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# PERFORMANCE ANALYSIS OF AN OPEN-LOOP SEPIC-BASED AC-DC CONVERTER WITH PASSIVE POWER FACTOR CORRECTION FOR EV CHARGING APPLICATIONS

J.Bhavani<sup>1</sup>, P.Ramesh<sup>2</sup>, Poonam Upadhyay<sup>3</sup>, K.Sindhusha<sup>4</sup>, Balakrishna Pamulaparth<sup>5</sup>

<sup>1 2 3 4</sup>Electrical and Electronics Engineering, VNRVJIET, Telangana, India.

<sup>5</sup>Sr. Lead R& D Engineer, GE Technology Center, Hyderabad, Telangana, India.

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Corresponding author: J.Bhavani

(bhavani\_j@vnrojiет.in)

## ABSTRACT

The Single Ended Primary Inductor Converter (SEPIC) is widely employed in electric vehicle (EV) charging applications due to its capability to provide a non-inverted output voltage with both step-up and step-down operation. When interfaced with an AC supply through a diode bridge rectifier, SEPIC-based converters often suffer from poor input power factor (PF) and high total harmonic distortion (THD). This paper presents an open-loop SEPIC-based AC-DC converter integrated with a passive source-side input filter to improve input power quality without relying on closed-loop control or active current shaping. The proposed system is analyzed using MATLAB/Simulink under resistive(R), resistive-inductive(R-L), and battery (R-L-E) load conditions. Simulation results demonstrate considerable THD reduction and PF improvement across all load types. Owing to its structural simplicity and reduced control complexity, the proposed approach is suitable for cost-sensitive and retrofit EV charging systems.

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**KEYWORDS:** SEPIC converter, AC-DC conversion, passive power factor correction, total harmonic distortion, Electric vehicle charging.

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1. INTRODUCTION

The rapid growth of electric vehicles and renewable energy technologies has increased the demand for efficient and grid-compliant power electronic converters [1], [2],[19]. EV charging infrastructure, in particular, imposes stringent requirements on input power quality, as excessive harmonic distortion and poor power factor can adversely affect grid stability, increase distribution losses, and violate regulatory standards such as IEEE-519 and IEC-61000 [8],[15],[16].Therefore, improving power factor and minimizing harmonic distortion are essential design objectives.

Among non-isolated DC-DC converter topologies, the Single Ended Primary Inductor Converter (SEPIC) has gained significant attention due to its ability to operate in both buck and boost modes while maintaining a non-inverted output voltage [3]–[6]. Compared to conventional buck, boost, and buck-boost converters, SEPIC converters offer improved flexibility, lower component stress, and enhanced suitability for battery-based energy storage systems [4], [5], [14].

To interface with AC sources, SEPIC converters are typically preceded by diode bridge rectifiers. However, this configuration introduces significant current distortion and poor power factor due to the non-linear conduction of the rectifier[6],[7],[12]. Although closed-loop power factor correction (PFC) techniques can mitigate these issues, they require complex control algorithms, additional sensors, and higher system cost[9], [10].

Passive power factor correction techniques provide a viable alternative by improving input current quality through appropriately designed source-side filtering without increasing control complexity [11], [18]. Motivated by these considerations, this work investigates the performance of an open-loop AC-DC SEPIC converter with passive input power factor correction under different load conditions relevant to EV charging applications

This paper investigates a simplified open-loop SEPIC- based AC-DC converter with passive input power factor correction suitable for multi-load EV charging applications. The main contributions of this work are Analysis of power quality degradation in open-loop AC-DC SEPIC converters under multiple load conditions, Design and evaluation of a passive source-side filtering approach for power factor improvement THD minimization without closed-loop control, Comparative performance assessment with and without PFC for resistive, inductive, and battery loads.

The system architecture consists of an AC input source, an active filter, a rectifier stage, the SEPIC converter, and different load configurations including R, R-L, and battery loads. The block diagram is shown in (figure.1). By filtering harmonics at the input, the converter operates more efficiently, maintaining near-unity power factor and reduced harmonic distortion before DC conversion.

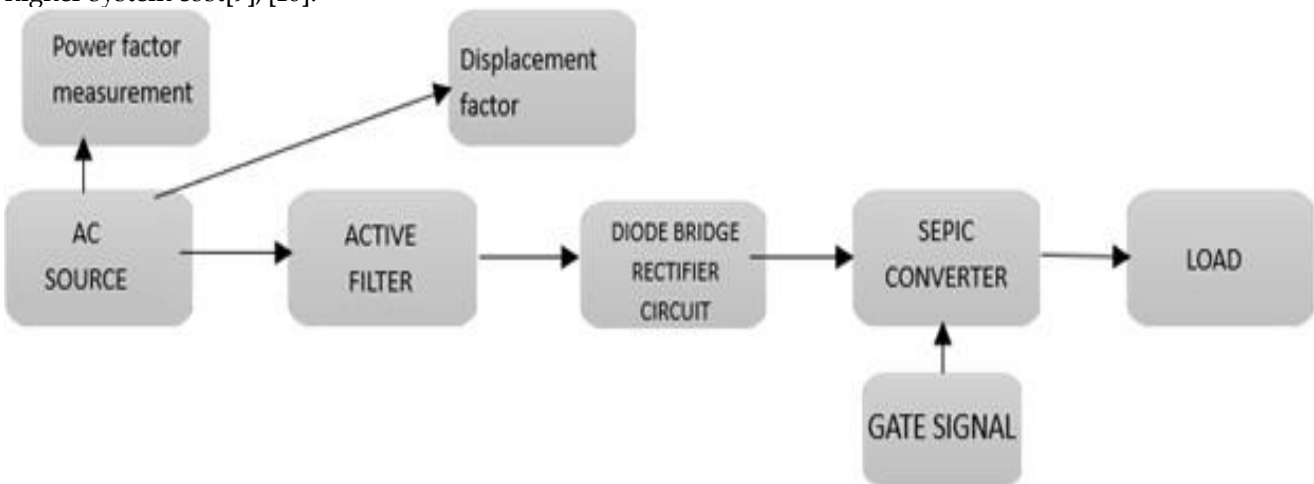


Figure 1: Block diagram of the Proposed AC-DC SEPIC converter.

2. EXISTING SYSTEM

In many recently deployed EV charging applications, the existing power conversion architecture primarily relies on converting AC supply into DC through a controlled rectifier stage, which is then followed by a SEPIC-based DC-DC

converter for voltage regulation and power transfer [1], [2].

In this configuration, the rectifier operates based on gate triggering signals, allowing controlled conduction Fig.2 and producing a regulated DC output that is stored across a smoothing capacitor located at the rectifier output. This DC voltage is

subsequently processed by the SEPIC converter to deliver a stable and appropriately regulated voltage

to the load typically a battery pack used for fast charging [4], [5].

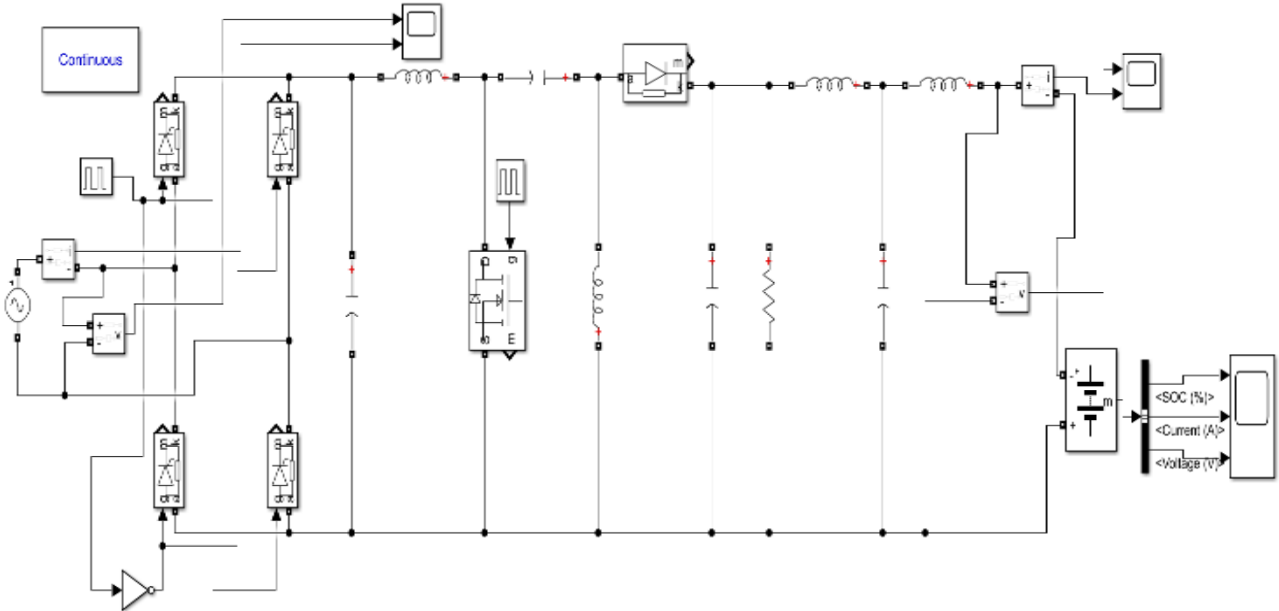


Figure 2: Circuit of the Existing System in Matlab Simulation.

Although this arrangement provides acceptable performance for basic charging tasks, it exhibits significant power quality limitations at the input side. Specifically, the system demonstrates a low power factor of approximately 0.5898 and a high total harmonic distortion (THD) of about 38.92%,

both of which exceed the permissible range defined by Institute of Electrical and Electronics Engineers standards [8]. The presence of excessive harmonics in the input current leads to inefficient power utilization, increased line losses, and potential interference with other connected grid equipment.

