JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

# An Efficient Bridgeless Converter of Battery Charger for Electric Vehicle Applications

**[1]Abhishek Kumar Gupta, [2]Prof. Barkha Khambra**

[1]Research Scholar, [2]Assistant Professor
Department of Electrical & Electronics Engineering,
NRI Institute of Information Science and Technology, Bhopal, India

***Abstract :*** Energy storage systems have been widely used in numerous applications, such as renewable power systems, electric vehicles, uninterrupted power supplies, and microgrids, to compensate the power mismatch between the power generations and power consumptions. This paper proposed an efficient bridgeless converter of battery charger for electric vehicle applications. This research work shows design and implementation of a new charger for battery operated electric vehicle (BEV) with power factor improvement at the frontend. In the proposed configuration, the conventional diode converter at the source end of existing electric vehicle (EV) battery charger is eliminated with modified Landsman power factor correction (PFC) converter. The simulation of proposed model and analysis is performed using MATLAB software.

***IndexTerms*** **- Landsman, Power factor, Electric vehicle (EV), battery charger, Power, Capacity.**

## I. INTRODUCTION

In recent years the problems of "extend tension" related with electric vehicles (EVs) have been lightened by the presentation hybrids (HEVs) and plug in hybrids (PHEVs) and the advancement of higher vitality thickness batteries fit for storing more vitality in a similar space. With the expanding ubiquity of electric vehicles, "run nervousness" is currently being supplanted by "charging tension". This page tends to the issues related with giving appropriate chargers and the charging framework important to help the developing populace of EVs.

It takes around three minutes top off petroleum or diesel engined vehicle at a filling station with enough fuel to go around 300 miles, costing about $35 in USA and about £52 ($80) in the UK. To travel 300 miles in a little EV traveler vehicle would require three full charges of a common 25kWh battery used to power these vehicles costing about $2.50 per accuse in the USA of electricity valued at $0.10 per unit (kWh) and £2.50 ($3.90) in the UK with electricity evaluated at £0.10 per unit. The low vitality cost is one of the attractions of owning an EV. Lamentably to put the 25 kWh of vitality expected to travel every 100 miles into the battery in a similar time (1 moment) that the proportional measure of diesel fuel is siphoned into the tank would require a power supply fit for conveying a power of 1.5 Megawatts. To place this into point of view, 25 kWh is the measure of vitality a normal family unit expends in an entire day. Giving electrical circulation offices to enable clients to devour this measure of vitality from the electricity grid in one moment isn't reasonable and regardless of whether it was, no EV battery could acknowledge vitality in light of current circumstances.

The arrangements don't simply include the advancement of chargers; they include the structure and turn out of a system of open and private charging stations with related client validation and charging frameworks, open security and arranging issues, the exchange of international benchmarks and expanding the electricity grid to convey the expanded burden. There are no single responses to these issues. From one viewpoint, national and international norms associations endeavor to discover authoritative answers for these issues, yet there are such a large number of contending national gauges. Then again businesses endeavors endeavor to jump the challenge by thinking of new and extraordinary imaginative answers for separate their contributions. A portion of these issues are investigated here.

Battery Electric Vehicles, additionally called BEVs, and all the more as often as possible called EVs, are completely electric vehicles with battery-powered batteries and no fuel motor. Battery electric vehicles store electricity locally available with high-limit battery packs. Their battery power is utilized to run the electric motor and all installed electronics. BEVs don't discharge any unsafe outflows and dangers brought about by conventional gas powered vehicles. BEVs are charged by electricity from an outside source. Electric Vehicle (EV) chargers are arranged by the speed with which they energize an EVs battery.

## II. PROPOSED METHODOLOGY

The input DBR is eliminated by two Landsman converters, which operates in parallel during the positive half line and negative half line, separately. Therefore, the conduction losses are reduced to half due to reduced number of components conducting in one switching cycle. For improved performance based switching, two converters, in synchronization.

