Dynamic charging of the lead acid battery using the Programmable Interface controller

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Abstract - *In this paper we have proposed the technique that serves the dynamic charging in a best-effort manner while minimizing the energy cost of users . Specifically, we have used the dynamic charging technique to minimize the energy cost of charging and discharging for batteries with respect to the same constraints . The simulation results provides that the proposed techniques achieves energy cost better or close to that of the conventional methods without requiring the prior knowledge of the load demand, renewable energy source output, and Electrical vehicle charging plans. We have used the concept of the piezo electrical charging as the dynamic charging method which can be used for energizing the battery. This increases the efficiency as well as the lifetime of the battery.*

Key Words: **Battery efficiency, dynamic charging, PIC microcontroller**

1.INTRODUCTION

In the field of electrical engineering ,there has been many researches long engaged in the identification of different forms of energy reduction from common and everyday life sources. Lead-acid batteries was invented by the French Scientist Gaston Planté and it has a great history in terms of a basic commodity for rechargeable electrical energy storage. The basic principle behind this is simple and robust and can be comparatively easily manufactured at a low cost. A large mass will clearly state that the energy-to-weight ratio will be low, but it can supply the large currents, so it has the high power-to-weight ratio, useful in, for example, automotive starting . Even though this will not show importance to their low cost means that they were still used even when other battery types may have better energy densities, for example in the backup energy producers for mobile phone towers, hospitals and remote storage. The Metal positive and negative grids are transformed into plates, with addition to the pressed lead-oxide in the paste form, often referred to as the 'Active material..'. The electrolyte used here is mostly the sulphuric acid and can require refilling at intervals due to evaporation and water loss if antimony containing electrodes were used. The automotive industry in specific has made a move to 'maintenance-Free' products that replace lead antimony with lead-calcium grid alloys and, since the 1970, a sealed or 'valve Regulated' (VRLA) design has been in use, allowing true 'maintenance-free' use. Some batteries for 'deep-cycle' applications in the compact spaces such as forklifts, marine engines starting have a series of tubular lead oxide positive electrodes instead of flat plates to increase surface area. They allow higher currents for more power density, but have a lower energy density.

1.1 PROGRAMMABLE INTERFACE CONTROLLER

Micro controllers are used for mostly specific applications. In micro controller family PIC16F877A is mostly used device nowadays. The reasons for its wide usage are it has large memory capacity, it has sufficient number of input and output ports . PIC16F874A/877A devices are mostly available in 40-pin and 44-pin packages. All the devices in the PIC16F87XA family share a common architecture with the very few differences. There are three memory blocks in each of the PIC16F87XA devices. The Program Memory and Data Memory have separate buses so that concurrent access can occur. The PIC16F87XA devices have a 13-bit program counter capable of addressing an 8K word x 14 bit program memory space. The PIC16F876A/877A devices have 8K words x 14 bits of FLASH program memory.

1.2 EXISTING SYSTEM

In the existed system, piezoelectric transducer is used to generate the electrical energy from the rain drops. It produced very low voltage value. It shows difficulty to guarantee a minimum power value needed for supply without the energy storage. This voltage value is not convenient for the practical applications.

DRAWBACKS

- Difficult to guarantee a minimum power value
- Efficiency is affected by the layer of water deposited on the transducer.
- The power production depends on the crystalline structure.

1.3 PROPOSED SYSTEM

Rechargeable battery only used in the electrical bike such as lead-acid and lithium ion. Rechargeable batteries are one time charged and it is used to some duration of time after that it will comes to dry stage, it is drawback of the existed system. We proposed dynamic battery charging smart electrical bike implemented by pic16f877a. We are using primary and secondary batteries. Secondary battery has two batteries and it is dynamically charging depend on pic controller. Primary battery gets charged from secondary battery.

