IJFANS INTERNATIONAL JOURNAL OF FOOD AND NUTRITIONAL SCIENCES
ISSN PRINT 2319 1775 Online 2320 7876
Research Paper , Journal Volume 10, Iss 08, 2021

ENHANCING ACTIVE POWER FILTERS FOR OPTIMAL PERFORMANCE IN GREEN ENERGY SYSTEMS

[#1]**DR.ARRAMARAJU PRASAD RAJU,** ***Professor & Principal,***
[#2]**Mr.PADAKANTI BALAKISHAN,** ***Assistant. Professor,***
Department of Electrical and Electronics Engineering,
SREE CHAITANYA INSTITUTE OF TECHNOLOGICAL SCIENCES, KARIMNAGAR, TS.

ABSTRACT: In distribution systems, the load abruptly rises or falls and behaves like a nonlinear load. As a result, the load draws nonsinusoidal currents from the alternating current mains, resulting in load harmonics, reactive power, and an excess of neutral currents, all of which pollute power systems. The fact that power technology devices do not work in a straight line and change states quickly causes the majority of pollution concerns in power systems. People believe that shunt active filters based on current-controlled PWM converters are the best option. This article discusses the harmonics and reactive power adjustment of a 3P4W microgrid distribution system with an IP-controlled active shunt. Based on offset orders, instantaneous currents or voltage signals in the time domain, this approach generates the required compensatory current extraction. Compensation in the time domain response is used because it is faster, easier to set up, and requires less processing resources than compensation in the frequency domain response.
Keywords: AC main, PWM converter, IP.

1.INTRODUCTION

When non-linear loads are employed in large quantities, they present a number of issues with the operation of power systems. The most significant harmonic components are seen in current and voltage patterns. Passive filters were previously employed to eliminate harmonics in line current. While they are beneficial, they are frequently large and cause the power system to vibrate. Active power line conditioners have become more prevalent than passive filters since they address both harmonics and reactive power at the same time.

The active power filter topology allows you to connect in series, shunt, or a combination of the two. Because it can tolerate current harmonics better in most industrial situations, the shunt active filter is more prevalent than the series active filter. Many different types of active filters have been proposed to improve the electric grid. The classifying factors are as follows.

The power and time required for a compensated machine to respond.

Things that need to be fixed in the system, such as voltage harmonics, current harmonics, and power factor A technique for estimating the standard current and voltage.

If used correctly, current-controlled voltage source inverters can be used to perform active filter operation. Many small power plants that use green energy sources such as solar panels and wind turbines will be connected to the electricity grid.

2.LITERATURE SURVEY

Johan H. R. Enslin and Peter J. M. Heskes

"Harmonic interaction between a large number of distributed power inverters and the distribution network," This study investigates the interaction of a large number of distributed power inverters with the distribution network. This research will investigate the phenomena of harmonic interference observed between large groups of these inverters and compare how the networks operate with various inverter topologies and control options.

Uffe Borup, Frede Blaabjerg and Prasad N. Enjeti

"Sharing of nonlinear load in three-phase parallel-connected converters," It was discussed how linear and nonlinear loads can be shared in three-phase power converters that are coupled in parallel but cannot communicate with one another. The main focus of the study is how to handle the problem that occurs when two harmonic correction converters are connected in parallel.

Pichai Jintakosonwit Hideaki Fujita, Hirofumi Akagi and Satoshi Ogasawara

"Implementation and performance of cooperative control of shunt active filters for damping of harmonics throughout a power distribution system," The goal of this research is to use voltage sensing to assist multiple active filters in reducing harmonics in a power distribution system. The configuration of an actual distribution system would change based on how the system is operating or if there is a breakdown. Shunt capacitors and loads are also individually connected and disconnected from the distribution system. Ignacio Candela, Rolando Pedro Rodrguez, Josep Pou, Joan Bergas, and J.

P. Burgos and Dushan Boroyevich

"Decoupled double synchronous reference frame PLL for power converters control," The basic frequency positive sequence component of the utility voltage when it is imbalanced and distorted was demonstrated. It proposes a positive-sequence detector that is based on a newly detached double synchronous reference frame phase-locked loop (PLL). This PLL totally eliminates the detection issues associated with standard synchronous reference frame PLLs. This is accomplished by converting both the positive and negative sequence components of the utility voltage into a double SRF. A decoupling network is constructed from this to extract and separate the positive and negative sequence segments. Soeren BaekhoejKjaer, John K. Pedersen, and Frede Blaabjerg wrote the article "A review of single-phase grid-connected inverters for photovoltaic modules" [5]. It is a test of Single-Phase Grid-Connected Photovoltaic Module Inverters. This study is primarily concerned with inverter technology for connecting photovoltaic (PV) modules to a single-phase grid. If an inverter has four types, they are classified according to the following criteria: 1) the number of power processing stages that work together; 2) the type of power separation between the PV module(s) and the single-phase grid; 3) the type of transformer used (line or high frequency); and 4) the type of grid-connected power stage. "Overview of control and grid synchronization for distributed power generation systems," by F. Blaabjerg, R. Teodorescu, M. Liserre, and A. V. Timbus, discusses the fuel cell, solar, and wind turbine structures for DPGS. The control systems of grid-side converters are also discussed, as is the option of compensating for low-order harmonics. Control solutions for grid failures are also discussed. The final section of this study discusses synchronization strategies and their importance in control.

