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POWER QUALITY IMPROVEMENT USING IMPROVED UNIFIED POWER QUALITY CONTROLLER

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ABSTRACT

Now a day's power electronics devices are used because of technological improvement..The increasing number of power electronics loads generally used in industry because of this load power quality problem arises. According to this consideration of power electronic load require ideal sinusoidal supply voltage for proper system operation. They are responsible for abnormal condition in distribution system. According to this scenario different mitigating technique are implemented over the years. Some of solution involves flexible compensator known as improved unified power quality controller .by using this controller we can compensate voltage sag/swell. also provide reactive power .this paper presents new control technique for iupqc. In that pulse width modulation control is used in it .it is achieved by using voltage and current sinusoidal references.

The experimental results verified by using improved unified power quality controller. The grid-voltage regulation was achieved by taking different load conditions. These results have demonstrated a suitable performance of voltage regulation at both sides of the iUPQC, even while compensating harmonic current and voltage imbalances.

Keywords: iupqc, power quality voltage sag, voltage swell.

I. INTRODUCTION

The use of electronic equipment, such as information technology equipment, power electronics such as variable speed drives, programmable logic controllers, and energy efficient lighting LED, static rectifier, converters to a complete change of electric loads nature .according to this consideration , poor power quality may arises that result into increased power losses, abnormal and undesirable performance of equipment's. In power system numbers of power quality problems are occurred such as voltage disturbance, current disturbance, voltage sag, voltage swell, harmonics and reactive power disturbance. So consumer's premises it is necessary to minimize these problems. . improve the voltage profile, stability of system, enhancement of power quality and reliability of power etc. the various flexible alternating current transmission system are come in electrical network. The FACTS based application of power electronic devices effective for the power distribution systems to enhance the quality and the reliability of power fed to the consumers. The FACTS technology consists of high power electronics devices. By using this Facts device we can implement system stability. So iupqc is one of the best solutions of degrading above problem.

The circuit of a iupqc consists of a combination of a shunt active filter and a series active filter connected in a back-to-back configuration. This combination allows the compensation of the load current and the supply

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voltage. Here we consider electrical system with two buses i.e., bus A and bus B. Bus A is a bus of the power system .Bus B is a bus of the micro grid, where nonlinear loads are connected, which requires premium-quality power supply. Our aim is to get the voltages at buses A and B must be regulated in order to properly supply the sensitive loads and the nonlinear loads.

II. IUPQC CONFIGURATION

The improved unified power quality conditioner consists of Shunt active filter and series active filter. It is nothing but the integration of series ad shunt active power filters, which are connected in back to back by a common DC capacitor .

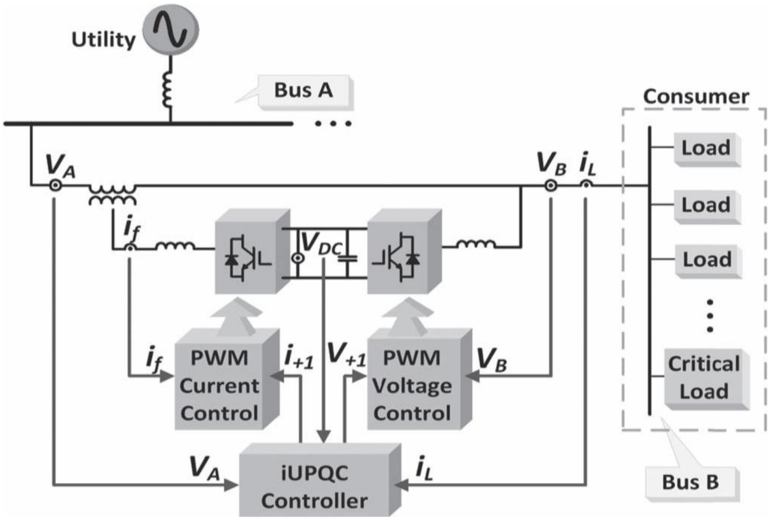

Fig 1.iUPQC configuration [19]

Fig.1 shows the circuit of iupqc, for input signals we have to consider the voltages and currents measurements for iUPQC controller. The iUPQC controller is composed of two PWM converters connected back-to-back through a common dc link. Three single-phase transformers are employed to insert the series converter between the power system and the load. The convenience of using or not shunt transformer is more related to economical issues regarding voltage/current levels and power ratings of the system and power converters of the iUPQC the iUPQC has a simpler controller and reduced number of measurements. Only the system voltage, the dc-link voltage and the load current are necessary as inputs to the iUPQC controller.

