Mitigation of Power Quality Issues in Hybrid Solar-Wind Energy System using Distributed Power Flow Controller

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V.Sowmya Sree ; G. Panduranga Reddy ; C.Srinivasa Rao **All Authors**

Abstract: Renewable Energy Sources find a scope for the prospects in meeting the growing demand with high power quality and reliability. This has led to the concept of Microgrid wi... **View more**

Metadata

Abstract:

Renewable Energy Sources find a scope for the prospects in meeting the growing demand with high power quality and reliability. This has led to the concept of Microgrid with widespread power supplying generation units called distribution generation units. The operation of a Micro-grid can be autonomous or with public grid interconnection. The combination of solar power and wind power is a reliable source of energy creating a constant energy flow by avoiding the fluctuations. The increase in penetration of non-linear loads and power-electronic incorporated distribution generation system initiates power quality disputes in the distributed power system. Hence, the mitigation of power quality issues is more fixated and few investigations led to the use of FACTS devices such as custom power semiconductor devices for this purpose. Distributed Power Flow Controller, which is emerged from Unified Power Flow Controller, is considered as the most reliable device among all the devices. The main difference between these devices is the absence of DC-link in Distributed Power Flow Controller. This paper presents the enactment of Solar-wind hybrid system without custom power device and with Distributed Power Flow Controller. The simulation results are validated using MATLAB/SIMULINK software.

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A 2.86-TOPS/W CMCB based Edge ML and RO-PUF engine for IoT based nano-electronic material applications

P. Rajasekar [a], M. Rama prasad Reddy [b], Karanam Deepak [c], K. Balamurugan [d], S. Amudha [e], C.J. Vignesh [f]

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Abstract

Energy-Effective Machine Learning and Ring Oscillator (RO) Physical Untraceable (PUF) is an IoT care effort that diminishes information move limit and ensures estimations and search interface protection (IoT). Independent contraption. This test gives preparing on Edge machines and PUF machines for IoT errands. This planning utilizes the current glass beam (CMCB), which is the focal circuit vertical to the two capacitors, to diminish the space of the concede line by a variable of48.5. Another element of expansion style has been proposed to broaden the weight matrix factors past a genuine authorized organization, while keeping the expense of clothing and energy low. Paper development and total is performed by CMCB with current discriminative styles and two-venture change. The means proposed give a disappointment rate of6.34 to the MNIST plate acknowledgment issue with an energy attainability of2.86 covers/W. PUF gives a unique harmony disappointment rate (BER) of2.3 in everywhere and the CRP is upgraded with ternary information sources. This mode has developed incomprehensibly, with a space of4.17×for taking care of all solicitations/reactions (CRP). Extremely low-10–59m 2/CRP.

Introduction

The success of the Internet of Effects (IoT) locator has reduced monetary vaults in terms of influence, attack, and data transmission. As the number of related trends increases, so do security and information management issues [1], [2], [3], [4], [5], [6], [7]. The battery life of the tracking loop is limited because it uses a large amount of capacity to bring all the raw information to the mat or reuse all the raw information at that point. The study of energy impact machines introduced in identification shots is fascinating (comparable to risking awakening to reduce the amount of information traveled and assessing the costs associated with non-essential information. Circuits have been studied. The limit is the recommended current mode, but the simple circuit is vulnerable to quantification in this respect, huge, and interchangeable within advanced technology, information development, and memory access. Drops are. It is a small element of machine teaching compared to mption. (3) SRAM section mode is simple while penetrating memory. It reduces memory usage. It is a verb string to information string like different comprehension ability. Memory calculations applied to. Direct (weak) classifiers based on many strings in attachments for modifying calculations are truly accurate and important. This plan is for scale and access to MAC, Very well identified in a particular expl icit development plan.Table 1.Table 2.

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Power Factor Correction Converter of a Wide Input and Output Voltage Range Battery Charger Using Buck-Boost Converter with BLDC Motor Drive

1 Dr.M. Rama Prasad Reddy, 2P. Dharani Kumar Reddy, 3A. Chakradhar, 4. N. Mahendra, 5T. JayaRamudu
1 Professor, 2,3,4,5 B-Tech student Scholar
1,2,3,4,5 Department of Electrical & Electronics Engineering,
1,2,3,4,5 G. Pullaiah College of Engineering and Technology, Nandikotkur Road,
Venkayapalle, Pasupula Village, Kurnool, Andhra Pradesh 518002

Abstract—This Paper deal among Power Factor Correction (PFC) in Brushless motor drives Buck-Boost DC-DC converter topology. To improve the Power quality (PQ) power factor corrected converter is essential. This paper mainly focuses on analysis and operating modes for a interleaved boost cascaded-by buck (IBCBB) converter suitable for a power factor correction (PFC) converter. The designed control structure provides a wide degree of control freedom to operate even if the VDC/Vmax (output voltage to peak of Input) less than 0.5. Moreover, the proposed converter is validated on the experimental setup and the results are presented in the paper. In addition, a two-stage universal battery charger with wide input and output voltage is been simulated and presented in the paper.

Keywords— Power Quality (PQ), Power Factor Correction (PFC), Bridgeless converters, cuk Converter, Bridgeless isolated cuk converter, Brushless dc motor(BLDC).

1.Introduction

Rectification is a process in which electric power is converted from AC to DC. It is widely used in many applications as most of electronics appliances nowadays require DC power. Conventional AC-DC converters, such as Bridge rectifiers, have been developed for this purpose but there are few factors to be controlled in this regard. The Non sinusoidal current drawn at the input side results in lower distortion as well displacement factors. Commanding the line current to follow the line voltage in a sinusoidal manner can gives higher efficiency with improved power factor and lower THD. AC side power factor (PF) is needed to be improved along with lowering of Total Harmonic Distortion of input line current. Tight regulation of the output voltage even in the case of dynamic loads is also a stringent requirement of DC-DC converters. A controller that simultaneously controls both the input as well as the output parameters is the choice.

To gain a high-power factor, different power factor correction (PFC) techniques have been introduced which can be divided into two parts, passive and active. Passive techniques consist of passive components such as inductors and capacitors that are used as input filter to reduce line current harmonics. However, improvements are not significant and another drawback is the relatively large size of these passive elements. Moreover, these techniques may not be able to handle dynamic loads. On the other hand, active PFC technique is more efficient solution, having a combination of switches and passive elements. Due to presence of switches, controllers can be implemented on active techniques of PFC. At the cost of complexity, the controlled active techniques can increase Power factor and reduce THD in the input AC current. Along with-it active techniques can also bring precise DC regulation for variable loads.

The active PFC technique uses a diode bridge rectifier followed by a dc–dc converter and the bulk capacitor. By controlling the dc–dc converter, the input line current is commanded to follow the input line voltage and in this way Power Factor approaches to unity. For medium and high-power applications boost dc-dc converter works better for power factor correction than other dc-dc converters such as buck boost and buck converters because of lower electromagnetic interference. Moreover, in case of boost PFC converter there is low requirement of filtering because of continuous line current, whereas other dc-dc converters such as buck, buck-boost, and
Flyback have higher requirement of filtering because of pulsating line current.

As boost converter is capable of handling much higher power levels as compared to its other counterparts, much research has been carried out on many different PFC techniques of this topology

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Power Quality Improvement in a Distribution System for Non-Linear Loads Using Fuzzy Controlled and D – STATCOM and Reactive Power Compensation in Power Grid.

Dr. G. Pandu Ranga Reddy
IEEE Faculty Associate
(Membership id: 95379693)
Associate Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology, Kurnool(Dt); Andhra Pradesh, India.
Bajarla Ismail
IEEE Student Branch chair
(Membership id:97641397)
B-Tech Student Scholar
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology, Kurnool(Dt); Andhra Pradesh, India.
R Dileep Kumar Reddy
B-Tech Student Scholar
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology, Kurnool(Dt); Andhra Pradesh, India.
Akumalla Arun
B-Tech Student Scholar
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology, Kurnool(Dt); Andhra Pradesh, India
Shaik Fayaz
B-Tech Student Scholar
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology, Kurnool(Dt); Andhra Pradesh, India

Abstract: A Power quality problem is an occurrence manifested as a nonstandard voltage, current or frequency that results in a failure or a mis-operation of end user equipments. Due to deteriorate the quality of power, other customers which are connected to the same PCC also experiences the poor quality of power so whole system gets affected by these non-linear loads. D-STATCOM solves these problems more efficiently and reliably. Many application of D-STATCOM is in the power systems at the distribution level. It compensates the reactive power, improves power factor, enhances voltage regulation and compensate at fault condition. Here in this project the main concern is harmonic distortion due to non-linear loads and mitigation of current harmonics using D-STATCOM and compensation of reactive power for load and maintains the grid reactive power near to zero using MATLAB/SIMULATION. A fuzzy based controller is also used and compared with conventional controller. Finally performance of the both controllers are compared and analyzed.

I INTRODUCTION

STATCOM [1] and D-STATCOM have similar strategies but objective of these two are different and covers the different area of objective. When STATCOM is connected to the distribution side then it is called D-STATCOM. D STATCOM has the additional advantage in the power systems. It has its own applications viz. to improve power factor, to improve voltage regulation, to maintain three-phase balanced voltage and compensate at the fault condition. DSTATCOM is a shunt connected power electronic device which used self-commutated device like IGBT, IGCT etc. Voltage source converter (VSC) is the main part of the STATCOM. It injects the compensated or harmonic component of the current to cancel out the other harmonic frequency component (other than power frequency). So it acts as an active power filter [3].

II POWER QUALITY

Power quality deals with maintaining a pure sinusoidal waveform of voltage and frequency. Voltage quality concern with deviation of voltage from ideal voltage (sinusoidal) it is a single frequency sine wave at rated magnitude and frequency with no harmonics. Current quality is a complimentary term of voltage quality concern with a deviation from the ideal current. Current should be in phase with the voltage.

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A Novel Method of Voltage Dynamic Voltage Restorer (DVR) Based on Five Level MLI Converter for Power Quality Improvement

1 Dr.G.panduRanga Reddy 2.Seela saimadhu, 3 Bale yeshwanthkumar, 4 Kolleseshadri, 5 Vishnu vardhanrudravaram.
1 Professor, 2,3,4,5,6B-tech student Scholar
1,2,3,4,5,6 Department of Electrical & Electronics Engineering,
1,2,3,4,5,6 G. Pullaiah College of Engineering and Technology, Nandikotkur Rd,
near Venkayapalle, Pasupula Village, Kurnool, Andhra Pradesh 518002.

Abstract— In the present electric power grids, power quality issues are recognized as a crucial concerns and a frequently occurring problem possessing significant costly consequence such as sensitive load tripping and production loss. Consequently, demand for high power quality and voltage stability becomes a pressing issue. Dynamic voltage restorer (DVR), as a custom power device, is one of the most effective solutions for "restoring" the quality of voltage at its load-side terminals when the quality of voltage at its source-side terminals is disturbed. In this paper, a new DVR topology based on double flying capacitor multicell (DFCM) converter for medium-voltage application has been proposed. The advantage of the proposed DVR is that it does not need any line-frequency step-up isolation transformer, which is bulky and costly, to be connected to medium-voltage power grid. The design and implementation of multilevel voltage source converter based dynamic voltage restorer (DVR) is dealt with in MATLAB Simulink. The objective of this study is to stabilize the voltage by compensating the sag, swell and harmonics in the system. Cascaded Multilevel Converter based DVR is used for harmonics control. This work proposes the enhancement of power transfer capability and maintaining unity power factor. Relative Harmonic analysis is also discussed based on the total harmonic distortion (THD) calculations. Now days the use of sensitive electronic equipment has increase which has lead to power quality problems. The various power quality disturbances are transients, interruptions, voltage sag, voltage swell, voltage collapse, harmonics etc. To solve these power quality problems various custom power devices are used. Dynamic voltage restorer (DVR) is a custom power device used for the Compensation of voltage sag and swell. Power quality problem is an occurrence manifested as a non-standard voltage, current or frequency. One of the major problems dealt here is the voltage sag. Dynamic Voltage Restorer provides a cost effective solution for protection of sensitive loads from voltage sags currents, although the applied voltage being sinusoidal. MATLAB/SIMULINK tool is used for evaluating the performance of the proposed control scheme.

Index Terms – ***Double Flying Capacitor MulticellConverter; Dynamic Voltage Restorer; Multilevel PowerConverters; Power Quality; Voltage Sag.***

I.INRTODUCTION

In recent years, the number of sensitive loads integrated to the power grid has been increased [1]–[3].Consequently, the demand for high power quality and voltage stability becomes a significant issue. In the present power grids, voltage sags are recognized as a serious threat and a frequently occurring power-quality problem and have costly consequence such as sensitive loads tripping and production loss [4]–[7].

Voltage sags are results of transient phenomenon in power grid such as short circuits in the upstream power transmission line or parallel power distribution line connected to the point of common coupling (PCC), inrush currents involved with the starting of large machines, sudden changes of load, energizing of transformers or switching operations in the grid [8]–[10]. According to the IEEE STD 1159-2009, voltage sag (also called voltage dip in the IEC terminology) is defined as a decrease of 0.1 to 0.9 p.u. in the rms voltage at system frequency and with the duration of half cycle to one minute [11].

Due to the above mentioned effects of voltage sags on sensitive loads, compensating voltage sags and minimizing their effects is necessary. Traditional methods of suppressing voltage variations include tap-changing transformers and uninterruptible power supplies (UPS) [12]. However, tap-changing transformer is bulky, costly and not fast enough to eliminate the voltage sag effects at load side. On the other hand, UPS is bulky and expensive device whose power rating should be same as load power rating [13]. Furthermore, there are custom power devices such as static synchronous compensator (STATCOM), distribution-STATCOM (D-STATCOM), unified power quality conditioner (UPQC), and

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Title: **High Step-Down Isolated Three-Phase AC–DC Converter fed Induction Motor Drive**

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Paper Authors : . **Dr.G.Pandu Ranga Reddy M.Tech.,Ph.D,T. Naganna,S. Prakash,U. Vinay,J. Shalem Raju**

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High Step-Down Isolated Three-Phase AC–DC Converter fed Induction Motor Drive

1. Dr.G.Pandu Ranga Reddy M.Tech.,Ph.D,2T. Naganna,3S. Prakash,4U. Vinay,5J. Shalem Raju
1Professor,2,3,4,5Student Scholar
1,2,3,4,5 Department of Electrical & Electronics Engineering,
1,2,3,4,5 G. Pullaiah college of Engineering and Technology, Nandikotkur Rd,Near Venkayapalle, PasupulaVillage, Kurnool, Andhra Pradesh 518002.

