International Journal of Scientific Research and Engineering Development-– Volume 4 Issue 3, May- June 2021

Available at www.ijsred.com

RESEARCH ARTICLE OPEN ACCESS

Automated Tariff Base Smart Charger for Electric Two-Wheeler

Ritik Pradip Malegaonkar*, Sanchit Devanand Mahajan**, Alfiya Altaf Shaikh***, Abhijit Baburao Tarkase****, Prof. Amol Sopan Varade*****

* (Department of Electrical Engineering, Amrutvahini College Of Engineering, Sangamner – 422608, Maharashtra,ritikmalegaonkar27@gmail.com)

**(Department of Electrical Engineering, Amrutvahini College Of Engineering, Sangamner – 422608, Maharashtra, sanchitmahajan121@gmail.com)

***(Department of Electrical Engineering, Amrutvahini College Of Engineering, Sangamner – 422608, Maharashtra,alfiyashaikh9329@gmail.com)

****(Department of Electrical Engineering, Amrutvahini College Of Engineering, Sangamner – 422608, Maharashtra,abhitarkase6486@gmail.com)

*****(Department of Electrical Engineering, Amrutvahini College Of Engineering, Sangamner – 422608, Maharashtra,amol.varade@avcoe.org)

----------**********----------

Abstract:

The current trend is towards the world of EVs, Still there are many thingswhich resisting these technologies. Less efficiency, Limitations over long-range, high charging time, high cost, safety related issues anda smaller number of charging stationare the factors which need to be innovate. In order to boast the electric vehicle industries, it is very much important to have the user friendly and innovative charging infrastructure available. Thispaper mainly focused on such factors, to design efficient and safe tariff base smart chargerat minimum cost, along with considering the recent problem. The device discussed here with Arduino UNO but we can replace it with microcontroller to make this system lighter and more optimum. This paper provides a solutionby developing an automated economical efficient smart tariff base charger/device for charging, which provides facilities to user charge vehicle at any place other than home or charging stations.In this paper, we have designed and discussed the best possible solution.

Keywords **—Electric Vehicle,Smart charger,Charging Technologies, Energy meter.**

----------**********----------

I. INTRODUCTION

There has been a boom of Electric Vehicles (EVs) take-up as efficient and eco-friendly promises of electro-mobility. The main advantage of Electrical vehicles besides the improved fuel economy is the reduction of carbondioxide emission. The carbon dioxide emission rate in May 2020 was near 417.16 ppm and it is simultaneously increasing. An electric vehicle uses many states of the art, environment-friendly technologies like regenerative braking system, solar charging, etc. which will greatly reduce the emission of harmful elements which are responsible for environmental pollution. Along with these green technologies use of efficient power electronics and lighting systems will greatly improve the overall performance of electric vehicles. Still,some factors need to be innovated. With the new wave of electric vehicles, there is a desire for constant innovations in the electric vehicles industry requiring a need for more features to accommodate the consumer demand. Pretty soon, seeing an electric vehicle on the road will become as common as driving past a traffic light, and it is only possible when we overcome the problem associated with EV technologies, like range anxiety, efficiency, infrastructure, charging time, safety, and last but not least is economy. To overcome such problems, and to promote

technologies for E-Mobility Green Technologies this paper will surely play a key role.

For understanding this tariff-based technique we must have to know what the tariff is, so basically the tariff is the amount of money frame by the supplier for the supply of electrical energy to various types of consumers. In other words, the tariff is the methods of charging a consumer for consuming electric power. The tariff covers the total cost of producing and supplying electric energy plus a reasonable cost. In addition to this, we can load specially design program with setters and getters to set the tariff accordingly.

II. AUTOMATED TARIFF BASE DEVICETECHNIQUE

Automated Tariff Base Device Technique is a smart, efficient and user-friendly extended charger circuitry to make charger able to charge vehicle conveniently and safely. Theoverall block diagram of this system as follows.