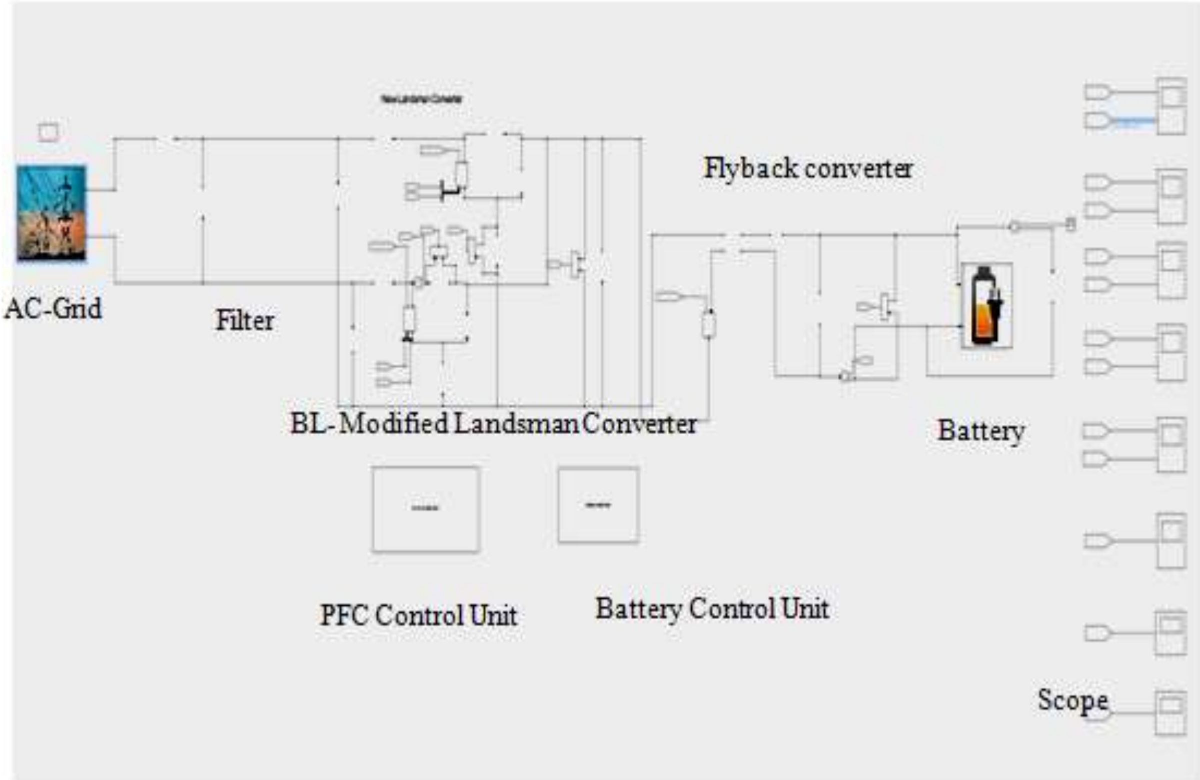


Figure 1: Battery Charger for electric vehicle Model

The main component of present model is as followings-

- AC grid
- BL- Modified Landsman Converter
- Flyback Converter
- PWM
- BL-PFC Control Unit