Abstract- A single-phase, three-level, single-stage power-factor corrected AC/DC converter operated under Induction motor Drive is presented. That operates with a single controller to regulate the output voltage and the input inductor act as a boost inductor to have a single stage power factor correction with good output response. The paper deals a single-stage three-phase isolated ac-dc converter topology utilizing SiC MOSFETs is proposed for power rectification with a stepped-down output voltage. Unlike the conventional two-stage [front-end power factor correction (PFC) stage and isolated dc–dc stage] ac–dc converters, the full/half bridge structure in dc–dc stage is eliminated in this structure. The high-frequency pulsating voltage is obtained directly from the PFC stage and is applied across the high frequency transformer, leading to a more compact design.

In addition, there is an advantage of zero voltage switching (ZVS) in four PFC MOSFETs connected to the high-frequency tank, which is not achievable in the case of a conventional two-staged ac–dc converter. A sine-pulse width modulation (PWM)-based control scheme is applied with the common-mode duty ratio injection method to minimize the current harmonics without affecting the power factor. An LC filter is used after the PFC semi stage to suppress the line-frequency voltage ripple. Furthermore, the intermediate dc-link capacitor value can be greatly reduced through no additional ripple constraints. The proposed converter is having an input power factor close to unity and better voltage regulation compared to the conventional ac-dc converter topologies and able to provide variable output voltages. Proposed topology is evaluated through Matlab/Simulink platform and simulation results are conferred.

Keywords: Power Factor Correction, Single Stage Converters, AC–DC Power Factor Correction, Three Level Converters.

(1) .INTRODUCTION

Power-electronic converters are becoming popular for various industrial drives applications. In recent years also high-power and medium-voltage drive applications have been installed. To overcome the limited semiconductor voltage and current ratings, some kind of series and/or parallel connection will be necessary. Due to their ability to synthesize waveforms with a better harmonic spectrum and attain higher voltages, multi-level inverters are receiving increasing attention in the past few years. The ac–dc power supplies with transformer isolation are typically implemented with some sort of input power factor correction (PFC) to comply with harmonic standards such as IEC 1000-3-2 [2]-[4]. Although it is possible to satisfy these standards by adding passive filter elements to the traditional passive diode rectifier/LC filter input combination, the resulting converter would be very bulky and heavy due to the size of the low-frequency inductors and capacitors. The most common approach to PFC is to use two-stage power conversion schemes.These two-stage schemes use a front-end ac–dc converter stage to perform ac–dc conversion with PFC with the output of the front-end converter fed to a back-end dc–dc converter stage that produces the desired isolated dc output voltage

[5]. Using two converter stages in this manner, however, increases the cost, size, and complexity of the overall ac–dc converter, and this has led to the emergence of single-stage power-factor-corrected converters.

In order to reduce the cost, size, and complexity associated with two-stage ac–dc power conversion and PFC, researchers have tried to propose single-stage converters that integrate the functions of PFC and isolated dc–dc conversion in a single power converter. Several single-phase [6]–[12] and three-phase [5] converters have been proposed in the literature, with three-phase converters being preferred over single-phase converters

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A Novel Fuzzy-Logic Controlled Tri-PortConverter Fed SRM Drive for EV Application Powered by Solar-PV System

1M.Venkateswarlu, 2A.Raghavendrudu, 3V.Yogeswar Yadav, 4K.Vamsidhar Reddy, 5P.Uday Kumar,
1 Assistant Professor, 2,3,4,5 B-tech students Scholar
1,2, 3, 4, 5 Department of Electrical and electronics engineering,
1, 2, 3, 4, 5 G. Pullaiah College of Engineering and Technology, Nandikotkur Rd,
Near Venkayapalle, Pasupala Village, Kurnool, Andhra Pradesh, 518002.

Abstract-Electric vehicle technology is becoming increasingly important as it takes care of the environmental issues related to ICE vehicle and reduces the dependency on fossil fuels. Electric vehicle being greatly dependent on the limited electrical energy provided by a battery, the power flow efficiency is very important in this context. Switched reluctance motors (SRMs) are one of promised motors for EV applications. In order to extend the EVs' driving miles, the use of photovoltaic (PV) panels on the vehicle helps decrease the reliance on vehicle batteries. Based on phase winding characteristics of SRMs, a tri-port converter is proposed in this work to control the energy flow between the Solar-PV panel, battery and SRM. Six operating modes are presented, four of which are developed for driving and two for standstill on-board charging. In the driving modes, the energy decoupling control for maximum power point tracking (MPPT) of the PV panel and speed control of the SRM are realized. In the standstill charging modes, a grid-connected charging topology is developed without a need for external hardware. When the PV panel directly charges the battery, a multi-section charging control strategy is used to optimize energy utilization.

The another objective is to regulate steady-state error in speed by using PI controller, this controller is un-popular due to tuning issues, to overcome this issues a new intelligent fuzzy-logic controller is adopted for achieving good performance. The proposed intelligent Fuzzy control schemes are highly used in several applications, in that Fuzzy controller has been greatly recognized due to enhanced performance over the classical PI controller.Simulation results based on Mat lab/Simulink prove the effectiveness of the proposed fuzzy-logic controller driven tri-port converter, which has potential economic implications to improve the market acceptance of EVs.

Index Terms—Electric vehicles, photo voltaic (PV), power flow control, switched reluctance motors (SRMs), tri-port converter.

1. INTRODUCTION

Photovoltaic Generators (PV) provide a clean and unlimited source of energy. As part of an ongoing project on low-cost PVpowered Electrical Vehicles, a control system is evaluated here for a specific configuration, based on PV panels that power a Switched Reluctance Motor, using independent controllers for maximizing the power supply and optimizing the operation of the motor [1-3]. In this paper the Simulink model for the speed control of switched reluctance motor is carried out by using different speed controllers. The Simulink models is designed for P, PI &Fuzzy logic controller separately and their performance result is been compared [4-5]. The Switched Reluctance Motor is an electric motor which runs by a reluctance torque. For industrial application very high speed of 50,000 rpm motor is used. The speed controllers applied here are based on conventional P& PI Controller and the other one is AI based Fuzzy Logic Controller [6-7].

The PI Controller proportional integral controller) is a most special case of the PID controller in which the derivative of the error is not being used. Fuzzy logic controller is a most intelligent controller which uses a fuzzy logic to process the input. Fuzzy logic is a many valued logic which is much like a human reasoning. In the industrial control FLC has various applications, particularly where this conventional control design techniques are very difficult to apply. A comprehensive reviews has done for SRM machine modeling, design and simulation and analysis and control [8-10].

Switched Reluctance Motor (SRM) has undergone fast growth in airspace starter/generator system, hybrid electric vehicles, washing machines, and industrial automation applications over the most recent decades [11]. The main reason behind this is SRM has simple, robust construction and reliable operation. So it can be used as a drive in vibrating and high temperature areas. In addition the cost of the SRM is low and the size of the motor is little and lower weight [12]. However the SRM is a nonlinear motor because it operates in saturation to produce maximum output torque and the developed torque is a nonlinear function of both rotor position and phase current. So it is not advisable to use conventional PID controller to control the speed of switched reluctance motor [13]. Fuzzy logic controller (FLC) one of the intelligent control technique, is used in this work. FLC

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Active Neutral Point Clamped Inverter with PV System for Induction Motor Applications

M.Venkateswarlu
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

S.Sankara Prasad
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

ABSTRACT: A new five-level voltage source inverter is offered here for medium-voltage high-power applications. It's based on a four-level nested neutral-point clamped (NNPC) converter that's been upgraded. It can function at a wide variety of voltages without requiring the use of a power semiconductor in series, and it has a higher quality output voltage and fewer components than traditional five-level topologies. An Active Neutral Point Clamped (ANPC) inverter topology with six switches is suggested. In comparison to the traditional 5L-ANPC inverter, it only requires six switches for single phase, down from eight. The switching states and working concepts are discussed. When comparing 5L-ANPC and traditional 5L-ANPC topologies, the results reveal that the 5L-ANPC topology has reduced conduction loss and hence higher efficiency.

I. INTRODUCTION

Multilevel inverters are becoming more popular in academics and industry as one of the best power conversion solutions for medium and high power applications [1]–[3]. The adoption of multilayer inverters in medium-power applications is motivated by the desire to reduce switch voltage stress and output filter size. In comparison to their two-level predecessors, they also have better output quality, lower Total Harmonic Distortion (THD), lower common-mode voltage, and reduced Electromagnetic Interference (EMI) [4]. Furthermore, due to the usage of a low voltage drop component, multilayer inverters have the potential to reach higher efficiency than standard inverters., leading to their low voltage application such as photovoltaic (PV) cells [5]–[7]. There are three types of classic multilevel inverter topologies: Neutral Point Clamped (NPC) type [8], [9], Flying- Capacitor (FC) type [11-12], and Cascaded H- Bridge (CHB) type [13], a single-phase leg of three types of topologies generating five-level output are shown in Fig. 1. The NPC type multilevel inverters generate the voltage levels from the neutral point voltage by adopting the clamping diodes. However, when voltage levels increase, more clamping diodes, active semiconductor switches and DC-link capacitors are needed. Excessive number of clamping diodes are connected in series to block the higher voltage, thus producing more conduction losses and generating reverse recovery currents that affect the switching losses of other devices. The DC- link voltage balancing problem is another issue for higher levels NPC inverters. As another type of classic multilevel inverters, the FC inverter produces the required output voltage levels by summing the FC and DC-link voltages. The increased number of capacitors in higher levels leads to complex control method to balance the voltages of both DC-link capacitors and FCs. The higher switching frequency to keep the capacitors properly balanced and capacitors maintenance costs result in the less industrial penetration of FC type. The CHB multilevel inverters use series-connected Hbridge cells with an isolated dc voltage sources connected to each cell. Similarly, to have more output levels, more cells are needed. This will lead to impracticality of this type of topology since more isolated DC sources are required.

Improvement of Power Quality by Using Unified Power Quality Conditioner for Industrial Applications

S.Sankara Prasad
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

M.Venkateswarlu
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

Abstract—in this paper presents Three-phase unified Power Quality (UPQC) to improve power quality. The UPQC is realized by the integration of series and shunt active power filters (APF) sharing a common dc bus capacitor. The realization of shunt APF is carried out using a three-phase Voltage Source Inverter (VSI), The performance of the applied control algorithm is evaluated in terms of power-factor correction, source neutral current mitigation, load balancing, and mitigation of voltage and current harmonics in a three-phase, four-wire distribution system for different combinations of linear and non-linear loads. Dynamic Voltage Restorer (DVR) is presented to improve the Power quality in distribution system by injecting voltage in series for the protection of sensitive loads against voltage sags and voltage swells. The performance of the DVR depends on control technique involved .This circuit consists of capacitor in series with the interfacing inductor of the shunt active filter. The series capacitor enables reduction in dc-link voltage requirement of the shunt active filter and simultaneously compensating the reactive power required by the load, so as to maintain unity power factor, without compromising its performance. This allows us to match the dc-link voltage requirements of the series and shunt active filters with a common dc-link capacitor. AC induction motor has a fixed in the output side to run the ac machine with required speed. The proposed topology enables UPQC to compensate voltage sags, voltage swells and current harmonics with a reduced DC-link voltage without compromising its compensation capability by implementing the circuit in MATLAB/SIMULINK software.

Index Terms: Power quality, UPQC, Load balancing, voltage sags, voltage swells, AC Induction motor, APF.

I.INTRODUCTION

Electric power system is considered to be composed of three functional blocks generation, transmission and distribution. For a reliable power system, the generation unit must produce adequate power to meet customer's demand, transmission systems must transport bulk power over long distances without overloading or jeopardizing system stability and distribution systems must deliver electric power to each customer's premises from bulk power systems [13]. Distribution system locates the end of power system and is connected to the customer directly, so the power quality mainly depends on distribution system. The reason behind this is that the electrical distribution network failures account for about 90% of the average customer interruptions [15]. In the earlier days, the major focus for power system reliability was on generation and transmission only as these more capital cost is involved in these. In addition their insufficiency can cause widespread serious consequences for both society and its environment. But now a day's distribution systems have begun to receive more attention for reliability assessment.

Initially for the improvement of power quality or reliability of the system FACTS devices like static synchronous compensator (STATCOM), static synchronous series compensator(SSSC), interline power flow controller (IPFC), and unified power flow controller (UPFC) etc are introduced [12]. These FACTS devices are designed for the transmission system. But now a day's more attention is on the distribution system for the improvement of power quality, these devices are modified and known as custom power devices. The main custom power devices which are used in distribution system for power quality improvement are distribution static synchronous compensator (DSTATCOM), dynamic voltage Restorer (DVR), active filter (AF), unified power quality conditioner (UPQC) etc.

II.UNIFIED POWER QUALITY CONDITIONER

The best protection for sensitive loads from sources with inadequate quality, is shunt-series connection i.e. unified power quality conditioner (UPQC) .Recent research efforts have been made towards utilizing unified power quality conditioner (UPQC) to solve almost all power quality problems for example voltage sag, voltage swell,

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Control of a Three-Phase Hybrid Converter for a PV Charging Station

1 M Venkateswarlu, 2 D Lohith Kumar,3 K Karthik,4 Y Viveka Vardhan,5 P ChinnaNagasivudu
1Assistant Professor, 2,3,4,5B-tech student Scholar
1,2,3,4,5 Department of Electrical & Electronics Engineering,
1,2,3,4,5G. Pullaiah College of Engineering and Technology, Nandikotkur Rd,
near Venkayapalle, Pasupula Village, Kurnool, Andhra Pradesh 518002

ABSTRACT- A new Hybrid Converter (HBC) is proposed, to replace a DC/DC Boost converter and a DC/AC converter to reduce conversion stages and switching losses. In this project, control of a three-phase HBC in a PV charging station is going to be proposed. This HBC interfaces a PV system, a dc system with a hybrid plugin electrical vehicle (HPEVs) and a three-phase ac grid. The control of the HBC is designed to realize maximum power point tracking (MPPT) for PV, DC bus voltage regulation, and AC voltage or reactive power regulation. Simulation results demonstrate the feasibility of the designed control architecture. The control strategies are to be implemented based on the combination between the Incremental conductance (IC) method and the Proportional Integral (PI) controller along with Fuzzy logic control, that strategies can be extract the maximum power from a PV system. The PI Controller is to be used to track the maximum power from the PV panel, at different atmospheric condition. The Solar PV power generation system is comprised with several elements like solar panel, DC-DC converter, MPPT Control Strategies and load. The validity of the HBC for PV system is to be simulated with the help of MATLAB/SIMULINK environment.

