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Modelling Of Hybrid Electric Vehicle Charger

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Abstract
The plug-in hybrid electric vehicle (PHEV) is a hybrid electric vehicle whose battery can be recharged by plugging in a charging cable into an external electric power source, in addition to internal combustion engine-powered generator .Conductive AC charging method is used to connect the Electric vehicle supply equipment (EVSE) and Electric vehicle(EV).The on board charger used promotes fast charging of EV .Interfacing of EV and EVSE is designed based on the automotive industry standards IEC and ISO.
Keywords: *Electric Vehicle (EV), Electric vehicle supply equipment (EVSE), International Electro Technical Commission (IEC), International Standard Organization (ISO), Plug in hybrid Electric vehicle (PHEV), Power factor corrector (PFC).*

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I. INTRODUCTION

Now-a-days, it is important to find alternate sources of energy, as the oil reserves are exhaustible and burning of such fuels causes air pollution. Hence Plug-in hybrid electric vehicles are essential to reduce pollution. Electric motor and internal combustion engine are the two propulsion sources of PHEV.

The automotive industry standards applicable to EVSE side is IEC and the automotive industry standards applicable to EV side is ISO. On-board chargers are used in this model. Lithium-ion battery is used because it has longer life and supports fast charging.

1.1 OBJECTIVE

1. The main purpose of this project is to provide electrical and physical interface between EV and EVSE to facilitate conductive charging and design of an on-board charger for fast charging of the hybrid electric vehicle.

2. This project is for designing an interfacing system between EV and EVSE as per automotive industry standard using MATLAB software.

3. To achieve fast charging of hybrid electric vehicles.

4. To obtain less power losses during charging.

II. EXISTING SYSTEM

In the existing system, the block diagram and components of an on-board charger are studied. The on-board charger contains two main components, Power factor Corrector and DC-DC converter. PFC consists of AC-DC converter and DC-DC boost converter.

Firstly, the 230V AC input is supplied to the AC- DC converter. Then, this 230V AC is converted to 230V DC. The capacitor used in the bridge circuit does not allow sudden changes in voltage.

Secondly, this 230V DC is supplied to DC-DC boost converter which boosts the voltage to 400V DC. This 400V DC is given to DC-DC converter.

DC-DC converter is a combination of DC-AC converter, linear isolated transformer and AC-DC converter. The boosted 400V DC is supplied to DC-AC converter which produces an output of 400V AC. Further this 400V AC is given to the primary of transformer. The transformation ratio is maintained as unity, hence secondary voltage is same as primary i.e.; 400V AC. This 400V AC is supplied to AC-DC converter which produces an output of 330VDC.

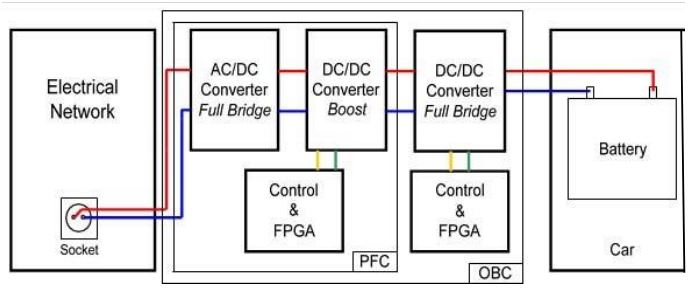

Fig-1: Block diagram of on-board Charger

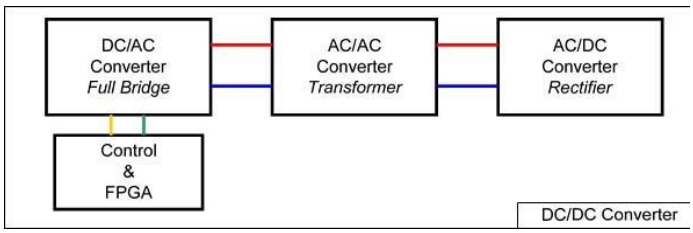

Fig-2: Simulink model of DC-DC Converter

III. PROPOSED SYSTEM

"ONE COUNTRY-ONE CHARGER"

In our daily life we find many electrical vehicles like bicycles, scooters, cars, buses etc; All of these vehicles battery ratings are different. It is inconvenient to use various chargers based on rating. Hence the idea is to have a single charger which can charge any electric vehicles of different rating.