III. OPERATING PRINCIPLE

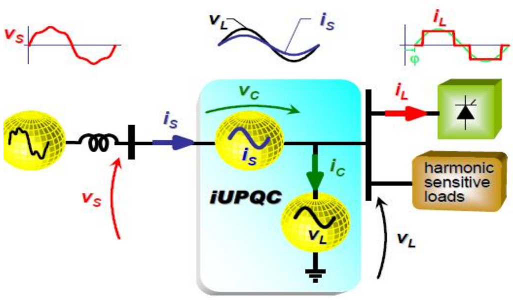

Fig 2.Operating Principle of Iupqc.[18]

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Fig.2 shows the principles of the iUPQC. The shunt active filter generates a fundamental positive-sequence voltage at nominal value. the compensated load is supplied under regulated, sinusoidal and balanced voltage conditions (*vL*). On the other hand, the series active filter imposes a fundamental positive-sequence current (*iS*) to be drained from the network. In steady state, the series active filter drains a positive-sequence current in phase with the fundamental positive-sequence component of the supply voltage *vS*. The magnitude of *iS* correspond to the average active power demanded by the load, plus an active current component to compensate for losses inside the iUPQC. Since the shunt active filter of the iUPQC behaves as an ideal voltage source, it offers ideally null impedance for harmonic currents, whereas the series active filter offers ideally infinite impedance, according to this consideration all harmonic current injected by nonlinear load will be forced to follow in to shunt active filter of iupqc and it supplies reactive power of the load, series filter drains only active portion of load current.[2]

IV. IUPQC CONTROLLER

The controller of the iUPQC is very simple. It is based on the p-q Theory. A fundamental part of this controller is the synchronizing control circuit based on a Phase Locked-Loop (PLL), which tracks accurately the frequency and phase angle of the fundamental positive-sequence component of the supply voltage Vs. Fig. shows the complete control block diagram of the iUPQC controller. Since the present approach of iUPQC is designed for application in three-phase three-wire systems (without neutral conductor), zero-sequence components are out of interest. Hence, simplified 2x2 matrixes of the Clarke Transformations and a reduced numbers of measurements can be employed as input signals for the iUPQC controller.

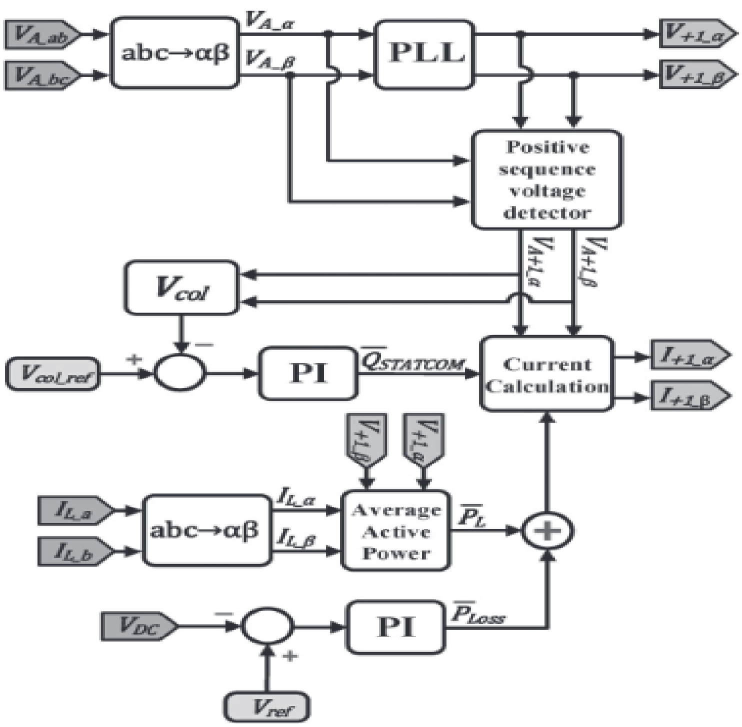

Fig.3. Iupqc controller.[19]

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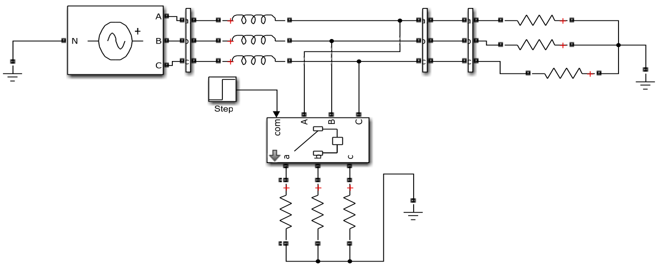
V. RESULT AND DISCUSSION

Simulation Diagram Of System Without Iupqc At Different Load Condition.