Index Terms—**Plug-in hybrid vehicle (PHEV), Vector Control, Grid-connected Photovoltaic (PV), Three-phase Hybrid Boost Converter, Maximum Power Point Tracking (MPPT), ChargingStation.**

I. INTRODUCTION

The environmental and economic advantages of PHEV lead to the increase in number of production and consumption [1]. The U.S. Department of Energy forecasts that over one million PHEVs will be sold in the U.S. during the next decade [2]. Research has been conducted on developing a charging station by integrating a three-phase ac grid with PHEVs [3]–[5]. The comparison of different PHEV chargers' topologies and techniques are reviewed in [1], [6]. However, a large-scale penetration of PHEVs may add more pressure on the grid during charging periods. Therefore, charging stations with PV as an additional power source become a feasible solution. For PV charging stations, [7] proposed an architecture and controllers. The charging management is developed in [8] by considering the grid's loading limit. For this type of systems, it requires controlling at least three different power electronic converters to charge PHEVs. Each converter needs an individual controller, which increases complexity and power losses of the system. Consequently, it is urgent to investigate multi-port converters to reduce the number of converting stages.

The objective of the paper is to implement such a multi-port converter in a PV charging station for PHEVs and design the controller.

A. Related Works

In order to decrease the number of switching stages, the inverse Watkins-Johnson technique is proposed in [9] bysupplying power simultaneously to dc and ac loads. Single-phase and three-phase of hybrid boost converters (HBC) that can integrate a dc power source, dc loads and ac loads for a microgrid are proposed in [10] and [11], respectively. Recent research in [12] also suggests that a hybrid single-phase converter can be applied in grid-connected applications.

All previous research on HBC controller design [10]–[12] assumes that the hybrid converter is connected to a stiff dc voltage source. Hence, the function of maximum power point tracking (MPPT) for PV systems is not yet developed for HBC. Although MPPT algorithm exists in the literature, the application is mainly for a dc/dc converter (e.g., [13]) or a dc/ac converter (e.g., [14]).

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VEHICLE-TO-GRIDANCILLARYSERVICESUSINGSOLARPOWERED ELECTRICVEHICLECHARGINGSTATIONS

1M Bhagya Lakshmi, 2I Divya Sree,3K NavyaSree, 4Y Lavanya,5B Sandhyarani, 6K Rajeswari
1Assistant Professor, 2,3,4,5,6B-tech student Scholar
1,2,3,4,5,6 Department of Electrical & Electronics Engineering,
1,2,3,4,5,6 G. Pullaiah College of Engineering and Technology, Nandikotkur Rd,
near Venkayapalle, Pasupula Village, Kurnool, Andhra Pradesh 518002

Abstract— Concernsabouttheexponentialincreaseintheusageoffossil fuel especially in the transportation sector which leads to researchand development of alternative sources for powering vehicles. The mostsuitable alternative for the fossil fuel is electrification of vehicles whichhelpstopreventemissionsaswellasithelpstoprovidepowerbackto the grid when its needed(Vehicle-to-Grid).If the powering of electricvehicle is done by renewable energy, then that helps to provide moregreenerandcleanermeansoftransportation.Giventhisbackground,asolarphotovoltaic(PV)poweredElectricvehiclechargingfacility(EVCF)isdesignedforchargingtheElectricVehicles(EV)withAC-DC converter and vector control techniques.The simulations results inMATLABSIMULINKenvironmentdemonstratestheEVparticipationinancillaryservicesthroughEVaggregatoragents.

Index Terms—Electric vehicles (EV) , ancillary services, converters,powerconversion,solarpowergeneration

I.INTRODUCTION

Every industry is becoming smart and automated now a days andtransportationisoneamongthem.Inthelastcoupleofyearsthereisalotofdiscussionabouttheenergyconservationandthedepletion of fossil fuels. Most of the leading economies aim to transform theirtransportation system green by 2040 . As per Electric Vehicle (EV)policies,Indiatooisplanningtoadopt100%EVsinroadtransportby2030. The major advantages with the use of EV is reduced pollutionand easy integration of renewable resources.Electrification of roadhelpstoreducetheenvironmentalproblems.ThreemodesofEVcharging, named Quick,Budget and Green in a solar powered EVCharging Facilities(EVCF) is discussed in [1].The dependence of theEVCFOnthe grid can be minimized by incorporating renewableenergysource(SolarPV)andaBatteryEnergyStorageSystem(BESS), but the BESS greatly increases the investment.Instead, theEVs can be utilized as temporary storage devices to store the PVpower. The excess PV power can supply the grid as well.The invertercontrolthroughIcosphialgorithmisdiscussedin[2].Itdiscussaboutmaximumgreenenergyintegrationwiththegrid.

A.EVChargingstandards

EVs can be charged from domestic or public charging locations.TheinternationallyacceptedforEVchargingaredevised bysociety of automotive engineers (SAE), international electromechanicalcommission (IEC) and CHAdeMO EV standards [3]. The Europeanstandards for charging defines charging types as MODES whereas inUS they are termed LEVELS. [4] Japan and China developed theircommon charging scheme named CHAdeMO. TESLA has developedtheir own separate charging standard [3], [5]. [6] also discusses thecharger topologies and power levels of some manufactured PHEVandEVs.[4]discussesthedifferentchargingstd.ofEVsinEurope,USA etc.There are some standards for charging sockets also. Eachchargingstdhavecorrespondingspecifiedsocketsforcharging.Level-2 DC Charging is a combined system of charging.This chargeris mainly used for the residential and commercial types of chargingfacilities.Thesechargercanusedformaximumof20KWpowertrans-fer applications [7]. The fast charging mode is aimed at minimizationofchargingtimeorqueuingtimeofthecustomer.[8]is discussingthe algorithm for charging time minimization. In this paper chargingis designed for the working frequency and voltage of 50Hz and

Power Quality Improvement by using Unified Power Quality Conditioner with Fuzzy Logic controller

M. Bhagya Lakshmi
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

U CHAITANYA
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

Abstract - One of the major concerns in electricity industry today is power quality. It becomes especially important with the introduction of advanced and complicated devices, whose performance is very sensitive to the quality of power supply. The electronic devices are very sensitive to disturbances and thus industrial loads become less tolerant to power quality problems such as voltage dips, voltage sags, voltage flickers, harmonics and load unbalance etc. At present, a wide range of very flexible controllers, which capitalize on newly available power electronics components, are emerging for custom power applications. Among these, the distribution static compensator, dynamic voltage restorer and unified power quality conditioner which is based on the VSC principle are used for power quality improvement. In this paper, a fuzzy logic controller with reference signal generation method is designed for UPQC. This is used to compensate current and voltage quality problems of sensitive loads. The results are analyzed and presented using matlab/simulink software.

Keywords: power quality, upqc, voltage sag, fuzzy logic controller

I. INTRODUCTION

HERE has been a continuous rise of nonlinear loads over the years due to intensive use of power electronic control in industry as well as by domestic consumers of electrical energy. The utility supplying these nonlinear loads has to supply large vars. Moreover, the harmonics generated by the nonlinear loads pollute the utility. The basic requirements for compensation process involve precise and continuous VAR control with fast dynamic response and on-line elimination of load harmonics. To satisfy these criterion, the traditional methods of VAR compensation using switched capacitor and thyristors controlled inductor coupled with passive filters are increasingly replaced by active power filters (APFs). The APFs are of two types; the shunt APF and the series APF. The shunt APFs are used to compensate current related problems, such as reactive power compensation, current harmonic filtering, load unbalance compensation, etc. The series APFs are used to compensate voltage related problems, such as voltage harmonics, voltage sag, voltage swell, voltage flicker, etc. The unified power quality conditioner (UPQC) aims at integrating both shunt and series APFs through a common DC link capacitor. The UPQC is similar in construction to a unified power flow controller (UPFC). The UPFC is employed in power transmission system, whereas the UPQC is employed in a power distribution system. The primary objective of UPFC is to control the flow of power at, fundamental frequency. On the other hand the UPQC controls distortion due to harmonics and unbalance in voltage in addition to control of flow of power at the fundamental frequency. The schematic block diagram of UPQC is shown in Fig. 1. It consists of two voltage source inverters (VSIs) connected back-to-back, sharing a common DC link in between. One of the VSIs act as a shunt APF, whereas the other as a series APF. The performance of UPQC mainly depends upon how quickly and accurately compensation signals are derived. Control schemes of UPQC based on PI controller has been widely reported. The PI control based techniques are simple and reasonably effective. However, the tuning of the PI controller is a tedious job. Further, the control of UPFC based on the conventional PI control is prone to severe dynamic interaction between active and reactive power flows. In this work, the conventional PI controller has been replaced by a fuzzy controller (FC). The FC has been used in APFs in place of conventional PI controller for improving the dynamic performance. The FC is basically nonlinear and adaptive in nature. The results obtained through FC are superior in the cases where the effects of parameter variation of controller are also taken into consideration. The FC is based on linguistic variable set theory and does not require a mathematical model. Generally, the input variables are error and rate of change of error. If the error is coarse, the FC provides coarse tuning to the output variable and if the error is fine, it provides fine tuning to the output variable. In the normal operation of UPQC, the control circuitry of shunt APF calculates the compensating current for the current harmonics and the reactive power compensation. In the conventional methods, the DC link capacitor voltage is sensed and is

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A Novel Method of Cascaded H-Bridge Multi Level Inverter for Industrial Applications

U CHAITANYA
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

M.Bhagya Lakshmi
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

Abstract-A new topology of cascaded multilevel converter is proposed. The proposed topology is based on a cascaded connection of single-phase sub multilevel converter units and full-bridge converters. Compared to the conventional multilevel converter, the number of dc voltage sources, switches, installation area, and converter cost is significantly reduced as the number of voltage steps increases. In order to calculate the magnitudes of the required dc voltage sources, three methods are proposed. Then, the structure of the proposed topology is optimized in order to utilize a minimum number of switches and dc voltage sources, and produce a high number of output voltage steps. The prior H-bridge based multilevel inverter can increase the number of output voltage levels by adding switch components and DC input voltage sources. If it employs seven switches and three DC sources, the number of output voltage levels becomes seven. Although its THD characteristics are improved. To mitigate this problem, we propose an efficient PWM switching method for the prior H-bridge based multilevel inverter. The operation and performance of the proposed a single-phase 31-level converter with multilevel converter is verified by MATLAB/ SIMULINK.

I. INTRODUCTION

Over many years, Induction motor drives have been popularly used for variable speed control applications in industries. This is because the induction motor is simple in construction and requires less maintenance. In recent times, multilevel inverters (MLI) are gaining popularity and widely used for induction motor drive applications [1-3]. It is especially used for medium to high voltage and high current drive applications. There are many advantages of multilevel inverters as compared to conventional inverters. Main advantages are low total harmonics distortion (THD), low switching losses, good power quality and reduced electromagnetic interference (EMI). Main feature of multilevel inverter is that it reduces voltage stress on each component [4-8]. The topologies of multilevel inverters are classified into three types. They are flying capacitor, diode clamped and H-bridge cascaded multilevel inverters.

Cascaded H-bridge (CHB) multilevel inverter is one of the most popular inverter topology used in high-power medium voltage (MV) drives. It is composed of a multiple units of single-phase H-bridge power cells. In practice, the number of power cells in a CHB inverter is mainly determined by its operating voltage and manufacturing cost. Cascaded H-bridge multilevel inverter requires the least number of components for the same voltage level as compared to all three types of inverter [9-11]. The growth of multilevel inverter caused development of various modulation schemes. The most common initial application of multilevel converters has been in traction, both in locomotives and track-side static converters. More recent applications have been for power system converters for VAR compensation and stability enhancement, active filtering, high-voltage motor drive, high-voltage dc transmission and most recently for medium voltage induction motor variable speed drives. Many multilevel converter applications focus on industrial medium-voltage motor drives, utility interface for renewable energy systems, Flexible AC Transmission System (FACTS) and traction drive systems.

In recent years, multilevel inverters have received more attention in industrial applications, such as motor drives, static VAR compensators and renewable energy systems. Compared to the traditional two-level voltage source inverters, the stepwise output voltage is the major advantage of multilevel inverters.

II. PROPOSED TOPOLOGY

In Fig.1, two new topologies are proposed for a seven-level inverter. As shown in. 1, the proposed topologies are obtained by adding two unidirectional power switches and one dc voltage source to the H-bridge inverter structure. In other words, the proposed inverters are comprised of six untidier tonal power switches (Sa, Sb, SL,1, SL,2, SR,1, and SR,2) an two dc voltage sources (VL,1 andVR,1). In this paper, these topologies are called developed H-bridge. As shown in Fig.1, the simultaneous turn-on of SL,1 and SL,2(orSR,1and SR,2)

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A FUZZY CONTROLLER BASED MULTI-INPUT HIGH STEP-UP CONVERTER FOR RENEWABLE ENERGY-DRIVE SYSTEMS

1.M. Bhagya Lakshmi, 2. T. Sai Jahnavi, 3. I. Virajitha, 4. U. Renuka Devi, 5. Y. Tejaswarupini,
1Assistant Professor, 2,3,4,5B-tech student Scholar
1,2,3,4,5 Department of Electrical & Electronics Engineering,
1,2,3,4,5, G. Pullaiah College of Engineering and Technology, Nandikotkur Rd,
near Venkayapalle, Pasupula Village, Kurnool, Andhra Pradesh 518002

ABSTRACT: This paper proposes a multiple input power conditioner topology with Fuzzy controller to integrate intermittent nature of renewable sources such as solar, wind, etc. Solar PV and wind generator are utilized as the primary energy source to meet the load demand and well-regulated output voltage is obtained from the multiple input power conditioners. The high step-up voltage conversion gain, approximately 30 times, can be achieved from the proposed converter. The generated high output voltage is then fed the three-phase inverter driving the PMSM. The control strategies for the proposed multi-input converter and the PMSM drive system will be described. Simulation results show the effectiveness of the proposed multi-input high step-up converter for renewable energy-drive systems under different operating conditions. Performance evaluation of the proposed converter shows that the proposed fuzzy controller tune the parameters of dc/dc converter to obtain well regulated output voltage to the load from the intermittent nature of source.

Keywords- DC/DC converter, Fuzzy logic, Hybrid energy system,Renewable energy, Solar photovoltaic Wind energy.

I. INTRODUCTION

Many converter topologies are reported in the literature toprovide a good match between different voltage andcurrent characteristic renewable energy resources. In seriesconnected topology [1]. Output voltage and current regulationis difficult for the intermittent nature of renewable sources.Parallel connected topology [2] is inherently complex andresults high cost due to multiple number of converters andcommunication devices between individual converters. Thereis a supreme need for integrated power converters that arecapable of interfacing, and concurrently, controllingseveral power terminals with low cost and compactstructure. The multiple-input dc/dc converter is useful forcombining several energy sources whose power capacity and/or voltage levels are maintained dissimilar [3,4]. An idealmultiple-input power supply could accommodate a varietyof sources and combine their advantages automatically,such that the inputs are interchangeable.

