

ANALYSIS AND IMPACT OF ELECTRIC VEHICLE CHARGING STATION ON POWER QUALITY

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Abstract - An advanced bridgeless(BL) Cuk motor grounded EV(Electric Vehicle) battery bowl with high power factor(PF) and increased effectiveness, is designed and developed in this work. It provides low cost and high power viscosity grounded charging result for EV. This bowl incorporates lower number of bias operating over one switching cycle, which reduces the fresh conduction loss incurred by a diode ground therapy of conventional bowl. Hence, it improves the bowl effectiveness. The added advantage of proposed topology is that the unwanted capacitive coupling circle is removed, as well as unwanted conduction through the body diode of inactive switch in preliminarily developed BL Cuk motor is avoided. This significantly improves the bowl effectiveness. For the constant current(CC) and constant voltage(CV) charging, the commands, are accompanied by a flyback motor. The proposed bowl draws a sinusoidal current from AC mains along with the total harmonious deformation(THD) in force current is reduced to the limits specified by the IEC 61000-3-2 guidelines. The bettered effectiveness and PQ indicators of proposed bowl, are delved to demonstrate its satisfactory charging operation at all operating conditions.

Key Words: Bridgeless Cuk converter, Battery charger, DCM, Flyback converter, PFC, Power quality.

I. INTRODUCTION

Currently, for sustainable development of the ultramodern transportation sector, battery powered electric vehicles(BEVs) are dominating over the conventional gasoline powered vehicles. To grease the battery charging in BEVs, an AC- DC motor grounded on board or off board bowl is the significant supporting outfit of the electric vehicle(EV). colorful off- board and on- board topologies of EV battery dishes, are bandied in the literature with unidirectional or bidirectional configuration under position 1, position 2 or position 3 orders. Along with high power viscosity and small form factor, an off- board bowl must have bettered power quality(PQ) characteristics to maximize the energy application during charging. still, the conventional EV bowl with a diode ground therapy(DBR) draws a unhealthy current from the mains, worsening the input power factor(PF), with total harmonious deformation(THD) as high as 55.3, as shown in Fig. 1. The battery standing and specifications of EV under test, are given in Table-I. It's egregious from these recorded waveforms that the performance of the DBR fed bowl doesn't misbehave with the transnational regulations similar as the IEC6100-3-2 standard. To manage up with these problems, bettered PQ grounded EV dishes, are considerably being studied in the literature, which draws a sinusoidal input current with high PF and affair voltage is regulated stiffly at constant value. Several topologies of frontal end PFC transformers depending upon the off- board or on- board configuration, are bandied in the literature for EV dishes. colorful on-

board EV dishes have significant advantage of high power viscosity and effectiveness. still, an off- board configuration offers more practical result due to reduced vehicle weight and felicity to charge at high power range. Different PFC motor topologies with interleaved input at front- end and zero voltage switching(ZVS). The interleaving of two phase inputs, comes with the benefits of reduced affair ripple current and. reduced size of the inductor. also, the semiconductor bias are operated in parallel, which results into reduced conduction losses, comparatively.

