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New Control System Based Solar PV Integrated Unified Power Quality Conditioner for Enhancement of Power Quality

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ABSTRACT- Today power framework request is expanding. In late year's power debased at dissemination side and Power misfortune is expanding at shopper side because of more employments of non-straight burden. Power Quality issues made by touchy burden. In this paper MAF based UPQC gadget used to lessen voltage and current bends. In this paper we use UPQC which comprises of a series compensator and a shunt compensator and the PV cell is associated in the middle of shunt and series associated voltage compensators. The compensator in series to a source is utilized to relieve the voltage sounds between the sources and loads. Though the shunt dynamic channel is associated in corresponding with the heap is utilized to decrease and the consonant flows created by the heap, diminish the absolute symphonious bending (THD), removing power from PV circuit, and increment the power component of the framework. The Synchronous reference outline based control is utilized in shunt and series compensators in UPQC. In this paper the power Quality can be improved by decrease of contortions prompts expansion in effectiveness of force framework. The exhibition of MAF based UPQC is shown by reproducing the created framework plan in MATLAB/Simulink under a Non-straight burden.

List Terms—Power Quality, shunt compensator, series compensator, UPQC, Solar PV,MPPT.

I.INTRODUCTION

With the headway in semiconductor innovation, there is an expanded infiltration of force electronic burdens. These heaps, for example, PC power supplies, flexible speed drives, swtiched mode power supplies and so forth have generally excellent productivity, in any case, they draw nonlinear flows. These nonlinear flows cause voltage contortion at reason behind normal coupling especially in conveyance frameworks. There is likewise expanding accentuation on clean energy age through establishment of roof PV frameworks in little condos just as in business structures [1], [2]. Be that as it may, because of the discontinuous idea of the PV energy sources, an expanded entrance of such frameworks, especially in frail dispersion frameworks prompts voltage quality issues like voltage hangs and enlarges, which ultimately precariousness in the matrix [3]–[7].

These voltage quality issues likewise lead to visit bogus stumbling of force electronic frameworks, breaking down and bogus setting off of electronic frameworks and expanded warming of capacitor banks and so forth [8]–[10]. Power quality issues at both burden side and matrix side are serious issues looked by current dissemination frameworks. Because of the interest for clean energy just as tough power quality necessity of modern electronic burdens, there is need for multifunctional frameworks which can incorporate clean energy age alongside power quality improvement. A three stage multi-useful sunlight based energy change framework, which makes up for load side power quality issues has been proposed in [11], [12]. A solitary stage sun based pv inverter alongside dynamic power separating capacity has been proposed in [13], [14]. Significant examination work has been done in incorporating clean energy age alongside shunt dynamic sifting. However shunt dynamic separating has capacity for both burden voltage guideline, it comes at the reason for infusing receptive power. Hence shunt dynamic separating can't direct PCC voltage just as keep up with lattice current solidarity power factor at same time. As of late, because of the tough voltage quality necessities for refined gadgets stacks, the utilization of series dynamic channels has been proposed for use in little condos and business structures [15], [16]. A sun powered photovoltaic framework incorporated alongside unique voltage restorer has been proposed in [17]. Contrasted with shunt and series dynamic power channels, a brought together power quality conditioner (UPQC), which has both series and shunt compensators can perform both burden voltage guideline and keep up with matrix current sinusoidal at solidarity power factor at same time. Coordinating PV exhibit alongside UPQC, gives the double advantages of clean energy age alongside general dynamic. The mix of PV exhibit with UPQC has been accounted for in [18]–[20]. Contrasted with customary lattice associated inverters, the sunlight based PV coordinated UPQC has various advantages, for example, further developing power nature of the network, shielding basic burdens from framework side unsettling influences separated from expanding the shortcoming ride through capacity of converter during homeless people. With the expanded accentuation on

circulated age and miniature networks, there is a restored interest in UPQC frameworks [21], [22]. Reference signal age is a significant assignment in charge of PV-UPQC. Reference signal age methods can be extensively partitioned into time-space and recurrence area procedures [8]. Time area methods are generally utilized as a result of lower computational necessities continuously execution. The regularly utilized procedures incorporate immediate receptive power hypothesis (p-q hypothesis), simultaneous reference outline hypothesis (d-q hypothesis) and momentary even part hypothesis [23]. The primary issue being used of simultaneous reference outline hypothesis based technique is that during load uneven condition, twofold consonant part is available in the d-hub current. Because of this, low pass channels with exceptionally low profile off recurrence is utilized to sift through twofold consonant part. This outcomes in helpless unique execution [24]. In this work, a moving normal channel (MAF) is utilized to channel the d-pivot current to acquire principal load dynamic current. This gives ideal lessening and without diminishing the transfer speed of the regulator [25]. As of late, MAF has been applied in further developing execution of DC-interface regulators just as for framework synchronization utilizing stage locked circle (PLL).