1. Resistive load



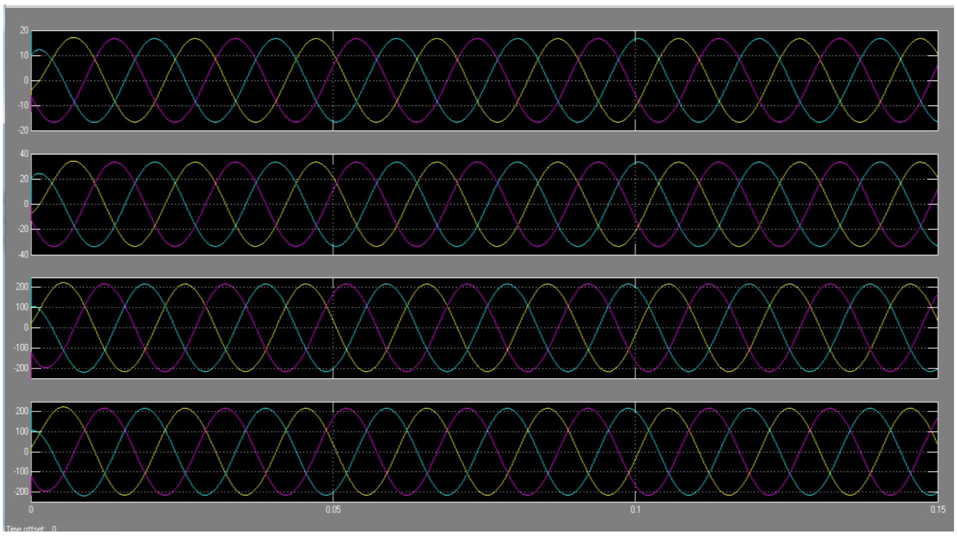
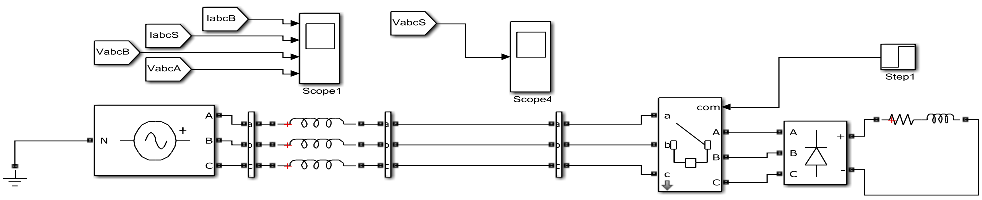


Fig.4   output waveform of resistive load a] Load current (Ib) ,b] source current (Ia) c] Load voltage (VL) d] source voltage (Va).

2. Non Linear Load



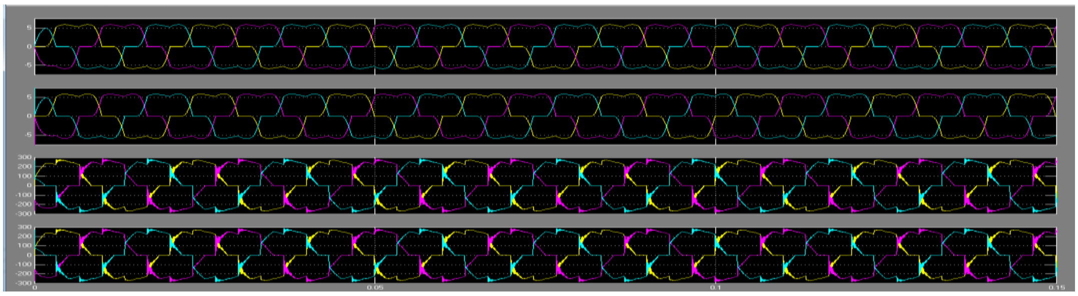


Fig5 output waveform of nonlinear load

[a] Load current (Ib) [b] source current (Ia)   [c] Load voltage (VL) [d] source voltage (Va).

Simulation Diagram of System with Iupqc at Different Load Condition.