For this purpose we use a buck converter and PI controller, inaddition to our existing model. The required rating is set in the constant and the difference between the reference value and measured value(error) is given to the PI controller. PI controller sets duty cycle proportionate to the error produced. Therefore the battery gets charged with the required rating. This reduces e-waste to a great extent.

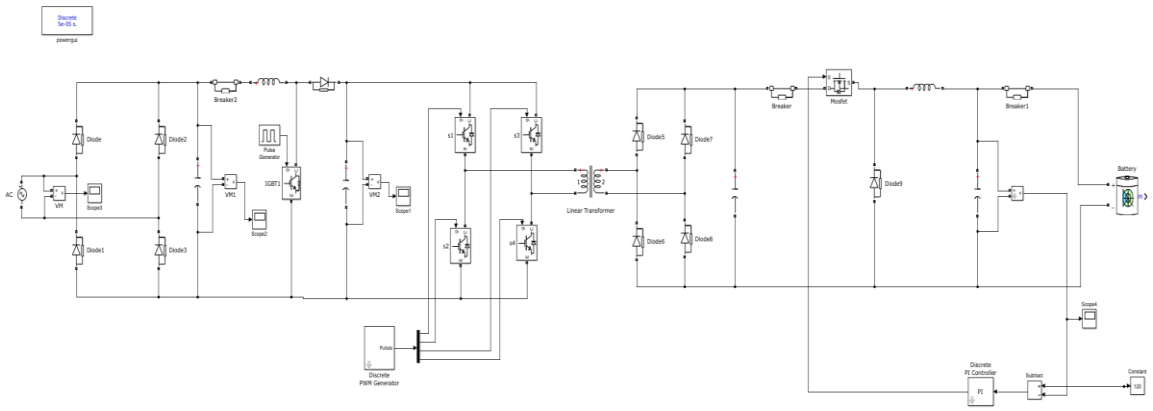

Fig-3: Simulink diagram of On-board charger

IV. SIMULATION RESULTS

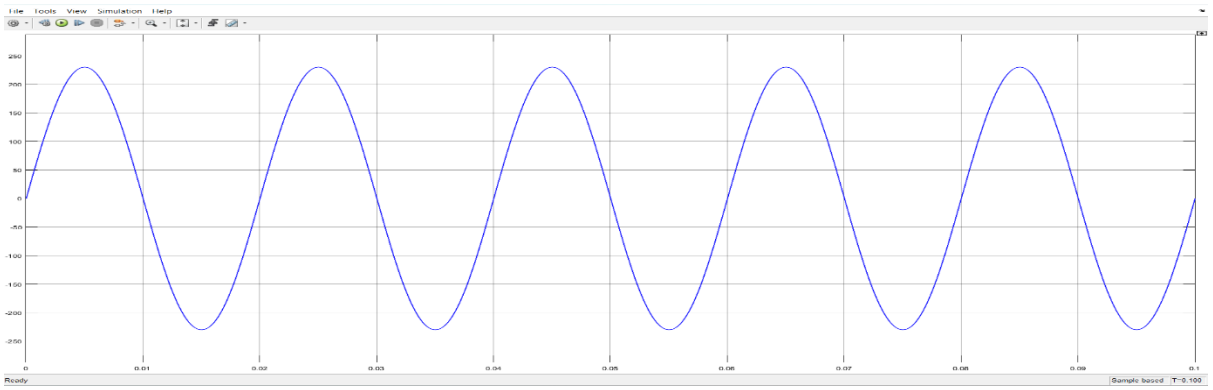