In this paper, the activity of UPQC is seen exhaustively. A lift DC-DC converter is utilized to interface sun powered situated PV group with DC association of UPQC. The unique power from the sun oriented based PV show is imbued into the grid through the shunt converter. The Voltage and Current Harmonics are repaid by series and shunt compensators separately utilizing SRF regulator. The Objective of this paper, is to plan a MAF based UPQC and to build the Quality of the power.

II. Framework CONFIGURATION AND DESIGN

Fig1 Unified Power Quality Conditioner (UPQC) is equipped for performing more than one capacity for example it is a multi work power conditioner. UPQC can be utilized to keep away from symphonious burden current from entering the power framework, to amend voltage change and to reimburse different voltage aggravations of the capacity give. It is a custom power gadget proposed to lighten the struggles that impact the exhibition of touchy or potentially fundamental burdens. UPQC has series and shunt pay capacity for (voltage and current) sounds, voltage aggravations (counting glimmer, droop, enlarge and so forth), receptive power, and power-stream control. Generally, an UPQC made out of two voltage-source inverters (Vsi's) with a standard dc connect planned in single stage, three-stage three-wire, or three-section four-wire designs. One electrical converter is managed as an inconsistent voltage supply inside the series compensator (APF or DVR).

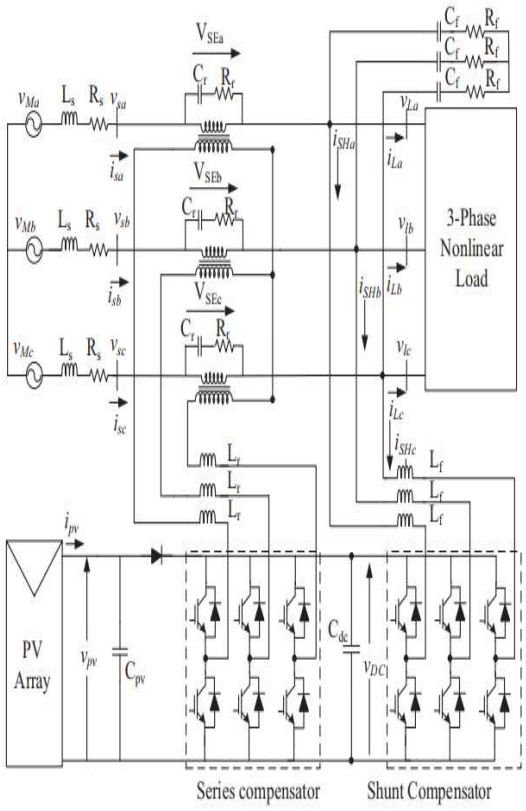

Fig.1. System Configuration PV-UPQC

The extra inverter is managed as an inconsistent current source in the shunt dynamic power channel (APF). The series inverter adjusts for voltage supply contortions (for example counting symphonious variations, negative and zero arrangement components, list, swell, and flickers).The shunt APF converter repays for load current aggravations (for example brought about by sounds, incongruities), execute the dc interface voltage guideline and repays the responsive power.

III. CONTROL DESIGN:

a)Series electrical converter: It's a voltage-source inverter connected in series with AC line through a

series transformer and works as a voltage supply to alleviate voltage unsettling influences. It destroys supply voltage flash and lopsided characteristics from the heap terminal voltage. The board of the series electrical converter yield is performed by exploitation beat width tweak (PWM).Among the varying PWM strategy, the hysteresis band PWM is normally utilized as a result of its simple execution. Likewise, other than fast reaction, the strategy doesn't need any information of framework boundaries. During this work hysteresis band PWM is utilized for the administration of inverters.