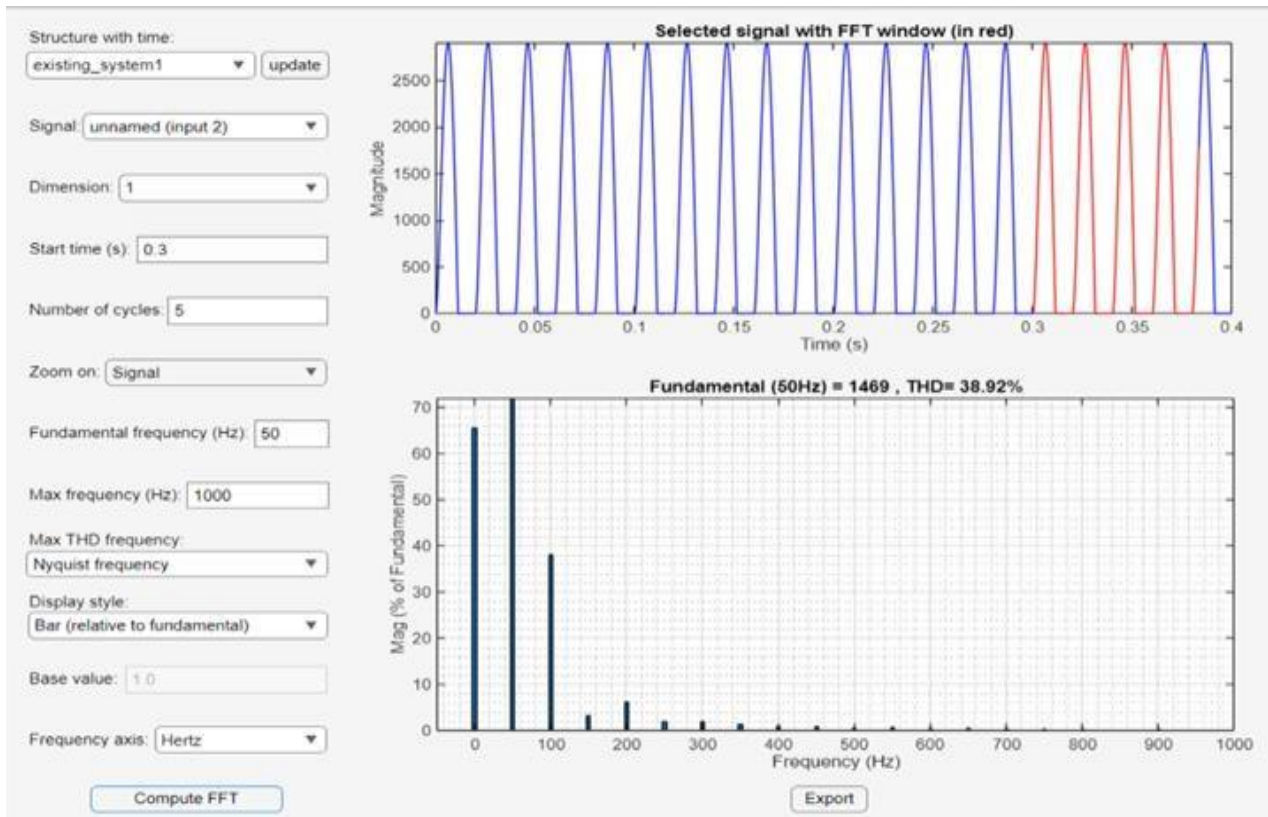


Figure 3: Simulation Results of THD Measurement of the Existing System in matlab Simulation.

Furthermore, because the converter is gate-controlled, the system requires an external triggering circuit, which increases both the complexity and the physical size of the hardware. This additional circuitry not only raises implementation costs but also reduces system reliability over extended operation [10]. (figures 2-4) in the original analysis illustrate the simulated performance of the conventional design, showing distorted input current waveforms, significant harmonic content, and poor alignment between input voltage and current waveforms.

These drawbacks clearly indicate that while the traditional AC-DC SEPIC architecture is effective in regulating output voltage, it falls short in terms of power factor and harmonic mitigation. This shortcoming

motivates the development of a simplified, filter-based solution capable of improving power quality at the source side without relying on additional complex control mechanisms [6], [7].

A conventional AC-DC SEPIC system consists of an uncontrolled diode bridge rectifier followed by a DC-DC SEPIC converter [4], [5]. A bulk capacitor is used at the rectifier output to smooth the DC voltage before it is supplied to the SEPIC stage.

The inductor current ripple is considered from the standard value i.e., 20% of the input current.

Allowed inductor current ripple  $\Delta I_L = 20\%$  of  $I_{in}$  Duty Cycle (SEPIC)

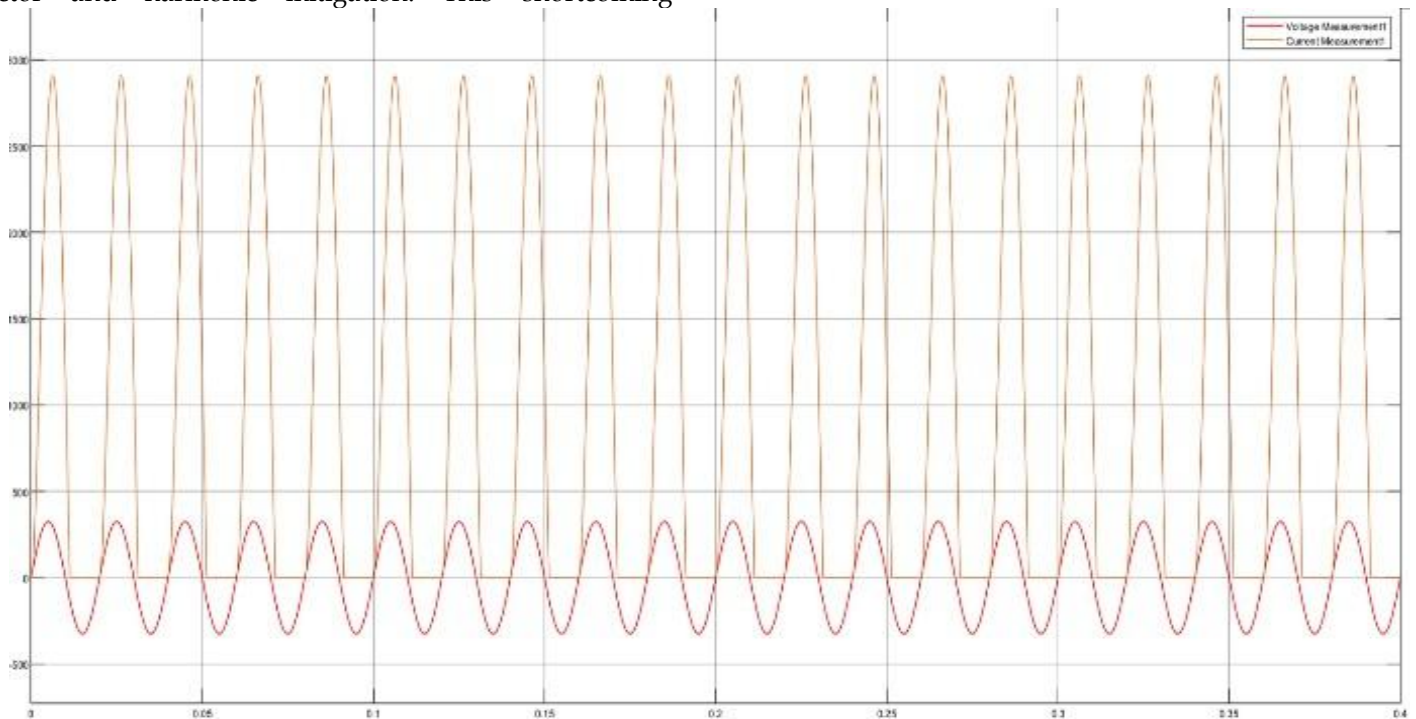


Figure 4: Simulation results of input voltage and current measurements of the existing system in matlab simulation.

Simulation analysis of the existing system shows that the input current wave form is highly distorted and not in phase with their put voltage. Theme assured power factor is approximately 0.5898, while the THD is around 38.92%, exceeding the limits specified by IEEE power quality standards [8]. These issues are primarily caused by the absence of any power factor correction mechanism and the inherent non-linear behavior of the diode rectifier.

### 3. MATHEMATICAL ANALYSIS

To design the proposed converter, a set of theoretical calculations was performed to determine the key component values required to ensure efficient and stable operation. The analysis was first carried out for a purely resistive load, and the same procedure can be extended to other load configurations including R-L and battery loads.

The SEPIC converter topology is chosen because of its ability to regulate voltage in both step-up and step-down

modes, making it well-suited for EV charging applications

$$I_{L2,peak} = 61.75 + 9.88 = 71.6A$$

From the capacitor equation

$$C = \frac{I_O * D}{f_s * \Delta V_c}$$

$$f_s * \Delta V_c$$

For  $\Delta V_c = 5V$ :

$$C = \frac{(61.75 * 0.603)}{(55,000 * 5)} = 135 \mu F$$

$$(55,000 * 5)$$

Similarly the voltage ripple of the capacitor is also considered from the standard value i.e., 5% of the output voltage.

$$\Delta V = 24.7V * (5\% \text{ of } V_O)$$

Ripple voltage (5% of  $V_O$ ):

$$\Delta V = 0.05 * V_O$$

$$\Delta V = 0.05 * 494 = 24.7V$$

Capacitor with  $\Delta V_c = 4.94V$ :

[3],[4]. For this project, the selected load power is 30.5kW, with the following design specifications.

Output power  $P_{out} = 30,500W$  (30.5kW)

$$C_2$$

$$C_2$$

$$= \frac{I_O * D}{f_s * \Delta V_c}$$

$$f_s * \Delta V_c$$

$$= \frac{61.75 * 0.603}{4.94 * 55,000} = 137.05 \mu F$$

$$4.94 * 55,000$$

Load resistance  $R = 8\Omega$

Input DC voltage  $V_{in} = 325V$  Output voltage

Distortion Factor (DF)

$$DF = \frac{1}{\sqrt{(1+(THD)^2)}} \\ V_o = \sqrt{P_{out} * R}$$

$$DF = \frac{1}{\sqrt{(1+(0.1972)^2)}} \\ = 0.9811$$

$$V_o = \sqrt{30.800 * 8} = 494V$$

$$\sqrt{(1+(0.1972)^2)}$$

Displacement Factor ( $\cos\phi_1$ )

Output current

$$I_o$$

$$= \frac{V_o}{R}$$

$$R$$

$$494$$

$$\cos\phi = 0.9867$$

Overall Power Factor (PF)

$$PF = DF * \cos\phi$$

$$I_O =$$

$$= 61.75A$$

$$8$$

$$PF = 0.9811 * 0.9867 = 0.968$$

These theoretical calculations provide a base line for

Switching frequency  $f_s = 55kHz$  Efficiency  $\eta = 0.95$

Sizing the key components of the SEPIC converter, ensuring stable operation for resistive loads and easy adaptability for

other types of loads. By designing the system with minimal ripple and optimized duty cycle, the converter achieves high efficiency and an improved input power factor, supporting compliance with Institute of Electrical and Electronics Engineers power quality standards [8].

