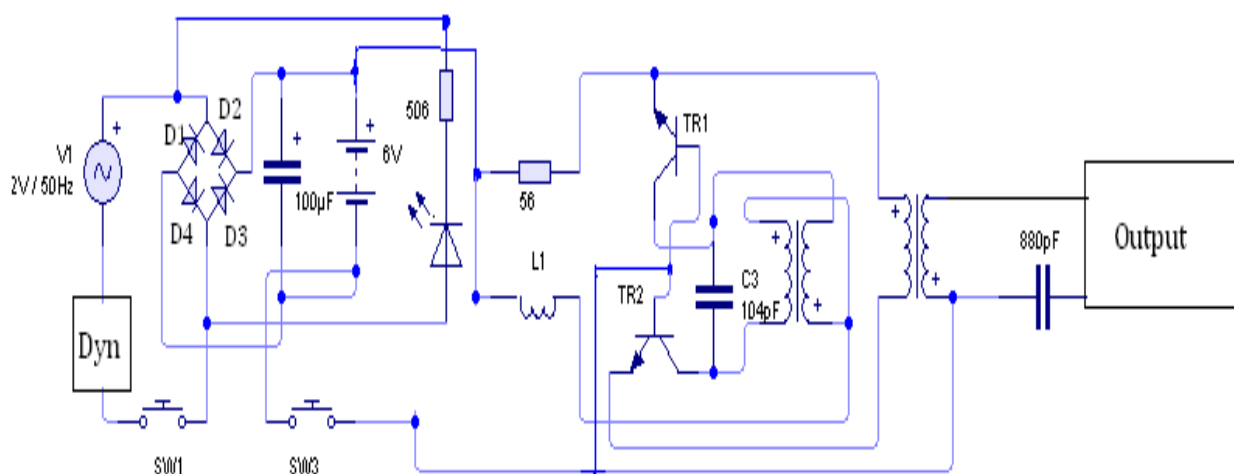
3. TABLES AND FIGURES
3.1.1 Data of Time (minute) vs. Voltage(volt) when battery was charging:

| Number of observation	Time (minute)	Voltage (volt)
1	10	0.67
2	20	1.34
3	30	2.01
4	40	2.68
5	50	3.35
6	60	4.02
7	70	4.69
8	80	5.36
9	90	6.03

Dynamo rotates with cycle wheel then if we using voltmeter ie. Voltmeter port connected with dynamo port the indicator show the voltage at various time.

3.1.2 Data of Time (minute) vs. current (mA) when battery was charging:

| Number of observation	Time (minute)	current (mA)
1	10	5.5
2	20	11
3	30	16.5
4	40	22
5	50	27.5
6	60	33
7	70	38.5
8	80	44
9	90	49

Dynamo rotates with cycle wheel then if we using ammeter ie. ammeter port connected with dynamo port the indicator show the current at various time.

3.2.1 Time vs Voltage:
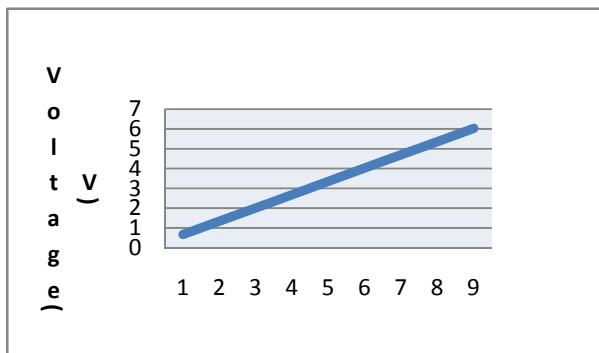
From the above graph show that voltage linearly increases with time.

3.2.2 Time vs. current curve:
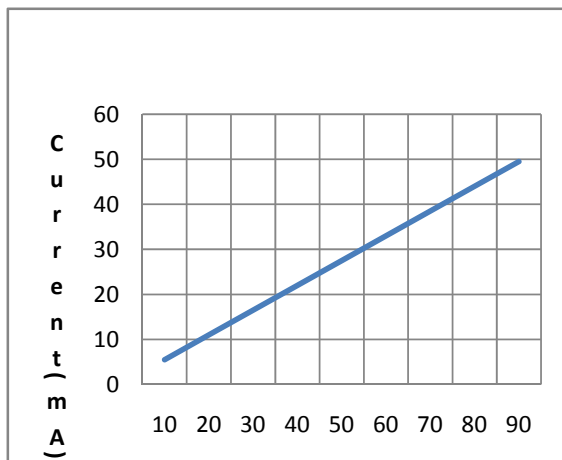
From the above graph show that current linearly increases with time.

5. COMPARISON WITH OTHER EXISTING PROJECT

In other existing project people generally use only dynamo in bi-cycle to convert mechanical energy into electrical energy. There is no storing system in that project. As a result people cannot use electrical energy for other purposes. In that project electrical energy is used instantly. In that project tier can be damaged early.
In our project at first mechanical energy is converted into electrical energy then stored in a re-chargeable battery. So we can use electrical energy for other purposes. We use a cover around the movable part of the dynamo so that tier cannot be damaged.

Analyzing this project we found that if running bi-cycle only 1.5 hours then battery will be fully charged. If lighting energy saving bulb 4 hours will be continued. So the total investment cost will be gotten within 5 mounts. Expected life of our project 8 years & also output preferable. So our project is perfect optimum cost effective project compared with other similar project.

5. REFERENCES

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