## III. SIMULATION AND RESULTS

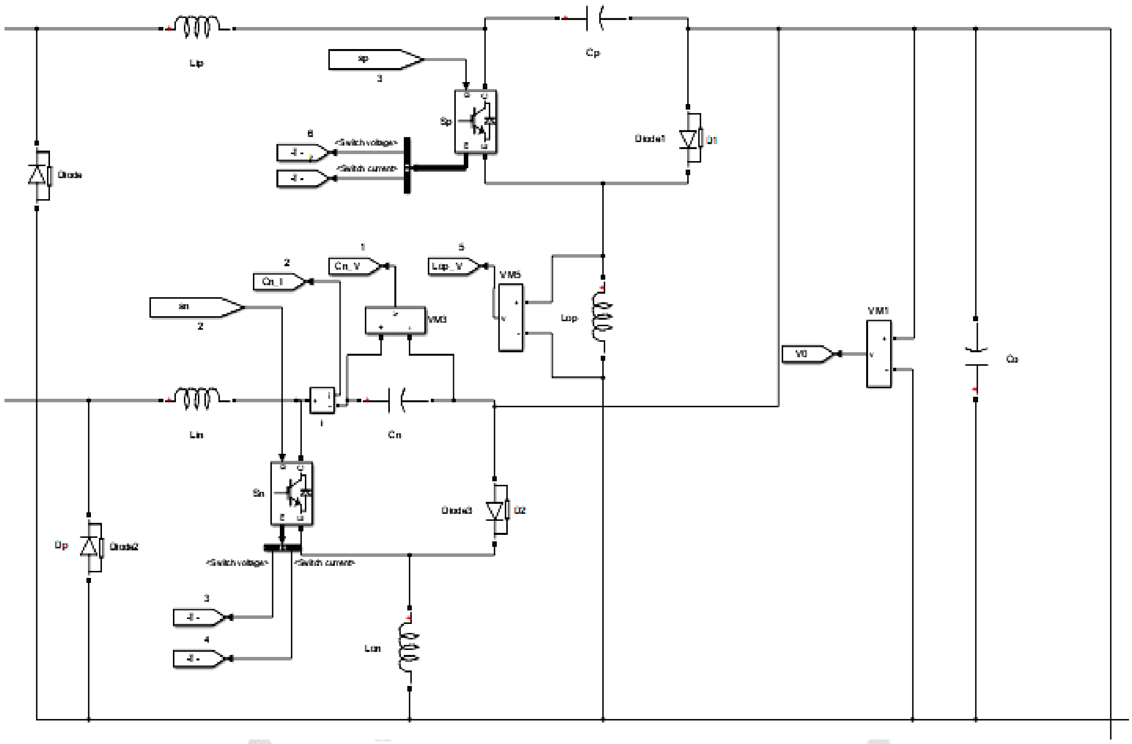


Figure 2: New Landsman Converter

In figure 2 is showing landsman converter circuit. Where Implements a diode in parallel with a series RC snubber circuit. In on-state the Diode model has an internal resistance (Ron) and inductance (Lon).

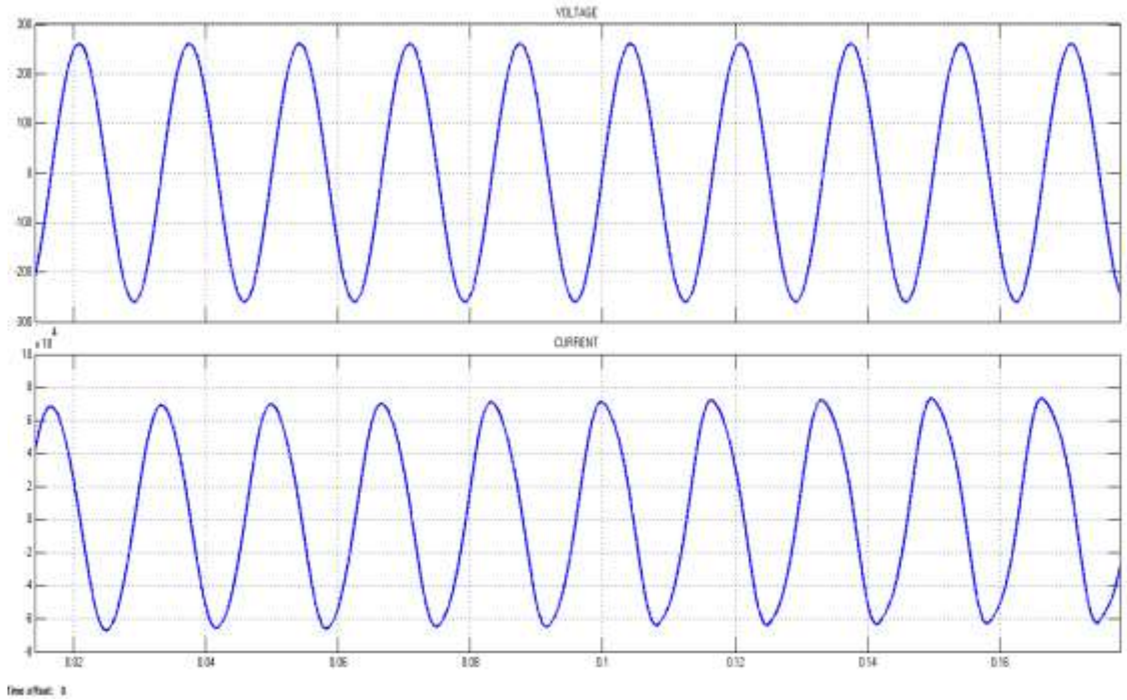


Figure 3: Output of Ac source voltage and current

Figure 3 presents output of source voltage is 260V and 10A current.