### 4. PROPOSED SYSTEM WITHOUT POWER FACTOR CORRECTION FOR VARIOUS LOADS

In the proposed configuration, an open-loop SEPIC converter is interfaced with an uncontrolled diode bridge rectifier and powered through an AC source. This configuration allows the system to function with various load conditions while keeping the control circuit simple and hardware cost low. However, prior to applying any power factor correction (PFC), it is essential to evaluate the baseline performance of the system for different types of loads including resistive(R), resistive-inductive(R-L), and battery (R-L-E) loads [5], [6]. The power switch that is preferred to this utilized is BJT at it is designed for high power application.

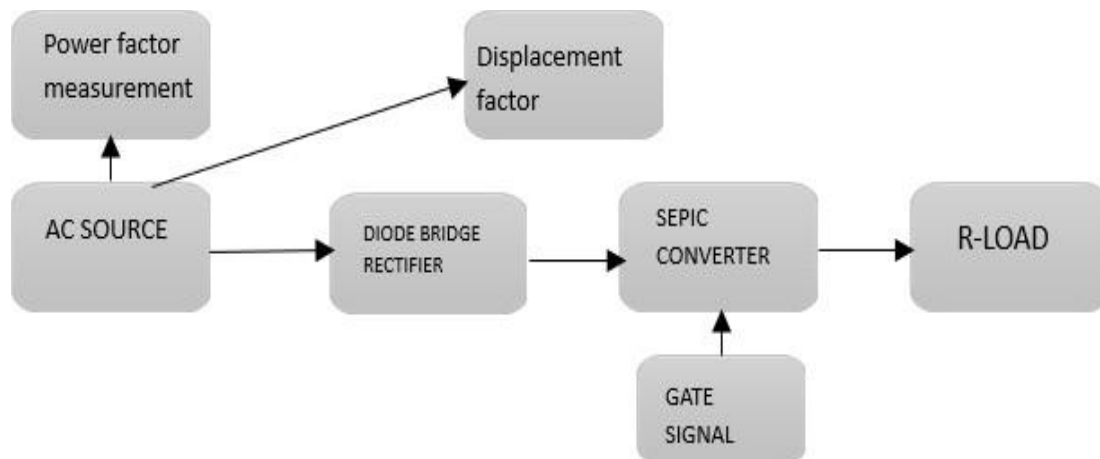


Figure 5: Block diagram of power factor measurement of the proposed system without power factor correction with R-LOAD.

The open-loop design is selected to focus on the natural harmonic behavior of the system without the influence of additional control algorithms. By doing so, it becomes easier to assess the extent of distortion in input current waveforms and its impact on power quality parameters such as power factor and Total harmonic distortion (THD) [8]. The block diagram of the proposed system is shown in (figure 5).

#### 4.1. Performance with R-load

The first simulation is conducted using a purely resistive load to establish a reference case. The block diagram of the R-load configuration is shown in Fig.5. The system is modeled and executed in MATLAB/Simulink, and the input

Voltage and current wave forms are presented in (Figure 6).

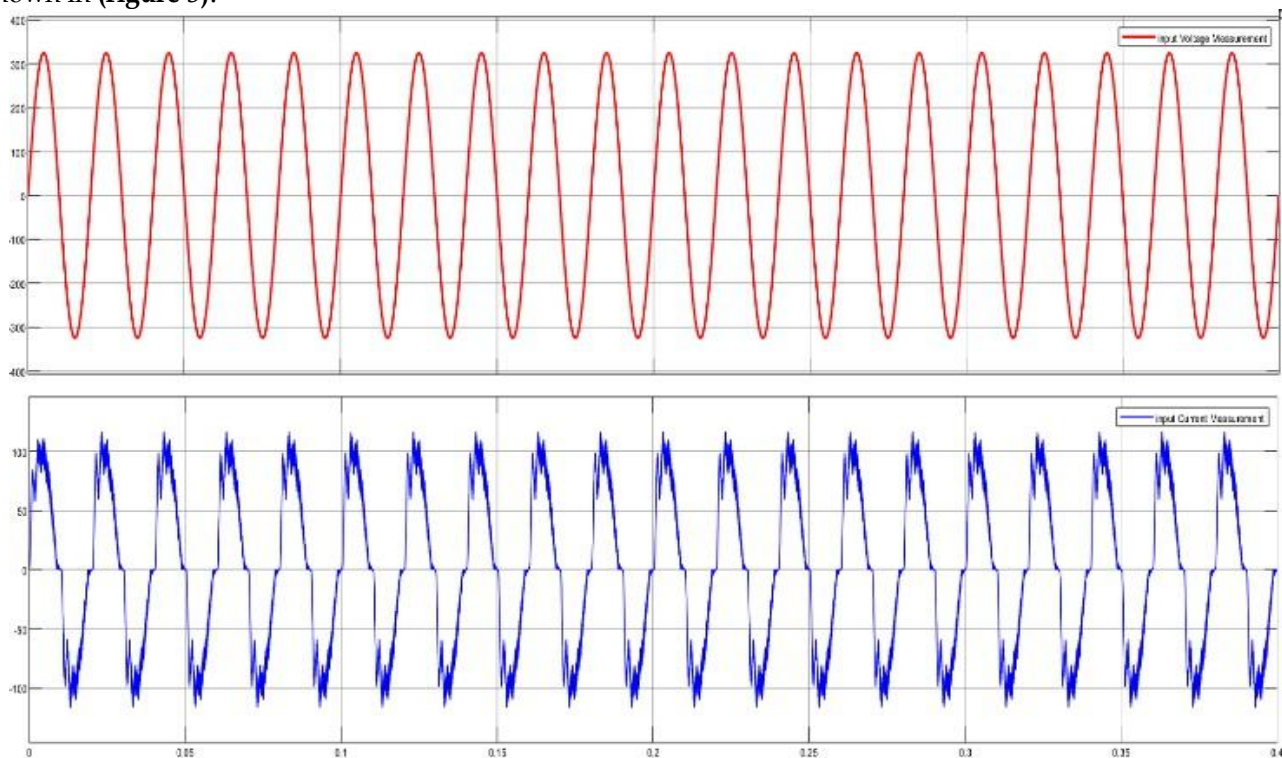


Figure 6: Simulation results of input voltage and current measurements of the proposed system without power factor correction for R-load in matlab simulation.

It can be observed that the input current contains significant harmonic distortion and is not in phase with the input voltage, leading to a decrease in power quality. The THD analysis obtained from the simulation, shown in (Figure7),

indicates that the THD is approximately 19.71%, which is far from the recommended standard of less than 5% [8]. This distortion results in reduced power factor and increased line losses.

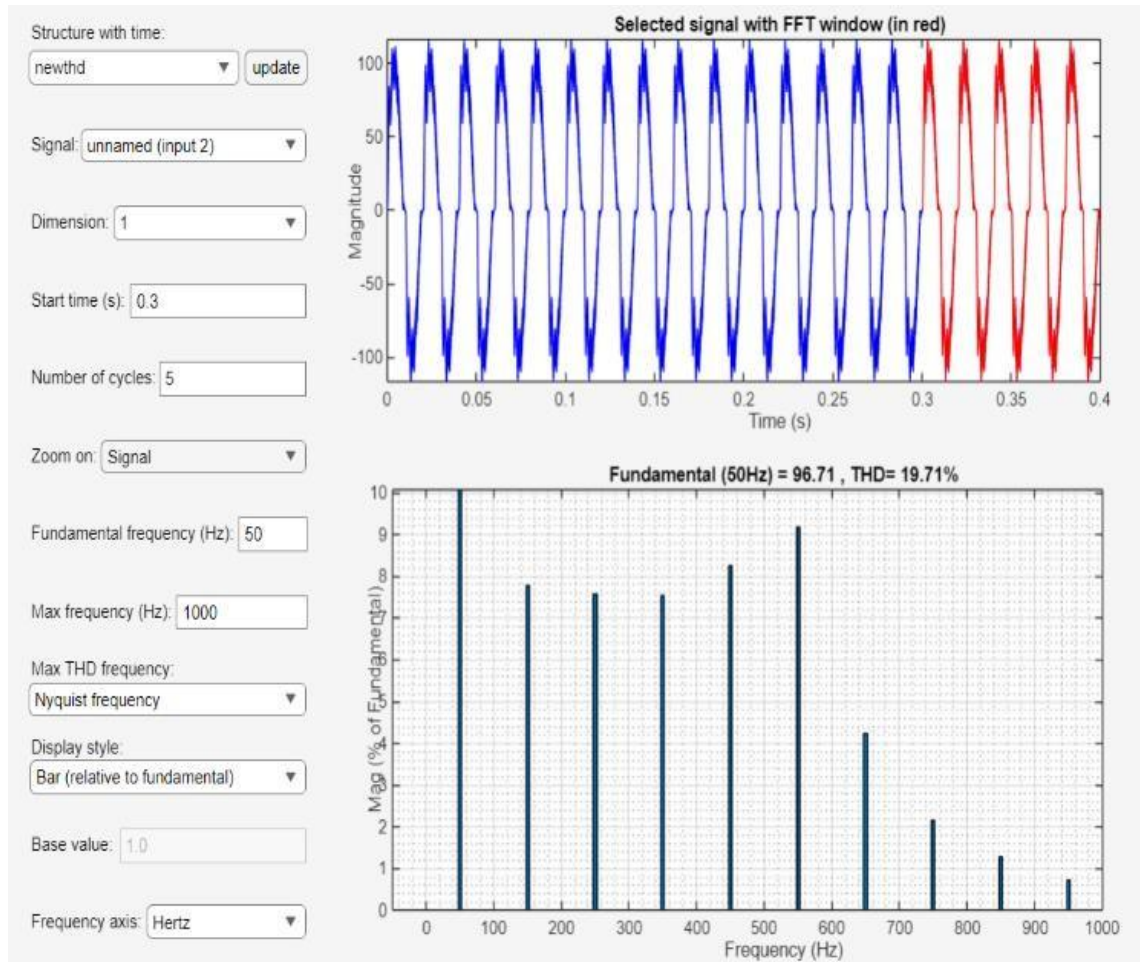


Figure 7: Simulation results of THD measurement of the proposed system without power factor correction for R-load in matlab simulation.

