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IMPROVEMENT OF FACTS DEVICE WITH FILTER BANK FOR POWER QUALITY UPGRADING BY FUZZY LOGIC CONTROLLER

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Abstract
These days control gadgets look into has included the significance of energy quality examinations, for solid outline, Custom Power Devices (CPD) and Flexible AC Transmission position (FACTS) gadgets. The approach offered in this paper uses the arrangement and shunt compensator of Unified Power Quality Conditioner (UPQC) to infuse a pay voltage in-stage with the source current over voltage changes. In the proposed show a joint approach of FACTS gadget with channel bank is utilized to control quality upgrade encouraged with fluffy rationale controller. The tuned aloof channel and Thyristor controlling structure a shunt latent channel (SPF) to repay DC voltage. The twists in the DC voltage influence the general power nature of the framework.
Keyword: - FACTS, Fuzzy Logic Controller, Power Quality, UPQC

Introduction
Power quality issues are getting progressively monstrous in these days in the break of the growing number of energy electronic gadgets that hang on as nonlinear burdens. A liberal grouped status of answers for control quality issues is recognizable for dispersion arrange administrator and the end client [1] . The power taking care of at the source, stack and for receptive and symphonious remuneration by control electronic gadgets are getting ideally common because of the huge favorable circumstances offered by them. The shunt dynamic power channel (APF) is reliably connected with the heaps to adjust for on the whole current related issues, for instance, the responsive power pay, control factor change, current consonant remuneration, and load unbalance pay, while the arrangement dynamic power channel is introduced in an arrangement commonly a line through the arrangement transformer. It goes about as controlled voltage source and can repay all voltages related glitches, for instance voltage droop, voltage sounds, voltage swell, flash, and so on [2]. UPQC is a Custom Power Device and comprises of affectionately intertwined arrangement dynamic power channel that repays voltage unbalances, voltage sounds, voltage droop/swell, voltage flash and shunt dynamic power channel that remunerates current music, current unbalance and receptive current.[3]

Current Harmonics And Problems
Alexander kusko et. al. [4] presented that non linear loads such as fluorescent lighting with electronic ballasts, switch mode power supply, single phase SMPS, battery chargers, rectifiers, inverters, three phase power converter fed drives, arc furnaces, arc welding, discharge lighting and saturable reactors etc. will produce current harmonics in the power system leading to current and voltage waveform distortion. All these loads draw the non sinusoidal currents resulting in current harmonics and are injected back into the supply system through the point of common coupling (PCC) . Angelo Baggini [5] explained the effect of current harmonics on the performance different power system equipment such as s capacitors, transformers, motors, energy and demand metering equipment causing additional losses, overheating and overloading and interference with telecommunication lines.

A. Harmonic Mitigation In Low Voltage Power
Harmonic distortion in a power distribution system can be suppressed through three basic approaches namely: (1) Passive filtering (2) Active power filtering and (3) Hybrid active power filtering. 2.3.1 Passive Filtering of Harmonics Gonzalez, D. A., et.al [4] proposed shunt passive filters for harmonic mitigation in power system.

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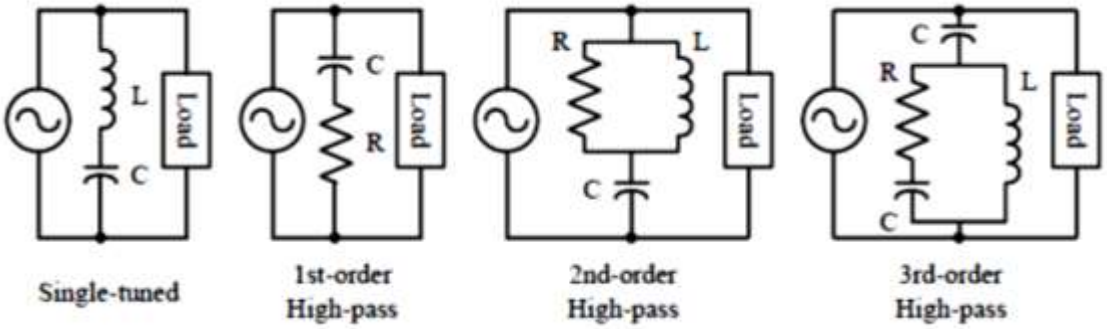

Figure. 1: Common types of passive filters and their configurations

B. Definition

THD is defined as the RMS value of the waveform remaining when the fundamental is removed. A perfect sine wave is 100%, the fundamental is the system frequency of 50 or 60Hz. Harmonic distortion is caused by the introduction of waveforms at frequencies in multiplies of the fundamental i.e: 3rd harmonic is 3x the fundamental frequency / 150Hz. Total harmonic distortion is a easurement of the sum value of the waveform that is distorted[6].

Power Measurement

Despite the use of good quality test meter instrumentation, high current flow can often remain undetected or under estimated by as much 40%. This severe underestimation causes overly high running temperatures of equipment and nuisance tripping. This is simply because the average reading test meters commonly used by maintenance technicians, are not designed to accurately measure distorted currents, and can only provide indication of the condition of the supply at the time of checking.