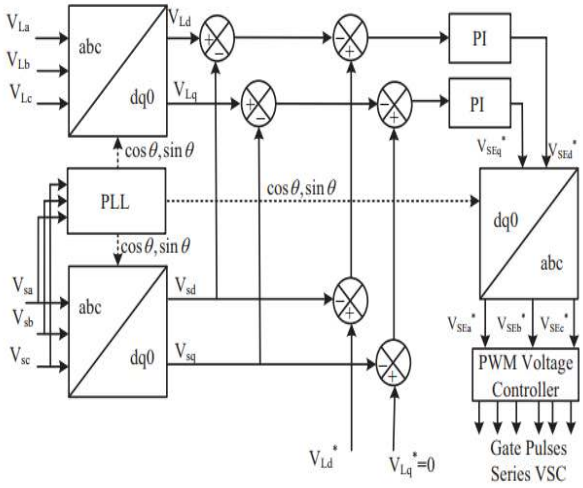

Fig3.1:Control Structure of Series Compensator

b) Shunt inverter:

It's a voltage-source inverter connected in shunt with an analogous AC line that acts to cancel current distortions, compensate reactive current of the load and improve the power factor of the system. It together performs the DC-link voltage regulation, leading to a big reduction of the DC capacitor rating. The output current of shunt device is adjusted by using a dynamic hysteresis band by dominant the standing of the semiconductor switches like output current follows the reference signal and remains in a much planned hysteresis band.

c) DC link capacitor:

The 2 VSI's are connected back to back with one another through this capacitor. The voltage across this electrical condenser provides the independent DC voltage for correct operation of each inverter. With correct management, the DC link voltage acts as a supply of active as well as reactive power and so eliminates the necessity of external DC supply like battery.

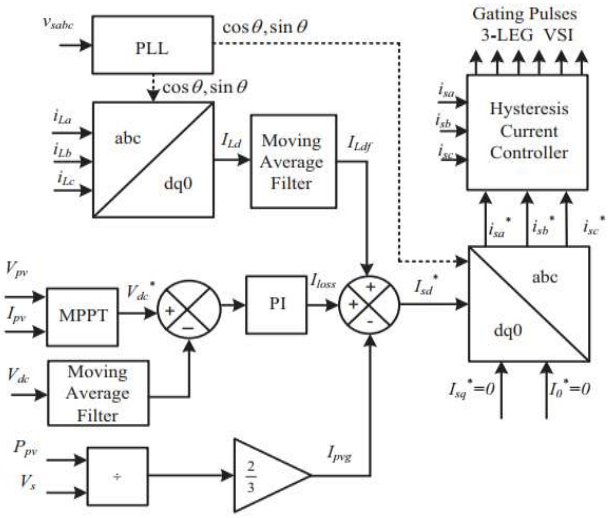

Fig3.2: Control Structure of Shunt Compensator

d)Low pass filter:

It is used to attenuate high-frequency components of the voltages at the output of the series converter that are generated by high frequency switching of VSI.

e) High pass filter:

It is installed at the output of shunt converter to absorb ripples produced due to current switching.

f) Series transformer:

The necessary voltage generated by the series inverter to retain a pure sinusoidal load voltage and at the preferred value is injected into the line through these series transformers. An appropriate turn's ratio is frequently considered to diminish the current flowing through the series inverter.