4.2. Performance with R-L Load

Next, the system is tested with a resistive-inductive load to observe the impact of inductive

component on system performance. The block diagram for this configuration is shown in (Figure 8).

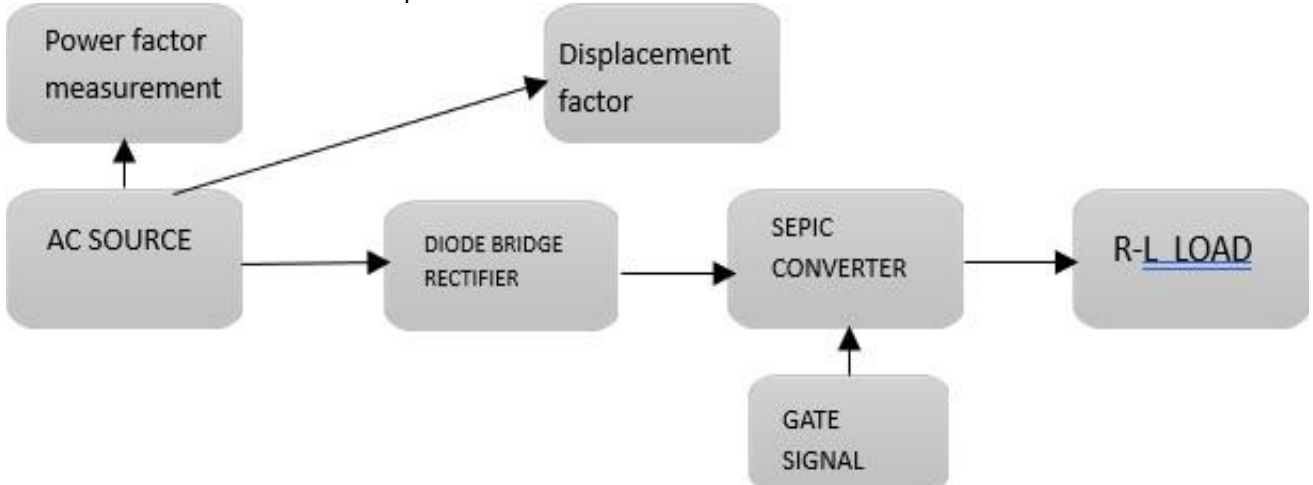


Figure 8: Block diagram of power factor measurement of the proposed system without power factor correction with R-L LOAD.

As expected, the presence of inductance introduces an additional phase shift between input

voltage and current, causing a further drop in power factor and rise in harmonic distortion.

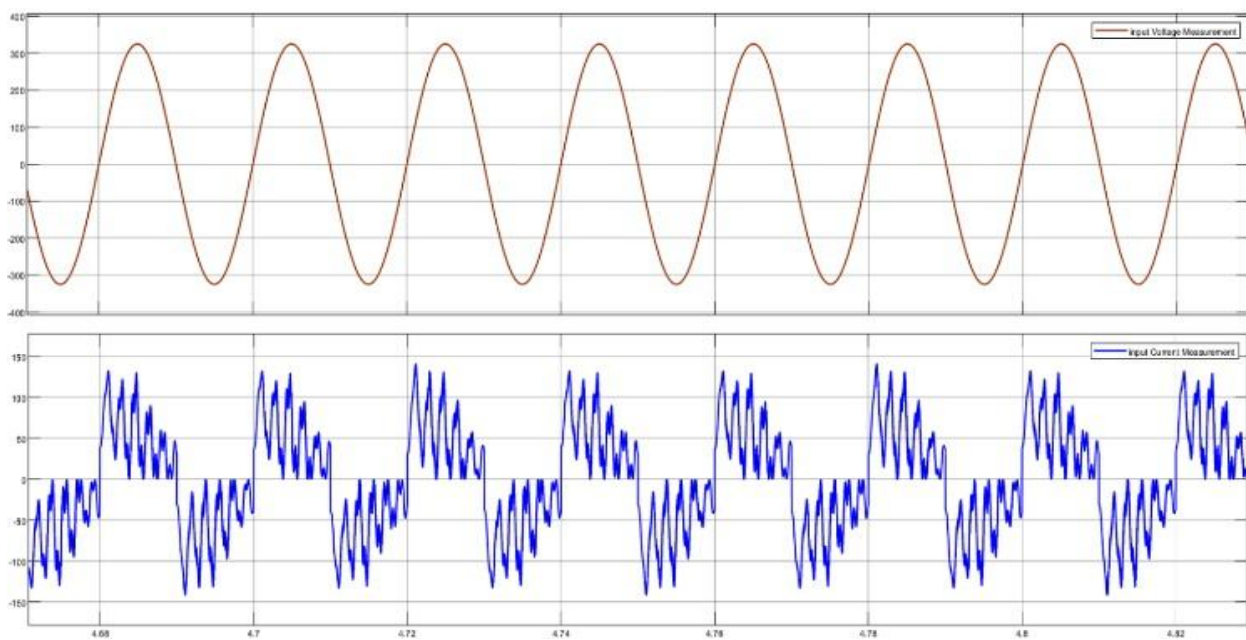


Figure 9: Simulation results of input voltage and current measurements of the proposed system without power factor correction for R-L load in matlab simulation.

Simulation results reveal that the power factor drops to approximately 0.7183, and the THD increases significantly to 69.44%, as illustrated in (Figure.9 and 10). The distortion of the current

waveform is more severe than in the purely resistive case, confirming that inductive loading worsens input power quality without PFC measures [6], [7].

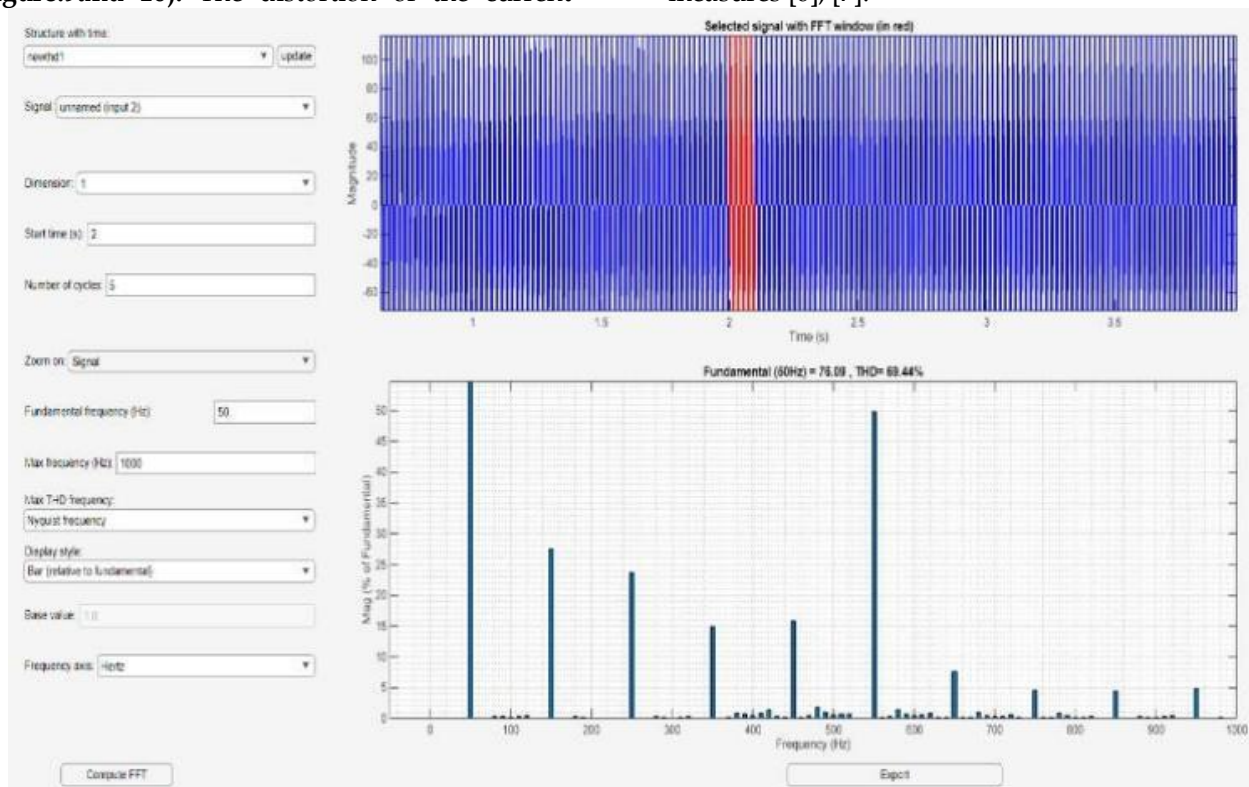


Figure 10: Simulation results of THD measurement of the proposed system without power factor correction for R-L load in matlab simulation.

### 4.3. Performance with BATTERY Load(R-L-E)

Finally, the open-loop system is evaluated using a battery load(R-L-E configuration), which closely

resembles the real-world charging scenario for electric vehicle applications [1], [2]. The block diagram for this test case is shown in (Figure 11).

