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A Novel Control Strategies for Power Quality Improvement with Multilevel Inverter Based IPQC for Microgrid

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ABSTRACT

A micro network is a hybrid energy system consisting of several distributed resources and local loads. Now, every day that increases daily life, the micro network plays a vital role in the generation of energy that uses renewable energy sources. The use of power electronic devices in a micro network involves the generation of harmonics and leads to various energy quality problems. To overcome voltage and overcurrent fluctuations, a variable reactor based on magnetic flux control is proposed. IPQC performance can be verified using MATLAB/ SIMULINK

KEYWORDS: *Power Quality, IPQC, microgrid*

I. INTRODUCTION

Strength is not created or destroyed, but is often regenerated from one type to another. An energy technology is nothing more than the conversion of different unique types of energy into AN energy. Electricity is produced in bulk in production stations called power stations. The force generated is required by customers. This purpose, due to loss of electricity and resistance quality problems within the transmission lines of the FACTS machine, is added to reduce these problems. The small network ends in a positive distribution in geographical proximity. The entire distribution consists of a huge electricity processor to control and visualize the trade of the structures between the networks [1-3]. Once this processor is definitively exploited, it presents itself in serious problems of high electricity and power consumption with the help of the creation of a thin band verbal exchange and a native management system, the small complete network is exploited with a marginal investment. An electrical converter with a forty-eight pulse structure was cascading many electrical conversion devices in the form of a 3-degree diode terminal with the help of the electrical device in sectional motion. It ends with a high pace and prolonged delays, this causes a serious lack of the power transmission capacity, while the distribution [4]. Interline Power Flow Controller is one of each of the advanced controllers in a versatile mechanism controller for AC equipment that fully compensates for collection and manages the force force within the machine [5].

At the same time, the administration of the orthogonal d-q model of the flow converter 2 was added once within the micro network. Thanks to the ability to transmit the attitude of the version, the collection voltage is injected near the administration and, therefore, the machine receives more than the amount paid [6]. Microgrid ends in a fine distribution in a geographical position, the entire distribution consists of effective energy within the management proximity processor to manipulate and monitor the alternative installation between the networks. once the processor is fully exploited, it resolves into satisfactory problems of high energy and energy consumption through the growing verbal exchange of thin band and the native management formula, the small complete network is exploited with a marginal investment and, mainly, the small network is able to disconnect from the microrred masses. disturbs and protects the transmission of harmonics [7]. Using the grid interface conversion machine, the traditional sequence and parallel shape are customized. 2 Three-phase 4-leg inverters tend to build a grid interconnection machine to compensate for the contemporary harmonic, they will widen complications and losses inside the device [8] - [9]. The distributed generator now not only injects energy into the grid, but also improves the quality of force. Thanks to its ability, the hump management technique compensates autonomously for voltage imbalances in an active and reactive hump administration [10]. A flexible AC distribution system aims to increase the ease and reliability of the installation in the micro-network, the planning of administration algorithms and prolonged kalman filters for the frequency of tracking and extraction of harmonics in the mains voltage and in the Today's load in a small network.

By minimizing complete system planning, operating costs and the price of load reduction, the electrical device is co-optimized to increase the money and reliability of the network [11].

The main advantage of multilevel inverters is that the output voltage can be generated with low harmonics. Therefore, it is admitted that the harmonics decrease proportionally to the level of the inverter. For these reasons, multilevel inverters are desirable for non-coded electrical applications [12]. However, there is no shortage of disadvantages. Its manipulation is a much bigger problem and the methods are despite the fact that they are now not widely used in the industry. In this article, the modeling and simulation of a multilevel inverter, the use of neutral point inverters (NPC) have been carried out with motor load, the use of the Simulink / MATLAB program. The first section presents multi-level investor manipulation strategies rather than identifying a seven-level investor in the second section. Total harmonic distortion (THD) is mentioned in section 1/3. The aim is to highlight the limitation to which multilevel inverters are no longer effective in reducing the harmonics of the output voltage [13, 14].

II. Improved Power Quality Conditioner

System Configuration

The new IPQC can be established sequentially and in parallel in a microrred or frequent coupling factor (PCC). For simplicity, IPQC is set to PCC. Figure 8 shows the configuration of the three-phase special device of the IPQC with transformer and inverter. and characterize respectively the source voltage and the impedance of the conventional power supply. Passive filters, which have the function of absorbing harmonics, are derived from each side. The main winding of a transformer is inserted together between the conventional resistance utility and the micro-network, while the secondary winding is connected to a PWM converter with voltage source. It is the DC aspect voltage of the inverter. The microrred consists of a harmonic charge, a photovoltaic mobile phone system, a battery storage system and a regular charge. The proposed IPQC has the following functions.