1V.SIMULATION DIAGRAMS

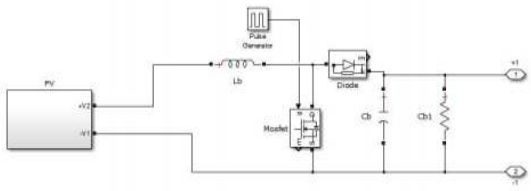

Fig 4.1 PV Module with Boost Converter

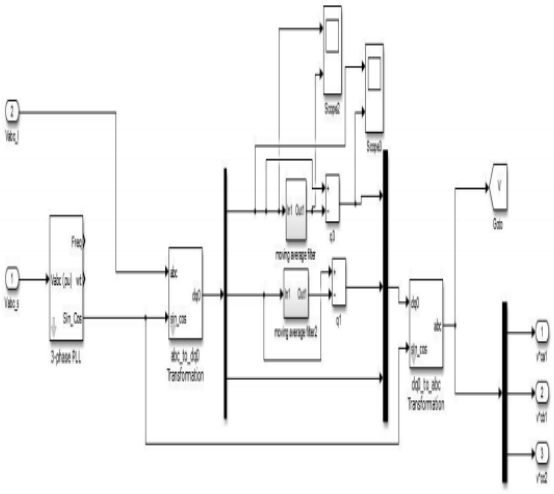

Fig 4.2 SRF Control for Series Converter

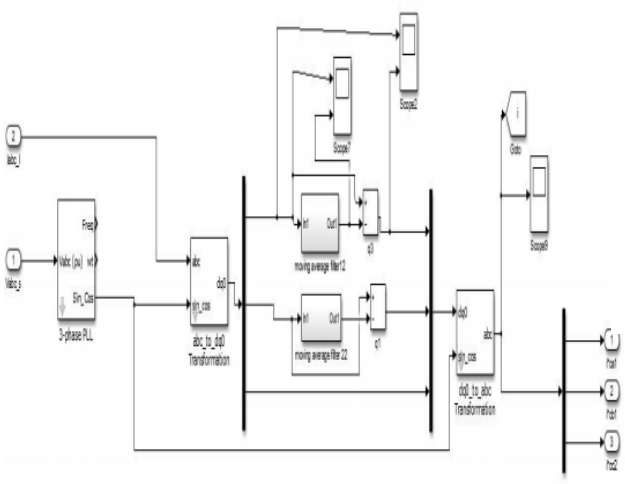

Fig 4.3 SRF Control for Shunt Converter

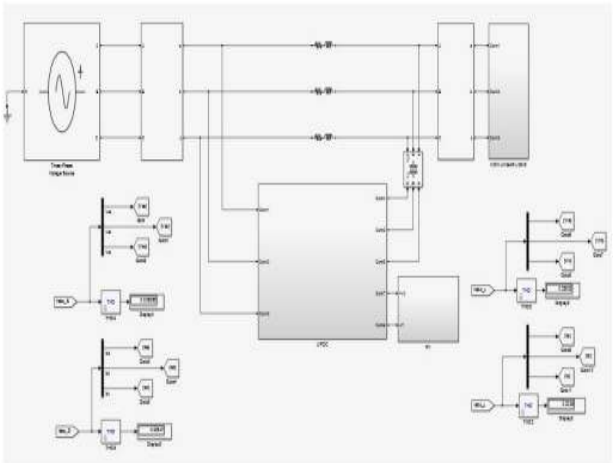

Fig 4.4 Simulink model for MAF based UPQC

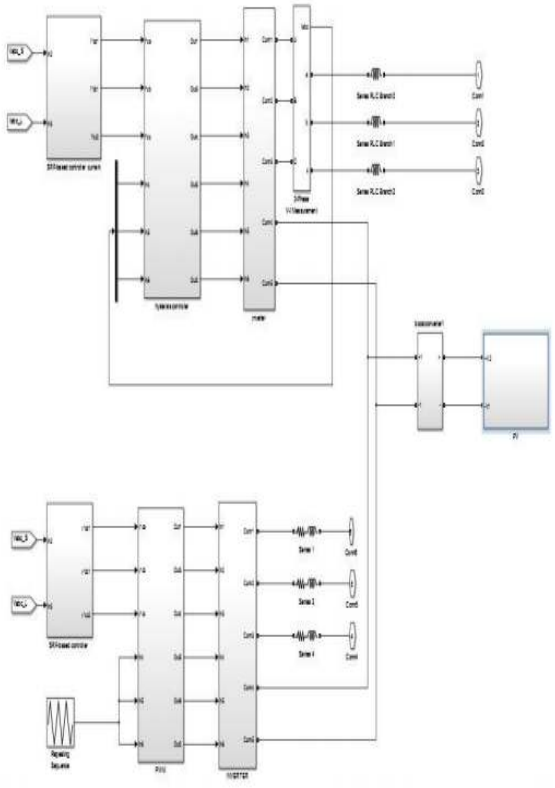

Fig 4.5 Unified Power Quality Conditioner

V.SIMULATION RESULTS

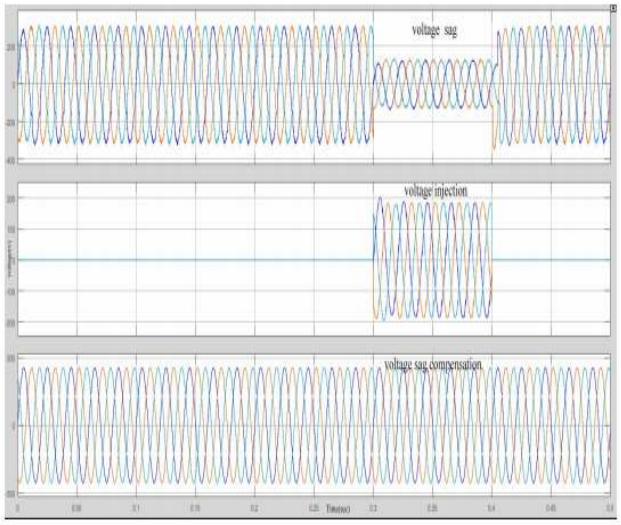

Fig: 5.1 Voltage Sag Compensation Waveforms in PV – UPQC

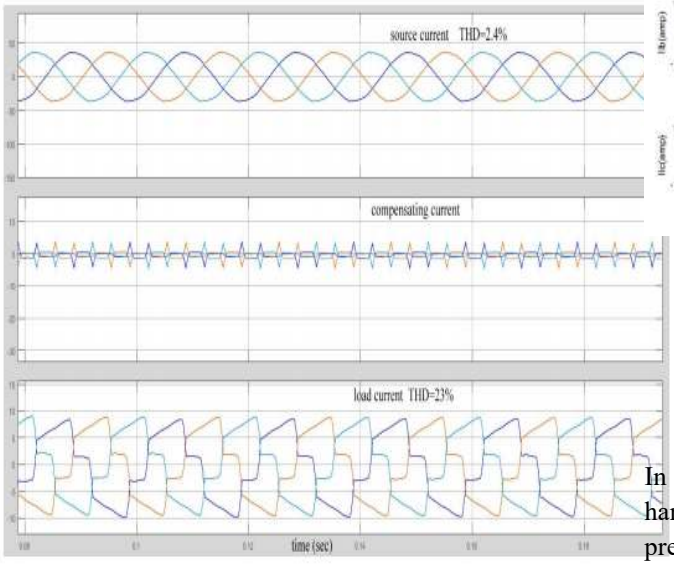

Fig: 5.2 Mitigation of Current Harmonics waveforms in PV - UPQC

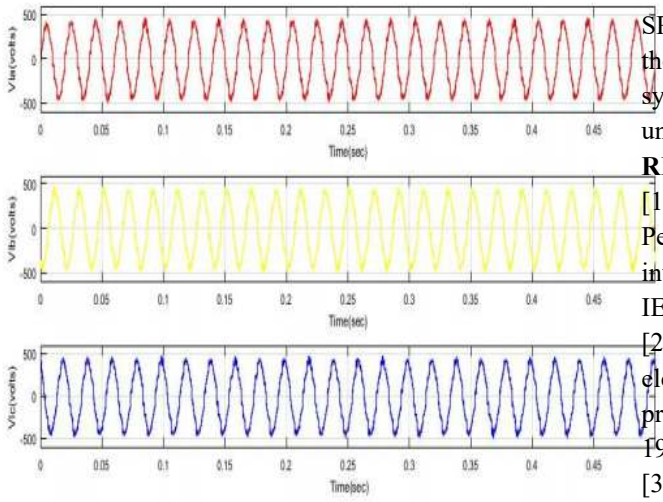

Fig 5.3: Load voltage waveforms