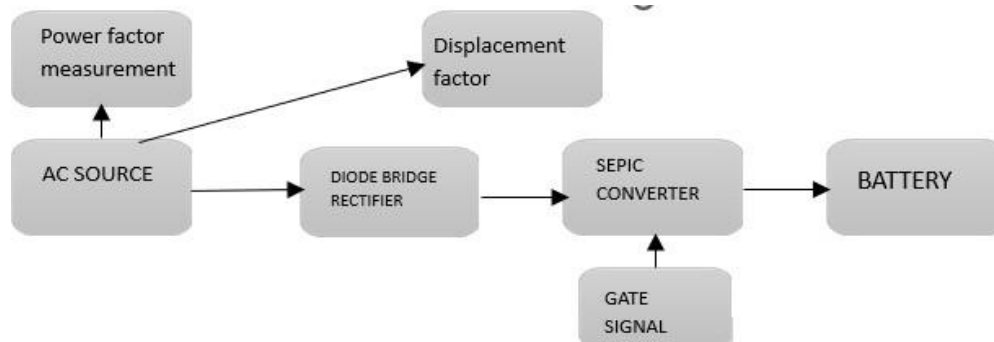


Figure 11: Block diagram of power factor measurement of the proposed system without power factor correction with R-L-E LOAD/BATTERY.

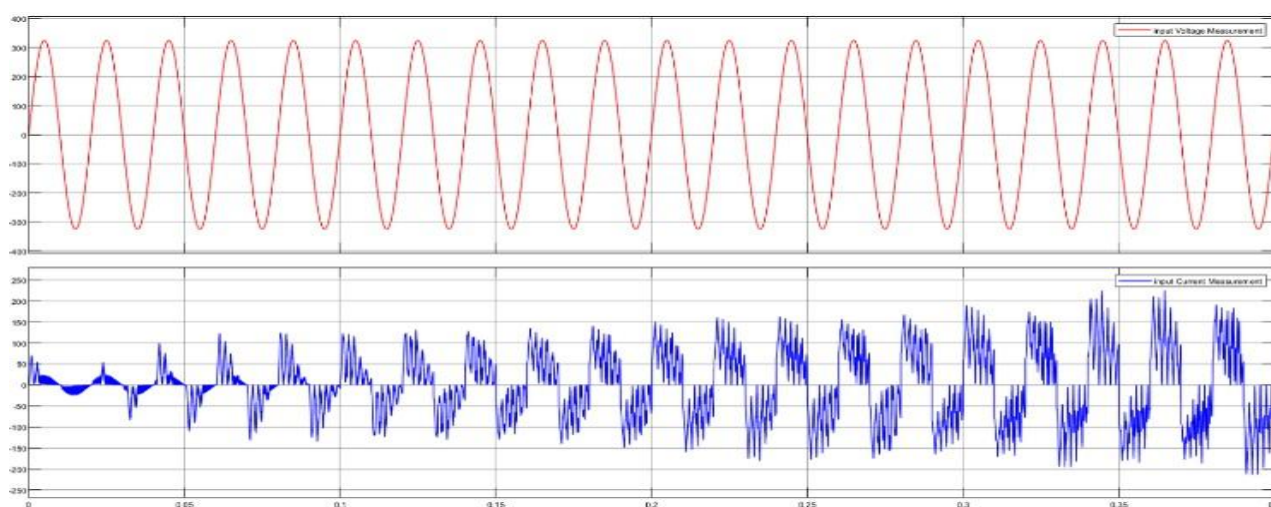


Figure 12: Simulation results of input voltage and current measurements of the proposed system without power factor correction for R-L-E load or battery load in matlab simulation.

The simulated input voltage and current waveforms (Figure 12) display considerable distortion, while the THD spectrum (Figure 13) shows a THD level of 67.77%. The measured power factor is 0.8042, which, although slightly better than

the R-L case, remains well below the ideal range. This indicates that battery charging introduces nonlinear current characteristics that further degrade power quality at the source side.

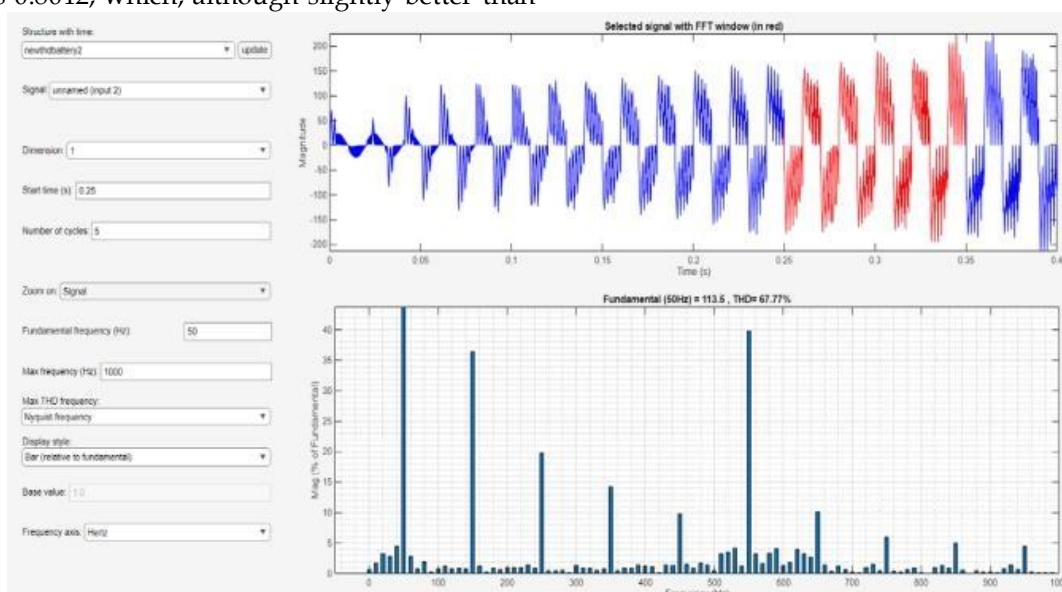


Figure 13: Simulation results of THD measurement of the proposed system without power factor correction for R-L-E load or battery load in matlab simulation.

Across all three load conditions R, R-L, and R- L-E the system consistently exhibits poor input power factor and high harmonic distortion. The worst performance is observed under inductive and battery loads, where THD exceeds 60%. This level of distortion not only violates Institute of Electrical and Electronics Engineers harmonic standards but can also cause increased thermal stress on components, higher transmission losses, and degraded grid performance [8], [9].

The results clearly indicate that without appropriate power factor correction mechanisms, the open-loop SEPIC configuration cannot meet modern grid power quality requirements. This motivates the inclusion of filtering solutions at the input side, as discussed in the following section.

### 5. PROPOSED SYSTEM WITH POWER FACTOR CORRECTION FOR VARIOUS LOADS

To address the poor power factor and high harmonic distortion observed in the previous section, an active input filter was introduced at the AC source side of the open-loop SEPIC converter. The purpose of this filter is to suppress harmonic components at the point of entry, ensuring that the

current waveform closely follows the voltage waveform. This method achieves power factor correction (PFC) and Total harmonic distortion (THD) reduction without the need for complex control circuitry [5], [7].

The selected filter is sized based on the system’s operating frequency and harmonic content. By optimizing the filter inductance, the converter maintains near-sinusoidal current input, minimizes phase displacement, and complies with the Institute of Electrical and Electronics Engineers harmonic standards [8]. Simulation studies were conducted for R, R-L, and R-L-E (battery) load conditions to verify performance improvements.

#### 5.1. Performance with R-Load

Initially, the system was tested with a purely resistive load and an active filter placed at the source. The simulation wave forms (**Figure14**) and the THD is shown in (**figure 15**) show a clear improvement in input current quality, which is now almost perfectly in phase with the input voltage. The measured power factor improved to 0.9056, compared to 0.8941 without the filter.

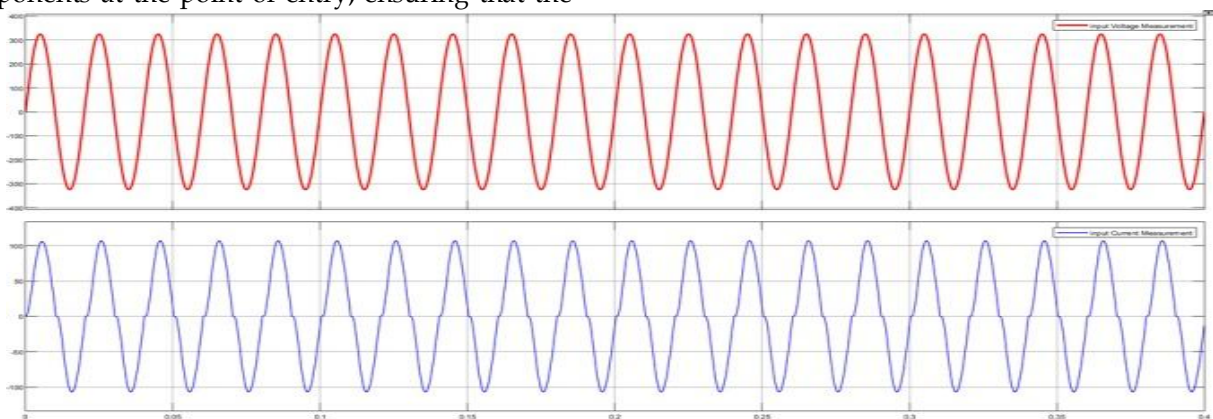


Figure 14: simulation results of input voltage and current measurements of the proposed system with filter for R-load in matlab simulation.

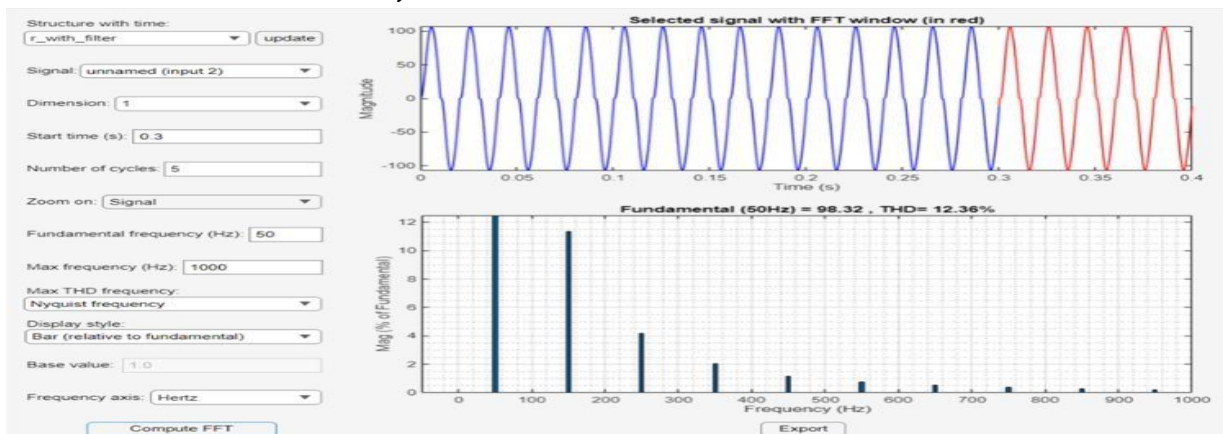


Figure 15: Simulation results of THD measurement of the proposed system without power factor correction for R-L-E load or battery load in matlab simulation

### 5.2. Performance with R-L Load

The system was next evaluated with a resistive-

inductive(R-L) load, which had previously shown the worst harmonic profile.