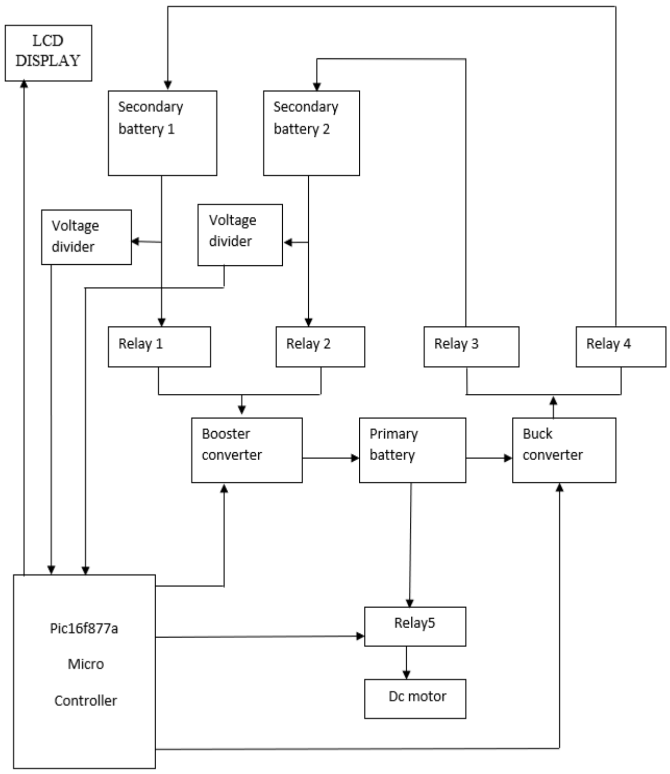
ADVANTAGES

- Increased battery efficiency
- Cost efficient setup
- Extension of the battery life

2.WORKING OF THE CIRCUIT

In this project, the dynamic charging technique is implemented in the electrical hub motor by pic16f877a. The circuit contains one primary battery, two secondary batteries, four relay, boost and buck converters, load, two voltage dividers and micro controller (pic16f877a) and LED display. Secondary battery1 is connected to voltage divider1, relay1 and relay 3. Secondary battery2 is connected to relay2 ,relay 4 and voltage divider2. The voltage divider 1 and 2 is given as input to the pic controller. The voltage divider splits the voltage and gives as input to the PIC. The PIC is used to compare the voltages of the secondary battery. It is used to find the charge level of the secondary batteries. The relay 1and 2 is connected to boost convertor1. The boost converter1 get voltage from secondary battery 1 or 2 it depends upon pic controller. The boost converter is connected to primary battery, and primary battery connected to load and boost converter2. The buck converter gets the voltage from the primary battery and gives to the relay 3 or 4 for the dynamic charging purpose depending upon the pic controller. When the secondary battery1 has more voltage, the relay 1 and 3 gets on. The power discharges form the secondary battery 1 through boost converter and reaches the primary battery. The exceeding charge is passed through buck converter and passed to the secondary battery 2 which gets charged. The reverse process occurs when the secondary battery2 has more voltage. The electric bike is switch on at the same time pic controller during the dynamic charging process. By this process, the battery efficiency and the lifetime of the battery can be increased.

3.BLOCK DIAGRAM



3.1 BOOST AND BUCK CONVERTER

The buck boost converter is DC to DC type of converter. The output voltage of the converter is less or greater than the input voltage that is applied to it. The magnitude of the output voltage depends on the duty cycle of the voltage. These circuits are also known as the step up and down transformer and these names comes from the analogous step up and step down transformer. The input voltages are step up and down to a certain level of more than or less than the input voltage. By using the low conversion energy in this types of circuits, the input power is equal to the output power. The expression below shows the conversion.

Input Power [Pin] = Output Power [Pout]

3.2 VOLTAGE DIVIDER

The voltage divider rule is one of the most important in the electric circuits, which is used to change a large voltage into a small voltage. Using just an input voltage and two series resistors we can get an output voltage. The output voltage is a fraction of the input voltage. The example for voltage divider is two resistors are connected in series. When the input voltage is applied across the pair of the resistor and the output voltage will appear from the connection between them. Generally, these dividers are used to reduce the magnitude of the voltage or to create reference voltage and also used at low frequencies as a signal attenuator.

4.CONCLUSION

We have presented an approach for the increase of efficiency of the battery by the dynamic charging technique. In this technique the battery is recharged dynamically so that the battery is prevented from getting dry as well as the battery efficiency is increased. It also increases the battery life time. This approach can be used in the motor bike which uses the hub motors that are linked to the wheels. For the future research, it would be more challenging to optimally design the dynamic charging EV system considering stochastic driving cycle in the automobiles.

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