J. M. Carrasco, L. G. Franquelo, J. T. Bialasiewicz, E. Galván, R. C. P. Guisado, M. Á. M. Prats, J. I. León, and N. M. Alfonso,

"Power electronic Systems for the grid integration of renewable energy sources: a survey," This essay argues that distributed energy resources are increasingly being considered as an alternative to and supplement to large conventional power facilities. A power electronic interface must meet standards pertaining to both the renewable energy source itself and how it affects power system functioning. This is especially true if the intermittent energy source accounts for a significant portion of the system's capacity.

3.PROPOSED SYSTEM

The utilization of renewable energy sources (RES) at the distribution level is known as

IJFANS INTERNATIONAL JOURNAL OF FOOD AND NUTRITIONAL SCIENCES
ISSN PRINT 2319 1775 Online 2320 7876
Research Paper , **Journal Volume 10, Iss 08, 2021**

distributed generation (DG). The power company is concerned about the significant amount of intermittent RES in distribution systems because it could jeopardize network security, voltage regulation, and power quality (PQ). As a result, DG systems must adhere to stringent technical and legal guidelines to ensure that the entire network operates safely, reliably, and efficiently. Power electronics and digital control technology have advanced significantly, and DG systems may now be actively managed at PCC to improve PQ and system performance. Nonetheless, PCC's substantial usage of power electronics-based equipment and non-linear loads creates harmonic currents, which may reduce power quality.

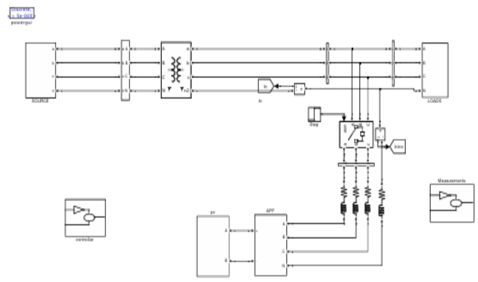

Fig. 1 The primary SIMULINK circuit of the Grid-Linked Solar Power System with Shunt APF

MATLAB-SIMULINK was used to create a simulation model for the three-phase, four-leg PWM converter with the parameters presented in Table 1.

Variable	Description	Value
V_S	Source voltage	55 [V]
f	System frequency	50 [Hz]
v_{dc}	dc-Voltage	162 [V]
C_{dc}	dc capacitor	2200 [μF]
L_f	Filter inductor	5.0 [mH]
R_f	Internal resistance	0.6 [Ω]
T_S	Sampling time	20 [μs]
T_c	Execution time	16 [μs]

Table1 Configuring options

The purpose is to determine how effectively the proposed control scheme's current harmonic compensation performs under various operating situations. A six-pulse rectifier provided the load, which was not linear. Figure 1 depicts the experiment's phase-to-neutral source voltage from time t=0 to time t=0.8. The graph depicts the source currents from time t=0 to time t=0.8.

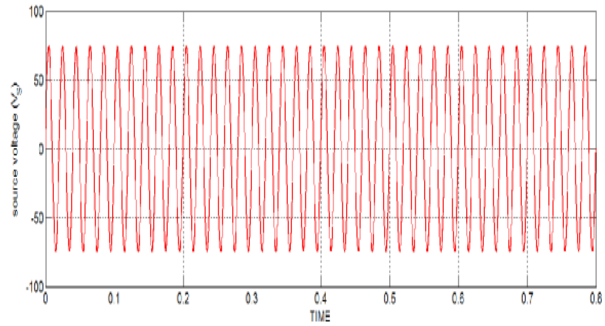

Fig.2 volts from the positive source to the phase

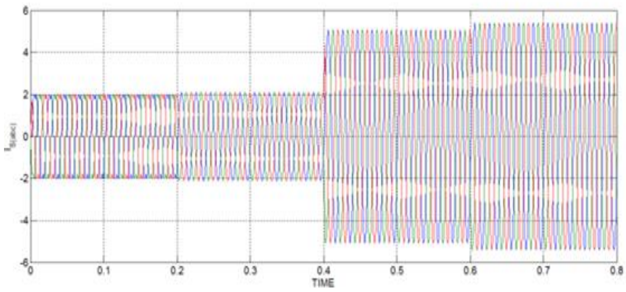

Fig.3 Currents' Origin

Because the load is not linear, a non-cyclic current is required, as seen in Fig.Figure 7.6 depicts the load current from t=0 to t=0.4.