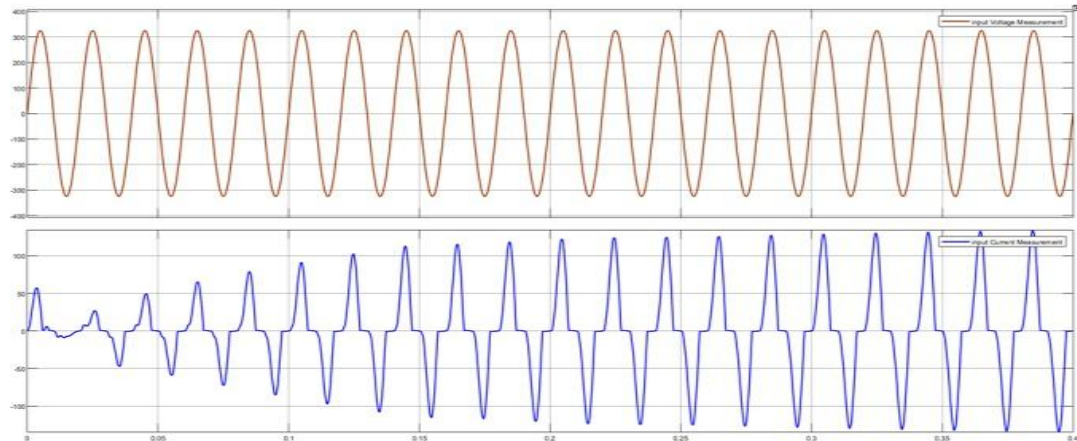


Figure 16: Simulation results of input voltage and current measurements of the proposed system with filter for R-load in matlab simulation.

By using a filter inductance of 15 mH, the power factor increased to 0.9127, and THD dropped from 69.44% to 16.31%, as illustrated in (Figure 16 and 17).

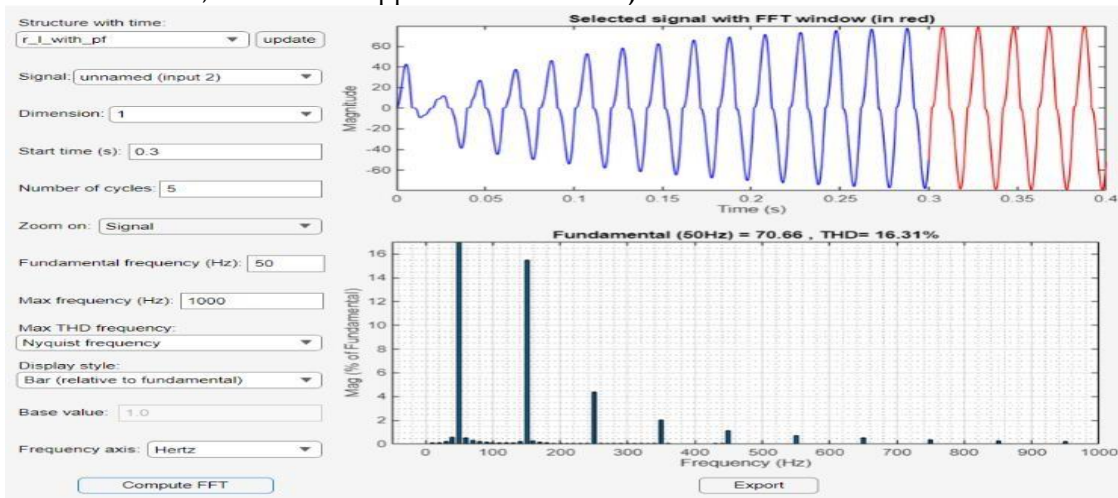


Figure 17: Simulation results of THD measurement of the proposed system without power factor correction for R-L load or battery load in matlab simulation.

inductance of 80mH was used in this case. As shown in (Figure 18), the input current waveform is almost sinusoidal, with only minor distortion visible.

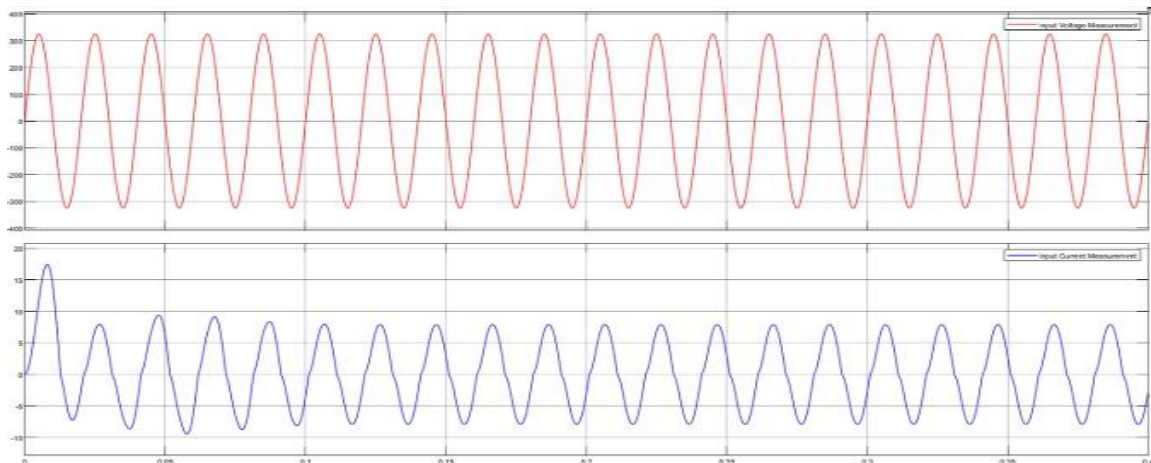


Figure 18: Simulation results of input voltage and current measurements of the proposed system with power factor correction for R-L-E load or battery load in matlab simulation.

The power factor improved to 0.9056, and the THD decreased significantly to 7.77%, which is very close to the IEEE recommended limit of 5% for low-voltage systems [8]. (Figure 19) depicts the harmonic profile for this test case. This confirms that properly designed filtering can effectively correct the power factor even for nonlinear and inductive loads.

Although the presence of inductance still causes some residual distortion, the overall waveform

shape shows a significant reduction in high-frequency harmonic components. With further fine-tuning of the filter value, THD can be reduced even further, meeting or approaching IEEE harmonic limits [8], [9].

### 5.3. Performance with R-L-E Load

Finally, the system was tested under battery load conditions, which are the most representative of practical EV charging applications [1],[2]. A filter

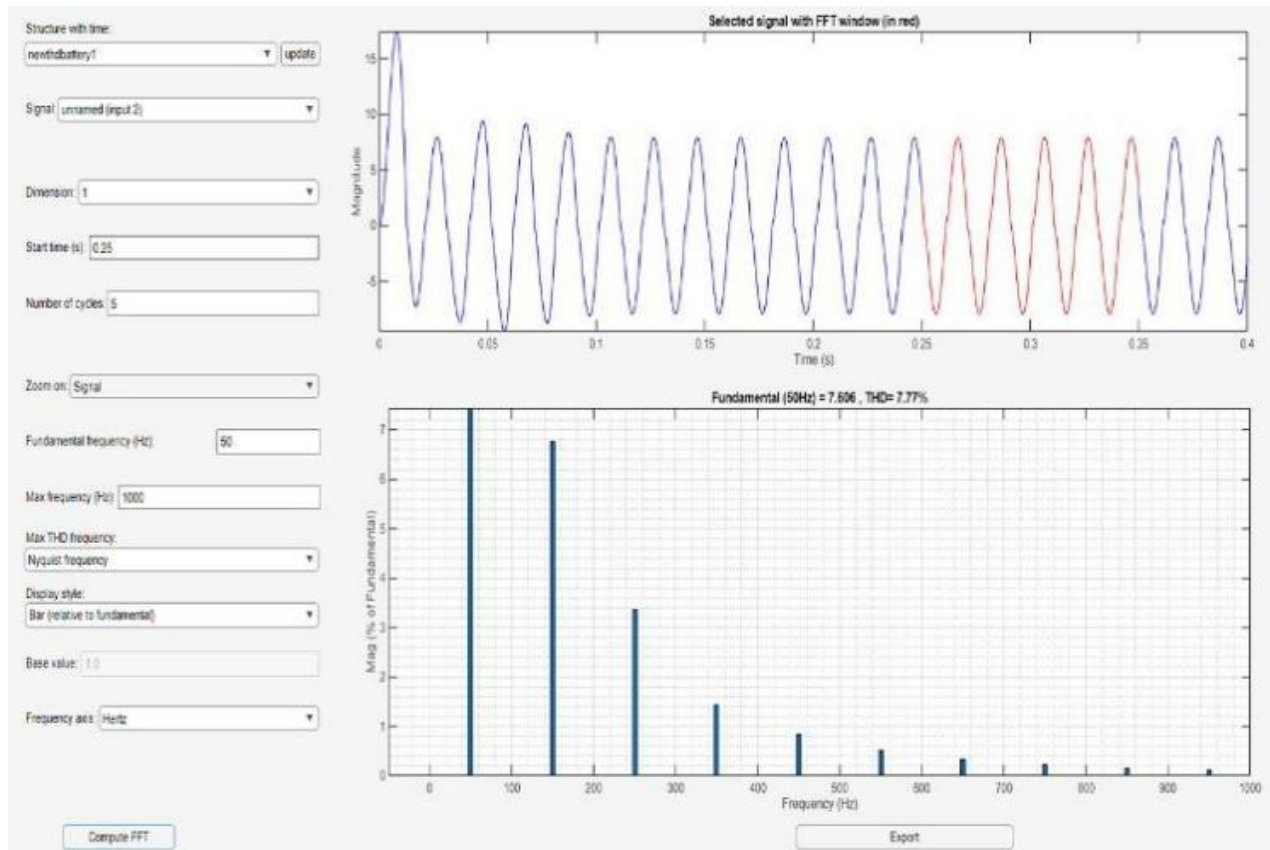


Figure 9: Simulation results of THD measurement of the proposed system with power factor correction for R-L-E load or battery load in matlabsimulation.

