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Matlab Implementation of Power Quality Improvement Based on Fast Dynamic Control

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ABSTRACT

The paper is based on power quality with fast dynamic control having no isolation transformer. The concept is simulated using famous MATLAB tool and the proposed architecture is based on four switching devices only, forming two half-bridge voltage-source inverters-one connected in parallel with the load and another one connected in series with the AC mains and both having the same DC link.

KEYWORDS: *UPQC, APF, DVR, DC. PVSI, SVSI.*

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I. INRODUCTION

A transformer-less UPQC (TL-UPQC) utilizing four switch devices is given. It consists of two half-bridge voltage-source inverters with one connected in parallel with the load and another one connected serial with the AC mains. The two inverters share an equivalent DC link. The parallel electrical converter is controlled by a hysteria is current controller [22]-[23] and therefore the series inverter is controlled by a boundary controller with second-order switch surface [24]-[26]. The DC-link electrical condenser voltages are balanced by a mechanism that coordinates the physical phenomenon and boundary controllers. A 1kVAprototype has been designed and evaluated. The experimental results are favorably compared with theoretical predictions and alternative UPQCs. The growing use of power natural philosophy primarily based instrumentality in trendy plants is leading to a load that is sensitive and harmonics manufacturing in nature. Curiously, these instrumentalities usually turn out distortion in currents and/or voltages. Thus, there's a replacement trend to put in mitigating instrumentality that may serve the twin purpose, to teach the utility additionally on the client. So, with the implementation of Custom Power Devices within the distribution facet, Power Quality is increased. One in all the foremost effective solutions to power quality problems within the distribution facet is that the installation of Unified Power Quality Conditioner (UPQC). Unified power quality conditioners that may written agreement with each current and voltage sort power quality problems can management load voltage, mitigate voltage transients, take away input current harmonics and rectify input power issue over a good operative vary. Every unified power quality conditioner acts as associate degree APF (Active Power Filter) and a DVR (Dynamic Voltage Restorer) with their DC links shared with identical energy storage devices.

II. PROBLEM DEFINITION

The power rating of typical DG systems ranges from 1kw to 20kw and such architecture provides numerous advantages to the society and power systems. Hence reducing carbon emissions increasing efficiency optimizing asset utilization and improving system security and stability flexibility and reliability. Similar to the traditional power systems it is very essential to provide consumers quality based electricity to overcome system malfunctions or activation of device protections the green energy resources are intermittent in nature and there generated power and voltage sometimes fluctuate and the current harmonics caused by nonlinear loads would cause grid voltage distortion and hence increase the loss in the distribution transformers thus need an equipment that enhances the power quality at point of common coupling.

III. METHODOLOGY

This work can adopt a research methodology that mixes the idea model with empirical analysis and refinement of the planned theme on MATLAB simulation tool. MATLAB could be helpful high-level development surroundings for systems that need mathematical modeling, numerical computations, information analysis, and improvement ways. MATLAB is a useful high-level development environment for systems which require mathematical modeling, numerical computations, data analysis, and optimization methods. A parallel half-bridge voltage-source inverter (PVSI), formed by the switching devices, 1S and 2 S, filter inductor L, DC-link capacitors, 1dcC and 2dcC, is connected in parallel with the load. A series half-bridge voltage-source inverter (SVSI), formed by the switching devices, 3S and 4 S, filter inductor xL filter capacitor xC, and the DC-link capacitors 1dcC and 2dcC, is connected in series with the AC mains. The two inverters shared the same DC link.