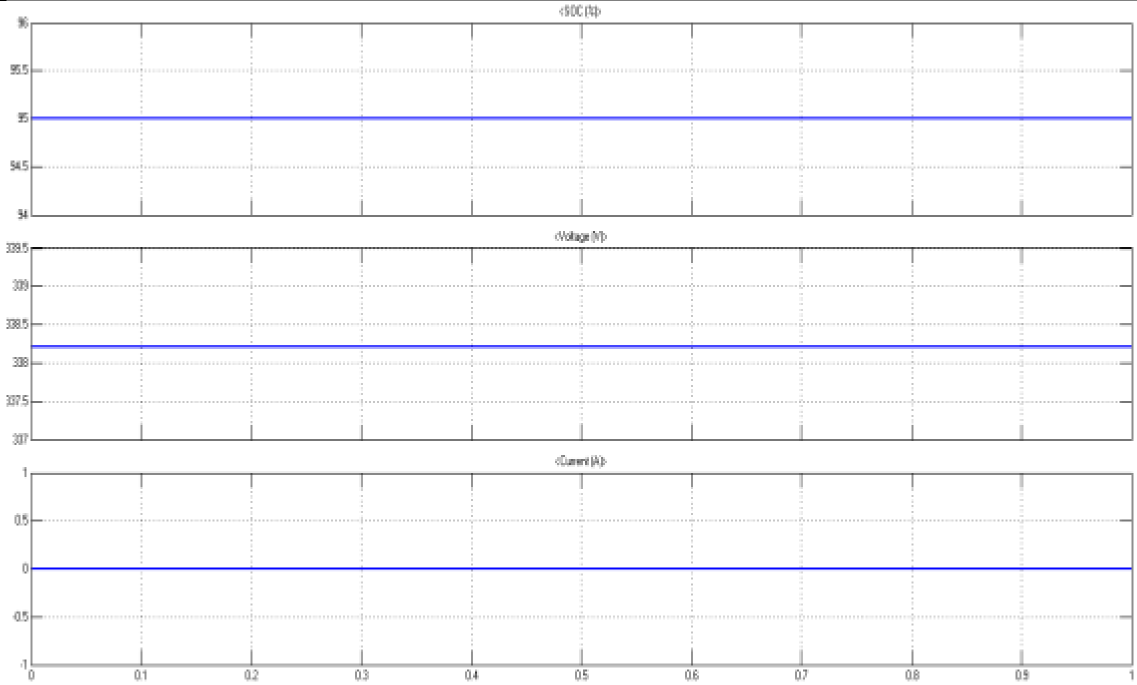

Figure 4: Performance of Battery

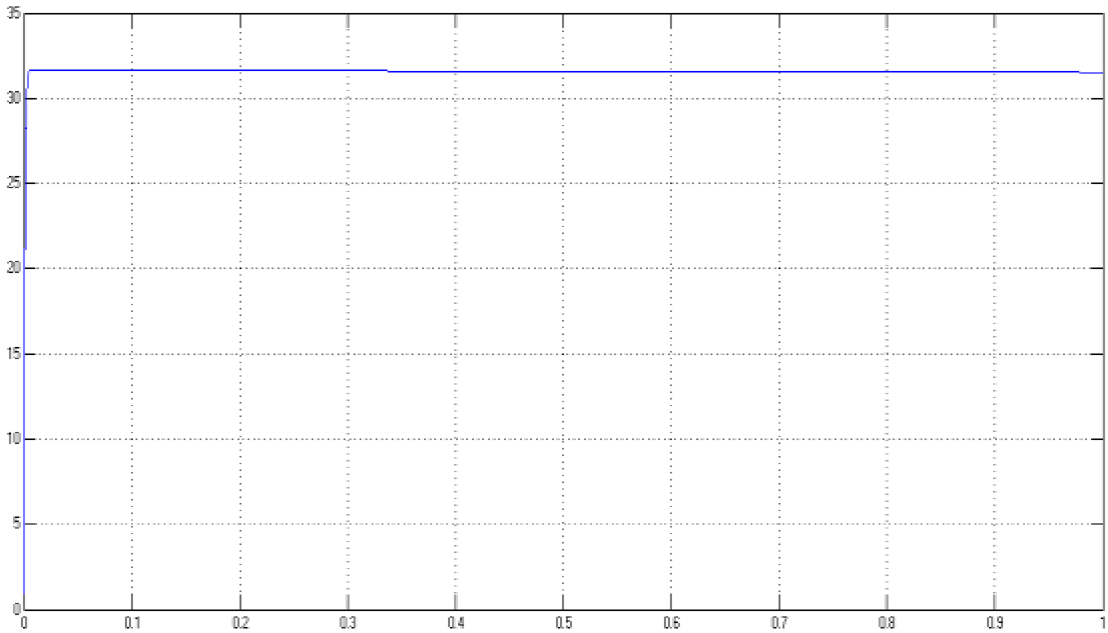

Figure 5: Battery output current

Figure 4 and 5 is showing output performance of battery. Here it can be seen that state of charge of battery is 95% and voltage is 338.25V and current is 33A

## IV. CONCLUSION

This paper proposed an improved EV charger with modified BL Landsman converter followed by a flyback converter, analysed, and validated in this work to charge an EV battery with inherent PF Correction. The design and control of the proposed EV charger in discontinuous mode (DCM) mode have offered the advantage of reduced number of sensors at the output. Moreover, the proposed BL converter has reduced the input and output current ripples due to inductors both in input and output of the converter.