Several multiple-input converters have been reported in theliterature. A general multiple-input converter, which onlyutilizes one inductor, has been reported in literature [5].Characteristic and properties of multiple-input converters arealso presented. Power sources can be put in parallel byusing the coupled transformer to implement the multipleinput converter and the regulated dc output voltage can be achieved [6]. Multiple input power conditioner to integratesolar-PV and wind energy sources, is proposed to achievethe regulated output voltage and described in detail in thispaper [7]. Design of intelligent controller for the powerconverter is essential to harvest maximum energy form thenonlinear v-i characteristic renewable energybased sources.

In this paper, the multi-input high step-up dc-dcconverter for renewable energy PMSM drive systemapplications is proposed. The multi-input high step-up dc-dcconverter topology is introduced for generating the highoutput voltage of 600Vdc from the low input about 20Vdc.The control strategy based on PI controller for the proposedmulti-input high step-up dc-dc converter is described in orderto obtain the high output voltage at the desired level. Byconnecting the three-phase inverter between the proposedconverter and the three-phase PMSM, the satisfactoryoperations of the motor drive system can be achieved underdifferent operating conditions. The indirect vector controlbased on PI controller is employed in order to regulate thespeed of the motor. The overview structure of the proposedmulti-input high step-up dc-dc converter for renewableenergy-PMSM drive system is shown in Fig. 1. As can beseen, the multi-input renewable energy sources such as fuelcells, PV modules and wind turbines are supplied to theproposed multi-input converter in order to deliver the powerto the PMSM load.

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BLDC Motor-Driven Solar PV Array-Fed Water Pumping System Employing Zeta Converter

[1] S SANKARA PRASAD, [2] S RAMNATH , [3] Y RAVI KUMAR, [4] A MOHAMMED TABREZ , [5] MOHAMMED YASEEN1Assistant Professor, 2,3,4,5,B.tech student Scholar 1,2,3,4,5,Department of Electrical & Electronics Engineering, 1,2,3,4,5,G. Pullaiah College of Engineering and Technology, Nandikotkur Road near Venkayapalle, Pasupula Village, Kurnool, Andhra Pradesh 518002

Abstract: This paper proposes a solar photovoltaic (SPV) array fed water pumping system utilizing a zeta converter as an intermediate DC-DC converter in order to extract the maximum available power from the SPV array. Controlling the zeta converter in an intelligent manner through the incremental conductance maximum power point tracking (INC-MPPT) algorithm offers the soft starting of the brushless DC (BLDC) motor employed to drive a centrifugal water pump coupled to its shaft. Soft starting i.e. the reduced current starting inhibits the harmful effect of the high starting current on the windings of the BLDC motor. A fundamental frequency switching of the voltage source inverter (VSI) is accomplished by the electronic commutation of the BLDC motor, thereby avoiding the VSI losses occurred owing to the high frequency switching. A new design approach for the low valued DC link capacitor of VSI is proposed. The proposed water pumping system is designed and modeled such that the performance is not affected even under the dynamic conditions. Suitability of the proposed system under dynamic conditions is demonstrated by the simulation results using MATLAB/Simulink software.

Key words: **Brushless dc (BLDC) motor, incremental conductance maximum power point tracking (INC-MPPT), solar photovoltaic (SPV) array, voltage-source inverter (VSI), waterpump, zeta converter**

I. Introduction

Severe environmental protection regulations, shortage offossil fuels and eternal energy from the sun have motivated theresearchers towards the solar photovoltaic (SPV) array generatedelectrical power for various applications [1]. Water pumping isreceiving wide attention nowadays amongst all the applicationsof SPV array. To enhance the efficiency of SPV array and hencethe whole system regardless of the operating conditions, itbecomes essential to operate SPV array at its maximum powerpoint by means of a maximum power point tracking (MPPT)algorithm [2-4]. Various DC-DC converters have been alreadyemployed to accomplish this action of MPPT. Nevertheless, a Zeta converter [5 -9] based MPPT is still unexplored in any kindof SPV array based applications. An incremental conductance (INC) MPPT algorithm [2] is used in this work in order togenerate an optimum value of duty cycle for the IGBT

(Insulated Gate Bipolar Transistor) switch of Zeta converter such that theSPV array is constrained to operate at its MPP. Variousconfiguration of Zeta converters such as self-lift circuit, re-liftcircuit, triple-lift circuit and quadruple-lift circuit using voltage lift (VL) technique have been reported in aforementioned topologies have high voltage transfer gain but at the cost of increased number of components and switching devices. Therefore, thesetopologies of Zeta converter do not suit the proposed waterpumping system.

The PV inverters dedicated to the small PV plants must be characterized by a large range for the input voltage in order to accept different configurations of the PV field. This capability is assured by adopting inverters based on a double stage architecture where the first stage, which usually is a dc/dc converter, can be used to adapt the PV array voltage in order to meet the requirements of the dc/ac second stage, which is used to supply an ac load or to inject the produced power into the grid. This configuration is effective also in terms ofcontrollability because the first stage can be devoted to track the maximum power from the PV array, while the second stage is used to produce ac current with low Total Harmonic Distortion (THD).

BLDC motors are preferred over DC motors and inductionmotors due to their advantages like long operating life,higher efficiency, low maintenance and better speedtorque characteristics. Stator windings of BLDC motorsare energized in a sequence from an inverter. A bulkierDC link capacitor is connected in between the dc-dcconverter and inverter to get a constant voltage at the inputof inverter, thus to make the voltage ripple free.ButtheDC link capacitor is bulkier in size and its life time isaffected by operating temperature. Moreover the cost isabout 5-15% of overall cost of BLDC motor drive. As anattempt to reduce the cost of motor, DC link capacitor canbe eliminated at the expense of torque ripple. Thus a newtorque ripple compensation technique is proposed tocompensate for the torque ripple associated with theelimination of the DC link capacitor. In this method,torque ripple compensation technique is proposed to asolar PV array fed DC link capacitor free BLDC motor.

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Active Neutral Point Clamped Inverter with PV System for Induction Motor Applications

M.Venkateswarlu
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

S.Sankara Prasad
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

ABSTRACT: A new five-level voltage source inverter is offered here for medium-voltage high-power applications. It's based on a four-level nested neutral-point clamped (NNPC) converter that's been upgraded. It can function at a wide variety of voltages without requiring the use of a power semiconductor in series, and it has a higher quality output voltage and fewer components than traditional five-level topologies. An Active Neutral Point Clamped (ANPC) inverter topology with six switches is suggested. In comparison to the traditional 5L-ANPC inverter, it only requires six switches for single phase, down from eight. The switching states and working concepts are discussed. When comparing 5L-ANPC and traditional 5L-ANPC topologies, the results reveal that the 5L-ANPC topology has reduced conduction loss and hence higher efficiency.

I. INTRODUCTION

Multilevel inverters are becoming more popular in academics and industry as one of the best power conversion solutions for medium and high power applications [1]–[3]. The adoption of multilayer inverters in medium-power applications is motivated by the desire to reduce switch voltage stress and output filter size. In comparison to their two-level predecessors, they also have better output quality, lower Total Harmonic Distortion (THD), lower common-mode voltage, and reduced Electromagnetic Interference (EMI) [4]. Furthermore, due to the usage of a low voltage drop component, multilayer inverters have the potential to reach higher efficiency than standard inverters., leading to their low voltage application such as photovoltaic (PV) cells [5]–[7]. There are three types of classic multilevel inverter topologies: Neutral Point Clamped (NPC) type [8], [9], Flying- Capacitor (FC) type [11-12], and Cascaded H- Bridge (CHB) type [13], a single-phase leg of three types of topologies generating five-level output are shown in Fig. 1. The NPC type multilevel inverters generate the voltage levels from the neutral point voltage by adopting the clamping diodes. However, when voltage levels increase, more clamping diodes, active semiconductor switches and DC-link capacitors are needed. Excessive number of clamping diodes are connected in series to block the higher voltage, thus producing more conduction losses and generating reverse recovery currents that affect the switching losses of other devices. The DC- link voltage balancing problem is another issue for higher levels NPC inverters. As another type of classic multilevel inverters, the FC inverter produces the required output voltage levels by summing the FC and DC-link voltages. The increased number of capacitors in higher levels leads to complex control method to balance the voltages of both DC-link capacitors and FCs. The higher switching frequency to keep the capacitors properly balanced and capacitors maintenance costs result in the less industrial penetration of FC type. The CHB multilevel inverters use series-connected Hbridge cells with an isolated dc voltage sources connected to each cell. Similarly, to have more output levels, more cells are needed. This will lead to impracticality of this type of topology since more isolated DC sources are required.

Improvement of Power Quality by Using Unified Power Quality Conditioner for Industrial Applications

S.Sankara Prasad
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

M.Venkateswarlu
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

Abstract—in this paper presents Three-phase unified Power Quality (UPQC) to improve power quality. The UPQC is realized by the integration of series and shunt active power filters (APF) sharing a common dc bus capacitor. The realization of shunt APF is carried out using a three-phase Voltage Source Inverter (VSI), The performance of the applied control algorithm is evaluated in terms of power-factor correction, source neutral current mitigation, load balancing, and mitigation of voltage and current harmonics in a three-phase, four-wire distribution system for different combinations of linear and non-linear loads. Dynamic Voltage Restorer (DVR) is presented to improve the Power quality in distribution system by injecting voltage in series for the protection of sensitive loads against voltage sags and voltage swells. The performance of the DVR depends on control technique involved .This circuit consists of capacitor in series with the interfacing inductor of the shunt active filter. The series capacitor enables reduction in dc-link voltage requirement of the shunt active filter and simultaneously compensating the reactive power required by the load, so as to maintain unity power factor, without compromising its performance. This allows us to match the dc-link voltage requirements of the series and shunt active filters with a common dc-link capacitor. AC induction motor has a fixed in the output side to run the ac machine with required speed. The proposed topology enables UPQC to compensate voltage sags, voltage swells and current harmonics with a reduced DC-link voltage without compromising its compensation capability by implementing the circuit in MATLAB/SIMULINK software.

Index Terms: Power quality, UPQC, Load balancing, voltage sags, voltage swells, AC Induction motor, APF.

I.INTRODUCTION

Electric power system is considered to be composed of three functional blocks generation, transmission and distribution. For a reliable power system, the generation unit must produce adequate power to meet customer's demand, transmission systems must transport bulk power over long distances without overloading or jeopardizing system stability and distribution systems must deliver electric power to each customer's premises from bulk power systems [13]. Distribution system locates the end of power system and is connected to the customer directly, so the power quality mainly depends on distribution system. The reason behind this is that the electrical distribution network failures account for about 90% of the average customer interruptions [15]. In the earlier days, the major focus for power system reliability was on generation and transmission only as these more capital cost is involved in these. In addition their insufficiency can cause widespread serious consequences for both society and its environment. But now a day's distribution systems have begun to receive more attention for reliability assessment.

Initially for the improvement of power quality or reliability of the system FACTS devices like static synchronous compensator (STATCOM), static synchronous series compensator(SSSC), interline power flow controller (IPFC), and unified power flow controller (UPFC) etc are introduced [12]. These FACTS devices are designed for the transmission system. But now a day's more attention is on the distribution system for the improvement of power quality, these devices are modified and known as custom power devices. The main custom power devices which are used in distribution system for power quality improvement are distribution static synchronous compensator (DSTATCOM), dynamic voltage Restorer (DVR), active filter (AF), unified power quality conditioner (UPQC) etc.

II.UNIFIED POWER QUALITY CONDITIONER

The best protection for sensitive loads from sources with inadequate quality, is shunt-series connection i.e. unified power quality conditioner (UPQC) .Recent research efforts have been made towards utilizing unified power quality conditioner (UPQC) to solve almost all power quality problems for example voltage sag, voltage swell,

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Closed Loop Control of PV High Voltage Gain DC-DC converter with Two-Input Boost-stages

1S.Sankara Prasad , 2 G.Lakshmi Narayana , 3T.VijayBharadwaz , 4 M.Nagendra Babu , 5 P.Rufus Kumar ,
1Assistant Professor,2,3,4,5B-techstudents Scholar
1,2,3,4,5DepartmentofElectrical&ElectronicsEngineering,
1,2,3,4,5G.PullaiahCollegeofEngineeringandTechnology,Nandik otkurRd,NearVenkayapalle,Pasupula Village,Kurnool,AndhraPradesh518002

Abstract*:* Dc-dc converter is a device which produces a dc output voltage when a dc input is given. If output voltage needed is higher than input voltage we go for boost converter. The conventional boost converter can be used for step up applications because of low conduction loss, simple structure and low cost. However, it is not suitable for high step-up applications. Generally conventional boost converters have been used to obtain higher output voltage than the input voltage. When these boost converters are operated for high ratios it leads to high voltage and current stress on the switch. Hence an interleaving technique of boost converter has been presented. This method of approach can be used in high power applications to produce high voltage gain when compared to the conventional boost converter. A simple dc-dc boost converter are unable to provide high step-up voltage gains due to the effect of power switches, rectifier diodes, and the equivalent series resistance of inductor and capacitors. In this paper proposes new dc-dc converter to achieve high voltage gain without an extremely high duty ratio. In the proposed converters, two inductors with the same level of inductance are charged in parallel during the switch –on period and are discharged in series during the switch-off period. In this converter mainly proposed converter. That is used for PV system. To achieve high-voltage conversion ratios, a new family of high-voltage-gain dc–dc power electronic converters has been introduced. The proposed converter can be used to draw power from two independent dc sources as a multiport converter or one source in an interleaved manner. They draw continuous input current from both the input sources with low current ripple which is required in many applications, e.g., solar. Several diode-capacitor stages are cascaded together to boost up the voltage which limits the voltage Stresses on the switches, diodes, and capacitor. In extension the input DC source is replaced with PV system and closed loop control is used to maintain output current is constant.

Key words: conventional boost converter, DC source,switches, diodes, and capacitor

(I) INTRODUCTION

With the increased penetration of renewable energy sources and energy storage, high-voltage-gain dc–dc power electronic converters find increased applications in green energy systems. They can be used to interface low voltage sources like fuel cells, photovoltaic (PV) panels, batteries, etc., to the 400-V bus in a dc micro grid system (see Fig.1) [1]. They also find applications in different types of electronic equipment such as high-intensity-discharge lamps for automobile headlamps, servo-motor drives, X-ray power generators, computer periphery power supplies, and uninterruptible power supplies [4].