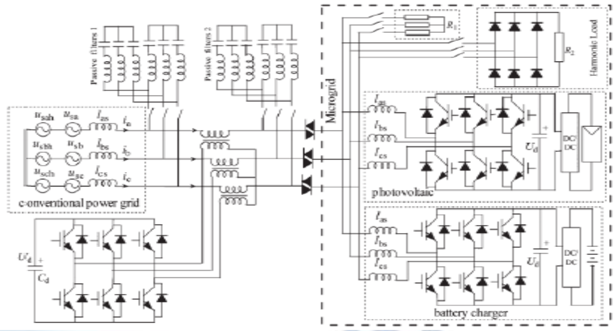

Fig.1 Circuit of the Proposed IPQC.

III. Power Flow Control

When the power slip control and state of the art fault limiter are cause for concern, only the vital is taken into account. In the sentences of the previous analysis, the known primary winding shows the adjustable impedance + (1 - α). With the alternative coefficient α, it is possible to obtain the equivalent impedance of the main winding, as shown in Table I. Therefore, when the most important winding is combined in the collection in the circuit, it can be used to manage the resistance between the electrical network conventional and the micro-net or the internal electric drift of the micro-net. The control diagram of the power float is tested in Figure 9 when the new variable reactor is connected in series between the ends of the emitter and the receiver. Suppose that the equal impedance + (1 - α) of the variable reactor is R + jX. In the sentences in the vector sketch in Figure 9, the following equations can be obtained

$$U_m \cos\varphi = U_s \cos(\varphi - \delta) + RI$$

$$U_m \sin\varphi = U_s \sin(\varphi - \delta) + XI$$

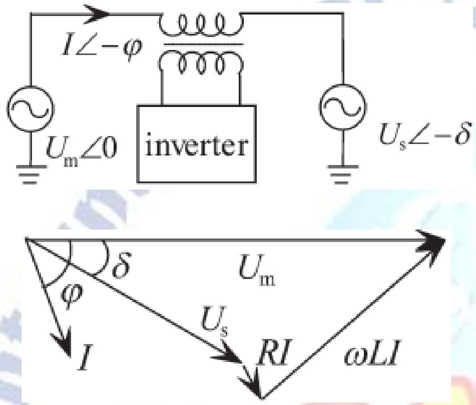

Fig 2: Power flow control principle and its vector diagram.

IV. Multilevel Inverter

The multilevel conversion of electricity was as fast as that introduced for the first time more than two years ago. The not unusual thought consists in using a greater quantity of energy semiconductor switches to present the conversion of energy in small voltage steps. There are a number of blessings for this approach over the traditional power conversion approach. Smaller voltage passages lead to the production of higher power quality waveforms and also avoid voltage stress (dv / dt) in load and electromagnetic compatibility problems. Another key feature of multilevel converters is that these microconductors are wired in a serial type connection, which allows operation at higher voltages. However, sequential connection is usually done with clamping diodes, which eliminate overvoltage problems. Furthermore, when it is thought that the switches are not really connected in sequence, their switching can be staggered, which reduces the switching frequency and, for this purpose, the switching losses. converter, neutral point inverter (NPC) and flywheel condenser inverter. Some features of these new converters include industrial units, flexible AC transmission structures (FACTS) and automotive propulsion, as verified in Fig. 12. A place where multilevel converters are more regular than is more appropriate. It is that of renewable photovoltaic electricity that efficiency and first-rate electrical strength are a wonderful concern for researchers.

V. MATLAB/SIMULINK Results

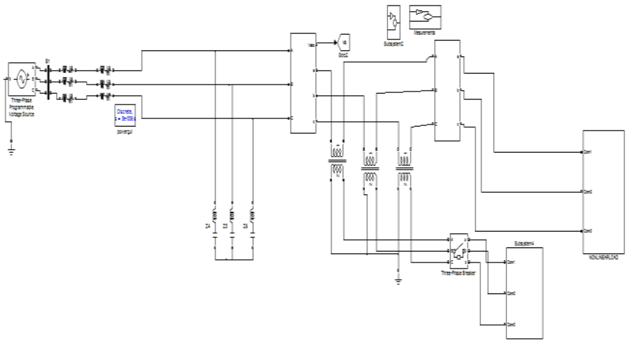

Fig 3: shows the proposed IPQC with MLI.

