

An Active Filter with Resonant Current Control to Suppress Harmonic Resonance in a Distribution Power System

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ABSTRACT:

A shunt active filter operated as a harmonic conductance is able to suppress harmonic resonance in the distribution power system. However, due to the inherent phase lagging in digital-signal processing, the active filter really behaves as a harmonic admittance instead of conductance. This may induce unintentional harmonic amplification at other locations in the feeder when starting the active filter, which is similar to the so-called "whack-a-mole" phenomenon. This paper presents an active filter with resonant current control to suppress harmonic resonance. The current control is realized by parallel-connected band-pass filters tuned at harmonic frequencies to ensure that the active filter functions as an approximately pure conductance. The conductance at dominant harmonic frequencies can be separately and dynamically adjusted to guarantee the damping performance. In addition, in order to address the harmonic resonance, the line distributed-parameter model of a radial feeder is developed with considering harmonic damping by variable conductance and admittance, respectively. Simulation results show that the active filter with the resonant control provides better damping performance compared with other control methods.

I. Introduction:

Voltage mutilation, because of symphonious reverberation between control factor amendment capacitors and line inductors, has gotten genuine worries in the circulation control framework. This situation ends up huge because of broad

utilization of nonlinear loads and additionally high entrance of inverter-based dispersed age frameworks. As indicated by IEEE sexually transmitted disease. 519-1992, greatest permissible voltage adds up to consonant contortion (THD) is 5% and individual voltage bending is 3% in conveyance organizes beneath 69kV. This rule is likewise incorporated into IEEE standard for interconnecting conveyed assets with electric power frameworks (IEEE sexually transmitted disease. 1547.2-2008). Tuned-detached channels are regularly embraced to adapt to consonant issues, however their usefulness may experience the ill effects of segment maturing, recurrence moving, or inadvertent resonances. In this way, designing adjustment on aloof channels is oftentimes required to keep up their separating exhibitions. The shunt dynamic channel controlled as a settled or variable conductance has been proposed to smother consonant resonances in an outspread power dissemination framework. The befuddling between the conductance of dynamic channel and the trademark impedance of the line may bring about unexpected enhancement of music because of the symphonious standing waves.

Power quality is one of the real issues in the power framework. With the expansion in the utilization of energy electronic gear the power quality abatements. As a result of the non-direct qualities they tend to draw sounds, in this manner instigating

music into the framework. The sounds aim different issues in the framework like current mutilation, voltage twisting, poor power factor, and high request music can cause obstruction in the close-by correspondence systems. In the event that these sounds go in line towards the source they cause over-warming of line, gear, commotion or vibrations. With a specific end goal to lessen these issues, diverse gadgets are utilized to repay the sounds.

II. Literature Review

Toward the finish of nineteenth century because of the progressions in AC transmission, the voltage sinusoidal of steady recurrence appeared. The plan of transformer, transmission lines and machines depends on the voltages of steady recurrence. The voltage with non-sinusoidal waveform will cause glitch of transformer, machine and transmission framework gear. In the mid twentieth century changes in the estimation of clear power and responsive power under voltage misshaped conditions were illustrated. With the headway in control electronic innovation and increment in the utilization of non-straight loads in different applications, sounds turned into a noteworthy worry in dispersion framework. The utilization of nonlinear burdens is prompting generation of sounds.

At the point when the consonant streams move through the line because of their impedances symphonious voltages are produced and actuated into the appropriation frameworks. In IEEE 519 the level of consonant streams that a client can infuse into the conveyance framework were characterized. The power framework to exchange greatest measure of energy it

ought to be worked at solidarity control factor. The essential techniques utilized for the decrease of music in the framework incorporate confinement transformers, line reactors and consonant trap channels or uninvolved channels.

In prior days for the pay of sounds inactive channels were utilized, however they have numerous downsides like massive, constrained pay, and they may cause reverberation if not composed appropriately. Dynamic channels were intended to defeat these disadvantages of the inactive channels. The dynamic channels not just give variable remuneration to the distinctive sounds at once yet additionally receptive power pay now and again. In light of the task dynamic channels are separated into three kinds, arrangement APF, shunt APF and UPQC. Arrangement dynamic channels are associated on the source side of the line which is utilized for the end of voltage sounds and keep up the nature of voltage waveform. Shunt dynamic channels are associated on the heap side which are utilized for the end of current music. Cross breed channels are blend of both the dynamic and uninvolved filters. This sort of filters will have the upsides of both the filters.