The comparison across the three load conditions clearly demonstrates the effectiveness of the proposed filtering approach. While the R-L-E (battery) configuration initially had one of the highest THD levels, it achieved the

Most significant improvement after adding the filter. The improved power factor across all load types not only enhances the efficiency of power transfer but also minimizes grid disturbances, reduces component stress, and improves system reliability [6], [8]. Moreover, this strategy avoids the complexity and cost associated with closed-loop or active control methods while still providing substantial harmonic mitigation.

## 6. IMPLEMENTATION OF PROPOSED SYSTEM TO THE EXISTING SYSTEM

The previously discussed filter-based power factor correction (PFC) technique was integrated into the existing SEPIC-based AC-DC architecture to evaluate its impact on improving the overall power quality of the legacy system. As analyzed earlier, the baseline performance of the existing configuration without any PFC exhibited a low power factor of 0.5898 and a high THD of 38.92%, which falls outside the acceptable range set by the Institute of Electrical and Electronics Engineers standards [8].

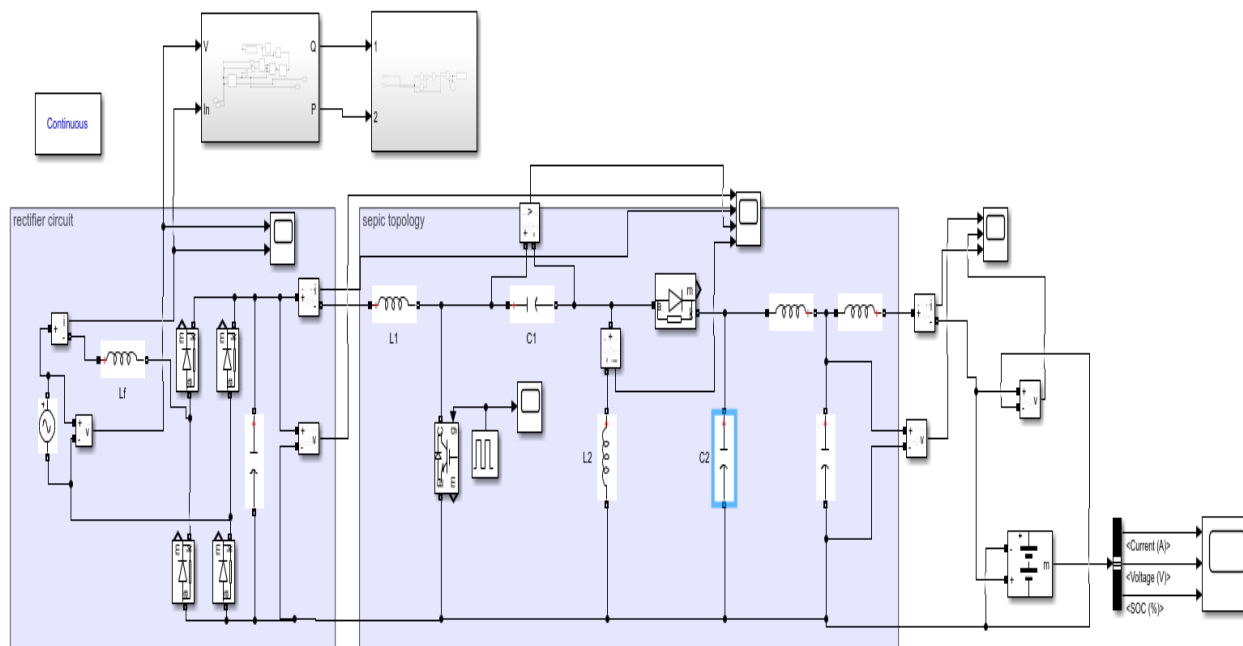


Figure 20: Simulation of the proposed system from the existing system.

For this implementation, the same filter value to the existing system (Figure 20), which provided the best results for the battery load in the proposed system, was connected at the input side of the existing converter. The intention was to validate the versatility of the filter design and to assess whether similar improvements in power factor and THD could be achieved without modifying the core power conversion stage [5], [7].

This THD level not only satisfies but exceeds IEEE harmonic distortion standards, which typically allow up to 5% THD shown in (figure 22) for low-voltage systems [8], [9].

The significant improvement achieved through this straightforward filtering technique demonstrates that the proposed method can be retrofitted into existing power converter architectures without requiring complex redesigns or additional control algorithms. This approach simplifies implementation, reduces overall system cost, and enhances compatibility with modern grid standards.

Furthermore, by eliminating the need for gate-controlled rectifiers, the system can also avoid the external triggering circuitry that adds bulk and complexity.

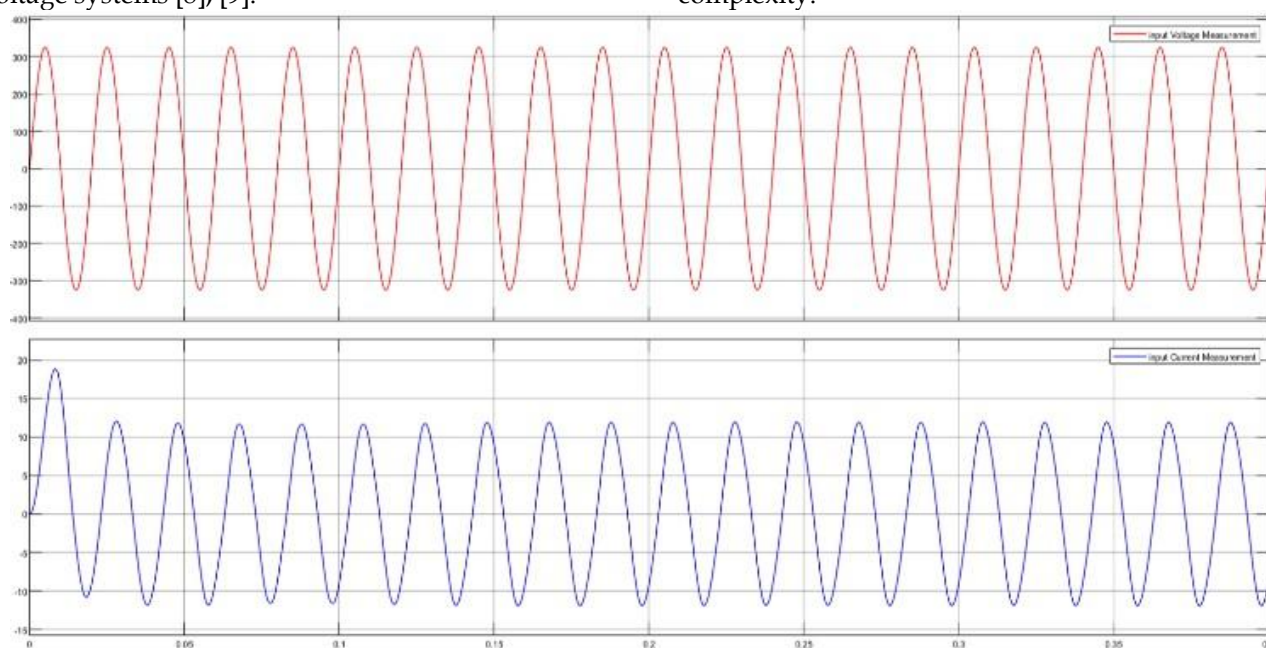
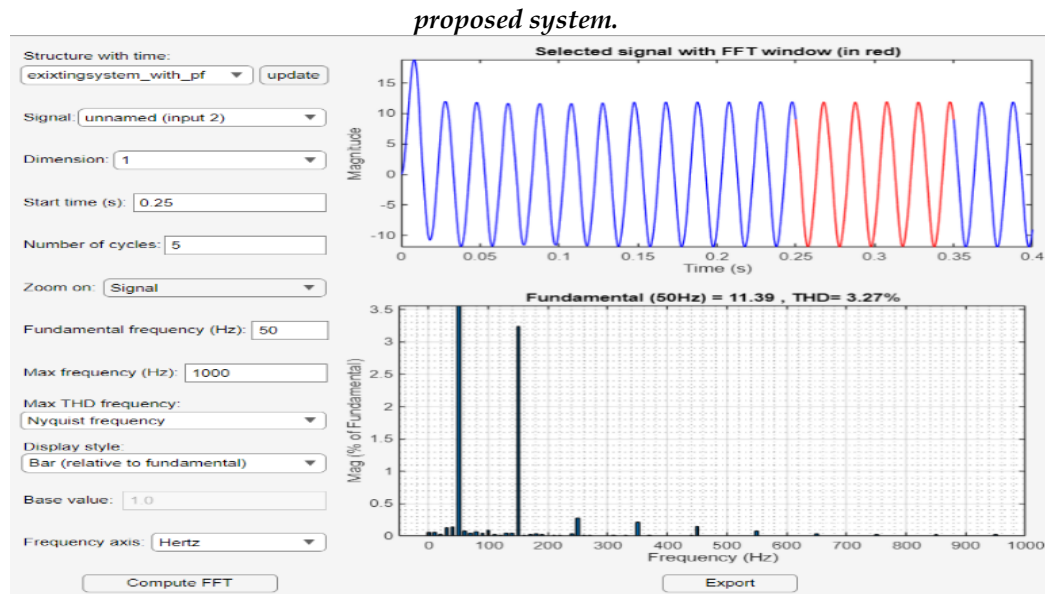


Figure 21: Simulation results of input voltage and current measurements of the existing system from the



**Figure 22: simulation resultsofTHDmeasurementof the existing systemfrom the proposed system.**

This results in a more compact, cost-effective, and efficient solution [10].

