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"Study Of Adaptive Power Management Scheme For Reducing Power"

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Abstract**—** The development of any country depends to a large extent on availability and usage of electricity. Conservation of electricity has now become a vital element of economic growth giving benefit to state's exchequer and this conservation is more essential due to the concern for fast depletion of non-renewable sources of energy in the country. The main aim of this paper is to construct a control system that can manage (turn on/off and control speed) various common home appliances like Heater, Fan, Air Conditioner etc of domestic load at instantaneous time. The potential transformer is used to measure voltage and a current transducer is used to measure a current flow through load, further it communicates with microcontroller using one analog to digital converter. Microcontroller takes the V and I data from ADC. Based on this data it decides which device is to be operated and at what power it is to be operated. The outputs of the microcontroller are fed through the power electronics devices. It is a very versatile model and has applications in various fields. Its aim is to not only provide comfort to its user but also to conserve energy. It is an environmental friendly model which helps in saving more power. This model is an intelligent system which can control devices (namely heater, fan, A.C.) based on current and voltage variation.

Keywords**— Active power filter (APF), harmonics, modified phase locked loop (MPLL), synchronous reference frame (SRF), unifiedpower-quality (PQ) conditioner (UPQC**).

1. INTRODUCTION

A power quality problem is an occurrence manifested as a nonstandard voltage, current or frequency that results in a failure or faulty operation of end use equipment. The presence of harmonics in power lines poses a power quality problem and results in greater power losses in the distribution system, interference problems in communication systems and, sometimes, in operation failures of electronic equipment. Active filters are special equipment that use power electronic converters to compensate for current and/or voltage harmonics originated by non-linear loads, or to avoid those harmonic voltages that might be applied to sensitive loads. This paper presents the application of a simulation tool to analyze the effectiveness of a filter in harmonics currents suppression in real time power system. The modem power distribution system is becoming highly vulnerable to the different power quality problems [1-2]. The extensive use of non-linear loads is further contributing to increased current and voltage harmonics issues. Furthermore, the penetration level of small/large-scale renewable energy systems based on wind energy, solar energy, fuel cell, etc., installed at distribution as well as transmission levels is increasing significantly.

2. ADAPTIVE POWER MANAGEMENT

Embodiments of the present invention are directed at minimizing power consumption of a computer while permitting the execution of meaningful tasks by programs installed on the computer. In accordance with one embodiment, a method that implements power conserving measures based on the amount of capacity that is available from a power source is provided. More specifically, the method includes identifying the current amount of power that is available from a power source. Then a determination is made regarding whether the current amount of power available is associated with a reduced performance state. If the current amount of power is associated with a reduced performance state, the method changes the configuration of the power consuming devices to place the computer in the reduced performance state.

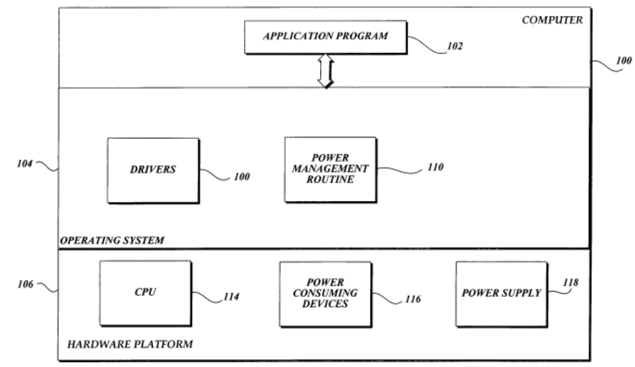

Fig1. Adaptaive Power Management

Market requirements, environmental needs, business costs, and limited battery life dictate that computers use as little energy as possible while still providing robust computing services. The energy consumed by a computer can be more efficiently managed by providing enough computational power for each service as needed instead of providing maximum computational power at all times. Computers su ch as a laptops, desktops, and mainframe computers, personal digital assistants (PDAs), cellular telephones, etc., provide services by causing program instructions to be executed by electronic circuitry. In this regard, various devices in a computer maintain electronic circuitry that consumes power so that services may be provided.

