FACTS DEVICE FOR VOLTAGE REGULATION IN MICRO GRID APPLICATIONS

N. Kalpana[1]

[1]*Assistant.Professor, Department of Electrical and Electronics Engineering, MECS, Hyderabad, Telangana, India*

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ABSTRACT- The ability circuit of the UPQC includes a mixture of a shunt controller along with a series controller connected inside a back-to-back configuration. The twin topology from the UPQC, i.e., the iUPQC, was presented, in which the shunt controller behaves being an ac-current source and also the series one being an ac-current source, both in the fundamental frequency. This paper presents an enhanced controller for that dual topology from the unified power quality conditioner (iUPQC) stretching its usefulness in power-quality compensation, plus micro grid programs. Quite simply, the iUPQC will act as a static synchronous compensator (STATCOM) in the grid side, while

Key Words: iUPQC, micro grids, static synchronous compensator (STATCOM), unified power quality Conditioner (UPQC).

1. INTRODUCTION

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In presents days, the STATCOM is basically employed for current regulation, whereas the UPQC and also the iUPQC happen to be used as solution for additional specific programs. Furthermore, these are utilized only for particularly cases, where their relatively expense are economized through the power quality improvement it may provide, which may be unfeasible by utilizing conventional solutions. In comparison, power-electronics-driven loads generally require ideal sinusoidal supply current to be able to function correctly, whereas those are the most responsible ones for abnormal harmonic power level within the distribution system. Within this scenario, products that may mitigate these drawbacks happen to be developed.

Supplying even the conventional UPQC settlements in the load or micro grid side. Experimental answers are presented to verify the brand new functionality from the equipment. Applying this controller, past the conventional UPQC power quality features, including current sag/swell compensation, the iUPQC may also provide reactive power support to manage not just the burden-bus current but the current in the grid-side bus.

Through the years. A few of the solutions involve an adaptable compensator, referred to as unified power quality conditioner and also the static synchronous compensator [1].

The STATCOM has been utilized broadly in transmission systems to manage the current by way of dynamic reactive power compensation. By adding the additional functionality just like a STATCOM within the iUPQC device, a broader scenario of programs could be arrived at, particularly just in case of distributed generation in wise grids and because the coupling device in grid-tied micro grids.

The primary distinction between these compensators may be the kind of source emulated through the series and shunt power converters. Within the UPQC approach, the series ripper tools are controlled like a no sinusoidal current source and also the shunt one like a no sinusoidal current source. Hence, instantly, the UPQC controller needs to determine and synthesize precisely the harmonic current and current to become compensated.

However, within the iUPQC approach, the series ripper tools works as a controlled sinusoidal current source and also the shunt ripper tools like a controlled sinusoidal current source. Which means that there is no need to look for the harmonic current and current to become compensated, because the harmonic voltages appear naturally over the series current source and also the harmonic power flow naturally in to the shunt current source? In actual power converters, because the switching frequency increases, the ability rate capacity is reduced.

Therefore, the iUPQC offers better solutions if in comparison using the UPQC just in case of high-power programs, because the iUPQC paying references are pure Sinusoidal waveforms in the fundamental frequency. Furthermore, the UPQC has greater switching deficits because of its greater switching frequency. This paper proposes an enhanced controller, which grows the iUPQC benefits. This enhanced form of iUPQC controller includes all benefits of individual's previous ones, such as the current regulation in the load-side bus, and today supplying also current regulation in the grid-side bus, just like a STATCOM towards the grid.

