INTERNATIONAL JOURNAL OF TECHO-ENGINEERING

ISSN : 2057-5688

DESIGN AND RECITAL INVESTIGATION OF THREE STAGE PLANETARY PV INTEGRATED UPQC

B. MEGHANA*, Y. RAJASEKHAR REDDY**

PG SCHOLAR*, ASSISTANT PROFESSOR & HOD**

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING, MOTHER TERESA INSTITUTE OF SCIENCE & TECHNOLOGY, SATHUPALLY

ABSTRACT: The intrusion of unified power quality conditioner in power transmission line can compensate voltage compensation and it brings more attention among various compensation techniques. The incremental production of sustainable renewable energy resource becomes more popular because of its eco-friendly and non polluting nature. Advancement of power production interfaces power compensating technique due to various power quality problems like voltage sag, voltage swell, voltage flicker, large voltage spikes and voltage distortion, etc. Both series and shunt compensators are attached within this proposed topology. The system posses active power filtering and distributed generation. In most case the power production and increasing the voltage from solar system may employ Maximum Power Point tracking algorithm (MPPT); it tracks maximum power from the panel and improves the efficiency. The compensation technique eliminates the need of MMPT by shunt compensation at load current; other inequalities are performed through series compensator. The experimental verification is done through MATLAB software. The transformer fetched with inverter terminal can do active power filtering; DC link capacitor delivers power whenever it is necessary to functioning. The inequalities correction improves power factor more than 0.85 by inter combining DSTATCOM and dynamic voltage restorer (DVR).

Keywords: Unified Power Quality Conditioner (UPQC), Maximum Power Point Tracker (MPPT), Sag/Swell, flicker, voltage distortion, DSTATCOM, DVR

I. INTRODUCTION The dual source functioning of power management in transmission line is established in [1] through UPQC. PV supplies high voltage during day-time and battery functioning during the unavailability of solar cells. But UPQC functions through voltage distributed by DC link capacitor. Inter harmonics compensation is enabled through active power filtering. The self tuning filter associated with unit vector generator is fetched UPQC to improved the system efficiency. The paper [2] also

ISSN : 2057-5688

enrolled with UPQC to perform voltage sag/swell compensation. Normally non linear loads dealt with power factor interruption. The reduction in power factor may cause severe problems in appliances. Thus harmonics are decreased more over nominal range. The modified power angle control defined with synchronous reference frame theory is defined in paper [3] to make the system convenient to work under low spikes and responsible for voltage distortion. By intruding required reactive power both series and shunt compensations are performed well. Under various loaded conditions the open unified power quality conditioner is performed in [4] to limit the harmonics. If harmonics decreases the additional power needed gradually goes down. At that time power factor reach up to 0.8. In paper [5], fuel cell arrangement is covered with four legged converter on shunt and three legged converter on series. Reference frame theory with instantaneous reactive power is combined to obtain a reference signal. In addition with above theories, ANFIS is enabled to maintain steady state power flow at DC blink capacitor. These concentrate on sag, swell and neutral current compensation. The distribution generation is associated with UPQC in [6]. The active power functioning is enabled in grid connecting mode to receive power from PV and delivers to grid. Through islanding mode the system makes grid structure through inverter fetched within it. As from the above statements, UPQC does a vital role in power functioning and reducing instability. This would be a better choice for voltage sag, swell, and distortion compensation. Availability, reduction in noise, lesser harmonics in this proposed topology makes convenient for large power system. The non linear loads need huge power to do its function without disturbance. Eventually the system performs well, but large power is required. So in this case a complete satisfactory compensation technique is needed. If it is given the power transmission line won't suffer or else it faces some difficulties. In this case the role of UPQC becomes essential and unavoidable. To establish a better power compensating technique UPQC is preferred. It comprised of shunt and series compensator in a back-back connection. The shunt and series is said to be DSTATCOM & DVR. A DC link capacitor interconnects both compensators respectively. The compensating devices need power to perform well. By adding negative and zero sequence components the shunt compensator maintains source current. Injecting harmonics to provide opposition for actual within the system. This process avoids the harmonics that