1.1 Electric Vehicle

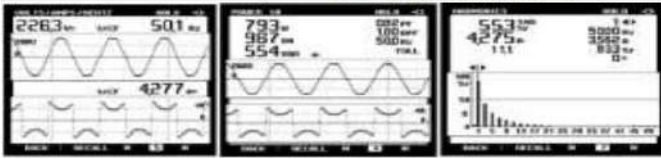
Electric Vehicle (EV) is an emerging development in the high level world because of the way that it mitigates biological pollutions and all the while extends eco-invitingness of the vehicles. Staggered inverter controls electric drive of EV of high power and updates its introduction which is the impression of the way that it can make sinusoidal voltages with simply focal trading repeat and have essentially no electromagnetic impedance. This paper portrays precisely unique geology of EVs and presents transformer less stunned converter for high voltage and high current EV. The fell inverter is IGBT based and it is ended in a progression. It is typical fit for EV as it uses separate level of dc sources which are in sort of batteries or force modules. Appeared differently in relation to normal vehicles, Electric Vehicles (EVs) are more eco-accommodating on account of the improvement of the engine action and recovery of dynamic energy during easing back down. With the module elective (PEV), the vehicle can be chipped away at electric-only modes for a driving extent of up to 30–60 km. The PEVs are charged for now from the electric power grid where energy can be made from boundless sources, for instance, wind and sun controlled energy and from nuclear energy. EVs are presumably going to overpower the general drive in coming years. Cross variety developments can be used for basically a wide scope of empowers and engines. Thusly, it's definitely not an advancement development. In EVs and FCVs, there are more electrical parts used, for instance, electric machines, power electronic converters, batteries, ultra capacitors, sensors, and microcontrollers. Despite these charge fragments or subsystems, conventional internal consuming engines (ICE), and mechanical and water fueled structures may regardless be accessible

1.2 Converters

Still, the interleaved PFC transformers don't give the result for poor thermal application of PFC switches, analogous to the conventional boost PFC motor. An LLC reverberative motor fed EV bowl offers the fresh advantage of low EMI(Electromagnetic hindrance) noise and low switching loss. still, the complex fine analysis of reverberative motor, makes the motor infelicitous for EV charging over wide input voltage range. A full- ground PFC motor comes out to be most promising result for EV dishes but designing the individual gate motorist for four semiconductor switches, comes with the disadvantage of increased size and complexity. thus, to give the easy perpetration along with retaining the advantage of high power viscosity and effectiveness, colorful unidirectional PFC off- board EV dishes.

Table1: Specification Of Ev under Test

Components	Specification
Speed	0-25 kmph
Range	120 km per Charge
Battery rating	12V, 100Ah (4 Battery)
Motor rating	48V, 1000W BLDC Motor
Charging time	5-8Hours
Charger Specifications	Charger open circuit voltage:63-65V Charger Output current:10-12A Input supply voltage:160-260V



The bridgeless buck- boost motor offers the most seductive result for PFC in EV dishes as they can both buck and boost the input voltage. The different buck- boost configurations grounded transformers similar as Cuk and SEPIC transformers are described. nonetheless Zeta, Cuk and SEPIC PFC transformers have low input current ripple and wide duty cycle variation range, still the SEPIC motor has the limitation of spastic affair current, unlike Cuk motor. thus, Cuk motor provides further doable charging characteristics to the battery due to low ripple in battery current. numerous topologies of BL Cuk motor grounded upon conventional PFC Cuk motor.

II. LITERATURE STUDY

C. Chan just as K. Chau, "Force electronic gadgets limits in electric vehicles," in Proc. IEEE IECON'90 three., pp. 701- 706. In a worldwide herein power protection just as natural control are raising issues, the improvement of electric vehicle progressive age has really taken a stimulated beat. The 1990s are likely to the years wherein the long looked for practical, inside your methods electric lorries will in truth begin to be analyzed. The paper manages the cost of an outline of flow inconvenience and furthermore what's more predetermination propensities in electric fueled Vehicle drive systems, with side interest toward the final product of fast advancement of electrical engines and also electric force hardware. The inconveniences of power virtual stuff in different segments along side battery chargers, electric fueled brakes notwithstanding exceptional basic uses of electric lorries are looked at. The market length of electrical vans inside the coming years and moreover the practical electric controlled autos and truck influences are investigated.

C. Chan and K. Chau, "Power electronics challenges in electric vehicles," in Proc. IEEE IECON'1993., pp. 701–706. In this paper challenges of power electronics in EV's including electric propulsion system, Battery charging system have been discussed.