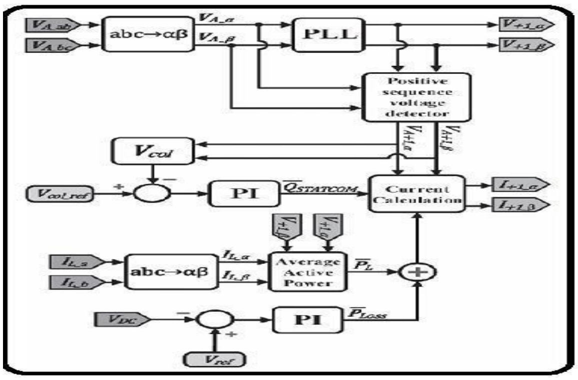

Figure.1.Proposed system architecture

2. METHODOLOGY:

Using a STATCOM to be sure the current regulation at bus A isn't enough since the harmonic power attracted through the nonlinear loads aren't reduced. Bus A is really a critical bus from the power system that supplies sensitive loads and can serve as reason for coupling of the micro grid. Bus B is really a bus from the micro grid, where nonlinear loads are connected, which requires premium-quality power [2]. The voltages at buses A and B should be controlled, to be able to correctly give you the sensitive loads and also the nonlinear loads. The results brought on by the harmonic power attracted through the nonlinear loads ought to be reduced, staying away from harmonic current propagation to bus A.

However, a UPQC or perhaps an iUPQC between bus A and bus B can compensate the harmonic power from the nonlinear loads and compensate the current at bus B, when it comes to current harmonics, unbalance, and sag/swell. Nonetheless, this really is still insufficient to be sure the current regulation at bus A.

Hence, to attain all of the preferred goals, a STATCOM at bus A along with a UPQC between buses A and B ought to be employed. However, the expense of the solution could be unreasonably high. A beautiful solution could be using a modified iUPQC controller to supply also reactive power support to bus A, additionally to any or all individual's benefits of the equipment, as presented. Based on the conventional iUPQC controller, the shunt ripper tools imposes a controlled sinusoidal current at bus B, which matches this functionality

(d). Consequently, the shunt ripper tools doesn't have further amount of freedom when it comes to paying active- or reactive-power variables to grow its functionality [3]. However, the series ripper tools of the conventional iUPQC uses only an energetic-power control variable p, to be able to synthesize a simple sinusoidal current attracted from bus A, akin to the active power required by bus B. When the electricity link from the iUPQC doesn't have large energy storage system or perhaps no power source, the control variable p also can serve as yet another active-power mention of series ripper tools to help keep the power within the electricity link from the iUPQC balanced.

Within this situation, the deficits within the iUPQC and also the active power provide d through the shunt ripper tools should be rapidly compensated by means of yet another active power injected through the series ripper tools in to the bus B. the iUPQC hardware and also the measured models of the three-phase three-wire system which are utilized in the controller [4]. The controller inputs would be the voltages at buses A and B, the present required by bus B (ill), and also the current vDC from the common electricity link. The outputs would be the shunt-current reference and also the series-current mention of pulse width modulation (PWM) controllers. The shunt ripper tools imposes the current at bus B. Thus, it's important to synthesize sinusoidal voltages with nominal amplitude and frequency. Consequently, the signals delivered to the PWM controller would be the phase-locked loop (PLL) outputs with amplitude comparable to 1 p.u.

There are lots of possible PLL calculations that could be utilized within this situation, as verified. For combined series-shunt power conditioners, like the UPQC and also the iUPQC, just the current sag/swell disturbance and also the power factor (PF) compensation from the load create a circulating average power with the power conditioners [5]. First, the circulating power is going to be calculated once the iUPQC is working as being a conventional UPQC. After, the equations includes the STATCOM functionality towards the grid bus A. In the two cases, it will likely be assumed the iUPQC

controller has the capacity to pressure the shunt ripper tools from the iUPQC to create fundamental current forever in phase using the grid current at bus A. For simplicity, the deficits within the iUPQC is going to be neglected. The ability flow within the series ripper tools signifies that the high power is needed just in case of sag current disturbance rich in active power load consumption. You should highlight that, for every PF value, the amplitude from the apparent power is identical for capacitive or inductive loads.

To be able to verify all of the power quality issues described within this paper, the iUPQC was linked to a grid having a current sag system, as portrayed. Finally, exactly the same procedure was carried out using the connection of the two-phase diode rectifier, to be able to better verify the minimization of power quality issues.

3. SIMULATION RESULTS

The enhanced IUPQC is designed using MATLAB/SIMULATION and the output wave forms corresponding to no-load and non-linear load are obtained as shown below.