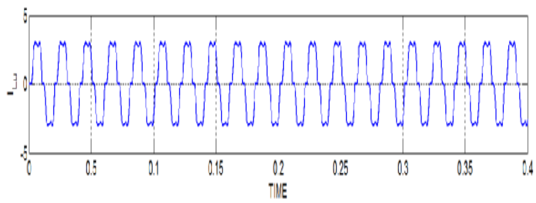

Fig. Loading takes less than 0.4 A.

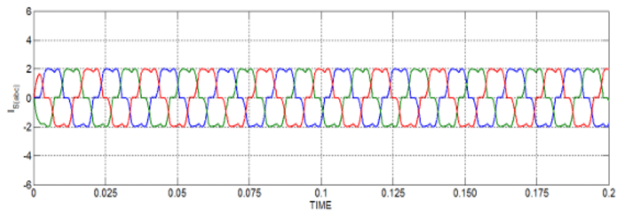

Fig.5 Currents from 5Sources less than 0.2

At t = 0.2, the active filter starts to make adjustments. At this node (iou), the active power filter injects an output current to correct for harmonic components, current imbalance, and neutral current. The waveform of the system currents (is) shown in Fig. is sinusoidal, with a small total harmonic distortion, when the correction is taking place.

ISSN PRINT 2319 1775 Online 2320 7876
Research Paper **Journal Volume 10, Iss 08, 2021**

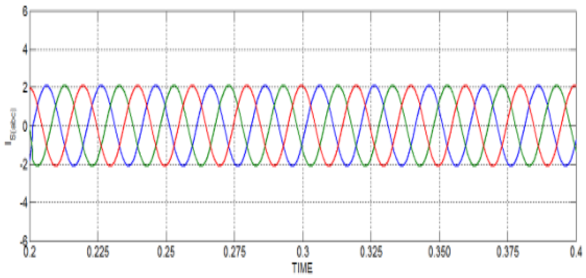

Fig. ource currents at 0.2t0.4 V

At time t = 0.4, as shown in Figure 7.9, there is a step change in the three-phase balanced load. Adjusted system currents in Figure continue to have a sinusoidal shape, even as the size of the load current changes.

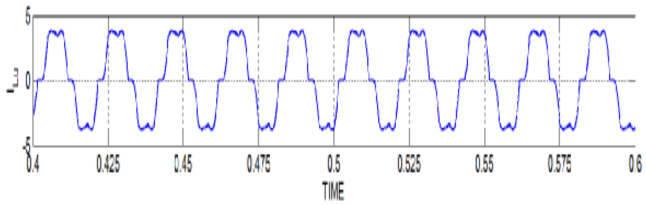

Fig.7 Load current at 0.4t0.6 V

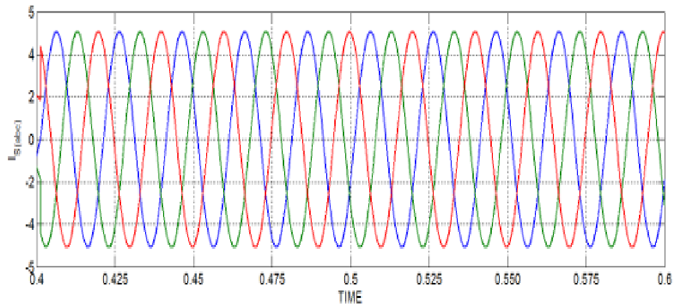

Fig.8 Source currents plotted at 0.4t0.6

As can be seen in Fig. 1, there is a current imbalance of 11% on phase u due to a single-phase load step change that occurs at t = 0.6. As shown in Fig. 1, a neutral current (iLn) travels via the load side neutral conductor.

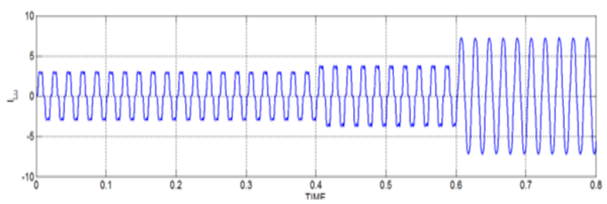

Fig.9Load Current

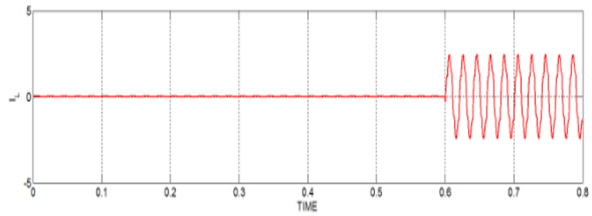

Fig.10 Current LoadNeutral.