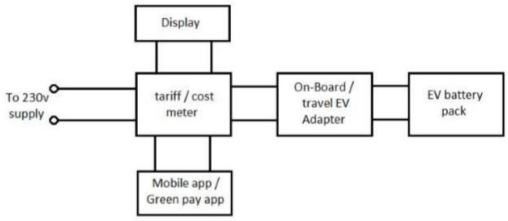

Fig.1Block Diagram of Smart Charging Device

This tariff cost meter is connected between supply and load. After switching supply on instantly it starts checking the parameters like supply voltage, current, temperature, and if any fault condition occurs then it will show message on display and it will not supply power to the load but if all parameters found in allowable limits, then it will start the next function to calculate the tariff for supplying power to load. Also provides on display current consumption and cost of charging till healthy condition, so that the consumer and supplier get the cost of power consumed as well. This also ensures the equipment as well as the operators safety. Here we have tried to have an economical as ell as user friendly charging system which can be mounted on any EV charger. While designing our main focus was mainly the two wheelers and all vehicles having a travel adapter or on-board charging system.

III. SIMULATION

The simulation is done using the software Proteus which allows having different output as the input is changed in circuitry. To have the complete simulation here an Arduino mega is used to measure andcalculate the parameter needsto find energy and cost of charging. Also, to simulate the protection here a relay is used before the main supply gets directly connected to the charger, and also an on-board MCB (Miniature circuit breaker) is used. The input given is the alternating AC current and voltage, where the current sensor ACS 712 is used to measure the actual current. The current sensor is connected in seriesto the charger and battery, also the voltage sensor is used to have the on-time voltage of the load

a) Normal condition:

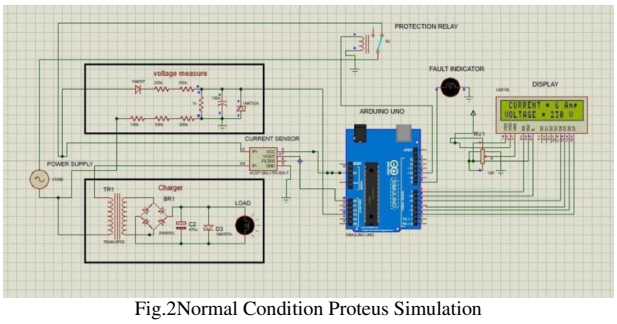

Fig.2Normal Condition Proteus Simulation

This is a simulation for the normalcondition where no fault is been occurred, allcomponentswillbeworkisdefinedandthe value ofvoltage,current, power,andcostareprintedon display.

b) Overvoltage:

Fig.3 Over Voltage Condition

Whenever the voltage of supply gets more than 300 V (according to set in program) the relay gets open and isolate the circuit (ensuring the operation in allowable limits only) and prints the fault on the display.

c) Under Voltage:

Fig.4 Under Voltage Condition

Whenever the supply voltage gets less than 180 V (according to set in program)then the relay gets open and prints the type of the fault on Display.

d) Under current:

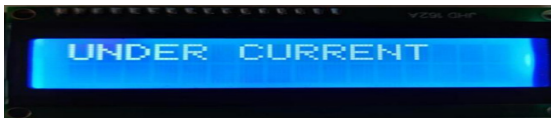

Fig.5 Under Current Condition

Whenever the current gets reduced less than the rated value (according to set in program) of the charger, it opens the relay and isolates all circuits also, displays the fault.

e) Over Current:

Fig.6 Over Current Condition

Whenever the current gets more than the rated value (according to set in program) of the charger, it opens the relay and isolates all circuit also displays the fault.

f) Over temperature:

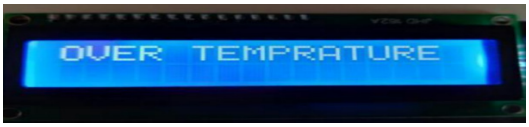

Fig.7 Over Temperature Condition

As with electrical parameters, it is very important to have over-temperature protection, because it can cause hazards to not only the charger but also the battery.

To detect the temperature here we used the thermostat which sends the value of actual temp to Arduino and trips the circuit when it is more than normal (according to set in program).