I. RESULTS

The results obtained using MATLAB simulation tool are as under:

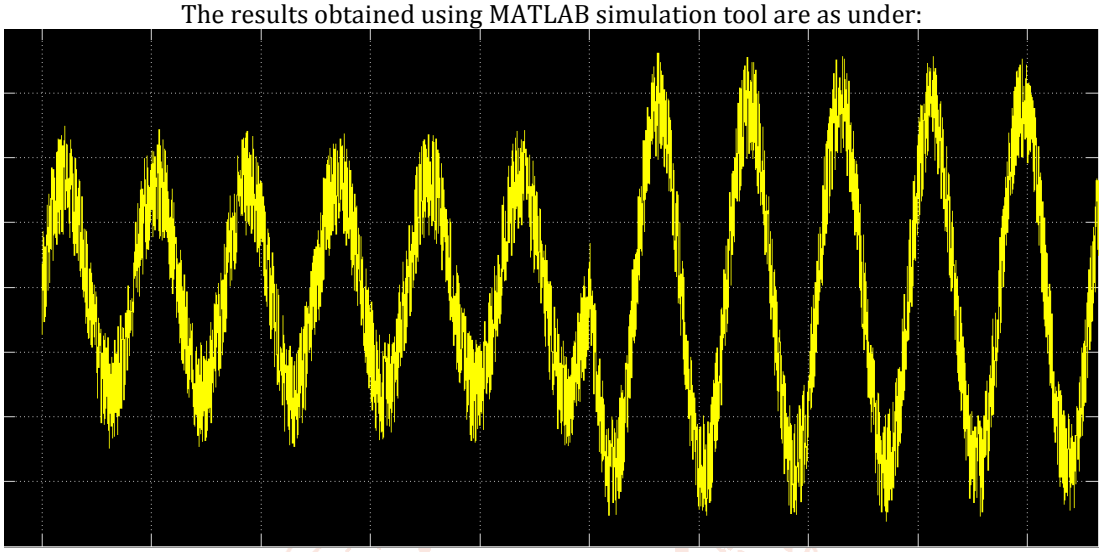

Fig.1 IP at SAG1

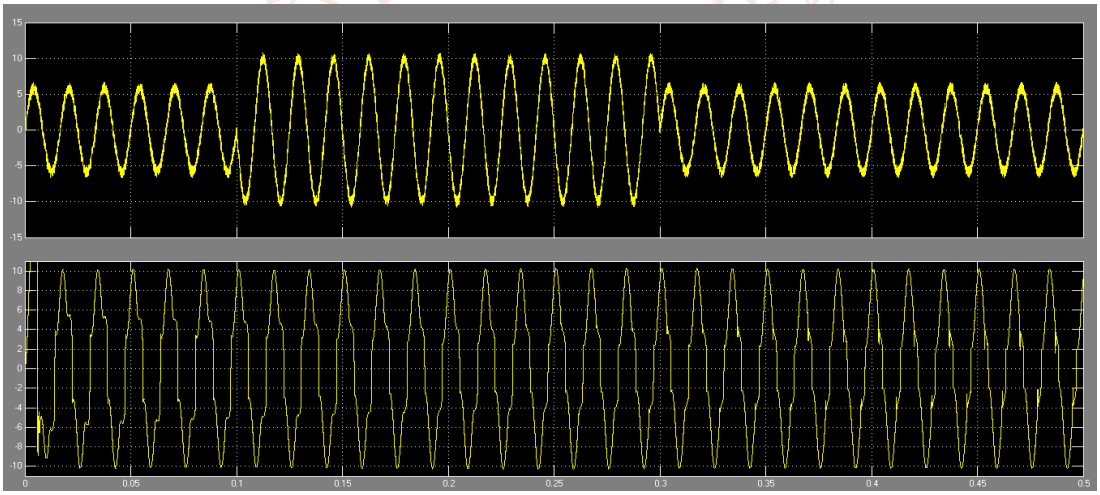

Fig.2 IS/IL Load during SAG

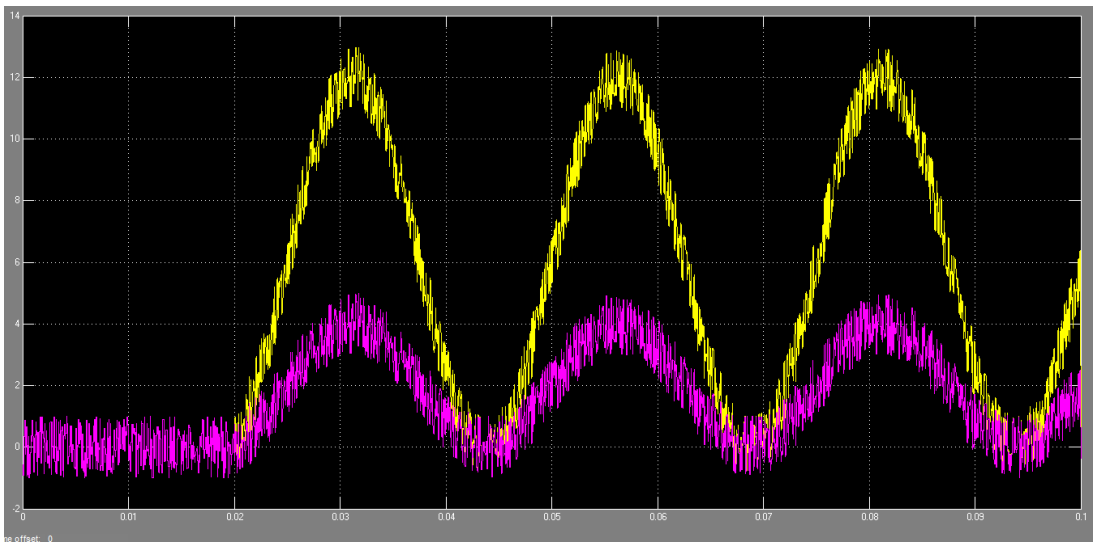

Fig.3 Steady State without DC