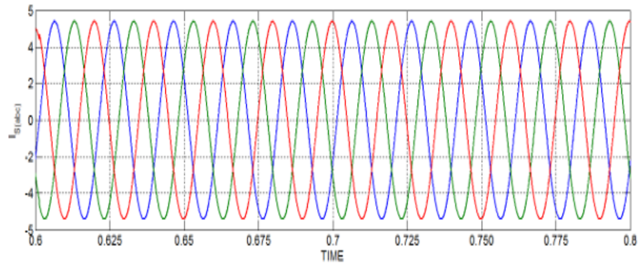

Fig.11 Currents from the source at 0.6t0.8 volts

4.CONCLUSION

DC-coupled 4.SUMMARY The power quality at the point of common connection for 3-phase 4-wire distributed generation has been researched, and a system to do so has been developed. Grid-interfacing inverters have been shown to be useful for power conditioning without disrupting power transmission under typical conditions. The inverter that connects to the grid in this way can do two things with the suggested method: inject the actual power generated by RES into the grid, and act as a shunt Active Power Filter.

By using this method, costly power conditioning equipment at PCC is unnecessary. Displaying and validating the simulation model built in MATLAB/SIMULINK 2009a of the proposed system connecting renewable energy sources. The control circuit, which is implemented at the load side with a non-linear unbalanced load, uses a phase lock loop, a proportional integral controller, and a hysteresis controller to provide the gating pulses for the 4-leg inverter. To sum it all up, the PCC efficiently compensates for the current unbalance, current harmonics, and load reactive power that would otherwise result from connecting an unbalanced and non-linear load to the grid and achieving unity power factor.

REFERENCES

1. Hamadi, S. Rahmani, and K. Al-Haddad, “A

ISSN PRINT 2319 1775 Online 2320 7876
Research Paper , **Journal Volume 10, Iss 08, 2021**

hybrid passive filter configuration for VAR control and harmonic compensation," IEEE Trans. Ind. Electron., vol. 57, no. 7, pp. 2419–2434, Jul. 2010.

2. P. Flores, J. Dixon, M. Ortuzar, R. Carmi, P. Barriuso, and L. Moran, "Static Var compensator and active power filter with power injection capability, using 27-level inverters and photovoltaic cells," IEEE Trans. Ind. Electron., vol. 56, no. 1, pp. 130–138, Jan. 2009.
3. H. Hu, W. Shi, Y. Lu, and Y. Xing, "Design considerations for DSPcontrolled 400 Hz shuntactivepowerfilterinanaircraftpowersystem,"IEEETrans.Ind.Electron.,vol.59,no. 9, pp. 3624–3634, Sep. 2012.
4. X. Du, L. Zhou, H. Lu, and H.-M. Tai, "DC link active power filter for three-phase diode rectifier," IEEE Trans. Ind. Electron., vol. 59, no. 3, pp. 1430–1442, Mar. 2012.
5. M. Angulo, D. A. Ruiz-Caballero, J. Lago, M. L. Heldwein, and S. A. Mussa, "Active power filter controlstrategywithimplicitclosedloopcurrentcontroland resonantcontroller," IEEE Trans. Ind. Electron., vol. 60, no. 7, pp. 2721–2730, Jul. 2013.
6. X. Wang, F. Zhuo, J. Li, L. Wang, and S. Ni, "Modeling and control of dual-stage high-power multifunctional PV system in d-q-0 coordinate," IEEE Trans. Ind. Electron., vol. 60, no. 4, pp. 1556–1570, Apr. 2013.
7. J.A.Munoz,J.R.Espinoza,C.R. Baier,L.A. Moran, E.E.Espinosa,P.E.Melin,and D. G. Sbarbaro, "Design of a discrete-time linear control strategy for a multicell UPQC," IEEE Trans. Ind. Electron., vol. 59, no.10,pp. 3797–3807,Oct. 2012.
8. L. Junyi, P. Zanchetta, M. Degano, and E. Lavopa, "Control design and implementation for high performance shunt active filters in aircraft power grids," IEEE Trans. Ind. Electron., vol. 59, no. 9, pp. 3604–3613, Sep. 2012.
9. Y.Tang,P.C.Loh,P.Wang,F.H.Choo,F.Gao,and F.Blaabjerg,"Generalizeddesignof high performance shunt active power filter with output LCL filter," IEEE Trans. Ind. Electron., vol. 59, no. 3, pp. 1443– 1452, Mar. 2012.
10. Z. Chen, Y. Luo, and M. Chen, "Control and performance of a cascaded shunt active powerfilterforaircraft electricpowersystem,"IEEE Trans. Ind.Electron., vol. 59, no.9, pp. 3614–3623, Sep. 2012.