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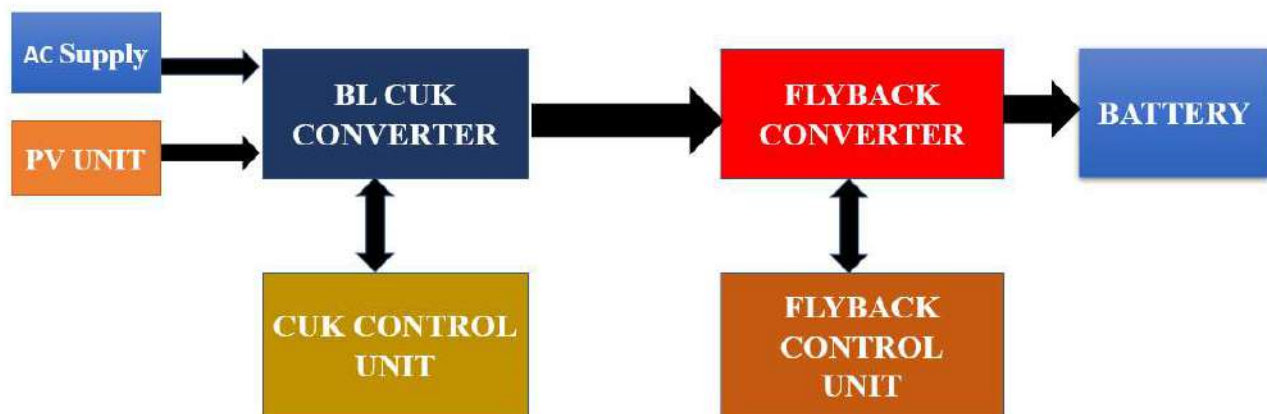
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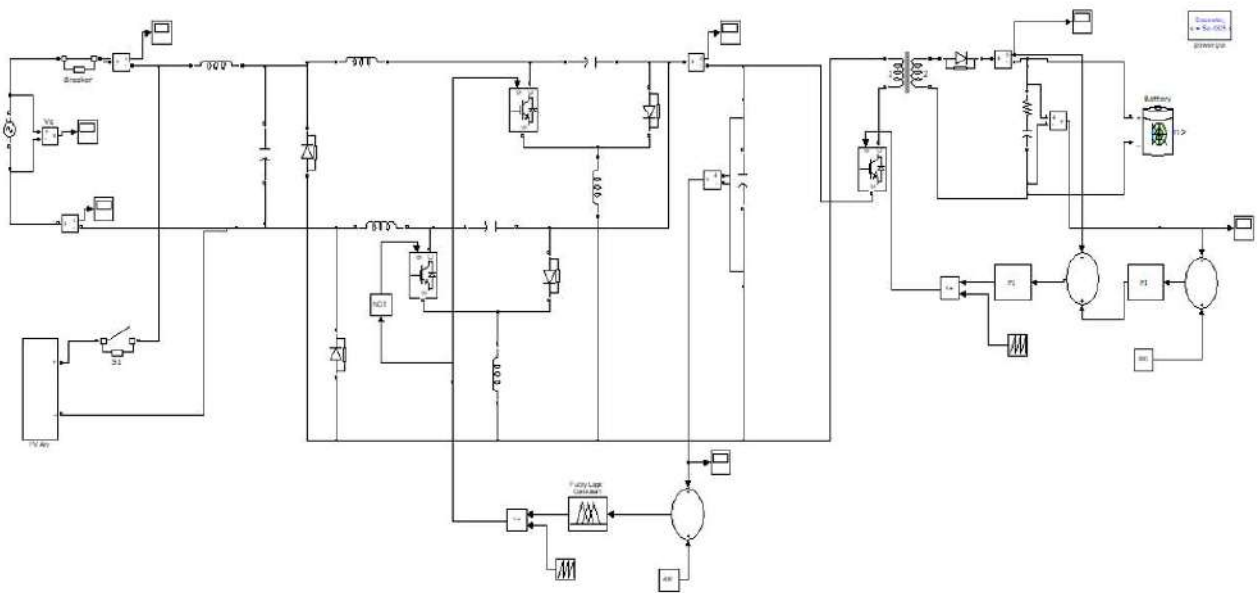
T. J. Liang, K. H. Chen and J. F. Chen, "Primary Side Control For Flyback Converter Operating in DCM and CCM," IEEE Transactions Power Electronics, vol. 33, no. 4, pp. 3604-3612, April 2018.