## REFERENCES


1. B. Singh and R. Kushwaha, "Power Factor Preregulation in Interleaved Luo Converter-Fed Electric Vehicle Battery Charger," in IEEE Transactions on Industry Applications, vol. 57, no. 3, pp. 2870-2882, May-June 2021, doi: 10.1109/TIA.2021.3061964.

2. X. Zan, G. Xu, T. Zhao, R. Wang and L. Dai, "Multi-Battery Block Module Power Converter for Electric Vehicle Driven by Switched Reluctance Motors," in IEEE Access, vol. 9, pp. 140609-140618, 2021, doi: 10.1109/ACCESS.2021.3119782.
3. R. Pandey and B. Singh, "A Power Factor Corrected Resonant EV Charger Using Reduced Sensor Based Bridgeless Boost PFC Converter," in IEEE Transactions on Industry Applications, vol. 57, no. 6, pp. 6465-6474, Nov.-Dec. 2021, doi: 10.1109/TIA.2021.3106616.
4. M. Elshaer, C. Bell, A. Hamid and J. Wang, "DC–DC Topology for Interfacing a Wireless Power Transfer System to an On-Board Conductive Charger for Plug-In Electric Vehicles," in IEEE Transactions on Industry Applications, vol. 57, no. 6, pp. 5552-5561, Nov.-Dec. 2021, doi: 10.1109/TIA.2021.3103700.
5. S. U. Jeon, J. -W. Park, B. -K. Kang and H. -J. Lee, "Study on Battery Charging Strategy of Electric Vehicles Considering Battery Capacity," in IEEE Access, vol. 9, pp. 89757-89767, 2021, doi: 10.1109/ACCESS.2021.3090763.
6. Naziris, A. Frances, R. Asensi and J. Uceda, "Black-Box Small-Signal Structure for Single-Phase and Three-Phase Electric Vehicle Battery Chargers," in IEEE Access, vol. 8, pp. 170496-170506, 2020, doi: 10.1109/ACCESS.2020.3024534.
7. Martínez-Navarro, V. -A. Cloquell-Ballester and S. Segui-Chilet, "Photovoltaic Electric Scooter Charger Dock for the Development of Sustainable Mobility in Urban Environments," in IEEE Access, vol. 8, pp. 169486-169495, 2020, doi: 10.1109/ACCESS.2020.3023881.
8. J. K. Nama, A. K. Verma, M. Srivastava and P. S. Tomar, "An Efficient Inductive Power Transfer Topology for Electric Vehicle Battery Charging," in IEEE Transactions on Industry Applications, vol. 56, no. 6, pp. 6925-6936, Nov.-Dec. 2020, doi: 10.1109/TIA.2020.3018419.
9. P. -Y. Kong, "Extending Energy Storage Lifetime of Autonomous Robot-Like Mobile Charger for Electric Vehicles," in IEEE Access, vol. 8, pp. 106811-106821, 2020, doi: 10.1109/ACCESS.2020.3000820.
10. M. Bayati, M. Abedi, G. B. Gharehpetian and M. Farahmandrad, "Sinusoidal-Ripple Current Control in Battery Charger of Electric Vehicles," in IEEE Transactions on Vehicular Technology, vol. 69, no. 7, pp. 7201-7210, July 2020, doi: 10.1109/TVT.2020.2994269.
11. H. Tu, H. Feng, S. Srdic and S. Lukic, "Extreme Fast Charging of Electric Vehicles: A Technology Overview," in IEEE Transactions on Transportation Electrification, vol. 5, no. 4, pp. 861-878, Dec. 2019, doi: 10.1109/TTE.2019.2958709.
12. R. Kushwaha and B. Singh, "A Modified Luo Converter-Based Electric Vehicle Battery Charger With Power Quality Improvement," in IEEE Transactions on Transportation Electrification, vol. 5, no. 4, pp. 1087-1096, Dec. 2019, doi: 10.1109/TTE.2019.2952089.