The performance of the proposed system has been analyzed for different load types, both with and without power factor correction. Table I presents the comparative results, showing the power factor (PF) and THD values obtained under various test conditions.

### 7. PASSIVE INPUT POWER FACTOR CORRECTION

To mitigate the observed power quality issues, a passive source-side input filter is introduced at the AC supply. Passive filtering has been reported as an effective and low-cost approach for harmonic mitigation in AC-DC converters [6],[9]. Passive filtering is a well-established and cost-effective approach for harmonic mitigation in single-phase AC-DC converters [11], [18]&[21].

The simulation results (**Figure 21 and 22**) clearly illustrate a substantial enhancement in waveform quality. The input voltage and current waveforms are now more closely aligned, with reduced distortion and improved

sinusoidal characteristics.

The measured power factor increased from 0.5898 to 0.632, and the THD decreased dramatically from 38.92% to 3.27%.

A parametric analysis is performed to determine the optimal filter inductance. Increasing inductance significantly reduces lower-order harmonics up to an optimal value, beyond which further improvement becomes marginal. This behavior highlights a tradeoff between harmonic mitigation and component size, consistent with reported studies [7], [12].

Performance With Passive Filter applied in the system is re-evaluated for all load conditions. For the resistive load, the power factor improves to approximately 0.9056. In the R-L load case, THD is reduced from 69.44% to about 16.31%, and the power factor improves to 0.9127. For the battery load, THD is reduced to approximately 7.77% with a corresponding power factor of 0.9056. These results are comparable with other passive PFC-based SEPIC configurations reported in the literature [6], [7],[18].

**Table 1: Title of the table**

TypeOf Load	WithoutPFC		With PFC	
	PF	THD	PF	THD
R-LOAD	0.8941	19.71%	0.9056	12.36%
R-LLOAD	0.7183	69.44%	0.9127	16.37%
R-L-E LOAD	0.8042	67.77%	0.9056	7.77%
EXISTING SYSTEM	0.5898	38.32%	0.632	3.27%

### 8. COMPARISON WITH CLOSED-LOOP TECHNIQUES

Closed-loop PFC methods can achieve near-unity power factor and low THD but require

additional sensors, controllers, and complex control algorithms [9], [10]. In contrast, the proposed passive filtering approach offers reduced complexity, improved reliability, and lower implementation cost. While the achievable

power quality is slightly inferior to closed-loop solutions, the proposed method provides a practical compromise for cost-sensitive applications [6].

## 9 COMPONENT STRESS AND PRACTICAL CONSIDERATIONS

The introduction of the passive input filter affects current stress on input-side components. Peak and RMS currents of the switch, diodes, inductors, and capacitors are evaluated through simulation to ensure safe operation [5].

Although a BJT is used in simulation for conduction analysis, practical high-power implementations typically employ IGBTs or wide-bandgap devices such as SiC MOSFETs to enhance efficiency and thermal performance [4]. The relatively large size of the passive filter limits its use in compact onboard chargers but makes it suitable for stationary and retrofit EV charging systems.

## 10. FUTURE SCOPE

Future work will focus on hardware implementation and experimental validation of the proposed system. The integration of closed-loop control strategies, adaptive filter tuning, and wide-bandgap semiconductor devices may further enhance performance and efficiency [17], [20].

Another potential area of extension is the enhancement of fast charging capability for EV applications by improving the output regulation

and charging profile. Incorporating smart controller AI-based algorithms may lead to further reduction in THD and improved stability, even under nonlinear loading [1],[2]. Moreover, hardware implementation and experimental validation can be carried out to support the simulation findings and to explore the real-world performance of the proposed system.

## 11. CONCLUSION

This paper presented a detailed performance analysis of an open-loop AC-DC SEPIC converter with passive input power factor correction under multiple load conditions. Simulation results demonstrate significant improvement in input power factor and substantial reduction in THD without the use of complex control strategies. The simplicity, scalability, and retrofit capability of the proposed approach make it suitable for low- and medium-power EV charging and other grid-connected power electronic applications.

## 12. CONFLICTS OF INTEREST

"The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper."

## 13. FUNDING STATEMENT

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## REFERENCES

- [1] Dr.A.SanthiMaryAntony,NandaKishoreV2,AnujaMRSen,VimaleshG,MonishaA,VishnusimharD,"DC-DC Converter for Fast Charging Li-Ion Battery in Electric Vehicle", 2023 IEEE | doi: 10.1109/ICSES60034.2023.10465492
- [2] SMSajjadHossainRafin,RejaulIslam,OsamaA.Mohammed,"Overview of Power Electronic Converters in Electric Vehicle Applications".2023,IEEE | doi:10.1109/3DPEIM55914.2023.1005252.
- [3] Slimane HADJI, Abdelhakim BELKAID, Korhan KAYISLI, Ilhami COLAK, Said AISSOU, Lylia LARBI,"A Comparative Analysis of Cuk, SEPIC, and Zeta Converters as Maximum Power Point Trackers",.2024IEEE | doi:10.1109/icSmartGrid61824.2024.10578258
- [4] LipingMo,YiboWang,ChaoqiangJiang,XiaoshengWang,BenZhang,"ANovelTopologyDerivationMethod Revealed From Classical Cuk, Sepic,andZetaConverters,".IEEE TRANSACTIONSONPOWERELECTRONICS,VOL.39,NO.7,JULY2024.0885-89932024  
IEEE. Personal use is permitted, but, republication/redistribution requires <https://www.ieee.org/publications/rights/index.html> for more information.
- [5] Shilpa Rathod, M.S.Aspalli,"Design And Analysis Of SEPIC Converter For EV Battery Charging Applications with IOT Based Monitoring System".2022IEEE | doi:10.1109/MysuruCon55714.2022.9972427.
- [6] I.AhmedandMuhibulHaqueBhuyan,"AComparativeStudyOnVariousRecentSingle-PhaseSingle-SwitchNonIsolatedAC-TO-DCSEPICConfigurations,".THESEUJOURNALOFELECTRICAL ANDELECTRONICENGINEERING(SEUJEEE),ISSN:p-2710- 2130, e-2710-2149, Volume 02, Issue 01, JANUARY 2022.
- [7] mohdrohdhisahid,abdulhalimyatim,taufiktaufik,"AnewAC-

- DC converter using bridgeless SEPIC Converter" 2010 ResearchGate, doi: 10.1109/IECON.2010.5675012
- [8] S.P. Sivakumar, Dr.G. Emayavaramban, Dr.A. Amudha, Dr.M. Siva Ramkumar, Dr. Viyathukattuva and S. Divyapriya, "Isolated Current-Fed AC to DC with SEPIC Converter For Electric Vehicle Applications", *International Journal of Psychosocial Rehabilitation*, Vol. 23, Issue 04, 2019 ISSN: 1475-7192.
- [9] Umang Singh Patel, S. Shiva Kumar, Vinaya Sagar Kommukuri, "Power Factor Correction Using Continuous Conduction Mode Based Bridgeless Sepic Converter For Improved THD And Voltage Regulation", *International Conference on Vision Towards Emerging Trends in Communication and Networking (ViTECoN)*. 978-1-5386-9353-7/19/2019 IEEE.
- [10] Maulik P. Suuthar, Uvesh A. Sipai, P. N. Kapil, "Implementation and fabrication of power factor correction using DC-DC converter. International Conference on Energy", *Communication, Data Analytics and Soft Computing (ICECDS-2017)* 978-1-5386-1887-5/17/2017 IEEE
- [11] Dr.J.Bhavani, J.Pushpa Kumari, Dr.T.Nireekshana ,Punitha a Kasu & Amulya Chennaram" Novel Systems of Wireless power Transfer for battery charging of EV applications using Quasi ZSI" *Journal of Theoretical and Applied information Technology with 1992-8645 with E ISSN-1817-3195*, Volume 103, No-01, 15<sup>th</sup> January 2025.
- [12] B. Singh, B. N. Singh, A. Chandra, K. Al-Haddad, A. Pandey, and D. P. Kothari, "A review of single-phase power factor correction converters," *IEEE Transactions on Industrial Electronics*, vol. 50, no. 5, pp. 962-981, Oct. 2000, doi: 10.1109/TIE.2003.818481..
- [13] M. H. Rashid, *Power Electronics: Circuits, Devices, and Applications*, 4th ed., Pearson, 2014.
- [14] N. Mohan, T. M. Undeland, and W. P. Robbins, *Power Electronics: Converters, Applications, and Design*, 3rd ed., Wiley, 2003.
- [15] IEC 61000-3-2, *Limits for Harmonic Current Emissions*, International Electrotechnical Commission, 2018.
- [16] IEEE Std 519-2014, *IEEE Recommended Practice and Requirements for Harmonic Control in Electric Power Systems*, IEEE, 2014.
- [17] Y. Zhang, J. Wang, and Z. Chen, "SEPIC-based power factor correction rectifiers for EV charging applications," *IEEE Transactions on Power Electronics*, 2019, doi: 10.1109/TPEL.2019.2913845.
- [18] B.-R. Lin and C.-H. Chen, "Passive power factor correction techniques for single-phase AC-DC converters," *IET Power Electronics*, vol. 8, no. 4, 2015, doi: 10.1049/iet-pel.2014.0291.
- [19] A. Jain and B. Singh, "Power quality issues and mitigation techniques in electric vehicle charging systems," *Electric Power Systems Research*, vol. 190, 2021, doi: 10.1016/j.epsr.2020.106724.
- [20] F. Blaabjerg, Y. Yang, D. Yang, and X. Wang, "Power electronics – the key technology for renewable energy systems and electric vehicles," *IEEE Journal of Emerging and Selected Topics in Power Electronics*, vol. 5, no. 3, pp. 1189-1200, 2017, doi: 10.1109/JESTPE.2017.2709558.
- [21] J. Bhavani, T. Nireekshana & Ms.D.Krishna Sindhura, "Development of Energy Source Management Using Bi-directional converter in Electric Vehicles, *International Journal of Design Engineering*, ISSN:0011-9342, Year 2021, Issue:8, Pages:15988-15996