The sounds in the source current are figured as reference motions by the controller and given to the inverter of the filter. Distinctive techniques are utilized to ascertain the reference signals, from the heap voltages and streams. The reference signals ascertained are utilized to produce the beats. The shunt dynamic channels utilize customary 3 leg or 4 leg inverters or multilevel inverters in view of the prerequisite of the framework. The three stage inverters are utilized for the sifting

task in the vast majority of the circuits. As of late the multi-level inverters are picking up fascination. The shunt APF utilizes VSC for the creation of harmonics.

The PWM VSCs have numerous favourable circumstances contrasted with different converters. The line sounds are less contrasted with different strategies, low power misfortunes, littler in measure. At high voltage the VSC couldn't deal with the power with the arrangement associated switches. Shunt dynamic channels goes about as a present source providing negative music into the framework. The reference streams are computed utilizing diverse control procedures. Diverse control techniques have distinctive extraction standards. A few standards can be utilized for both adjusted and lopsided load. Neural systems dissimilar to the general p-q hypothesis approach needn't bother with any numerical model.

III. Configurations for DES:

A Power Converter associated in a Standalone AC System or in Parallel with the Utility Mains Fig.2. demonstrates a dispersed power framework which is associated with specifically stack or in parallel with utility mains, as per its mode. This framework comprises of a generator, an info channel, an AC/AC control converter, a yield channel, a detachment transformer, yield sensor (V, I, P), and a DSP controller. In the Figures, a disseminated generator may work as one of three modes: a standby, a pinnacle shaving, and an independent power source. In a standby mode appeared in Fig. a generator set fills in as an UPS

framework working amid mains disappointments. It is utilized to expand the unwavering quality of the vitality supply and to improve the general execution of the framework. The static switch SW 1 is shut in typical activity and SW 2 is open, while if there should arise an occurrence of mains disappointments or over the top voltage drop discovery SW 1 is open and SW 2 is at the same time shut. For this situation, control procedures of DES are fundamentally the same as those of UPS. In the event that a transient load expands, the yield voltage has generally vast drops because of the inward impedance of the inverter and channel organize, which much of the time result in breakdown of touchy load. Fig. can fills in as a pinnacle shaving or interconnection with the lattice to nourish control back to mains. In the two modes, the generator is associated in parallel with the principle lattices. In a pinnacle shaving mode, this generator is running as few as a few hundred hours every year in light of the fact that the SW 1 is just shut amid the constrained periods. In the interim, in an interconnection with the lattice, SW 1 is constantly shut and this framework furnishes the network with consistent electric power. What's more, the converter associated in parallel to the mains can serve additionally as a wellspring of responsive power and higher symphonious current parts.

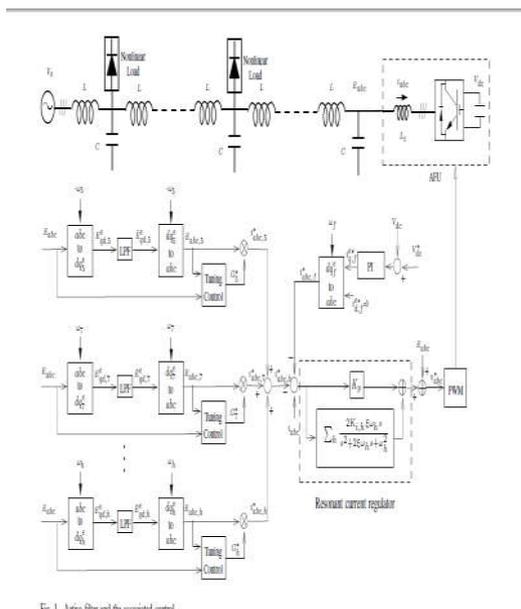


Fig. 1. Active filter and its associated control.

In an independent AC framework appeared in Fig. the generator is straightforwardly associated with the heap lines without being associated with the mains and it will work autonomously. For this situation, the activities of this framework are like a standby mode, and it serves consistently dissimilar to a standby mode and a pinnacle shaving mode.

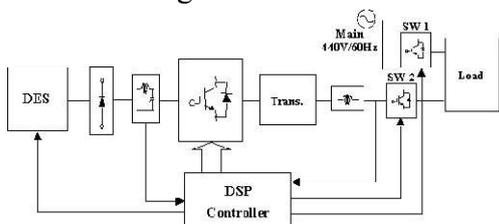


Fig.2. Block diagram of a standby mode

III. Fuzzy Logic Controller:

The traditional method problems greatly overcome by using fuzzy control strategy, it is Control the operation of Dual buck converters circuit with fuzzy control strategy. The traditional approach to building system controllers requires a prior model of the system. The quality of the model, that is, loss of precision from

linearization and/or uncertainties in the system’s parameters negatively influences the quality of the resulting control. At the same time, methods of soft computing such as fuzzy logic possess non-linear mapping capabilities, do not require an analytical model and can deal with uncertainties in the system’s parameters. Based on the nature of fuzzy human thinking, it is mentioned as the “fuzzy logic”