Most computers execute a computer program commonly referred to as an operating system that guides the operation of a computer and provides services to other programs. More specifically, an operating system controls the allocation and usage of hardware resources such as memory, mass memory storage, peripheral devices, etc. The computer instructions for initializing and operating the computing device are typically contained in a component of the operating system often referred to as the “kernel.” Shortly after a computer is started, the kernel begins executing. Since a kernel has direct control of the hardware and access to data that describes the state of a computer, a kernel may be used to regulate computing power and otherwise control energy consumption.

3. ACTIVE POWER FILTER

Harmonic distortion in power distribution systems can be suppressed mainly by, passive and active filtering. The passive filtering is the simplest conventional solution to mitigate the harmonic distortion. The uses of passive elements do not always respond correctly to the dynamics of the power distribution systems. Passive filters are known to cause resonance, thus affecting the stability of the power distribution systems. Frequency variation of the power distribution system and tolerances in components values affect the passive filtering characteristics. As the regulatory requirements become more stringent, the passive filters might not be able to meet future revisions of a particular Standard. This may required a retrofit of new filters. Remarkable progress in power electronics had spurred interest in Active Power Filters (APF) for harmonic distortion mitigation. Active filtering is a relatively new technology, practically less than four decades old. The basic principle of APF is to utilize power electronics technologies to produce specific current components that cancel the harmonic current components caused by the nonlinear load. APFs have a number of advantages over the passive filters. First of all, they can suppress not only the supply current harmonics, but also the reactive currents. Moreover, unlike passive filters, they do not cause harmful resonances with the power distribution systems. Consequently, the APFs performances are independent on the power distribution system properties. Active filtering is a relatively new technology, practically less than four decades old. There is still a need for further research and development to make this technology well established.

Classifications of APF

APF can be connected in several power circuit configurations as illustrated in the block diagram shown in Figure. In general, they are divided into three main categories, namely shunt APF, series APF and hybrid APF

1) Shunt Active Power Filter

This class of filter configurations is the most important and most widely used type in active filtering applications. It is connected to the main power circuit, as shown in the single-line diagram of Fig.2.4.

The purpose is to cancel the load current harmonics fed to the supply. It can also contribute to reactive-power compensation and balancing of three-phase currents, as mentioned above. Parallel filters have the advantage of carrying only the compensation current plus a small amount of active fundamental current supplied to compensate for system losses. It is also possible to connect several filters in parallel for higher currents, which makes this type of circuit suitable for a wide range of power ratings.

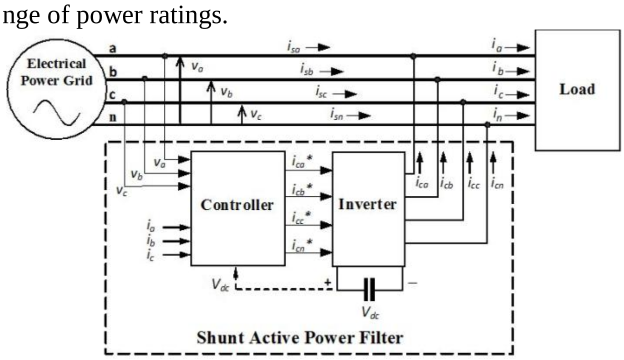

Fig2. Shunt Active Filter

2) Series Active Power Filter

The active filter in this configuration produces a PWM voltage waveform which is added or subtracted, on an instantaneous basis, to/from the supply voltage to maintain a pure sinusoidal voltage waveform across the load. The main power-circuit configuration is shown .

The inverter configuration accompanying such a system is a voltage-fed inverter without any current-control loops. Series active filters are less common industrially, than parallel active filters. This is because of the main drawback of series circuits, namely that they have to handle high load currents, which increases their current rating considerably compared with parallel filters, especially in the secondary side of the coupling transformer.

The main advantage of series filters over parallel ones is that they are ideal for eliminating voltage-waveform harmonics, and for balancing three-phase voltages. This, in fact, means that this category of filter is used to improve the quality of the system voltage for the benefit of the load. It provides the load with a pure sinusoidal waveform, which is important for voltage-sensitive devices.