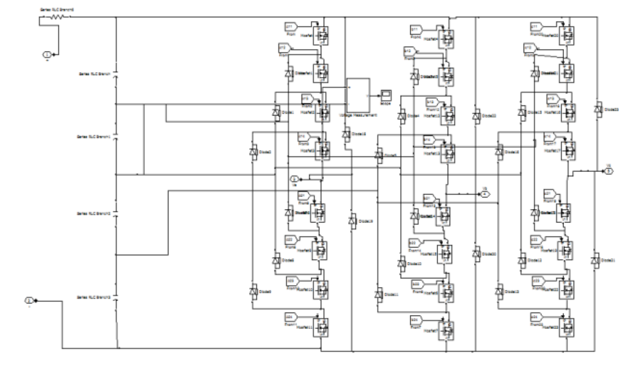

Fig 4: shows the proposed MLI system.

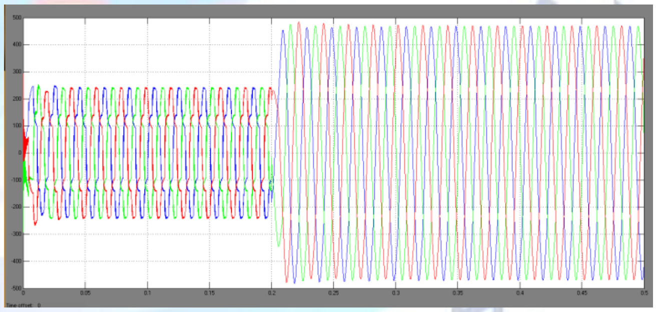

Fig 5:shows the load voltage response before and after MLI based IPQC operation.

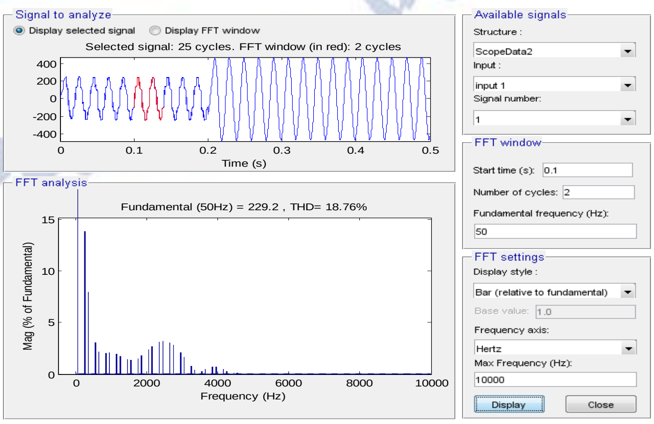

Fig 6: Current THD without IPQC (18.76%)

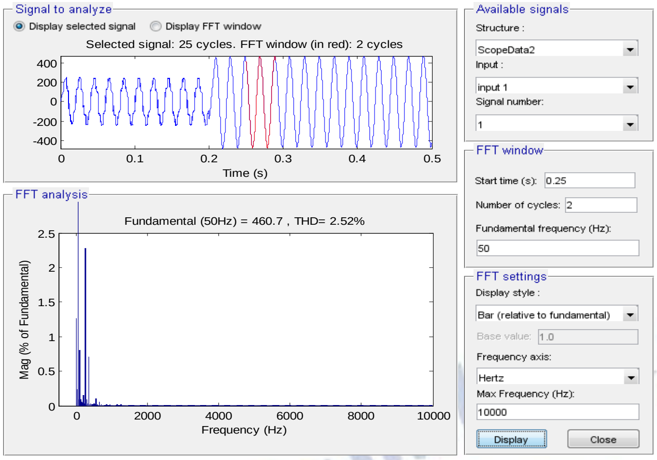

Fig 7: Current THD with IPQC (2.52%)