ISSN : 2057-5688

cause severe disturbance to the grid voltage. Even power factor also increases gradually with the above action. When the system chosen proper compensating technique it could not faces power factor issue. The efficiency of the system depends upon power factor. The motto of series compensator is load bus isolation; apart from this active and reactive power components are enrolled in source side in association with power factor. The value of bus voltage is modified severely. The combined solar and wind energy is chosen as energy source in proposed system with energy storage elements named battery and super capacitor. Super capacitor possesses huge power holding capability, lower energy density, and fast dynamic response. In another hand battery accumulates low power capacity; the response is low when compared with predecessor and higher energy capability. This collaboration makes power density and efficiency becomes high. These two energy resource easily interacted with solar energy as per the above mentioned advantages. In case any fault in input port, the amount of output voltage cannot achieve the required output. At such conditions, UPQC plays a major role. The relation between load and inverter becomes acceptable one.

II METHODOLOGY:

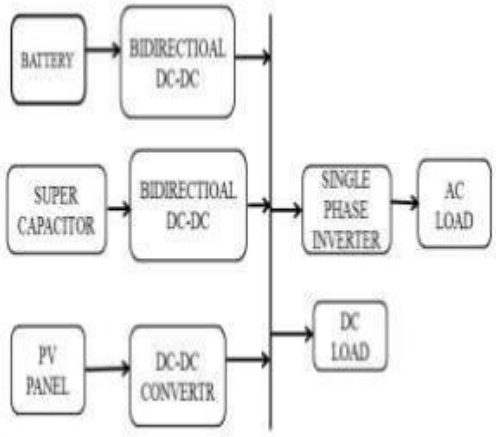


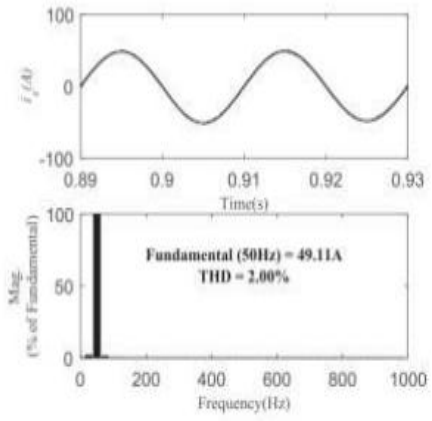
Fig.1. Bock diagram of proposed method.

The virtual resistance droop and virtual capacitive droop control is synthesized with energy storage devices characteristics. The solar panel would convert light energy from sun into electricity. If shades or poor climatic condition can affects the power production. At that situation the output of dc-dc converter tends to be low. Then varying the duty ratio only gives high voltage gain or else the system fails. The low power supply can cause voltage inequality and power factor reduction. In general the variation in input voltages also transformed into a constant one through dc chopper. Additionally battery and super capacitor deserves to tackle the power requirement. The renewable power generation becomes huge during day time. So the battery and super capacitor is in charging mode if the output of converter exceeds the load requirement. Due to the need of charging in storage elements, bidirectional dc-dc converters are preferred.

ISSN : 2057-5688

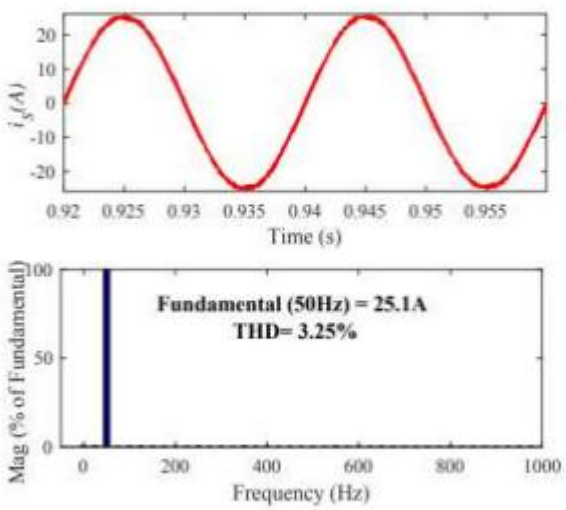
Because it allow the current to flow in both directions; whenever the storage section needs power it receives power from the load bus via bidirectional switches. Similarly the same thing is followed in discharging mode. Finally a constant dc voltage from load bus is completely converted into sinusoidal ac voltage through single phase inverter.