To achieve high voltage gains, classical boost and buck-boost converters require large switch duty ratios. Large duty cycles result in high current stress in the boost switch. The maximum voltage gain that can be achieved is constrained by the parasitic resistive components in the circuit and the efficiency is drastically reduced for large duty ratios. There are diode reverse recovery problems because the diode conducts for a short period of time. Also, larger ripples on the high input current and output voltage would further degrade the efficiency of the converter [5].Typically high-frequency transformers or coupled inductors are used to achieve high-voltage conversion ratios . The transformer design is complicated and the leakage inductances

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Paper Authors : U. Chaithanya, A. Chandana, M. Nagaveni, . Dishitha, D. Anuhya, G. Gayathri

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MULTI LEVEL INVERTER TOPOLOGIES WITH REDUCED DEVICE COUNT FOR INDUCTION MOTOR APLLICATIONS

1U. Chaithanya, 2 A. Chandana, 3 M. Nagaveni, 4. Dishitha, 5 D. Anuhya, 6 G. Gayathri
1Assistant Professor, 2,3,4,5,6 B-tech student Scholar
1,2,3,4,5,6 Department of Electrical & Electronics Engineering,
1,2,3,4,5,6 G. Pullaiah College of Engineering and Technology, Nandikotkur Rd,
near Venkayapalle, Pasupula Village, Kurnool, Andhra Pradesh 518002

Abstract-Multilevel inverter offer high power capability, associated with lower output harmonics and lower commutation losses. Their main disadvantage is their complexity, requiring a great number of power devices and passive components, and a rather complex control circuitry. This paper proposes a multilevel inverter with reduced number of switches for induction motor drive application, multilevel inverter with reduced number of switches. The inverter is capable of producing levels of output-voltage levels from the dc supply voltage. This paper proposes a new multilevel inverter topology using reduced number of auxiliary switches. The new topology produces a significant reduction in the number of power devices and switches required to implement a multilevel output using the induction motor applications. The inverter is capable of producing levels of output-voltage levels from the dc supply voltage. This paper proposes a new multilevel inverter topology using reduced number of auxiliary switches. Reduction in overall part count as compared to the classical topologies has been an important objective in the recently introduced topologies. In this paper, some of the recently proposed multilevel inverter topologies with reduced power switch count are reviewed and analyzed. The paper will serve as an introduction and an update to these topologies, both in terms of the qualitative and quantitative parameters. Multilevel inverters are used in high voltage AC motor drive, distributive generation, high voltage direct transmission as well as SVC applications. The concept of an MLI to achieve higher power is to use power semiconductor switches along with several lower voltage dc levels to perform the power conversion by synthesizing a staircase voltage levels. And also Extension of this paper is Single phase topology is extended to three phase topology and fed with an induction motor drive.

Index Terms—Even power distribution, fundamental switching frequency operation, multilevel inverters (MLI), reduced device count, source configuration.

(I) Introduction

From many years, Induction motor drives have been popularly used for variable speed control applications in industries. This is because the induction motor is simple in construction and requires less maintenance. In recent times, multilevel inverters (MLI) are gaining popularity and widely used for induction motor drive applications [1-3]. It is especially used for medium to high voltage and high current drive applications. There are many advantages of multilevel inverters as compared to conventional inverters. Main advantages are low total harmonics distortion (THD), low switching losses, good power quality and reduced electromagnetic interference (EMI). Main feature of multilevel inverter is that it reduces voltage stress on each component [4-8]. The topologies of multilevel inverters are classified into three types. They are flying capacitor, diode clamped and H-bridge cascaded multilevel inverters.

H-bridge multilevel inverter is one of the most popular inverter topology used in high-power medium voltage (MV) drives. It is composed of a multiple units of single-phase H-bridge power cells. In practice, the number of power cells in an H-Bridge inverter is mainly determined by its operating voltage and manufacturing cost. H-bridge multilevel inverter requires the least number of components for the same voltage level as compared to all three types of inverter [9-11].

More recent applications have been for power system converters for VAR compensation and stability enhancement, active filtering, high-voltage motor drive, high-voltage dc transmission and most recently for medium voltage induction motor variable speed

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Fault Analysis of 3 Level And 5 Level with Induction Motor Drive

1U Chaithanya, 2K Kalyanchakravarthi,3M Sriram swaroop,4T Manoj kumar,
1Assistant Professor, 2,3,4B-tech student Scholar
1,2,3,4Department of Electrical & Electronics Engineering,
1,2,3,4 G. Pullaiah College of Engineering and Technology, Nandikotkur Rd,
near Venkayapalle, Pasupula Village, Kurnool, Andhra Pradesh 518002

Abstract: In this project Fault analysis of 3 level and 5 level with Induction motor Drive is presented. Introduction motors are widely used in industrial applications for their intrinsic ruggedness and reduced cost. Recently, the use of adjustable speed drives has spread in many applications. Most of the industrials motors are used today are in fact induction motors. Induction motors have been used in the past mainly in applications requiring a constant speed because conventional methods of their speed control have either been expensive or highly inefficient. Multilevel inverters have a high number of switching states so that the output voltage is stepped in smaller increments. This allows mitigation of the harmonics at low switching frequencies thereby reducing switching losses. Almost 38% of faults in industrial loads like variable speed ac drive. IGBT's are used in almost all converters as power handling capability is high. It is estimated that among all types of faults in variable speed ac drives in industry, 10 µs. The performance of the system analyzed by using MATLAB/SIMULINK software.

Key words: Diode clamped Inverter, Fault, Switch open and Switch short.

I. INTRODUCTION

Majority of industrial drives use ac induction motor because these motors are rugged, reliable, and relatively and expensive. Induction motors are mainly used for constant speed applications because of unavailability of the variable frequency supply voltage but many applications need variable speed operations Industrial applications have begun to require higher power apparatus in topical years. Some medium voltage motor drives and utility applications require medium voltage[1]. For a medium voltage grid, it is difficult to connect only one power semiconductor switch directly. As a outcome, a multilevel power converter structure has been introduced as an alternative in high power and medium voltage situations. The perception of multilevel converters has been introduced since 1975[2]. The main advantages of multilevel inverters include the increase of power, the diminution of voltage stress on the power switching devices, and the generation of high quality production voltages[3][4-8]. Multilevel converters are mainly utilized to synthesis a desired single or three-phase voltage waveform. The desired multi-staircase.The importance of multilevel inverters has been increased since last few decades. These new types of inverters are suitable for high voltage and high power application due to their ability to synthesize waveforms with better harmonic spectrum and with less THD. Plentiful techniques have been introduced and widely studied for utility of non conventional sources and also for drive applications. The output voltage is obtained by combining several dc voltage sources[9].

An inverter convert DC power into AC power through waves called either sine waves or modified sine waves. A multilevel(MLI) uses a sequence of semiconductor power converters(usually two or three) thus generating higher voltage. While an inverter would have to flip several switches. An inverter is a device which receives dc supply for its input and produces ac output. A multilevel inverter is a more powerful inverter, in higher and medium voltage grid it is trouble to connect only one semiconductor switch directly, As a result multilevel inverter was introduced. A multilevel inverter is a power electronic device that is widely used in industries for high voltage and high power applications, with output harmonic content is reduced by using multilevel inverter (MLI)) One important application of multilevel converters is focused on medium and high-power conversion. Nowadays, there exist three commercial topologies of multilevel voltagesource inverters: neutral point clamped (NPC), cascaded H-bridge (CHB), and flying capacitors (FCs)[2]. Among these inverter topologies, diode multilevel inverter(MLI) reaches the higher output voltage and power levels and the higher reliability due to its modular topology[9][12][11]. Diode clamped inverter is the most commonly used multilevel topology , in which the diode is used as the clamping device to clamp the dc bus voltage so as to achieve steps in the output voltage. Nabae, Takahashi, and Akagi were proposed neutral point converter in 1981 it was essentially a three-level diodeclamped inverter [13].

Power Quality Improvement by using Unified Power Quality Conditioner with Fuzzy Logic controller

M. Bhagya Lakshmi
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

U CHAITANYA
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

Abstract - One of the major concerns in electricity industry today is power quality. It becomes especially important with the introduction of advanced and complicated devices, whose performance is very sensitive to the quality of power supply. The electronic devices are very sensitive to disturbances and thus industrial loads become less tolerant to power quality problems such as voltage dips, voltage sags, voltage flickers, harmonics and load unbalance etc. At present, a wide range of very flexible controllers, which capitalize on newly available power electronics components, are emerging for custom power applications. Among these, the distribution static compensator, dynamic voltage restorer and unified power quality conditioner which is based on the VSC principle are used for power quality improvement. In this paper, a fuzzy logic controller with reference signal generation method is designed for UPQC. This is used to compensate current and voltage quality problems of sensitive loads. The results are analyzed and presented using matlab/simulink software.

Keywords: power quality, upqc, voltage sag, fuzzy logic controller

I. INTRODUCTION

HERE has been a continuous rise of nonlinear loads over the years due to intensive use of power electronic control in industry as well as by domestic consumers of electrical energy. The utility supplying these nonlinear loads has to supply large vars. Moreover, the harmonics generated by the nonlinear loads pollute the utility. The basic requirements for compensation process involve precise and continuous VAR control with fast dynamic response and on-line elimination of load harmonics. To satisfy these criterion, the traditional methods of VAR compensation using switched capacitor and thyristors controlled inductor coupled with passive filters are increasingly replaced by active power filters (APFs). The APFs are of two types; the shunt APF and the series APF. The shunt APFs are used to compensate current related problems, such as reactive power compensation, current harmonic filtering, load unbalance compensation, etc. The series APFs are used to compensate voltage related problems, such as voltage harmonics, voltage sag, voltage swell, voltage flicker, etc. The unified power quality conditioner (UPQC) aims at integrating both shunt and series APFs through a common DC link capacitor. The UPQC is similar in construction to a unified power flow controller (UPFC). The UPFC is employed in power transmission system, whereas the UPQC is employed in a power distribution system. The primary objective of UPFC is to control the flow of power at, fundamental frequency. On the other hand the UPQC controls distortion due to harmonics and unbalance in voltage in addition to control of flow of power at the fundamental frequency. The schematic block diagram of UPQC is shown in Fig. 1. It consists of two voltage source inverters (VSIs) connected back-to-back, sharing a common DC link in between. One of the VSIs act as a shunt APF, whereas the other as a series APF. The performance of UPQC mainly depends upon how quickly and accurately compensation signals are derived. Control schemes of UPQC based on PI controller has been widely reported. The PI control based techniques are simple and reasonably effective. However, the tuning of the PI controller is a tedious job. Further, the control of UPFC based on the conventional PI control is prone to severe dynamic interaction between active and reactive power flows. In this work, the conventional PI controller has been replaced by a fuzzy controller (FC). The FC has been used in APFs in place of conventional PI controller for improving the dynamic performance. The FC is basically nonlinear and adaptive in nature. The results obtained through FC are superior in the cases where the effects of parameter variation of controller are also taken into consideration. The FC is based on linguistic variable set theory and does not require a mathematical model. Generally, the input variables are error and rate of change of error. If the error is coarse, the FC provides coarse tuning to the output variable and if the error is fine, it provides fine tuning to the output variable. In the normal operation of UPQC, the control circuitry of shunt APF calculates the compensating current for the current harmonics and the reactive power compensation. In the conventional methods, the DC link capacitor voltage is sensed and is

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A Novel Method of Cascaded H-Bridge Multi Level Inverter for Industrial Applications

U CHAITANYA
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

M.Bhagya Lakshmi
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

Abstract-A new topology of cascaded multilevel converter is proposed. The proposed topology is based on a cascaded connection of single-phase sub multilevel converter units and full-bridge converters. Compared to the conventional multilevel converter, the number of dc voltage sources, switches, installation area, and converter cost is significantly reduced as the number of voltage steps increases. In order to calculate the magnitudes of the required dc voltage sources, three methods are proposed. Then, the structure of the proposed topology is optimized in order to utilize a minimum number of switches and dc voltage sources, and produce a high number of output voltage steps. The prior H-bridge based multilevel inverter can increase the number of output voltage levels by adding switch components and DC input voltage sources. If it employs seven switches and three DC sources, the number of output voltage levels becomes seven. Although its THD characteristics are improved. To mitigate this problem, we propose an efficient PWM switching method for the prior H-bridge based multilevel inverter. The operation and performance of the proposed a single-phase 31-level converter with multilevel converter is verified by MATLAB/ SIMULINK.

I. INTRODUCTION

Over many years, Induction motor drives have been popularly used for variable speed control applications in industries. This is because the induction motor is simple in construction and requires less maintenance. In recent times, multilevel inverters (MLI) are gaining popularity and widely used for induction motor drive applications [1-3]. It is especially used for medium to high voltage and high current drive applications. There are many advantages of multilevel inverters as compared to conventional inverters. Main advantages are low total harmonics distortion (THD), low switching losses, good power quality and reduced electromagnetic interference (EMI). Main feature of multilevel inverter is that it reduces voltage stress on each component [4-8]. The topologies of multilevel inverters are classified into three types. They are flying capacitor, diode clamped and H-bridge cascaded multilevel inverters.

Cascaded H-bridge (CHB) multilevel inverter is one of the most popular inverter topology used in high-power medium voltage (MV) drives. It is composed of a multiple units of single-phase H-bridge power cells. In practice, the number of power cells in a CHB inverter is mainly determined by its operating voltage and manufacturing cost. Cascaded H-bridge multilevel inverter requires the least number of components for the same voltage level as compared to all three types of inverter [9-11]. The growth of multilevel inverter caused development of various modulation schemes. The most common initial application of multilevel converters has been in traction, both in locomotives and track-side static converters. More recent applications have been for power system converters for VAR compensation and stability enhancement, active filtering, high-voltage motor drive, high-voltage dc transmission and most recently for medium voltage induction motor variable speed drives. Many multilevel converter applications focus on industrial medium-voltage motor drives, utility interface for renewable energy systems, Flexible AC Transmission System (FACTS) and traction drive systems.

In recent years, multilevel inverters have received more attention in industrial applications, such as motor drives, static VAR compensators and renewable energy systems. Compared to the traditional two-level voltage source inverters, the stepwise output voltage is the major advantage of multilevel inverters.