IV. COMPARISON WITH CONVETIONAL CHARGERS

TABLE 1
COMPARISON WITH CONVECTIONAL CHARGER

Sr. No	Parameter	Convectional Charger	Automated Tariff Base Smart Charger
1	Shows charging cost on display	No	Yes
2	Provide Advance Protection	No (only Convectional protection)	Yes (Convectional +own-Circuitry)
3	Auto Payment option	No	Yes (with special apk)
4	Store charging data	No	Yes
5	Cost	Moderate	Moderate
6	Safety	High	Very High
7	Calibration while maintenance	Easy	Complicated
8	Permission for usability	Not Required	Required from government and regulatory Authorities.
9	Applicable to	Most of Vehicles	Two-WheelerOnly. (modification required in case of high rating applications).

V. FEATURES

• The programmable tariff zones feature in the Automated Tariff Smart Charger enables the utility/owner of the charging station to set higher pricing at peak hours which helps in flattening the demand curve. As an additional feature, the consumers can be made to access their energy consumptions from meter readings on electric vehicles charger which enables them to make use of those readings to reduce their energy consumption according to tariffs. Thus, the utility can attain improved efficiency as well as reliability.

• Integration of convectional EVS charger into Automated Tariff Smart Charger involves the implementation of hardware and software technologies. It is designed in such a way that it

incorporates the requirement of the EVS user as well as the owner of the charging station.

• Its promises to charge your EVS at various places.

• Leaser the cost than the conventional charging stations make it affordable

• Easy to use and understandable feature makes it user-friendly

• Also, the adding features like auto payment and supportively of mobile application can make it more unique

• Storing of charging history and battery consumption can help to have a better analysis of EVs.

• Vehicle to vehicle charging can be much easy and convenient.

• Also, it can be used to make the vehicle to grid charging infrastructure. Installation of all kinds of protection makes it safe to use.

VI. APPLICATIONS

- Individualvehiclecustomers
- EVManufacturingIndustries
- EVchargingIndustries
- EcoFriendlyandEconomical E Mobility…etc.

VII. CONCLUSIONS

Creating a complete charging infrastructure can be time-consuming and costly, maybe it possible in the future but to give an initial boost to the EVs world there is a technique needed which can reduce or give an alternative to time-consuming and costly resisting factor so ultimately it will be possible to see EVs on the road by sure. The technique discusses in this paper will surely play a key roleand eliminate the charging station dependency. It also allows users to charge EVS at any place where therated power supply is available, with calculated charging costs on display along with an easy and convenient payment method. In case of any faults eighter it is concerned with supply or device it provides complete protection for that as well. Due to this technique, instant and tedious job of payments will be easilypossible which gives access to use renewable energy sources like solar parking so that the future fleet of EVs could be fuelled by clean power. When the availability of charging stations increases moreconsumers will accept EVs and the adoption moves along a classic technology adoption curvefrom early adopters to laggards, making world of EVs possible.

ACKNOWLEDGMENT

We feel great pleasure in expressing our deep sense of gratitude and heartiest respect to Mr. Amol Varade sir, for the surveillance, learned guidance, and heart-touching inspiration thought out.

We have special mention of our gratitude to Mr. Sunil Kadlag, Head of Department, of Electrical Engineering for providing us the facilities of the department. We express our deep sense of gratitude to all other faculty members for the antagonistic discussion and suggestions providing us.

We thankfully, acknowledge the valuable opinions and co-operation of all the students of electrical engineering AVCOE Sangamner.

REFERENCES

[1] Analytical Study on The Performance Analysis of Power Train System of An Electric Vehicle by Chul-Ho-Kim And Kee -Man Lee
[2] Modern Electric, Hybrid Electric, And Fuel Cell Vehicles by MehdadEshani, Yamigaoand Ali Emadi
[3] Comparison Of Permanent Magnet Brushless Motor With Outer And Inner Rotor Used In E-Bikes By W.Chlebosz, G. Ombach, And J. Junak.
[4] Next-Generation Electric Bike by N. Pavan Kumar Reddy And K.V.S.S Vishnu Prashanth.
[5] International Energy Agency. (2014a). Energy Technology Perspectives 2014. Paris: OECD/IEA.
[6] International Energy Agency. (2014b). Key World Energy Statistics.
[7] International Energy Agency. (2016). Global EV Outlook 2016.
[8] Automatic Tariff Calculation with Wireless Energy Meter, International Journal of Innovative Research in Electrical, Electronics and Control Engineering [Volume 3] [Aug 2015]

