MECHATRONICS BOOK SERIES SYSTEM DESIGN AND SIGNAL PROCESSING

VOLUME 1

Editors
Asan G. A. Muthalif
Amir Akramin Shafie
Siti Fauziah Toha
Iskandar Al-Thani Mahmood

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EMAIL: iiumprinting@yahoo.com

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CHAPTER 26

A Conceptual Paper on Intelligent Car Battery Monitoring System

Abdul Hafiz Bin Sahar, Khairul Azhar Bin Muhamat, M. J. E. Salami, And A. M. Aibinu

Intelligent Mechatronics System Research Group

Department of Mechatronics Engineering, International Islamic University Malaysia.

P.O. Box 10. 50728, Kuala Lumpur, Malaysia.

maibinu@iium.edu.my

26.1 Introduction

A battery is an electrical storage device which is very useful in many systems. It stores and releases electrical energy as chemicals in the battery change. Batteries are categorized into rechargeable and non-rechargeable [1-2]. In rechargeable batteries, the process of storing and releasing energy is repeated while non-rechargeable batteries do not have this process to be repeated. Most commonly used rechargeable batteries are Valve-Regulated Lead-Acid type. The acid is typically 35% sulfuric acid and 65% water. Nickel-Iron batteries are also available. However this type of rechargeable battery has poor efficiency and the voltage is different which leads to difficulty in matching up with standard 12V, 24V or 48V systems.

A car battery is one of the rechargeable batteries. This battery supplies electrical energy to an automobile or a car in order to power up the starter motor, the lights, and the ignition system of the engine [3]. A car battery is normally Valve-Regulated Lead-Acid type which provides approximately 12V from the series connection of six galvanic cells. At full charge, the battery voltage should be 12.6V which is contributed by each cells voltage of 2.1V [3]. Valve-Regulated Lead-Acid car batteries are made up of plates and separate plates of lead dioxide. The plates are submerged into an electrolyte solution of sulfuric acid and water in order to allow chemical reaction that releases electrons which flow through conductors and produce electricity. As the battery discharges, the acid of the electrolyte reacts with the materials of the plates and changing their surface to lead sulphate. When the battery is recharged, the chemical reaction is reversed whereby the lead sulphate reforms into lead oxide and lead. As the plates restored to their original condition, the process of charging and discharging the battery is then repeated [3-5].

Car battery is one of the important parts of a car. It supplies the massive current required for the starter motor to turn the engine over [3]. In addition, it can also power electrical items such as side lights or a radio whilst the engine is switched off. When the engine is running, a relatively small amount of current is taken from the battery for the ignition system and where required, lights, wipers and so on. Therefore, the battery can be considered as the heart of the car's electrical system. However, it can suffer many kinds of ailments which result in components failure [6]. Hence, maintenance should be performed periodically in order to determine the condition of the battery.

There are many issues or problems related to car battery faced by car user. One of the issues is the maintenance of electrolyte level [7,8]. The battery electrolyte level should be kept topped up by using distilled water, to the point specified on the side of the battery. This is important since keeping the battery up to the mark with electrolyte and correctly charged will keep it ice-free in the most extreme conditions. Hence, car users always need to monitor the electrolyte level of the battery [6,9,10].

Another issue or problem frequently occurred is sulphated plates. This problem occurs after the battery is not charged for a long period of time. Hence, the process of electrolysis does not occur in the battery which then causes the sulphate on the plate to become difficult to be removed from the