II. PROPOSED TOPOLOGY

In Fig.1, two new topologies are proposed for a seven-level inverter. As shown in. 1, the proposed topologies are obtained by adding two unidirectional power switches and one dc voltage source to the H-bridge inverter structure. In other words, the proposed inverters are comprised of six untidier tonal power switches (Sa, Sb, SL,1, SL,2, SR,1, and SR,2) an two dc voltage sources (VL,1 andVR,1). In this paper, these topologies are called developed H-bridge. As shown in Fig.1, the simultaneous turn-on of SL,1 and SL,2(orSR,1and SR,2)

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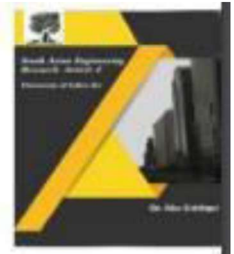

Improvement of Power Quality forFuzzy Controller Based Unified Power Quality Conditioner

1Y.Hazarathaiah, 2C.Shabarinath,3S.Vivek,4G.Purushottam Naidu,5P.Rakesh,
1Assistant Professor, 2,3,4,5B-tech students Scholar
1, 2,3,4,5 Department of Electrical & Electronics Engineering,
1, 2,3,4,5G. Pullaiah College of Engineering and Technology, Nandikotkur Rd,
Near Venkayapalle, Pasupula Village, Kurnool, Andhra Pradesh 518002

Abstract:In this project Fuzzy based Unified power quality conditioner for power quality improvement is presented. Unified power quality conditioner is a compensating device which is made for mitigation of all power quality problems together. This device will reduce harmonics which affects the quality of power. Unified power quality conditioner is the combinations of series active power filter and shunt active power filter which are joined back to back by a common DC link through capacitor. The performance of the filters mainly depends on its control strategy. A Fuzzy Logic Controller (FLC) is based on fuzzy sets and fuzzy rules with their membership functions of inputs and outputs. In this paper control technique is used for series active powerfilter and shunt active power filter is synchronous Reference frame (SRF) and instantaneous PQ (IPQ) used to compensate powerquality problems by a three phase unified power quality conditioner under imbalanced and distorted load conditions. This paper accentuates improvement of power quality by using Unified power quality conditioner with proportional integral controllerandfuzzy logic controller and comparing it with & without compensating devices. The performance and behavior of the proposed controllers has been evaluated through MATLAB/SIMULINK.

Keywords-Active filter, dual control strategy, power conditioning, three-phase distribution systems, unified power qualityconditioner (UPQC), Fuzzy Logic Controller
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I. INTRODUCTION

In recent years, many researchers give attention to solving power quality problems. These problems are appeared due to usage of reactive loads and non-linear loads. This load creates reactive power burden and harmonic problem. This harmonic pollution degrades the quality of power at transmission side as well as distribution side [1-2]. In literature, many papers have addressed these issues and have proposed the compensating devices for eliminating this problem. Usually passive filters are used to eliminate harmonics because of low cost and high efficiency.

However, this filters produce resonance with supply frequency therefore active filters are used for suppressing harmonics. The harmonics makes many undesirable effects such as increased heating losses in transformer, poor power factor, malfunction of medical equipments, and torque pulsation of motors. Power quality problems can be overcome, in real time, through the utilization of "custom power devices"(CPD) [3-4].The most commonly used CPD is unified power quality controller(UPQC), which is composed by two power converters that are connected in series and in shunt and sharing common dc voltage.A shunt converter (also known as the shunt active filter) acts as a harmonic compensator and injects the current in anti–phase with the distortion components present in the line current so that a balanced sinusoidal current flows through the feeder [5].

A series converter is responsible to compensate the major power quality problems related and with the voltage delivered to the load remain regulated and with low harmonic distortion.The required rating of series active filter is much smaller than that of a conventional shunt active filter [6]. Controllers are the most significant part of the UPQC and currently various control strategies are proposed by many researchers. Here, reference current and voltage extraction from the distorted mains is by modified synchronous reference frame technique. Fuzzy [7-8] logic control methodology has been demonstrated to allow solving uncertain and vague problems.In this paper

A Novel Method of Predictive Control with Different Controllers for Industrial Applications

D Vannurappa
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near
Venkayapalle, Kurnool, Andhra Pradesh 518002.

. Y Hazarathaiah
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near
Venkayapalle, Kurnool, Andhra Pradesh 518002.
.

Abstract: This paper presents a new control method for a matrix-converter-based induction machine drive. The switching state that optimizes the value of a quality function, used as the evaluation criterion, is selected and applied during the next discrete-time interval. Experimental results confirm that the proposed strategy gives high-quality control of the torque, flux, and power factor with a fast dynamic control response. Predictive control represents an optimization oriented alternative for the control of power converters and drives. Predictive torque control of induction machines has been shown to achieve excellent initial results. The objective of this paper is to help develop this promising control approach by introducing new elements to improve its performance. The resulting algorithm improves the efficiency of the converter from 91.1%to 92.6%and achieves a common-mode voltage mitigation of 50%, compared to the basic control method. A tradeoff is observed in the power quality.

Index Terms—AC–AC power conversion, matrix converter (MC), motor drives, predictive control, torque and flux control.

I. INTRODUCTION

The MATRIX converter (MC) is a single-stage power converter, capable of feeding an m-phase load from an n-phase source without using energy storage components [1]. The MC represents an alternative to the back-to-back converter in applications where size and weight are important. The absence of large capacitors or inductances allows the MC to give a compact solution [2], [3]. Several modulation techniques have been developed for MCs. These can be classified into two main groups: scalar and space vector methods [4]–[7]. The higher number of switching states and the direct interaction between the source and load introduces a certain amount of complexity into the analysis and implementation of an MC-based induction motor drive [8]–[12]. Predictive control is a control theory that was developed at the end of the 1970s [13]. Variants of this type of control strategy, associated with modulation techniques, have been used for power conversion and motor drive control [14]–[18]. The application of this family of nonlinear control techniques for torque and flux control in induction machines (IMs) has received attention from researchers due to the techniques' qualities of fast dynamic torque response, low torque ripple, and reduced switching frequency [19]–[23]. Model-based predictive control (MPC) has been introduced for motor current control [24], [25] and implemented on a variety of converter topologies [26]–[32]. An alternative technique for controlling the torque and flux of an IM has also been investigated [33]. The method has been considered for MCs through simulation studies [34], [35]. Both approaches share a common element: a quality function, which is evaluated for every valid switching state of the converter based on predictions obtained from a model of the system. The objective of this paper is to develop and experimentally validate an MC-based IM drive control method using MPC. This method features fast dynamic response, low torque ripple, and reactive input power control. The simple approach is based on the evaluation of an objective function through a unified switching-state selection criterion. This use of quality functions allows further attributes to be added to the method [24], such as reduction of switching losses, common-mode voltage control, spectrum regulation, etc. The method does not require additional modulation stages and can utilize all the allowable space vectors generated by the MC, including the rotating vectors.

The main contribution of this paper is to introduce the use of the predictive techniques in order to control the switching frequency, increase efficiency, and mitigate CMV in the PTC of an IM fed by a direct MC. The predictive techniques presented here can be extrapolated to more complex IMs such as multiphase IMs. In [47], a PTC of five-phase IM is implemented. Furthermore, in [48], a PTC with

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Improvement of Power Quality by Using Facts Controllers

Y Hazarathaiah
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

D Vannurappa
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

Abstract- Implementation of intelligence controller by using speed as feedback for significantly improving the dynamic performance of D-Statcom and voltage sag/swell conditions of the DVR, the comparative analysis of several control strategies fed D-Statcom for power quality improvement features is presented. Due to the sensitivity of consumers on power quality and also advancement in power electronics may attain the power quality concerns. D-Statcom technology is the most efficient way to compensate reactive power and cancel out low order harmonics generated by nonlinear loads. An D-Statcom is a device that is connected in parallel to and cancels the reactive and harmonic currents from the group of nonlinear loads so that the resulting total current drawn from the ac main is sinusoidal and also The Dynamic Voltage Restorer (DVR) is fast, flexible and efficient solution to voltage sag problem. The DVR is a power electronic based device that provides three-phase controllable voltage source with impedance circuit, whose voltage vector (magnitude and angle) adds to the source voltage during sag event, to restore the load voltage to pre-sag conditions. The DVR can restore the load voltage within few milliseconds. This paper discussed abc to dq0 base new control algorithm to generate the pulse. The simulation results are obtained through MATLAB/SIMULINK software.
***Key words- Power Quality, Voltage sags /swells, DVR,* D-Statcom.**

I.INTRODUCTION

There are different ways to improve power quality problems in transmission and distribution systems. Among these, the D-STATCOM is one of the most effective devices. A new PWM-based control scheme has been implemented to control the electronic valves in the D-STATCOM. The D-STATCOM has additional capability to sustain reactive current at low voltage, and can be developed as a voltage and frequency support by replacing capacitors with batteries as energy storage [6-7].

Advances in semiconductor device technology have fuelled a revolution in power electronics over the past decade, and there are indications that this trend will continue. However these power equipments which include adjustable-speed motor drives (ASDs), electronic power supplies, direct current (DC) motor drives, battery chargers, electronic ballasts are responsible for the rise in related PQ problems. These nonlinear loads are constructed by nonlinear devices, in which the current is

not proportional to the applied voltage Conventional passive filters are the earliest solution to mitigate the harmonics currents drawn by the non-linear loads, but due to its heavy in size and resonance with the impedance [3], its applications have becomes very limited in use.

One of the power electronic solutions to the voltage regulation is the use of a Dynamic Voltage Restorer (DVR). DVRs are a class of custom power devices for providing reliable distribution power quality. They employ a series of voltage boost technology using solid state switches for compensating voltage sags/swells. The DVR applications are mainly for sensitive loads that may be drastically affected by fluctuations in system voltage. Power Quality problems encompass a wide range of disturbances such as voltage sags/swells, flicker, harmonics distortion, impulse transient, and interruptions.

- Voltage sag :

Voltage sags can occur at any instant of time, with amplitudes ranging from 10 – 90% and a duration lasting for half a cycle to one minute.

- Voltage swell:

Voltage swell is defined as an increase in rms voltage or current at the power frequency for durations from 0.5 cycles to 1 min.

- Harmonics:

The fundamental frequency of the AC electric power distribution system is 50 Hz. A harmonic frequency is any sinusoidal frequency, which is a multiple of the fundamental frequency. Harmonic frequencies can be even or odd multiples of the sinusoidal fundamental frequency.

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ANOVEL METHOD OFHIGH-STEP UP CONVERTER WITH SOFT SWITCHING IN PV SYSTEMS

1.Y. Hazarathaiah, 2. D. Dhana Prasad, 3. D. Alif Basha, 4. S. K. Mohinuddin, 5. P. Mahaboob Basha,
1Assistant Professor, 2,3,4,5,6B-tech student Scholar
1,2,3,4,5,6 Department of Electrical & Electronics Engineering,
1,2,3,4,5,6 G. Pullaiah College of Engineering and Technology, Nandikotkur Rd,
near Venkayapalle, Pasupula Village, Kurnool, Andhra Pradesh 518002

ABSTRACT:

In the last several years, with the tension of global fossil energy, the renewable energy power systems, which are mainly on the photovoltaic (PV) power systems, are developing rapidly. In a PV power system, the output voltages of the PV panels are usually low and vary widely under the influences of weather and environment. The unregulated low voltage of PV panels, which cannot be provided for inverters, must be boosted and regulated through the high-gain converters. In this paper, a new High Step up DC-DC Converter is introduced for application in PV systems. The provided topology includes a boost converter using coupled inductors to increase the voltage gain. The only switch on this Converter is switched under Zero- Current Switching (ZCS), and also, all the diodes are switched on and off less than Zero-Current Switching. The voltage stress on the switch and all the diodes is much lower than the output voltage, and this makes the efficiency of this converter higher. The simulation model and the results are analyzed using MATLAB/Simulink.

Keywords:Photovoltaic (PV), High Step-up DC

-DC Converter, Zero-Current Switching.

(1) Introduction

Energy generation, transmission and distribution are undergoing profound changes with the emergence of localized grids in favour of a centralized grid. Whatever the reason: disaster mitigation, energy independence or financial gain, they all subscribe to and advance the separation from a central grid. And, it is happening across all sectors, from residential to commercial, communities to nations and urban to rural. These localized grids – minigrids, Micro grids, nanogrids and picogrids – however are not just miniaturizations of the grid as we know it. They are more in tune with today's energy and how it is used. And, not just the use, but also the generation, as diverse energy sources become more technologically available and affordable. According to the emerge Alliance, 80% of all AC electricity is now being used by DC based power electronics [1] heralding the change to energy sources that don't incur significant conversion losses at the point of use.

The general term of these localized grids, Microgrids [2], can be divided into AC and DC. However, the problems associated with AC Microgrids – synchronization of generators, reactive power and line unbalances, as well as their energy losses when converting to DC, favours the move to the DC microgrid. Such DC Microgrids may include AC and DC loads, dispatch able and non-dispatch able generators, energy storage, common distribution, management and demand response, and, a tether to the grid, where available, for increased reliability of service.

Renewable energy sources play an important role inelectricity generation. The benefits of renewable energysystem are more attractive than they ever had before.Specially, energy from the sun is the best option forelectricity generation as it is available everywhere and isfree to harness. The merits of solar PV system are cleanness,relative lack of noise or movement, as well as their ease ofinstallation and integration when compared to others.Electricity from the sun can be generated through the solarphotovoltaic modules (SPV). The SPV comes in variouspower output to meet the load [1]. However, the outputpower of a PV panel is largely determined by the solarirradiation and the temperature of the panel. At a certainweather condition, the output power of a PV panel dependson the terminal voltage of the system. To maximize thepower output of the PV system, a high efficiency, low-costDC/DC converter with a voltage and current feedback signalis employed to control the output voltage of the PV systemat optimal values in various solar radiation conditions [2].

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Title: **Power Quality Improvement and Reactive Power Compensation in a Grid Connected System for Non-Linear Loads Using DSTATCOM**

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Paper Authors : **A Suresh Kumar, S Saibharath, K Guru Saibharath, B Praveen Kumar, T Obulesh, B Ravi Kumar**

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Power Quality Improvement and Reactive Power Compensation in a Grid Connected System for Non-Linear Loads Using DSTATCOM

1 A Suresh Kumar, 2 S Saibharath,3 K Guru Saibharath,4 B Praveen Kumar,5 T Obulesh,6 B Ravi Kumar
1 Assistant Professor, 2,3,4,5,6 B-tech student Scholar
1,2,3,4,5,6 Department of Electrical & Electronics Engineering,
1,2,3,4,5,6 G. Pullaiah College of Engineering and Technology, Nandikotkur Rd,
near Venkayapalle, Pasupula Village, Kurnool, Andhra Pradesh 518002

Abstract - Power systems that are conceived to operate at the fundamental frequency (50 or 60 Hz) are more susceptible to erroneous behaviour as more and more non-linear loads are connected to the system. Large fluctuating loads like electric arc furnace, steel rolling mills, electric traction and some non-linear loads like rectifiers, inverters, fax machines, printers, PLCs, refrigerators, TVs, CFLs distort the voltage and current waveform and affect the performance of the grid voltage and currents as well as PCC (Point of Common Coupling) that causes poor power quality and harmonic distortion in power. Due to deteriorate the quality of power, other customers which are connected to the same pcc also experiences the poor quality of power so whole system gets affected by these non-linear loads. D-STATCOM solves these problems more efficiently and reliably. Many application of D-STATCOM is in the power systems at the distribution level. It compensates the reactive power, improves power factor, enhances voltage regulation and compensate at fault condition. Here in my paper the main concern is harmonic distortion due to non-linear loads and mitigation of current harmonics using D-STATCOM and compensation of reactive power for load and maintains the grid reactive power near to zero using MATLAB/SIMULATION.