Fig-4: Input voltage waveform

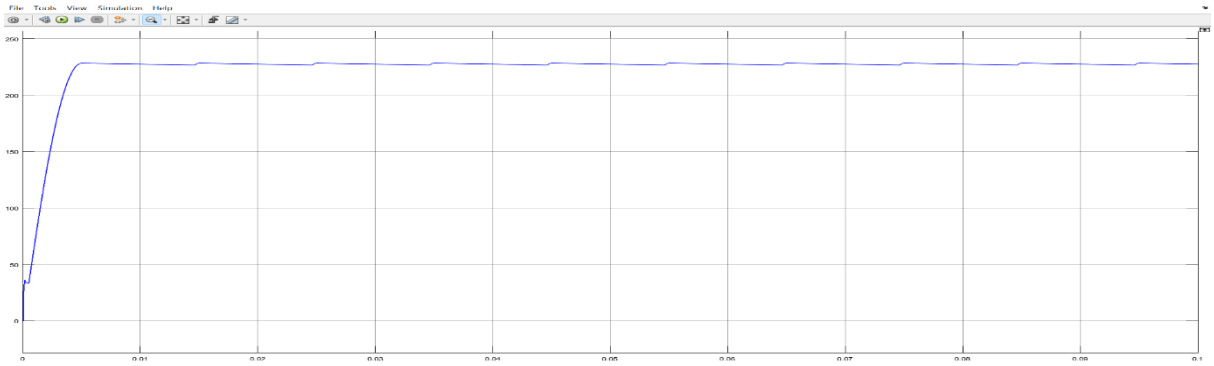

Fig-5: Output volatge of AC-DC full bridge converter

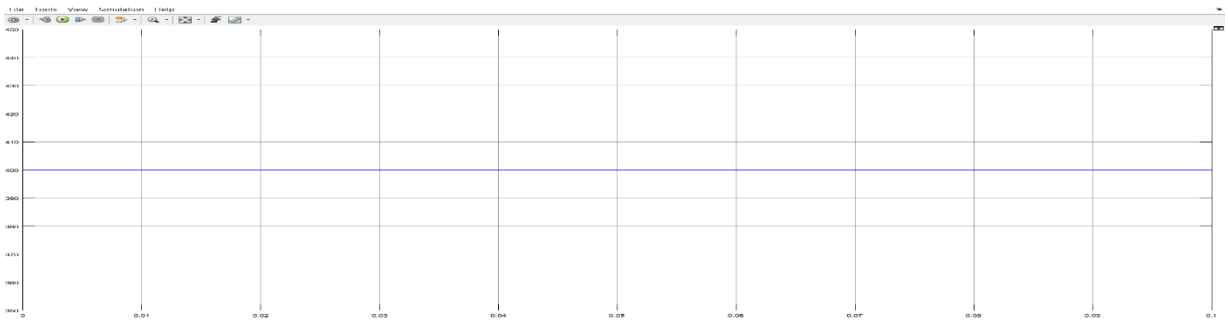

Fig-6: Output voltage of DC-DC boost converter

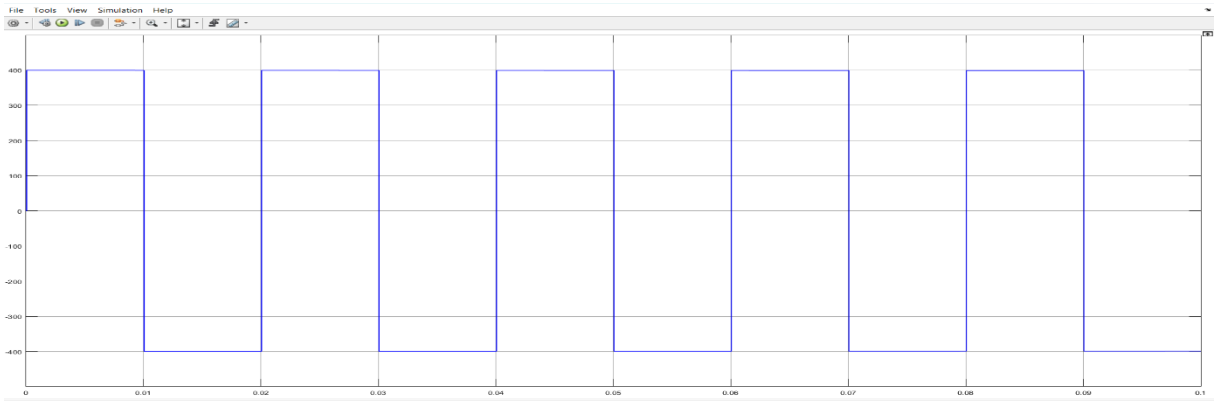

Fig-7: Output volatge of DC-AC converter

Fig-8: voltage across Lithium ion battery

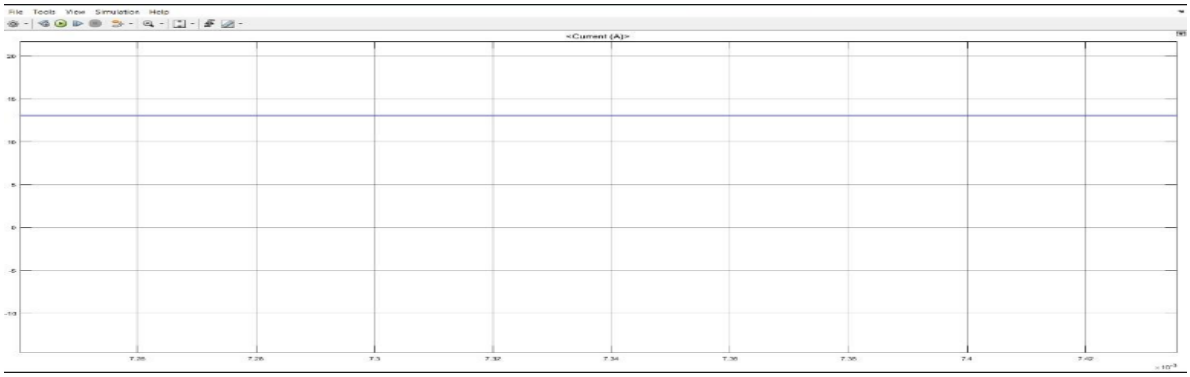

Fig-9:current through the Lithium ion battery

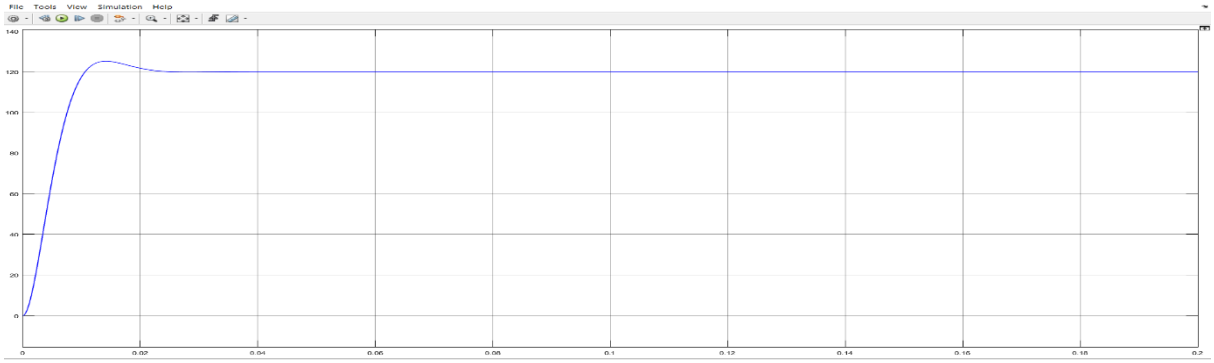

Fig-10: output waveform when the voltage set in the constant is 120V

V. CONCLUSION

In order to reduce pollution and to stop using fuels which are exhaustible in nature, we need to start using electric vehicles effectively. Hence plug-in hybrid vehicles should be used more and more. The charger of an electric vehicle should be robust and reliable. The modelling and implementation of on board charger is studied. Inaddition to this, the idea of having a single commercial charger which can charge any electric vehicle of different ratings has been discussed. This effectively reduces huge amount of e-waste being produced on earth.

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