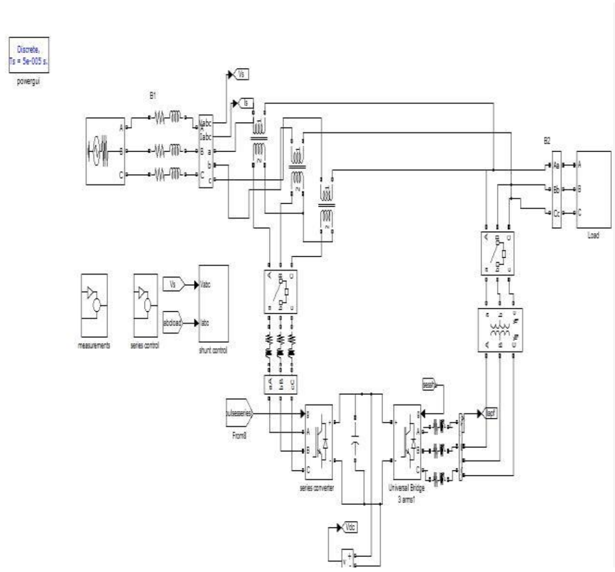

Fig-2. Simualtion model of iupqc with non linear load

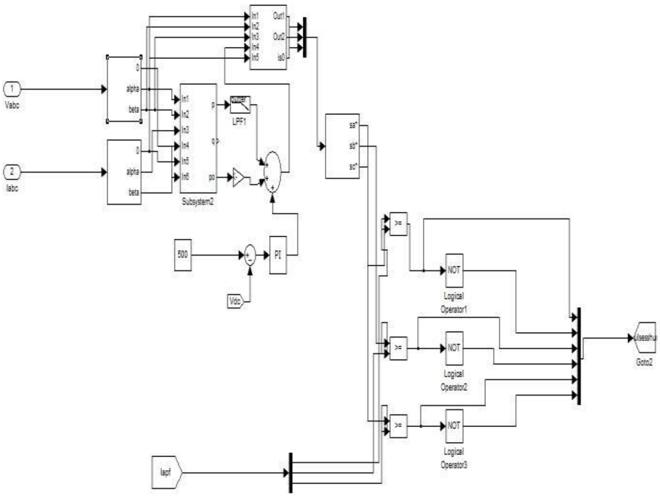

Fig-3 Simulation Model of Shunt Pulse Generator

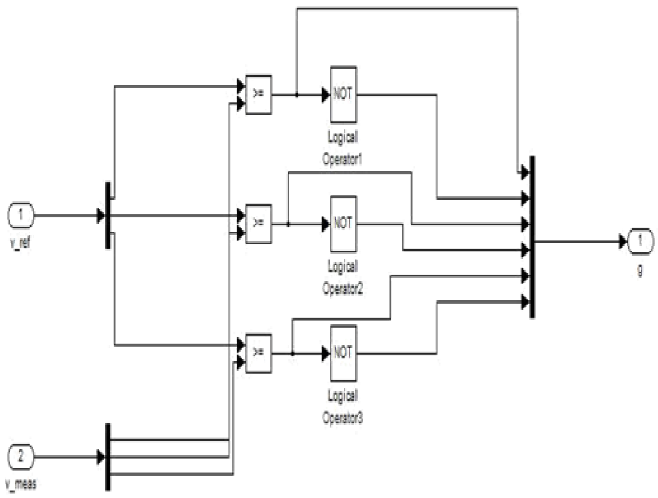

Fig-4 simulation model of for logical circuit for shunt pulse generator

No load condition

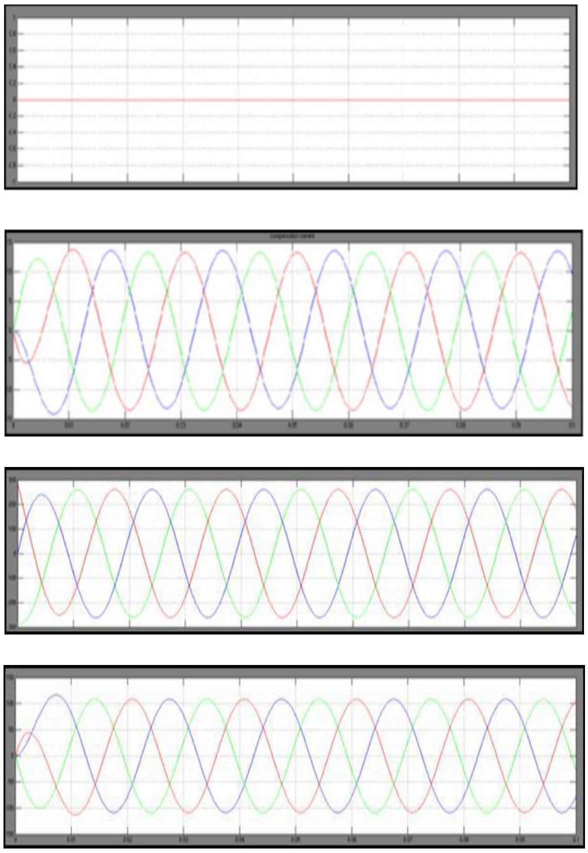

Fig-5: scope out puts at no load condition

A. No load condition
B. Compensation current
C. Load voltage
D. Supply voltage

Three phase non-linear load

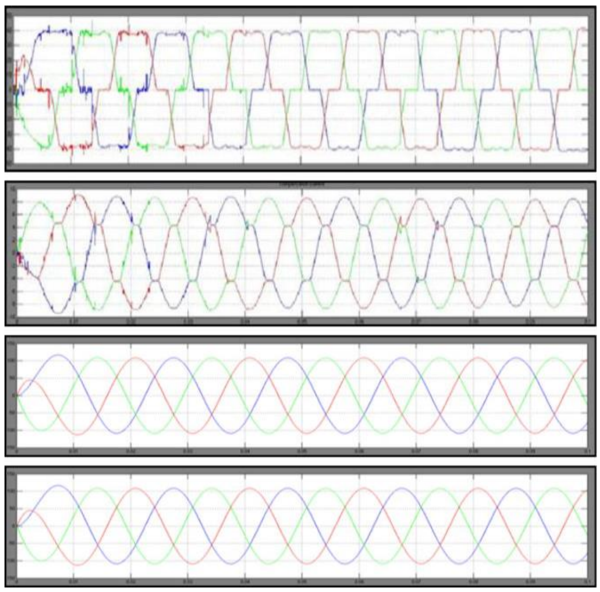

Figure6: SCOPE OUTPUTS WHEN CONNECTED TO NON-LINEAR LOAD

A.LOADCURRENT
B.COMPENSATION CURRENT
C.SOURCE VOLTAGE
D.LOAD VOLTAGE

3. CONCLUSION

The grid-current regulation was accomplished without any load, in addition to when offering a 3-phase nonlinear load. These results have shown an appropriate performance of current regulation at each side from the iUPQC, whilst paying harmonic current and current imbalances. In this way, additionally to any or all the ability-quality compensation options that come with a standard UPQC or perhaps an iUPQC, this enhanced controller also imitates a STATCOM towards the grid bus. Within the enhanced iUPQC controller, the power synthesized through the series ripper tools are based on the typical active power the burden and also the active capacity to supply the electricity-link current regulation, along with a typical reactive capacity to regulate the grid-bus current. This new feature improves the usefulness from the iUPQC and offers new solutions later on situations concerning wise grids and micro grids, including distributed generation and storage systems to higher cope with the natural variability of renewable sources for example solar and wind power. Furthermore, the enhanced iUPQC controller may justify the expense and promotes the iUPQC usefulness in power quality problems with critical systems, where it's important not just an C or perhaps a STATCOM, but both, concurrently. Despite adding yet another power-quality compensation feature, the grid-current regulation cuts down on the inner-loop circulating power within the iUPQC, which may allow lower power rating for that series ripper tools. The experimental results verified the enhanced iUPQC goals.

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