Keywords:D-STATCOM (Distributed Static Synchronous Compensator); Non-linear loads; PI Controller; Hysteresis Current Control; Harmonic Distortion.

I .Introduction

STATCOM [1, 2] and D-STATCOM have similar strategies but objective of these two are different and covers the different area of objective. When STATCOM is connected to the distribution side then it is called D-STATCOM. DSTATCOM has the additional advantage in the power systems. It has its own applications viz. to improve power factor, to improve voltage regulation, to maintain three-phase balanced voltage and compensate at the fault condition. DSTATCOM is a shunt connected power electronic device which used self-commutated device like IGBT, IGCT etc. Voltage source converter (VSC) is the main part of the STATCOM. It injects the compensated or harmonic component of the current to cancel out the other harmonic frequency component (other than power frequency). So it acts as an active power filter [3]. 2

Power Quality

Power quality deals with maintaining a pure sinusoidal waveform of voltage and frequency. Voltage quality concern with deviation of voltage from ideal voltage (sinusoidal) it is a single frequency sine wave at rated magnitude and frequency with no harmonics. Current quality is a complimentary term of voltage quality concern with a deviation from the ideal current. Current should be in phase with the voltage. According to IEEE standard 1100, “power quality is the concept of powering and

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PERFORMANCE EVALUATION OF SEPIC CONVERTER

1 A. Suresh Kumar , 2 M. Eshwar , 3 Y. Jaya Chandra , 4 N. Charan Kumar , 5 Y. Hemanth Kumar Reddy,
1 Assistant Professor, 2,3,4,5 B-tech students Scholar
1, 2,3,4,5 Department of Electrical & Electronics Engineering,
1, 2,3,4,5 G. Pullaiah College of Engineering and Technology, Nandikotkur Rd,
Near Venkayapalle, Pasupula Village, Kurnool, Andhra Pradesh 518002

Abstract*:* In modern era different portable electronic equipment is beneficial from a power converter which is having high efficiency with a wide input and output voltage ranges with a compact size. But conventional power converter can't able to maintain a wide operation range with high Efficiency, especially when up-and-down voltage is required. These characteristics can be obtained in a single ended primary inductor converter (SEPIC). The single-ended primary inductor converter (SEPIC) is a type of DC/DC converter which allows voltage at its output to be greater than, less than, or equal to than at its input voltage. The output of the SEPIC is controlled by the duty cycle of the control transistor/IGBT/MOSFET. This Paper goes into detail of simulation of open loop & closed loop control for the SEPIC converter in MATLAB & results is analysed

.

I INTRODUCTION

The power converters are the electronic circuits which are used for the conversion, control and conditioning of electric power. Single Ended Primary Inductor Converter (SEPIC) is a DC-to-DC converter and is capable of operating in either step up or step-down mode and widely used in battery operated equipment by varying duty cycle of gate signal of MOSFET. It can step up or step-down voltage. For Duty cycle above 0.5, it will step up and below 0.5, it will step down the voltage to required value. Various conversion topologies like Buck, Boost, Buck-Boost are used to step up or step-down voltage.

Some limitation like pulsating input and output current, inverted output voltage, in case of Buck converter floating switch make it unreliable for different application. So, it is not easy for conventional power converter design to maintain high efficiency especially when it step up or step down voltage. All these characteristics are obtained in SEPIC DC to DC power conversion. Different designs are used using active and passive components. Non-inverted output, low equivalent series resistance (ESR) of coupling capacitor minimize ripple and prevent heat built up which make it reliable for wide range of operation.

INDRODUCTION TO SEPIC CONVERTER:

The most common technology in all the electronic converters is switched mode power converters. Switched mode power converters convert the voltage input to another voltage signal by storing the input energy and then releasing that energy to the output at a different voltage as per switching operation. The most common classification of power conversion systems is based on the waveforms of input and output signals. Thus, power converters are classified as AC to DC converters, DC to AC converters, AC to AC converters and DC to DC converters. There are different kinds of DC-DC converters used for several years for different applications. Some of the applications require high voltages while some require low voltages. Depending on the application DC-DC converters are divided as Buck converters, Boost converters, Buck-Boost converters, Cuk converters and SEPIC converters. The brief introduction of these DC-DC converters is introduced in this section. In Buck converter,

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Performance Evaluation of PV Panel Configurations Considering PSC's for PV Standalone Applications

Asadi Suresh Kumar[1,2*], Vyza Usha Reddy[1]

[1] Department of Electrical & Electronics Engineering, SVU College of Engineering, Tirupati 517507, India
[2] Department of Electrical & Electronics Engineering, G Pullaiah College of Engineering and Technology, Kurnool 518002, India

Corresponding Author Email: asureshkumareee@gpcet.ac.in

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Keywords:
SP, TCT, TT, BL, PV, PSC

ABSTRACT

One of the major concerns for continuous solar photovoltaic (PV) generation is partial shading. The movement of clouds, shadow of buildings, trees, birds, litter and dust, etc., can lead to partial shadow conditions (PSCs). The PSCs have caused inconsistent power losses in the PV modules. This leads to a shortage of electricity production and the presence in the PV curve of several peaks. One of the simplest solutions to PSC's is the PV configurations. The objective of this paper is modelling and simulation of solar PV system in various shading scenarios for KC200GT 200 W, 5 x 5 configurations that includes Series/Parallel (SP), Total-Cross-Tied (TCT), Triple-Tied (TT), Bridge-Link (BL) configurations. Real time PSC's such as corner, center, frame, random, diagonal, right side end shading conditions are evaluated under all PV array configurations. A comparative analysis is carried out for the parameters such as open circuit voltage, short circuit current, maximum power point, panel mismatch losses, fill factor, efficiency under all PV configurations considering PSC's. From the comparison analysis best configuration will be presented.

1. INTRODUCTION

The need for electricity demand is increasing all over the world [1]. The best solution for ever-increasing electricity demand is through renewable energy sources (RES). Solar, wind, geothermal and biomass sources are some of the RES. Among the RES solar energy is popular. However, cost associated with installation and poor energy harnessing capabilities impact negatively. The uncertain non-linear power-voltage (P-V) and current-voltage (I-V) characteristic of PV panel are the key components of solar energy. The series and parallel connections of PV cells build a module. The performance and the reliability of the PV panel usually depends primarily on the occurrence of solar irradiance (G) and temperature (T) [2] insulation. Maximum power of PV module can be tracked using various techniques [3]. The major factors that affect maximum power point are partial shading conditions (PSC). PSC's not only come from passing clouds, but also from shades of birds, dust, surrounding buildings, and snow covering etc., [4]. All PV modules receive different insolation levels under PSC which lead to voltage and current differences between modules, thus creating hot spots in shaded PV modules. The diode is annexed as bypass diode [5] in order to avoid hot spot issues. Due to PSC's multiple maximum power point's will be created in P-V curve also called as local maximum power point. The best of local maximum power point's is called as global maximum power point. Due to the multiple maximum power points power losses increases, degrades the energy conversion efficiency etc.

Many researchers have recommended several methodologies to overcome PSC's, such as MPPT tracking methodologies, PV converter control strategies, PV panel reconfiguration strategies etc. Several MPPT techniques are discussed by Bollipo et al. [3] under PSC's. Conventional MPPT methods like P&O, IC and HC are not capable to track global maximum power point [6]. Intelligent based MPPT techniques shows the better performance than the conventional methods to track the global maximum power point [7-9]. Nevertheless, intelligent methods are complex in hardware implementation. Ali et al. [10] addressed the drawbacks of intelligent MPPT methods. Bingöl and Özkaya [11] reviewed and compared several PV panel configurations S, S-P, T-C-T, B-L, H-C, T-T. In this paper is modelling and simulation of solar PV system in various shading scenarios for KC200GT 200 W, 5 x 5 configurations that includes SP, TCT, TT, BL configurations. Real time PSC's such as corner, center, frame, random, diagonal, right side end shading conditions are evaluated under all PV array configurations. A comparative analysis is carried out for the parameters such as Maximum Voltage Vmp (V), Maximum Current Imp (A), Maximum Power Pmp (W), Open Circuit Voc (V), Short Circuit Current Isc (A), Fill Factor FF (%), PV Mismatch losses Pml (%), Efficiency η (%) under all PV configurations considering PSC's. From the comparison analysis best configuration will be presented.

2. CASE SYSTEM

In this paper a 200 W, 5 X 5 KC200GT PV system is considered as test case. The specifications of KC200GT PV panel are tabulated in Table 1. The test case is implemented

Advanced battery technologies related to electric vehicle applications

. K. Venkateswaramma[1]
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

K Jaya Sree[2]
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

Abstract:

Electricity is the most adaptable and widely used form of energy on the world, as illustrated by its development over the last century. We can store electrical energy as chemical energy in batteries and then use that chemical energy as electricity. The capacity of mobile device batteries is frequently a significant constraint. The battery life of a device determines how long it can be used. Battery modelling can help predict and possibly to extend the battery's lifetime. Several different battery models have been developed over time. This paper gives an overview of the various types of batteries that are available.Comparisons of different types of batteries are studied based on the parameters like charging, discharging, life time, and cost. Among these li-ion battery is preferred due to high energy density and power density and high efficiency.

Keywords: Battery, Electric vehicle, Energy sources, Controller, Alternator

1. Introduction:

Environmental vehicles are currently undergoing research and development in preparation for commercialization [1]. When it comes to these modern vehicles' powertrains, it's critical to ensure that there's enough power output to meet the vehicle's power performance requirements while it also maximizing energy efficiency[2-3]. To achieve this, drivetrain components must perform better and resistance losses must be drastically reduced. The device's rate of energy consumption is the primary determinant of battery life[4]. However, reducing average consumption isn't the only way to extend battery life [5-6]. Because of nonlinear physical effects in the battery, the usage pattern has an impact on the battery's lifetime. The effective battery capacity degrades during periods of high energy consumption, reducing the battery's lifetime [7-8]. The primary function of a battery is to store energy and use it for a variety of purposes. We primarily employ primary and secondary batteries [9-10]. Primary batteries, or non-rechargeable batteries, are used for low-power applications, while second-hand or rechargeable batteries can be found for a wide range of applications [11-12].In terms of efficiency, speed, and loss, lithium-ion batteries are currently improving. However, there are still problems with lithium-ion batteries in a variety of fields, with varying degrees of difficulty [25]. One of the most significant reasons is the lack of good exterior characteristic models of lithium-ion batteries in various operating situations. The lithium battery modelling is more precise in this paper[26].

The structure of the paper is summarized below; Section 2 provides an overview of different types of batteries and their materials compares the batteries based on their characteristics. Section 3 provides the advanced technologies of li-ion battery. Section 4 of the paper summarizes the importance of the battery.
So many types of battery technologies are available for the applications of electrical vehicles. Based on the different types of material Lithium-ion batteries are used. Li-ion batteries are used for high energy density and high specific energy. It is more reliable, long cycle life is more compared to the other material types of batteries.

2. Battery types:

Primary and secondary batteries, super capacitors, fuel cells, electrolyzes, and other energy storage systems based on electrochemistry have all been manufactured. The categorization of electrochemical batteries is depicted in Table 1.

2.1 Advanced Battery technology

2.1.1 NanoBolt lithium tungsten batteries

Working on battery anode materials, N1 Technologies, Inc. researchers added tungsten and carbon multi-layered nanotubes that bond to the copper anode substrate and form a web-like nano structure. This creates a large surface for more ions to attach to during recharge and discharge cycles. This speeds up the charging of the NanoBolt lithium tungsten battery while also storing more energy.

2.2.2 Zinc-manganese oxide batteries

Department of Energy's Pacific Northwest National Laboratory discovered an unexpected chemical conversion reaction in a zinc-manganese oxide battery while investigating conventional assumptions. If that process can be controlled, conventional batteries' energy density can be

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Implementation of Fuzzy Controller Based Brushless DC Motor Drives

K Jaya Sree
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

. K. Venkateswaramma
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

Abstract: This paper aims at the design and simulation of hybrid PI-fuzzy control system for the speed control of a brushless dc motor. The performance of the fuzzy logic controller (FLC) is better under transient conditions, while that of the proportional plus integral (PI) controller is superior near the steady-state condition. The combined advantages of these two controllers can be obtained with hybrid PI -fuzzy speed controller. Both the design of the fuzzy controller and its integration with the proportional-integral (PI) controller is to be done. In this paper, design and implementation of hybrid fuzzy controller is presented and its performance is compared with pi and fuzzy controller to show its capability to track the error and usefulness of hybrid fuzzy controller in control applications.

Index Terms—Brushless dc (BLDC) servomotor drive, fuzzy controller, modeling, PID controller, transient and steady-state performance.

I. INTRODUCTION

In recent years, brushless dc (BLDC) machines have gained widespread use in electric drives. These machines are ideal for use in clean, explosive environments such as aeronautics, robotics, electric vehicles, food and chemical industries and dynamic actuation. Using these machines in high-performance drives requires advance and robust control methods. Conventional control techniques require accurate mathematical models describing the dynamics of the system under study. These techniques result in tracking error when the load varies fast and overshoot during transients. In lieu of provisions for robust control design, they also lack consistent performance when changes occur in the system. If advance control strategies are used instead, the system will perform more accurately or robustly. It is therefore, desired to develop a controller that has the ability to adjust its own parameters and even structure online, according to the environment in which it works to yield satisfactory control performance. An interesting alternative that could be investigated is the use of fuzzy logic control (FLC) methods. In the last decade, FLC has attracted considerable attention as a tool for a novel control approach because of the variety of advantages that it offers over the classical control techniques.

They are electronically commutated [3]. For the variable speed applications of BLDC motor, Proportional, Integral and Derivative (PID) motor control is commonly used control [4].Because; it has simple design and ease of control. However, its performance depends on proportional, integral and derivative gains [5- 6]. When the operating condition changes, the re-tuning process of control gains is necessary for dynamically minimize the total controller error. The various algorithms are used to find optimal PID controller parameters such as Genetic Algorithm (GA) and Particle Swarm Optimization (PSO) [7-10].Particle Swarm Optimization (PSO) and genetic algorithm (GA) is given based on population size, generation number, selection method, and crossover and mutation probabilities. There is no guarantee for finding optimal solutions for controllers within a finite amount of time. To overcome the problems in PID controller, fuzzy logic controller and hybrid fuzzy PID controllers can be designed for the speed control of BLDC motor. In this proposed research work, the speed control of BLDC motor was analyzed and its performance has been observed by using fuzzy logic controller and hybrid fuzzy PID [11- 13].The simulation results of two methods are studied and compared with conventional PI controller by using MATLAB/SIMULINK computational software. The simulation results of proposed controllers are used to show the abilities and shortcomings of conventional PI controller.