III. BLOCKDIAGRAM

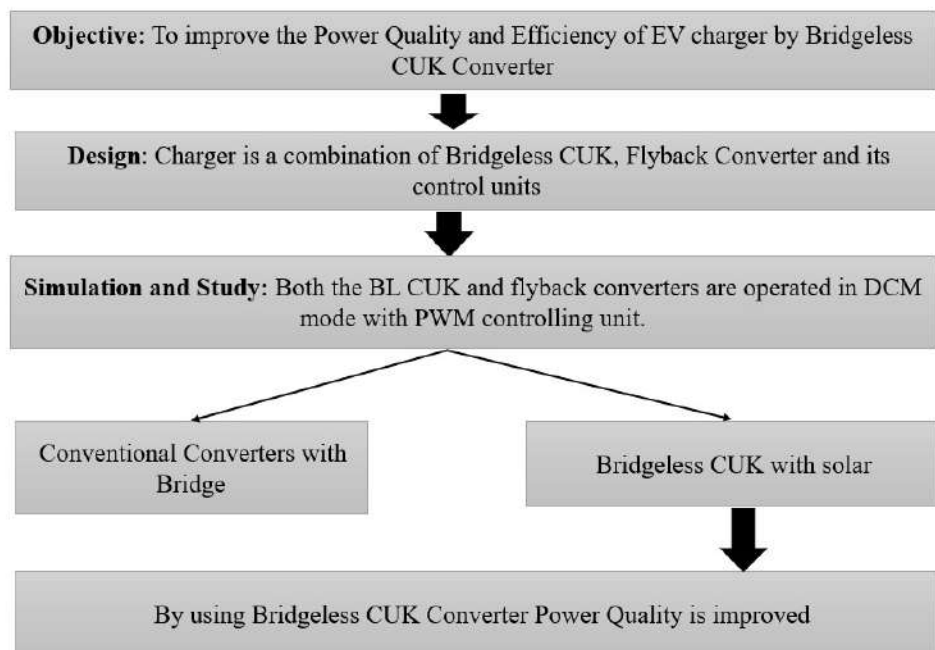


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IV. SIMULATION MODEL



V. WORKFLOW



VI. RESULT ANALYSIS



Fig: Input Supply Voltage

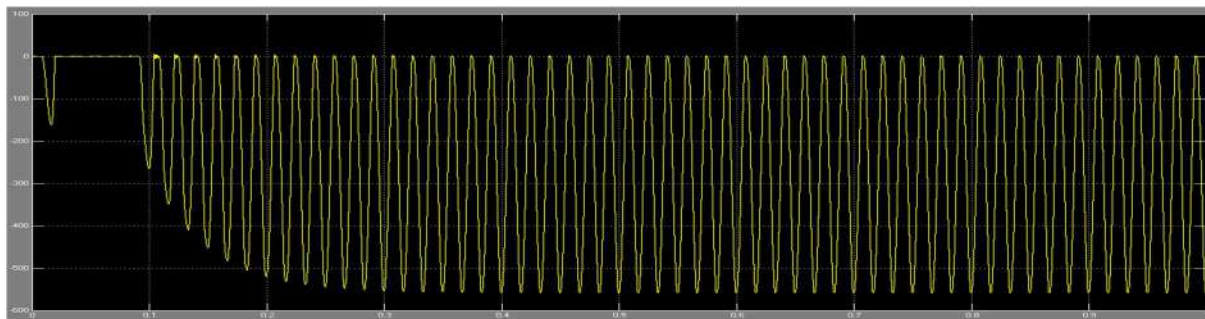


Fig : Line Current Waveform

Pulse Width Modulation (PWM) is the most effective means to achieve constant voltage battery charging by switching the solar system controller's power devices. When in PWM regulation, the current from the solar array tapers according to the battery's condition and recharging needs. Consider a waveform such as this: it is a voltage switching between 0v and 12v. It is fairly obvious that, since the voltage is at 12v for exactly as long as it is at 0v, then a 'suitable device' connected to its output will see the average voltage and think it is being fed 6v - exactly half of 12v. So by varying the width of the positive pulse - we can vary the 'average' voltage.