VI. Conclusion

The change indicators of the square-measurement cascade electric converter generated the victimization of the current controller on the triangular sampling day; It offers a general dynamic performance typical in transient and regular. to. conditions, doctoral analysis in addition to IEEE standards. fast idea of a specially based real power cascade development converter} fully secure IPQC is connected within the distribution network in the PCC through filter chokes and operates in a highly managed system. A cascade construction voltage power converter, especially IPQC based victimization, is the right power controller to be a desirable option that the cable can compensate for harmonics, reactive electricity and power problems. electricity with the IRP controller reduces harmonics and offers reactive compensation of electricity thanks to non-linear load currents; As a final result of the stop, providing current curves and the challenge of the strength of the spirit of the crew is also performed in any condition of transient and coherent state. This document has conferred a single variable reactor compatible with magnetic flux management. An electric machine with airspace is chosen and, therefore, the modern coil of the computer's electrical device is detected. An electric voltage converter is used to meet the current first day to supply each different current which is injected into the secondary. With the same speed set for the current day, the equal resistance of the first winding of the electrical system can be changed indefinitely. In the sentences of the new variable reactor, a splendid special IPQC for micro networks is designed. The first famous adjustable winding resistance, which performs the function of resistance, goes with the management of the flow, the current failure of the electrical circuit and the compensation of the primary voltage.

References

[1] N. Hatziargyriou, H. Asano, R. Iravani, and C. Marnay, "Microgrids,"*IEEE Power Energy Mag.*, vol. 5, no. 4, pp. 78–94, Jul./Aug. 2007.

[2] R. H. Lasseter, "Smart distribution: Coupled microgrids," *Proc. IEEE*,vol. 99, no. 6, pp. 1074–1082, Jun. 2011.

[3] H. Akagi, E. H. Watanabe, and M. Aredes, *Instantaneous Power Theory and Applications to Power Conditioning*. Piscataway, NJ, USA: IEEE Press, 2007, pp. 1–17.

[4] C. Sankaran, *Power Quality*. Boca Raton, FL, USA: CRC Press, 2002, pp. 133–146.

[5] R. C. Dugan, *Electrical Power Systems Quality*. New York, NY, USA: McGraw-Hill, 2003, pp. 167–223.

[6] A. Baggini, *Handbook of Power Quality*. Hoboken, NJ, USA: Wiley, 2008, pp. 187–257.

[7] B. Singh, K. Al-Haddad, and A. Chandra, "A review of active filters for power quality improvement," *IEEE Trans. Ind. Electron.*, vol. 46, no. 5,pp. 960–971, Oct. 1999

[8] F. Z. Peng, "Application issues of active power filters," *IEEE Ind. Appl. Mag.*, vol. 4, no. 5, pp. 21–30, Sep./Oct. 1998.

[9] K. M. Smedley, L. Zhou, and C. Qiao, "Unified constant-frequency integration control of active power filters—Steady-state and dynamics," *EEE Trans. Power Electron.*, vol. 16, no. 3, pp. 428–436, May 2001.

[10] H. Rudnick, J. Dixon, and L. Moran, "Delivering clean and pure power," *IEEE Power Energy Mag.*, vol. 1, no. 5, pp. 32–40, Sep./Oct. 2003. S. Buso, L. Malesani, and P. Mattavelli, "Comparison of current control techniques for active filter applications," *IEEE Trans. Ind. Electron.*, vol. 45, no. 5, pp. 722–729, Oct. 1998.

[11] M. Aredes, J. Hafner, and K. Heumann, "Three-phase four-wire shunt active filter control strategies," *IEEE Trans. Power Electron.*, vol. 12, no. 2, pp. 311–318, Mar. 1997

[12] Ramakrishna, B., Srikanth, T., Chaitanya, M.N., Muni, T.V., "Comparative analysis of perturb and observe method and current based method", International Journal of Innovative Technology and Exploring Engineering 8(6), pp. 1012-1016.

[13] Harshith, I., Raj, B.P., Raja Sekhar, G.G., T Vijay Muni, "A novel methodology for single phase transformerless inverter with leakage current elimination for pv systems application", International Journal of Innovative Technology and Exploring Engineering, 8(6), pp. 1017-1021.

[14] Sudharshan Reddy, K., Sai Priyanka, A., Dusarlapudi, K., T Vijay Muni, "Fuzzy logic based iUPQC for grid voltage regulation at critical load bus", International Journal of Innovative Technology and Exploring Engineering, 8(5), pp. 721-725

[15] Swapna Sai, P., Rajasekhar, G.G., T Vijay Muni, Sai Chand, M., "Power quality and custom power improvement using UPQC", International Journal of Engineering and Technology(UAE) 7(2), pp. 41-43.

[16] Vijay Muni, T., Srikanth, K.S., Venkatesh, N., Sumedha, K.L., " A high performance hybrid MPPT control scheme for a grid connected PV system based three level NPCMLI", International Journal of Engineering and Technology(UAE), 7(2), pp. 41-43.