III.RESULT AND DISCUSSION The simulink structure is designed to deal and witness PV-UPQC efficient operation. This section will define how amount of sag and swell are deduced. Active power filtering, power improvement, harmonic deductions are the advantages of UPQC. The below waveform describes the grid current harmonics and total harmonics.



(a)

(a)



(b)

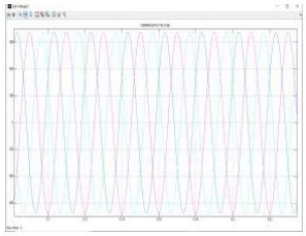
Fig.2. (a) & 1. (b).grid current harmonic spectrum & THD's

The linear power flow in transmission line with compensating harmonic content describes the load requirement. The above waveform visualizes the non linear load operates under different load conditions. Normally a load operates with low level of harmonics it become more effective or it else the filtering circuit is more essential

to standardize the power quality. The average value of grid tends to low. If entire circuit is enrolled with non linear load, the power factor on grid becomes low. The reactive power injection is necessary. The total harmonic distortion becomes less due to the presence of UPQC. The controllability and power continuing is visualized through below waveform. A certain amount of voltage is maintained

ISSN : 2057-5688

continuously in DC load bus and it have enough potential to satisfy the load requirements.



The below table visualizes total power compensated by the loads under differential conditions.

Topology	Voltage
d-q interfaced PV-UPOC	80V
PV-UPQC	30V
PV-UPOC	300V

IV.CONCLUSION A three phase power transmission line enrolled with UPQC is experimentally verified through MATLAB software. The steady state power flows is initiated by removing sag and swell in this system. The process of active filtering is done through shunt active filter attached with passive DC link capacitor. The filter present at output port of three phase inverter eliminates harmonics as much as possible. Through these activities the non linear loads are performed well with lower harmonics range and continuous power flow in transmission line. The three sources also took part in power scheduling. The shunt compensator does elimination of source voltage and source current.

V.FUTURE SCOPE The multiple renewable energy resource with lossless power transmission can improve the entire system with differential control topology. This process makes convenient for all non linear loads.

VI. REFERENCE

1. “Application of shunt active power filter for harmonic reduction and reactive power compensation L. B. Garcia Campanhol, S. A. Oliveira da Silva, and A. Goedtel, in threephase four-wire systems,” IET Power Electron., vol. 7, no. 11, pp. 2825–2836, 2014.

2. “Operation of Three-Level Inverter-Based Shunt Active Power Filter under Nonideal Grid Voltage Conditions with Dual Fundamental Component Extraction,” Y. Hoon, M. A. M. Radzi, M. K. Hassan, and N. F. Mailah, IEEE Trans. Power Electron., vol. 33, no. 9, pp. 7558–7570, 2018.

3. “Analysis and Mitigation of Power Quality Issues in Distributed Generation Systems Using Custom Power Devices,” E. Hossain, M. R. Tur, S. Padmanaban, S. Ay, and I. Khan, IEEE Access, vol. 6, no. c, pp. 16816–16833, 2018.

4. “The unified power quality conditioner: The integration of series- and shunt-active filters,”H. Fujita and H. Akagi, IEEE Trans. Power Electron., vol. 13, no. 2, pp. 315–322, 1998.

5. “Intelligent islanding and seamless reconnection technique for microgrid with

ISSN : 2057-5688

UPQC," S. K. Khadem, M. Basu, and M. F. Conlon, IEEE J. Emerg. Sel. Top. Power Electron., vol. 3, no. 2, pp. 483–492, 2015.

6. "Fuel cell integrated unified power quality conditioner for voltage and current reparation in four-wire distribution grid," C. K. Sundarabalan, Y. Puttagunta, and V. Vignesh, IET Smart Grid, vol. 2, no. 1, pp. 60–68, 2019.