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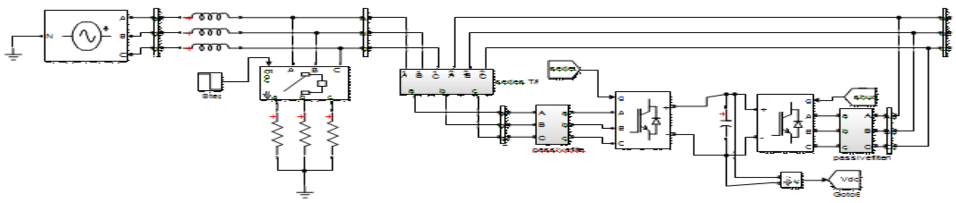
1. **No Load Condition**



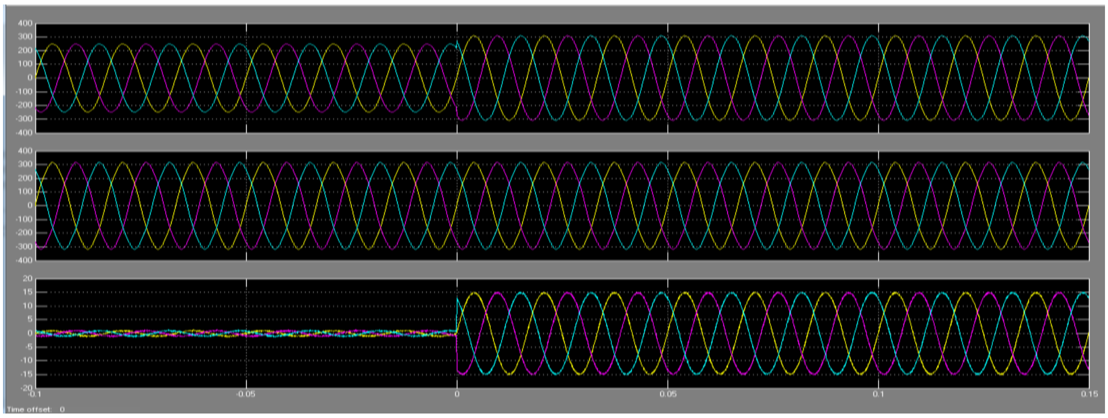
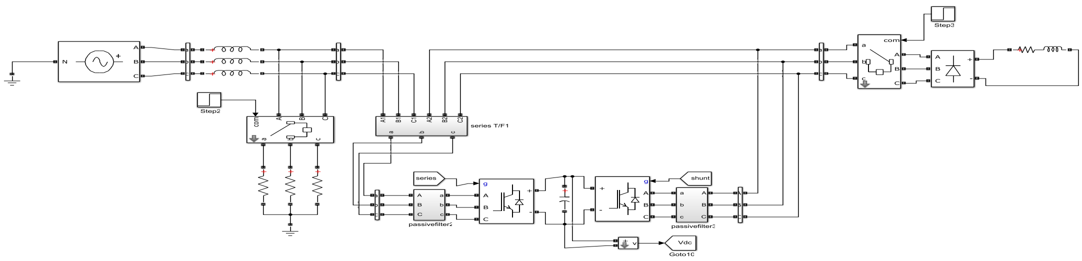


Fig.6. iUPQC response at no load condition: (a) grid voltages *VA*, (b) load voltages *VB*, and (c) grid currents

2.iupqc with 3 phase diode rectifier



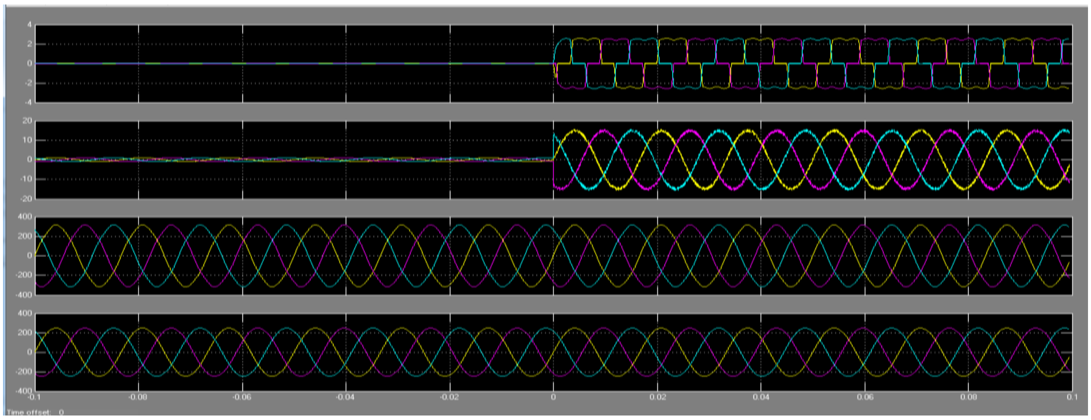


Fig.7 iUPQC transitory response during the connection of a three phase diode rectifier: (a) load currents, (b) grid currents, (c) load voltages and (d) grid voltages.

