Modelling of Electrical Vehicle Battery for Vehicle –to-Grid Applications

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Abstract: **Electrical vehicle battery models are essential when performing analysis of Electrical Vehicle system. The battery package of electric vehicle is complicated and unpredictable because of its chemical based functioning. In this paper, a battery model is presented with a number of internal and external factors taken into account, including temperature, age and wear.**

I. INTRODUCTION

In recent times there has been a large increasing in research and development of electric vehicles driven by growing environmental concerns as well as increasing fuel process. Electric vehicles are becoming an increase more popular alternative to traditional petrol and diesel powered vehicles. One of the most important parts of them is the battery package. Lithium batteries are considered because of their higher performance and their popularity in electric vehicle applications. It works by principle of "arrhenius law" and considering the charge cycle of the battery.in order to build a more realistic and external factors,such as the ambient temperature,age and are taken into account by applying the arrhenius law and considering the charge cycle of the battery

II. INTRODUCTION TO THE V2G BACKGROUND

Since this paper only study the battery behaviour in the v2g scenario, it is necessary to describe the whole simulation process.The simulation system consists of three main subsystems

- AGGREGATOR
- CHARGE STATION
- ELECTRIC VEHCILE(EV)

Three information mainly influence the process of charging and discharging of the battery.

- GRID SITUATION(GS)
- CAR STATUS(CS)
- CHARGEGING TYPE(CT)

The fuel level of the battery is described by state of charge (SOC) IN percentage. The temperature in parking location should not exceed a reasonable range (15-60 ℃).

III. INITIAL BATTERY LEVEL

To ensure that the modeling of charging and dicsharging process of the battery can be generalized to any initail conditions, a random generator of the initial battery level is applied. Instead of having the one initial level for all the simulations as an output value.A lower limit of 20%and upper limit of 90% are set to initial battery level. The upper limit exists because if there are devices used to recover energy.

- TEMPERATURE
- RANDOM TEMPERATURE

The temperature is one of the variables that influence in real life the entire system .The random temperature is 978-1-4673-5980 where problem may occur by chosen to work just with one temperature, constant for whole day.In our simulation,the temperature was limited

IV. ARRHENIUS LAW

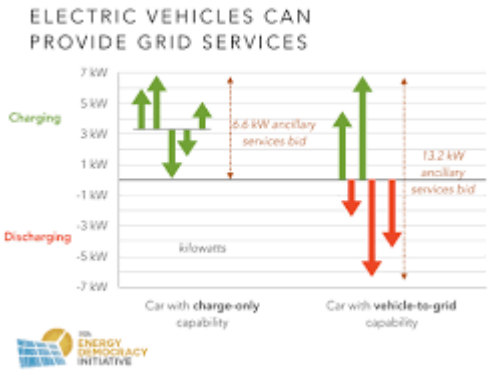
The function of all types of batteries is based on an chemical process and these chemicals reactions are dependent on temperature 25℃ is the working temperature in nominal performance. If it arrives at the lower limit the battery can be inversely damaged. This can be obtained using heating and cooling systems.

V.CHARGE CAPACITY AFFECTED BY TEMPERATURE

The arrhenius law implies that,for a battery,at a higher temperature more instantaneous power can be extracted.
Since the arrhenius law provides us connection of capacity at different temperature, we can simulate the effect of temperature of the battery of two steps.if it arrives at the upper or lower temperature limit,the battery can be irreversibly damaged. This can be obtained using heating and cooling.

VI.CHARGE AND DISCHARGING RATE AFFECTED BY TEMPERATURE

According to law ,the charging and discharging rates are also affected by the temperature. The existence of the self discharging phenomenon and its characteristics maybe good illustrations of this.
When an electric vehicle is plugged into the grid. They could have different rates because of the temperature.the opposite reaction occurs at low temperature.



VII. BATTERY WAR

- All types of rechargeable batteries wear out and no exception for a lithium battery.
- The life of a lithium battery depends on some very
- Important factors such as temperature and age.
- For a lithium battery two types of losses occurs.
- Permanent loss.
- Recoverable loss.

1. PERMANENT LOSS

The chemical reactions that shorten battery life, with when the product leaves the factory , and can be worsened because of high temperature and its age .this type of losses will always occurs , but can be controlled retaining the battery in the best way.

2. RECOVERABLE LOSS

As each time lithium battery is fully charged it losses 3% month.At a temperature may increase with increasing with age ,this type of losses can be recovered .the values of wear of the battery have been calculated based on life cycles of battery we estimate the wear coefficient only according to the cycle life in this range .

The life of lithium battery depends on some very important factors such as temperature and age. These were taken into calculating the coefficient of the battery.

VIII. CONCLUSION

In order to build a more realistic model of battery, internal and external factor such as the ambient temperature, age and wear were taken into account by applying Arrhenius law and considering the charge cycles of battery. The system now more accurately represents a real battery as used in a electric vehicle .this new model allows for more realistic situations of a vehicle to grid system providing more valuable and applicable results.

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