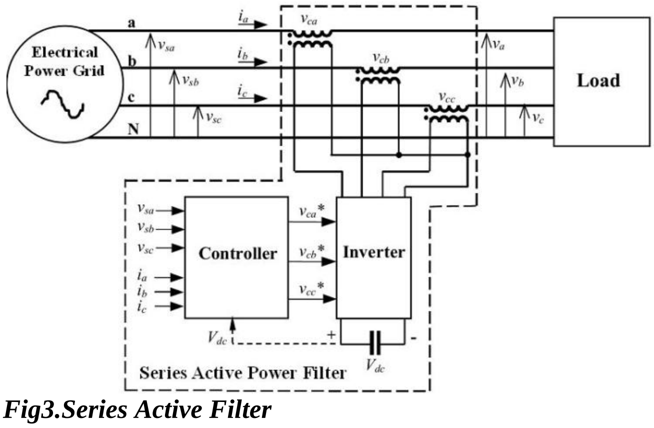

Fig3.Series Active Filter

3) Hybrid Active Power Filters

Technical limitations of conventional APFs can be overcome with hybrid APF configurations. They are typically the combination of basic APFs and passive filters. Hybrid APFs, inheriting the advantages of both passive filters and APFs provide improved performance and cost-effective solutions. The idea behind this scheme is to simultaneously reduce the switching noise and electromagnetic interference.

The idea of hybrid APF has been proposed by several researchers. In this scheme, a low cost passive high-pass filter (HPF) is used in addition to the conventional APF. The harmonics filtering task is divided between the two filters. The APF cancels the lower order harmonics, while the HPF filters the higher order harmonics. The main objective of hybrid APF, therefore is to improve the filtering performance of high-order harmonics while providing a cost-effective low order harmonics mitigation.

Nowadays various hybrid APFs using in electronic industry, but the two most prominent ones are shown in Figure2.6. Figure2.6 (a) is the system configuration of the hybrid shunt APF. Both the shunt APF and passive filter are connected in parallel with the nonlinear load.The function of the hybrid APF can thus be divided into two parts: the low-order harmonics are cancelled by the shunt APF, while the higher frequency harmonics are filtered by passive HPF. This topology lends itself to retrofit applications with the existing shunt APF.

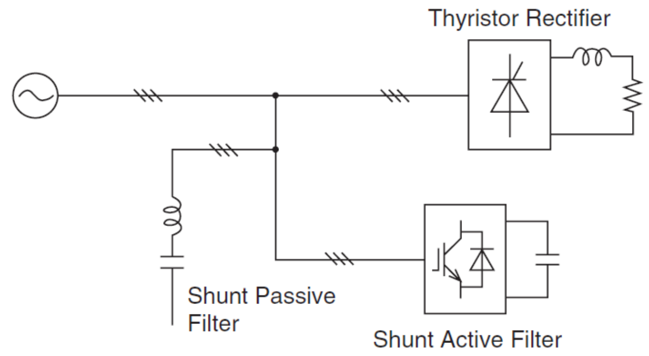

Fig4. Hybrid Active Filter

4. POWER SYSTEM HARMONICS

Power system harmonics are integer multiples of the fundamental power system frequency. Power system harmonics are created by non-linear devices connected to the power system. Harmonics are voltage and current frequencies riding on top of the normal sinusoidal voltage and current waveforms. The presence of harmonics (both current and voltage) is viewed as `pollution' affecting the operation of power systems.

The most common source of harmonic distortion is electronic equipment using switch-mode power supplies, such as computers, adjustable-speed drives, and high-efficiency electronic light ballasts. Harmonic waveforms are characterized by their amplitude and harmonic number. When a sinusoidal voltage is applied to a certain type of load, in which the load cause the current to vary disproportionately with the voltage during each cyclic period. These are classified as nonlinear loads, and the current taken by them will be a non sinusoidal waveform. When there is significant impedance in the path from the power source to a nonlinear load, these current distortions will also produce distortions in the voltage waveform at the load. Waveform distortion can be mathematically analyzed to show that it is equivalent to superimposing additional frequency components onto a pure sine wave.