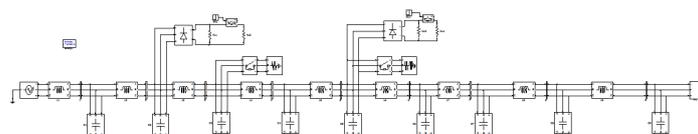
e(pu)							
ce (pu)	NB	NM	NS	ZE	PS	PM	PB
NB	NB	NB	NB	NM	NS	NVS	ZE
NM	NB	NB	NM	NS	NVS	ZE	PVS
NS	NB	NM	NS	NVS	ZE	PVS	PS
Z	NM	NS	NVS	ZE	PVS	PS	PM
PS	NS	NVS	ZE	PVS	PS	PM	PB
PM	NVS	ZE	PVS	PS	PM	PB	PB
PB	ZE	PVS	PS	PM	PB	PB	PB

Table.1. Graphical presentation of the rules

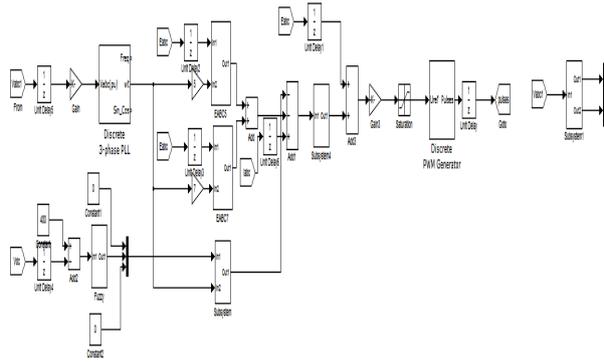
IV. Simulation Results:

The MATLAB Simulation block diagram of dual buck converters operated by using fuzzy controllers is shown in fig.4

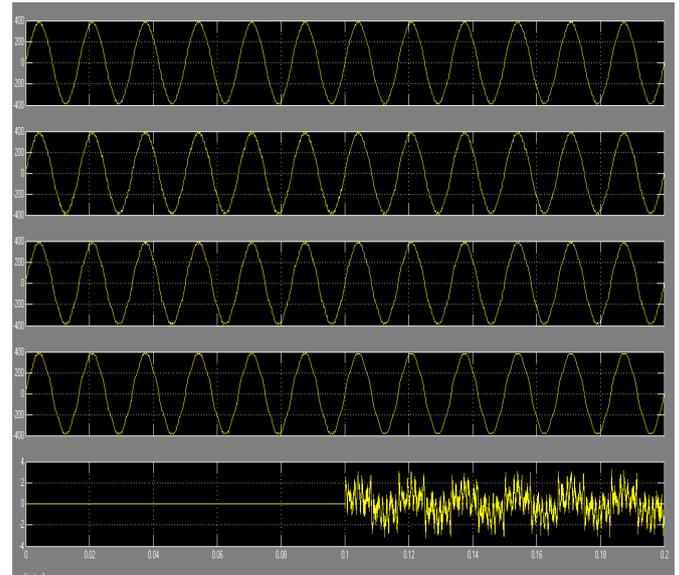
IV. MATLAB AND SIMULATION RESULTS



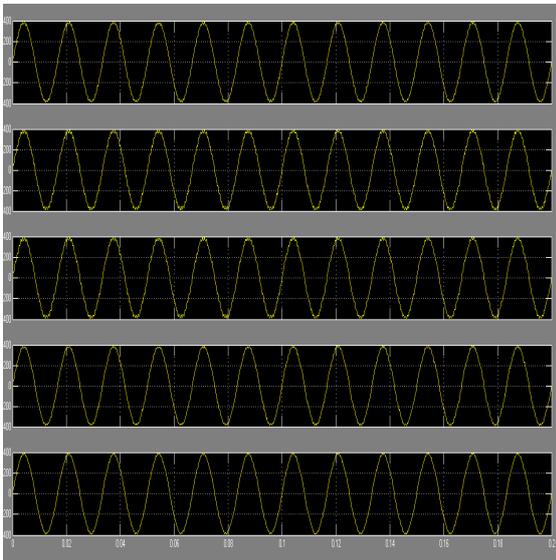
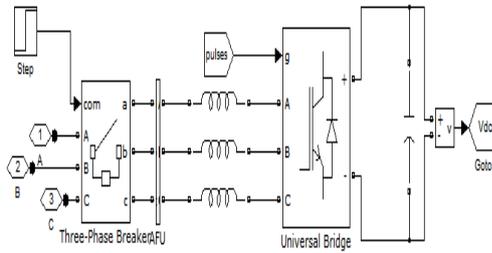
Proposed simlink circuit