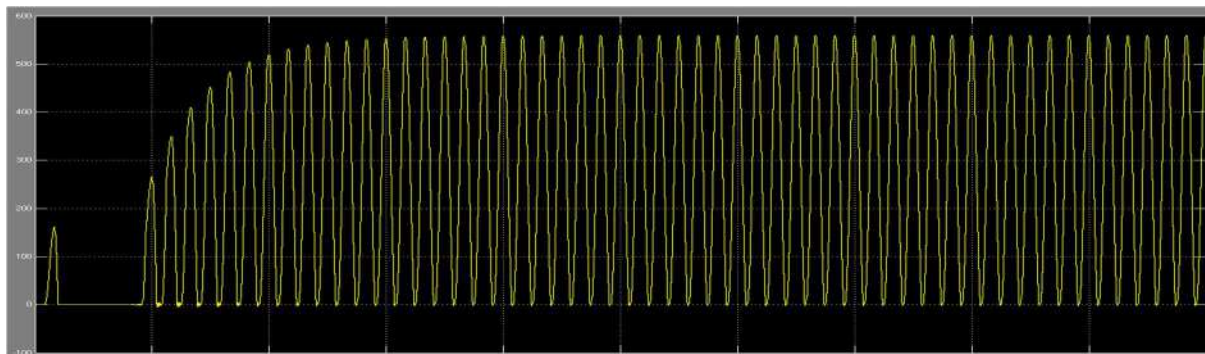


Fig : Line current waveform

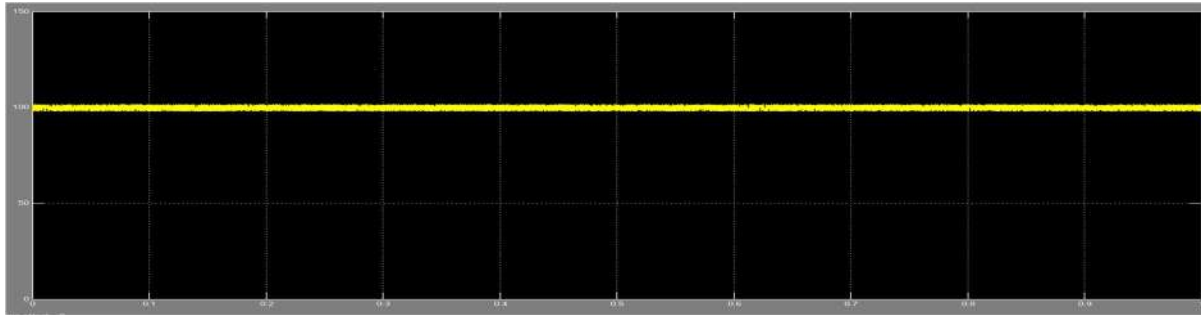
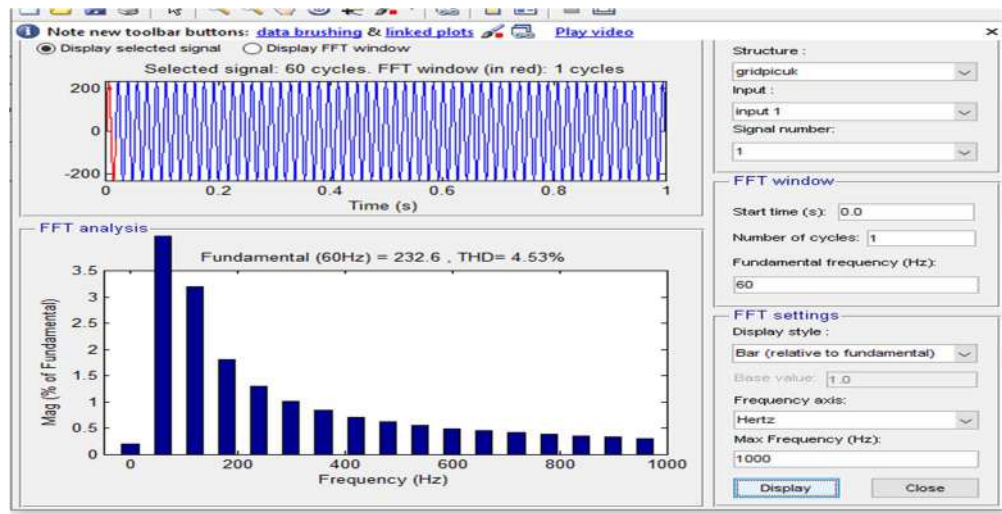
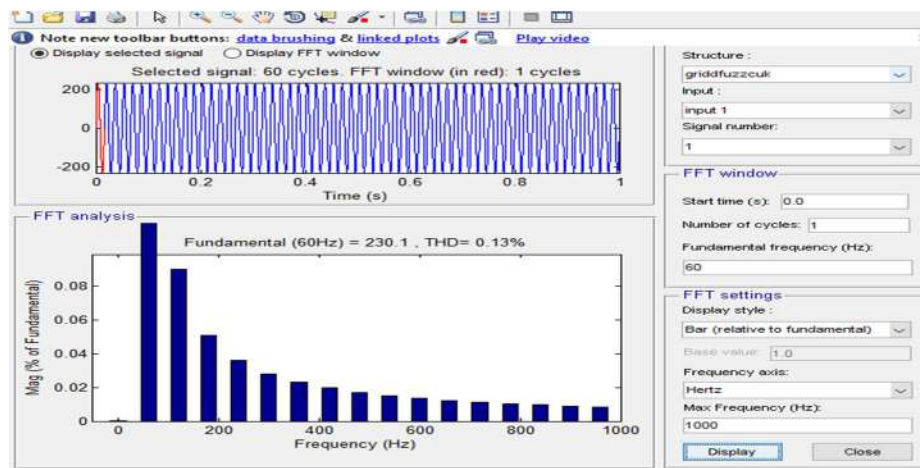


Fig : Battery output voltage

THD Of CUK Converter for EV CHARGER



THD of CUK Converter for EV CHARGER using FUZZY



Fuzzy logic is a convenient way to map an input space to an output space. Mapping input to output is the starting point for everything.

To determine the appropriate amount of tip requires mapping inputs to the appropriate outputs. Between the input and the output, the black box that can contain any number of things: fuzzy systems, linear systems, expert systems, neural networks, differential equations, interpolated multidimensional lookup tables, or even a spiritual advisor, just to name a few of the possible options. Clearly the list could go on and on.

Of the dozens of ways to make the black box work, it turns out that fuzzy is often the very best way. Why should that be? As Lotfi Zadeh, who is considered to be the father of fuzzy logic, once remarked: "In almost every case you can build the same product without fuzzy logic, but fuzzy is faster and cheaper

VII. CONCLUSIONS

An advanced PQ grounded EV bowl is proposed with BL Cuk motor conforming smaller number of conducting factors over single switching cycle. The proposed PFC Cuk motor offers excellent PFC characteristics in DCM mode using single voltage feedback control. thus, the size of the bowl is reduced. The added advantage of proposed topology is that the unwanted capacitive coupling circle is removed, as well as unwanted conduction through the body diode of inactive switch in preliminarily developed BL Cuk motor is avoided. This significantly improves the bowl effectiveness. The proposed bowl has shown satisfactory charging characteristics during steady state and over 50 variation in grid voltage. still, the PQ assessment of proposed bowl is attained as per the IEC 61000-3-2 guidelines over wide input voltage range. thus, the proposed bowl offers the doable EV charging volition for advanced power quality and effectiveness.

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