7. "Advanced control architectures for intelligent microgrids Part II: Power quality, energy storage, and AC/DC microgrids," J. M. Guerrero, P. C. Loh, T. L. Lee, and M. Chandorkar, IEEE Trans. Ind. Electron., vol. 60, no. 4, pp. 1263–1270, 2013.

8. "Combined operation of unified power-quality conditioner with distributed generation," B. Han, B. Bae, H. Kim, and S. Baek, IEEE Trans. Power Deliv., vol. 21, no. 1, pp. 330–338, 2006.

9. "Significant implication of unified power quality conditioner in power quality problems mitigation," K. Hasan, M. M. Othman, N. F. A. Rahman, M. A. Hannan, and I. Musirin, Int. J. Power Electron. Drive Syst., vol. 10, no. 4, p. 2231, 2019.

10. "Design and Performance Analysis of Three-Phase Solar PV Integrated UPQC," S. Devassy and B. Singh, IEEE Trans. Ind. Appl., vol. 54, no. 1, pp. 73–81, 2018.

11.[29] Saikiran, B., and R. Hariharan. "Review of methods of power theft in Power System." International Journal of Scientific & Engineering Research 5.11 (2014): 276-280.

12. Hariharan, R. "Design of controlling the charging station of PHEV system based on virtual instrumentation." (2012): 43-46.

13. Hariharan, R. "Design of controlling the smart meter to equalize the power and demand based on virtual instrumentation." 2013 International Conference on Power, Energy and Control (ICPEC). IEEE, 2013.

14. Hariharan, R., and P. Usha Rani. "Graph theory based power system restoration using LabVIEW." ARPN J Eng Appl Sci. ISSN 6608 (1819).

15. Hariharan, R., and P. Usha Rani. "Blackout restoration process by PHEV charging station integrated system using virtual instrumentation." 2017 Fourth International Conference on Signal Processing, Communication and Networking (ICSCN). IEEE, 2017.

16. Hariharan, R., and P. Usha Rani. "A Complete restoration methodology using virtual instrumentation." Int J of Control Theory Appl 9.2 (2016): 681-686.

17. Hariharan, R., P. Usha Rani, and P. Muthu Kannan. "Sustain the Critical Load

ISSN : 2057-5688

in Blackout Using Virtual Instrumentation." Intelligent and Efficient Electrical Systems. Springer, Singapore, 2018. 77-88.

18. Hariharan, R., and P. Usha Rani. "Optimal generation Start-Up strategy for Blackout Restoration Using Virtual Instrumentation." Indian Journal of Public Health Research & Development 8.4 (2017): 1128- 1132.

19. Sowmiya, N., P. Nandhini Devi, and R. Hariharan. "Review on Challenges Facing on Smartd grid Overcome by Intelligence System." Indian Journal of Public Health Research & Development 8.4 (2017): 1111-1117.

20. Harsha, Y. Sree, and R. Hariharan. "Improving Power Factor Using Landsman Converter in PMBLDC Motor." transactions on mechatronics 19.1 (2014): 213-224.

21. Hithesh, K., and R. Hariharan. "The effect of PHEVs to the electrical power system." International Journal of Pure and Applied Mathematics 119.16 (2018): 3419-3427.

22.Rajesh, S., R. Hariharan, and T. Yuvaraj. "Cuckoo Search Algorithm Based Critical Load Restoratinwith Dgr using Virtual Instrumentation."

23. K MoreKranthi, R Hariharan. “Fuzzy System Methodology for Restoration of Distribution System by Distributed Generation.” International Journal of Innovative Technology and Exploring Engineering 12.8(2019): 1435 – 1437.

24. Y Rambabu, R Hariharan. “A research on Power Quality Enhancement and Energy Management of Solar-Wind Smart Grid System.” International Journal of Engineering and Advanced Technology 1.9(2019): 6868 – 6870.

25. M DevaDarshanam, R Hariharan. “Research on Three-Phase Voltage Source PWM Rectifier Based on Direct Current Control.” International Journal of Engineering and Advanced Technology 1.9(2019): 6864 – 6867.