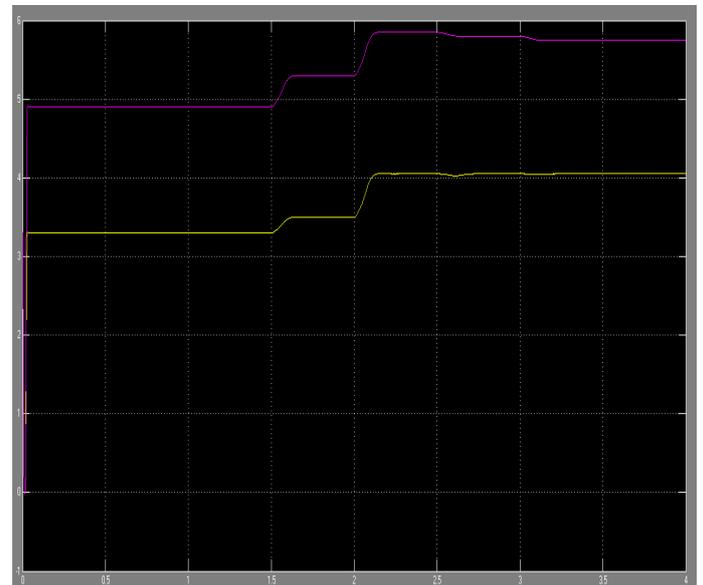
Proposed an Active Filter with Resonant Current Controller block



An Active Filter with Resonant Current Control on voltage waveforms next 5 bus's

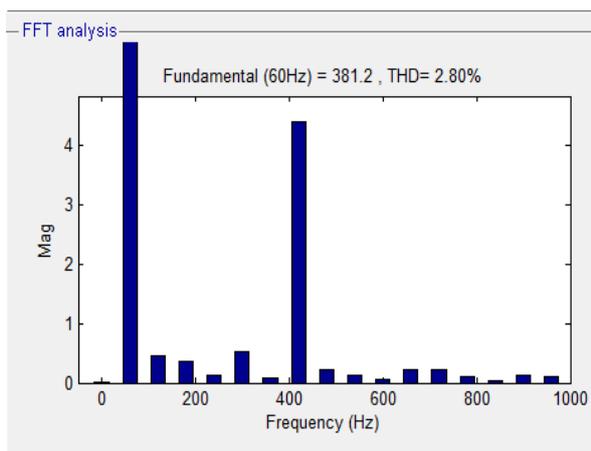


An Active Filter with Resonant Current Control on voltage waveforms first 5 bus's

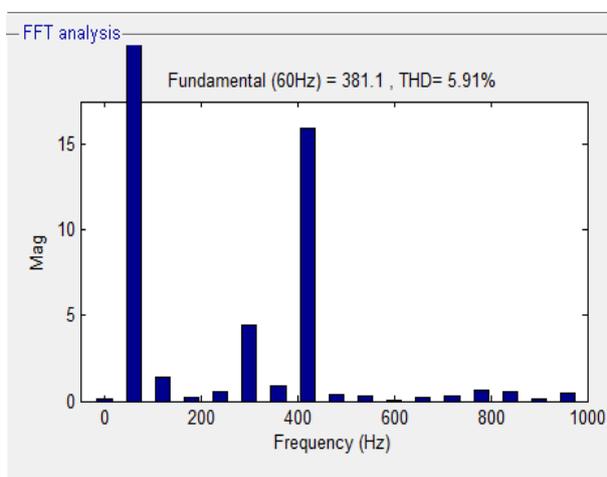


Afu off fuzzy

THD RESULT



Base paper THD VALUE



EXTENTION BY FUZZY CIRUIT of THD

CONCLUSION:

The active filter with the resonant cutting-edge manipulate is proposed on this paper to suppress harmonic resonances within the distribution energy machine. The present day control is implemented via various parallel band-skip filters tuned at harmonic frequencies in order that the lively filter can operate as an about natural harmonic conductance. A separate and tuning conductance for specific harmonic frequency is likewise realized to maintain the damping performance in reaction to load alternate or gadget version. The contributions of this paper are summarized

as follows. Due to controlling delay, the damping active filter out May unintentionally induce harmonic resonance at other places inside the feeder. This phenomenon is analyzed through the use of harmonic dispensed-parameter version. Based on both simulations and experiments, the resonant cutting-edge manipulate is capable of suppress harmonic resonance efficiently. Both present day loop and voltage loop are modelled to demonstrate contemporary-tracking functionality and damping performance of the energetic clear out. Damping overall performance of the energetic clear out is discussed when nonlinear hundreds are positioned at one of a kind buses. Multiple active filters might provide extra effective overall performance as compared to the termination-set up one.

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