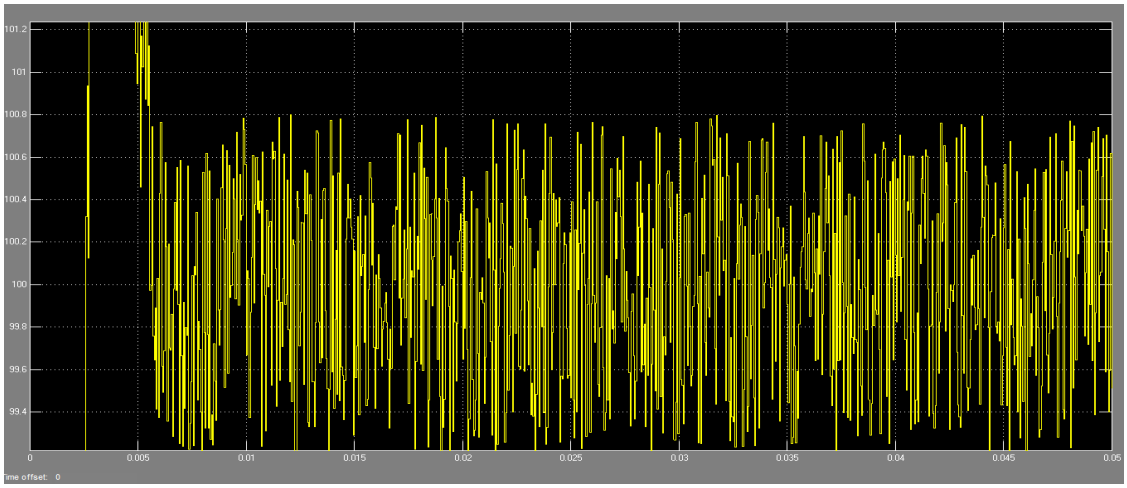

Fig.4 VDC at SAG2

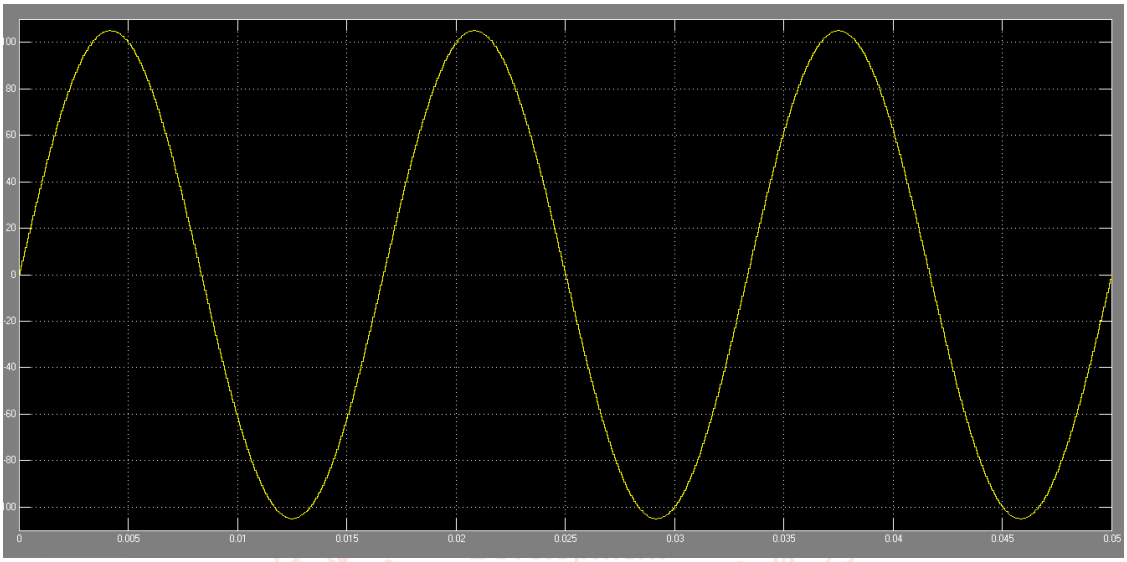

Fig.5 VS at SAG3

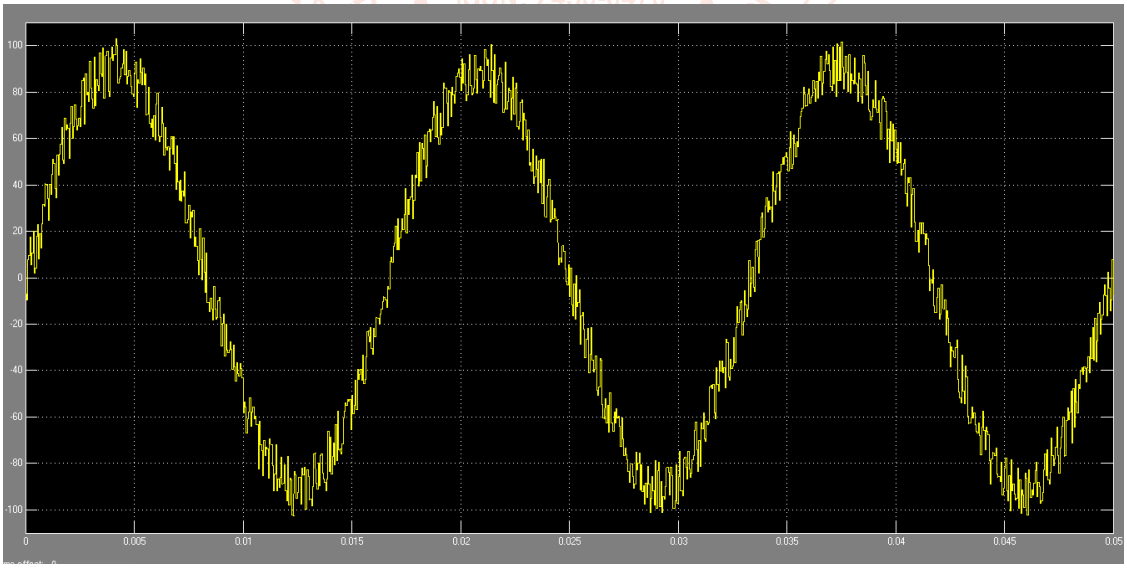

Fig.6 VX at SAG4

I. CONCLUSION

The research paper presents the power quality improvement using fast dynamic control. A 1kVA prototype has been built and evaluated under nonlinear load and voltage sag / swell conditions. The research paper introduces TL-UPQC with comparison among the TL-UPQC and other single phase UPQCs.

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