Fig.7 shows The load is a three phase diode rectifier with a series *RL* load at the dc link (R = 45 Ω and L = 22 mH), In that, the voltage-sag disturbance is increased due to the load connection. it is possible to verify that the

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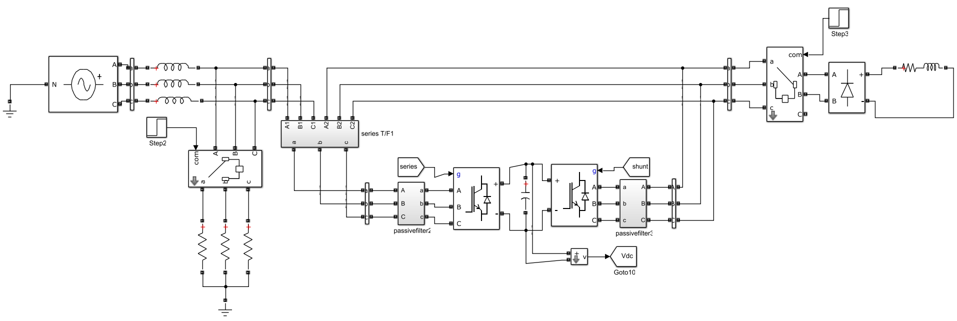
iUPQCis able to regulate the voltages at both sides of the iUPQC, simultaneously. Even after the load connection, at *t* = 0 s, the voltages are still regulated, and the currents drawn from bus A.

3 .iupqc with two phase diode rectifier



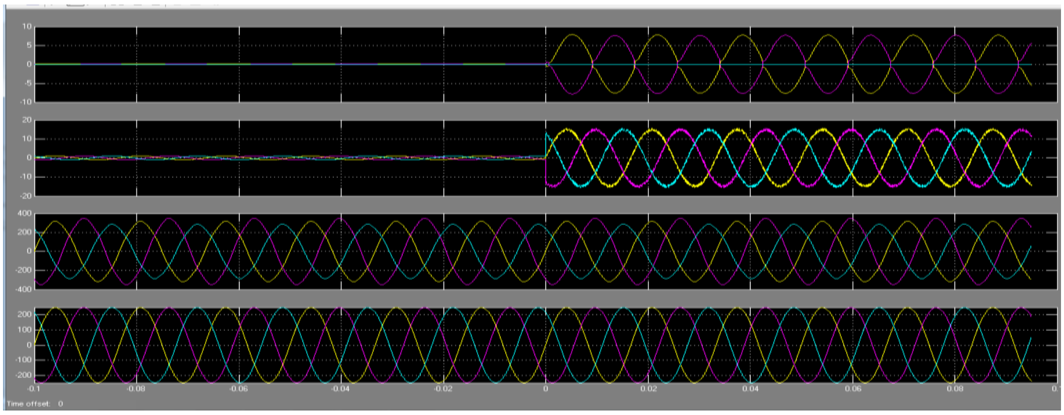


Fig.8 iUPQC transitory response during the connection of a two phase Diode rectifier: (a) load currents, (b) grid currents, (c) load Voltages and (d) grid voltages.

Fig. 8. iUPQC transitory response during the connection of a two phase diode rectifier: load currents, source currents, load voltages, and source voltages. are almost sinusoidal. Hence, the iUPQC can perform all the power-quality compensations, as mentioned before, including the grid-voltage regulation

VI. CONCLUSION

The objective of this topic is to improve the power quality in an electrical network using iupqc fact device. This new feature enhances the applicability of the iupqc and provides new solutions in future scenarios involving smart grids and micro grids, including distributed generation .The grid-voltage regulation was achieved with no load, as well as when supplying a three-phase nonlinear load. These results have demonstrated a suitable performance of voltage regulation at both sides of the iupqc, even while compensating harmonic current and voltage imbalances. From this project it is clear that the performance in the voltage profile or waveform gets improved using improved unified power quality conditioner

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