Power quality conditions change continuously, and only instruments offering true RMS measurement of distorted waveforms and neutral currents can provide the correct measurements to accurately determine the ratings of cables, bus bars and circuit breakers.

Neutral Currents

High harmonic environments can produce unexpected and dangerous neutral currents. In a balanced system, the fundamental currents will cancel out, but, triple- N's will add, so harmonic currents at the 3rd, 9th, 15th etc. will flow in the neutral. Traditional 3 phase system meters are only able to calculate the vector of line to neutral current measurements, which may not register the true reading. Integra 1530, 1560 and 1580 offer a 3 phase 4 wire version with a neutral 4th CT allowing true neutral current measurement and protection in high harmonic environments.

Harmonic Profiles

There is much discussion over the practical harmonic range of a measurement instrument, however study of the harmonic profiles of typically installed equipment can guide the system designer to the practical solution. A typical harmonic profile graph will show a logarithmic decay as the harmonic frequency increases. It is necessary to establish the upper level at which the harmonic content is negligible.

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Equivalent Circuit

An examination of reveals that if we move vertically up from collector to emitter. We come across p+, n- , p layer s. Thus, IGBT can be thought of as the combination of MOSFET and p+ n^- p layer s. Thus, IGBT can be thought of as the combination of MOSFET and p^+ n^- p transistor Q1 .Here Rd is resistance offered by n^- drift region. Approximate equivalent circuit of an IGBT.

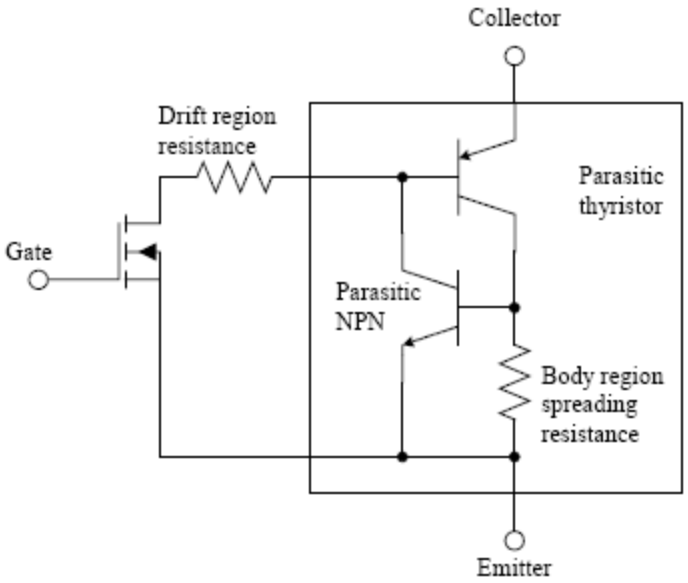

Figure 2:Equivalent Circuit of IGBT

Proposed work

PE are the most important cause of harmonics, inter harmonics, notches, and neutral currents. Harmonics are produced by rectifiers, ASDs, soft starters, electronic ballast for discharge lamps, switched-mode power supplies, and HVAC using ASDs. Equipment affected by harmonics includes transformers, motors, cables, interrupters, and capacitors (resonance). Notches are produced mainly by converters, and they principally affect the electronic control devices. Neutral currents are produced by equipment using switched-mode power supplies, such as PCs, printers, photocopiers, and any triplets generator.

- Lamp flicker
- Frequent blackouts
- Sensitive-equipment frequent dropouts
- Voltage to ground in unexpected
- Locations
- Communications interference
- Overheated elements and equipment.

Solutions To Power Quality Problems

There are two ways to deal with the moderation of energy quality issues. The principal approach is called stack molding, which guarantees that the gear is less delicate to control aggravations, permitting the activity even under critical voltage mutilation. The other arrangement is to introduce line molding frameworks that smother or neutralizes the power framework unsettling influences.

An adaptable and flexible answer for voltage quality issues is offered by dynamic power channels. As of now they depend on PWM converters and interface with low and medium voltage circulation framework in shunt or in arrangement. Arrangement dynamic power channels must work in conjunction with shunt uninvolved channels keeping in mind the end goal to remunerate stack current music. Shunt dynamic power channels work as a controllable current source and arrangement dynamic power channels works as a controllable voltage source.

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Active filter connection	Load on AC supply	AC supply on load
Shunt	-current harmonic filtering. -reactive current compensation -Current unbalance. -Voltage flickering.	
series	-current harmonic filtering. -reactive current compensation -current unbalance. -voltage flickering. -voltage unbalance.	voltage sag/swell. -voltage unbalance. -voltage distortion. -voltage interruption. -voltage flickering. -voltage notchings

Conclusion

A fluffy rationale controller is executed for three stage shunt dynamic power channel to acquire dc capacitor voltage and the reference streams. This encourages to enhance the power quality parameters, for example, responsive power and sounds because of nonlinear load. The fluffy rationale controller is a decent contender for controlling dynamic power channel to tackle control quality issues. Approach of fluffy rationale control is semantic portrayal, so it doesn't require a scientific model of system.

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