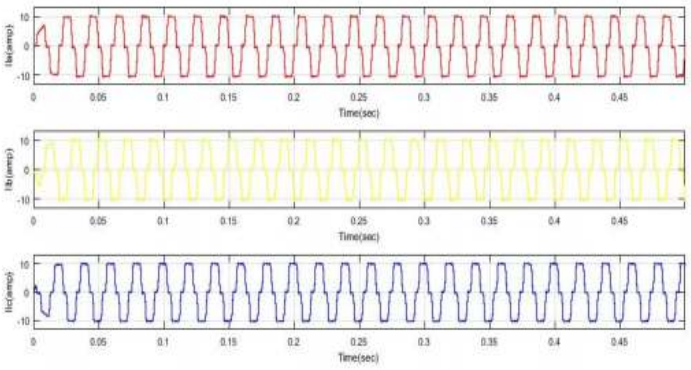

Fig 5.4: Load current waveforms

CONCLUSION

In this paper, mitigation of current and voltage harmonics using MAF based UPQC has been presented and tested under a non-linear load. Introduction of PV system in UPQC at DC link fed the supply voltage to link capacitors as well as fed power to the loads. The performance of SRF based controller particularly in non-linear load condition has been improved through the use of MAF. Introduction of SRF based controlling for MAF based UPQC reduces the harmonics, increases the power factor of the system and also maintains the percentage of THD under the limits of IEEE-519 standards.

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