5. SYNCHRONOUS-REFERENCE-FRAME (SRF)

Synchronous-reference-frame (SRF)-based control method to compensate power-quality (PQ) problems through a three-phase four-wire unified PQ conditioner (UPQC) under unbalanced and distorted load conditions. The proposed UPQC system can improve the power quality at the point of common coupling on power distribution systems under unbalanced and distorted load conditions. The simulation results based on Matlab/Simulink are discussed in detail to support the SRF-based control method presented in this paper. The proposed approach is also validated through experimental study with the UPQC hardware prototype.

6. UPOC

This paper introduces a low cost high performance three-phase unified power quality conditioner (UPQC) by using four-switch three-phase inverters. In the proposed UPQC, both shunt and series active power filters (APFs) are developed by using four-switch three-phase inverters so that the number of switching devices in the proposed topology is reduced from twelve in the traditional UPQC down to eight devices. In addition, by inserting an additional capacitor in series with the shunt APF, the DC-link voltage in the proposed UPQC can also be greatly lessened. As a consequence, by using a smaller number of power switches with lower rating voltage in the proposed UPQC system, we can greatly reduce the system cost of the UPQC without degrading the harmonic compensation performance. Design of passive components for the proposed UPQC to achieve a good performance is discussed in detail in this paper. Simulation studies are performed to verify the effectiveness of the proposed topology. The proposed control technique has been evaluated and tested under non-ideal mains voltage and unbalanced load conditions using Matlab/Simulink software. The proposed method is also validated through experimental study. The following diagram shows the generalized UPQC system

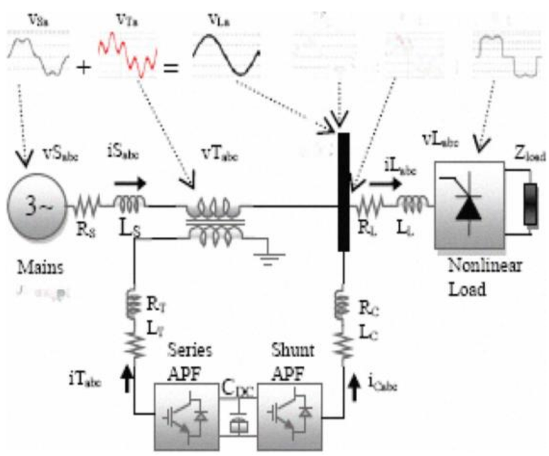

Fig4. UPOC System

7. SCOPE OF THE REVIEW

In this project, I am going to monitor the power of the system especially known as Industries and controlling the power line using power factor. Here the current transformers and po tential transformers are widely used for analyzing the perfor mance of the power and it is given to the circuit. It is known that electricity comes in our home is not stable in nature. Th ere are many fluctuations, raise and falls, and spikes in this c urrent. This unstable current may damage instruments. The f luctuating current wastes the electric current in the form of h eat energy. This heat energy not only gets wasted to the atm osphere, but also harms the appliances and wiring circuit.

In this project model we reduced down the voltage as the lo ad up to a certain limit until current starts increases. As most of the devices can work on 190 vAC, our project gradually decreases the voltage and measures the current, whenever it observes that the current increases, the power electronics cir cuit will stop decreasing the voltage. Use of power electroni cs reduces the mechanical arching and fast reaction time.

8. CONCLUSIONS

The proposed control strategy use only minimum measurem ent like loads and mains voltage measurements for series A PF based on the modified PLL with synchronous reference frame theory. To achieve the research objectives, the work f ocused on two main areas of the investigation. Firstly it miti gates the power quality issues . Secondly the integration of t he matrix converter and Unified Power Quality Conditioner is implemented for regulation of the Microgrid's frequency, mitigation of voltage sag, voltage swell, current harmonics a nd control of power flow. The objective of this work is to de sign, fabricate and test a harmonic filter configuration, with simple and effective control algorithm under both steady stat e and dynamic load conditions. The controller and hence the filter configuration is expected to work under following syst em conditions.

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