II. MODELING OF BLDC SERVO MOTOR DRIVE SYSTEM

The BLDC servomotor drive system consisting of BLDC servomotor and IGBT inverter is modeled [1]–[4], [15] based on the assumptions that all the stator phase

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Simulation of Step-Up DC-DC Converter for Photovoltaic Grid-Connected Applications

1K.Deepak, 2T.Ganesh,3B.Achyuth Narayana,4K.Amaresh,5P.Aves,
1Assistant Professor, 2,3,4,5B-tech students Scholar
1, 2,3,4,5 Department of Electrical & Electronics Engineering,
1, 2,3,4,5G. Pullaiah College of Engineering and Technology, Nandikotkur Rd,
NearVenkayapalle, Pasupula Village, Kurnool, Andhra Pradesh 518002

Abstract:In this project Fuzzy based Unified power quality conditioner for power quality improvement is presented. Unified power quality conditioner is a compensating device which is made for mitigation of all power quality problems together. This device will reduce harmonics which affects the quality of power. Unified power quality conditioner is the combinations of series active power filter and shunt active power filter which are joined back to back by a common DC link through capacitor. The performance of the filters mainly depends on its control strategy. A Fuzzy Logic Controller (FLC) is based on fuzzy sets and fuzzy rules with their membership functions of inputs and outputs. In this paper control technique is used for series active powerfilter and shunt active power filter is synchronous Reference frame (SRF) and instantaneous PQ (IPQ) used to compensate powerquality problems by a three phase unified power quality conditioner under imbalanced and distorted load conditions. This paper accentuates improvement of power quality by using Unified power quality conditioner with proportional integral controllerandfuzzy logic controller and comparing it with & without compensating devices. The performance and behavior of the proposed controllers has been evaluated through MATLAB/SIMULINK.

Keywords-Active filter, dual control strategy, power conditioning, three-phase distribution systems, unified power qualityconditioner (UPQC), Fuzzy Logic Controller.

I. INTRODUCTION

In recent years, many researchers give attention to solving power quality problems. These problems are appeared due to usage of reactive loads and non-linear loads. This load creates reactive power burden and harmonic problem. This harmonic pollution degrades the quality of power at transmission side as well as distribution side [1-2]. In literature, many papers have addressed these issues and have proposed the compensating devices for eliminating this problem. Usually passive filters are used to eliminate harmonics because of low cost and high efficiency.

However, this filters produce resonance with supply frequency therefore active filters are used for suppressing harmonics. The harmonics makes many undesirable effects such as increased heating losses in transformer, poor power factor, malfunction of medical equipments, and torque pulsation of motors. Power quality problems can be overcome, in real time, through the utilization of "custom power devices"(CPD) [3-4].The most commonly used CPD is unified power quality

controller(UPQC), which is composed by two power converters that are connected in series and in shunt and sharing common dc voltage.A shunt converter (also known as the shunt active filter) acts as a harmonic compensator and injects the current in anti–phase with the distortion components present in the line current so that a balanced sinusoidal current flows through the feeder [5].

A series converter is responsible to compensate the major power quality problems related and with the voltage delivered to the load remain regulated and with low harmonic distortion.The required rating of series active filter is much smaller than that of a conventional shunt active filter [6]. Controllers are the most significant part of the UPQC and currently various control strategies are proposed by many researchers. Here, reference current and voltage extraction from the distorted mains is by modified synchronous reference frame technique. Fuzzy [7-8] logic control methodology has been demonstrated to allow solving uncertain and vague problems.In this paper fuzzy logic controller is used for generation of switching

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A 2.86-TOPS/W CMCB based Edge ML and RO-PUF engine for IoT based nano-electronic material applications

P. Rajasekar [a], M. Rama prasad Reddy [b], Karanam Deepak [c], K. Balamurugan [d], S. Amudha [e], C.J. Vignesh [f]

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Abstract

Energy-Effective Machine Learning and Ring Oscillator (RO) Physical Untraceable (PUF) is an IoT care effort that diminishes information move limit and ensures estimations and search interface protection (IoT). Independent contraption. This test gives preparing on Edge machines and PUF machines for IoT errands. This planning utilizes the current glass beam (CMCB), which is the focal circuit vertical to the two capacitors, to diminish the space of the concede line by a variable of48.5. Another element of expansion style has been proposed to broaden the weight matrix factors past a genuine authorized organization, while keeping the expense of clothing and energy low. Paper development and total is performed by CMCB with current discriminative styles and two-venture change. The means proposed give a disappointment rate of6.34 to the MNIST plate acknowledgment issue with an energy attainability of2.86 covers/W. PUF gives a unique harmony disappointment rate (BER) of2.3 in everywhere and the CRP is upgraded with ternary information sources. This mode has developed incomprehensibly, with a space of4.17×for taking care of all solicitations/reactions (CRP). Extremely low-10–59m 2/CRP.

Introduction

The success of the Internet of Effects (IoT) locator has reduced monetary vaults in terms of influence, attack, and data transmission. As the number of related trends increases, so do security and information management issues [1], [2], [3], [4], [5], [6], [7]. The battery life of the tracking loop is limited because it uses a large amount of capacity to bring all the raw information to the mat or reuse all the raw information at that point. The study of energy impact machines introduced in identification shots is fascinating (comparable to risking awakening to reduce the amount of information traveled and assessing the costs associated with non-essential information. Circuits have been studied. The limit is the recommended current mode, but the simple circuit is vulnerable to quantification in this respect, huge, and interchangeable within advanced technology, information development, and memory access. Drops are. It is a small element of machine teaching compared to mption. (3) SRAM section mode is simple while penetrating memory. It reduces memory usage. It is a verb string to information string like different comprehension ability. Memory calculations applied to. Direct (weak) classifiers based on many strings in attachments for modifying calculations are truly accurate and important. This plan is for scale and access to MAC, Very well identified in a particular expl icit development plan.Table 1.Table 2.

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Simulation of Cascaded Symmetrical Inverter for Grid Connected System

1K.Deepak, 2M.Surendranath, 3Sameer Shaik, 4J.Ravi Kumar, 5K.Rakesh Reddy
1Assistant Professor, 2,3,4,5 - B.tech Students
1,2,3,4,5,6 - Department of Electrical and Electronics and Engineering and Technology
1,2,3,4,5,6 - G. Pullaiah College of Engineering and Technology, Venkayapalle, Kurnool,AP 518002

Abstract: Multilevel inverter has emerged recently as a very important alternative in the area of high-power medium voltage energy control. This project present cascaded multi cell with separate DC sources. Multilevel inverters are promising they have nearly sinusoidal output-voltage waveforms, output with better harmonic profile, less stressing of electronic components. The conventional is a single-phase eleven level inverter for grid connected photovoltaic systems, with a novel pulse width-modulated (PWM) control scheme .In a conventional concept to get the eleven level inverter output voltage using a four full bridge cascaded type inverter. The inverter is capable of producing eleven levels of output-voltage levels from the dc supply voltage. The proposed inverter system is capable of producing eleven level of output voltage levels dc supply voltage by using five full bridge cascaded topology type inverter. In this project has used to three H-bridge inverter with different dc sources. The multi-level inverters promising the high performance with reduced EMI and harmonics. The proposed project is eleven-level inverter was designed and results were also shown in the thesis. This project is focused on minimizing the number of semiconductors devices for a given number of levels.The proposed concept can be implemented to eleven level symmetrical cascaded multi level inverter for grid connected system by using Matlab/Simulink software.

Keywords-Multi level inverter; SPWM; harmonic analysis; power electronics
;

I. INTRODUCTION

Since past few year power consumers like industrial and commercial consumers face numerous power quality problems. Among them are harmonics and unbalances which are of great interest. Voltage quality get deteriorate with tremendous increase of nonlinear loads connected at distribution level. The primary target of grid-connected generation is to guarantee grid-connected current with the same frequency and phase with grid voltage with the minimal total harmonic distortion (THD)[1-2]. In recent years, the multilevel voltage inverter has received wide attention in research and high-power applications such as large induction motor drives, UPS systems and flexible AC transmission systems and single phase grid connected systems. As compared to traditional two-level inverters, the multilevel inverters have more advantages, such as lower semiconductor voltage stress, better harmonic performance, low electromagnetic interference and lower switching losses[2].

The common topology of this inverter is full-bridge three level. The need of multilevel inverter is to give a high output power from medium voltage source like batteries, super capacitors, solar panel. Multilevel inverters are promising; they have nearly sinusoidal output voltage waveform. It also reduces the harmonics of output current. As compared to conventional two-level inverter multilevel inverter has less switching losses, less stress on electronic components due to decrease in voltage, a smaller filter size, and lower electromagnetic interference(EMI), all of which make them cheaper, lighter and more compact[4-6]. The multi level inverter consists of several switches. In the multi level inverter the arrangement switches angles are very important. To synchronies the inverter frequency with grid frequency closed loop control action is carried out[8-1O]. This paper presents the cascaded H-bridge multilevel inverters for single phase grid connected system and their effects on grid current. Any carrier based PWM is applicable for cascaded H-bridge (CHB). The working of CHB with phase shifted modulation is explained in this paper. The paper is organized as follows. Section II explains Cascaded H-bridge seven-level inverter. Section III explains the control strategy and Section IV presents the simulation results with harmonic analysis. Section V summarizes the result.

II. CASCADED H-BRIDGE MULTILEVEL INVERTER

Cascaded H-bridge (CHB) multilevel inverter is one of the popular topology for converter used in high power medium voltage drives. It contains multiple units of single phase H-bridge power cells. The H-bridge cells are normally connected in cascaded on its ac side to achieve low harmonic distortion and medium voltage operation. In practice, the number of power cells in a CHB inverter is mainly determines by its operating voltage and the cost required for manufacturing. The CHB multilevel inverter requires a number of isolated

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Simulation of Speed control of switched reluctance motor using ANFIS

1 K.Deepak,2A.Susmitha,3 R.Nandini,4 P.Srilakshmi,5 M.Sameera
1Assistant Professor,2,3,4,5B-tech student Scholar
1,2,3,4,5Department of Electrical & Electronics Engineering
1,2,3,4,5 G. Pullaiah College of Engineering and Technology, Nandikotkur Rd, near Venkayapalle, Pasupula Village, Kurnool, Andhra Pradesh 518002

Abstract —This paper develops an ANFIS based torque controlof SRM to reduce the torque ripple. The ANFIS has theadvantages of expert knowledge of the fuzzy inference systemand the learning capability of neural networks. This controllerrealizes a good dynamic behavior of the motor, a perfect speedtracking with no overshoot and a good rejection of impact loadsdisturbance. The results of applying the adaptive neuro-fuzzycontroller to a SRM give better performance and highrobustness than those obtained by the application of aconventional controller (PI). The above controller was realizedusing MATLAB/Simulink.

Index Terms— ANFIS, Torque Control, Switched ReluctanceMotor.

I. INTRODUCTION

Switched reluctance motor is an electric motor that runs by reluctance torque and The SRM is very attractive for many industrial applications due to its simple fabrication ,accuracy, rugged construction ,high torque, low cost ,simple structure due to absence of magnets , rotor conductors and brushes, low construction cost, high reliability, high power density, fast dynamic response, good controllability, fault tolerance, high efficiency, etc. because of this advantages, this motor have attracted many researches, especially at last two decades. One of the primarydisadvantages of the SRM is the high torque ripple. high torque ripple which contributes to acoustic noise and vibration. The origin of torque pulsations is due to the non-linear and discrete nature of the torque production mechanism. Minimization of torque ripple is essential for high performance. The performance of SRM is depends on its design. It can be reduced by machine design or by control circuits. Conventionally, SRM is driven by asymmetric half bridges and there are three main control methods for SRM: single pulse operation, chopping-voltage PWM, and chopping-current regulation. Single pulse operation is usually used in high-speed operation.

Chopping-voltage PWM method is equivalent to reduced dc voltage signal pulse operation. In order to reduce the torque ripple at low speed, chopping current regulation is generally used.
A 8/6 poles SR motor. It is doubly salient and has no rotor windings. The torque in this motor is due to the tendency of rotor poles to align with the poles of exited stator phase. The direction of the torque is independent of the direction of the phase current. The phases are critically fed by unipolar currents to get unidirectional torque. A shaft position sensor is used to facilitate the turn on and off of the phase windings.

Fig.1 shows a typical control diagram for SRM driven by asymmetric half bridges. Current controller is employed to generate switching signals for the asymmetric half bridges according to the current reference. The current reference is either given by a speed controller or a torque distributer. If the current reference comes directly from a speed controller, flat top chopping current for each phase is employed. Due to the strong nonlinearity, in some cases, the flat top chopping current regulation might not provide satisfactory performance. Therefore, torque sharing control is used to distribute torque production between two phases in order to produce constant torque [2][7].

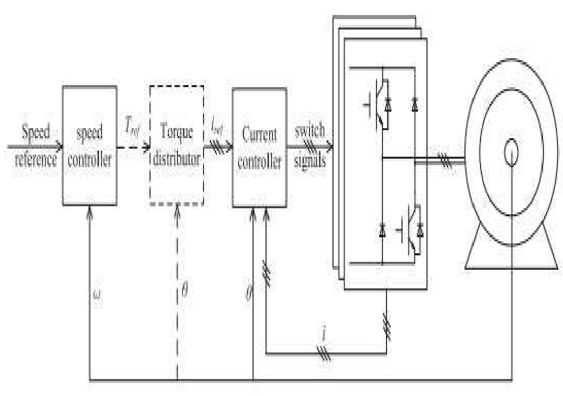

Fig.1. Typical SRM control diagram

Both flat top chopping current regulation and torque sharingcontrol rely on accurate current

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LOAD FREQUENCY CONTROL IN FOUR AREA POWER SYSTEM USING FUZZY LOGIC PI CONTROLLER

1. V. Sowmya Sree,2. K. Vaishnavi, 3. V. Mahalakshmi, 4. R. Proneeta
1 Assistant Professor, 2 3 4 B.Tech students
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology, Kurnool-518002
Andhra Pradesh

Abstract—Variations in load bring about drifts in frequency and voltage which in turn leads to generation loss owing to the line tripping and blackouts. These drifts might be reduced to the smallest possible value by automatic generation control (AGC) also known as Automatic load frequency control (ALFC) which constitutes of two sections viz. load frequency control (LFC) along with automatic voltage regulation (AVR). Here simulation evaluation is done to know the working of LFC by building models in SIMULINK which helps us to comprehend the principle behind LFC including the challenges. The four-area system is being taken into consideration for observing Load Frequency Control in a multi-area Power System. In this project one of the modern control techniques is adopted to implement a reliable stabilizing controller. A serious attempt has been undertaken aiming at investigating the load frequency control problem in a power system consisting of four power generation units and multiple variable load units. The main aim will be to examine the robustness and reliability of using Fuzzy controller among the conventional PI controller is examined through simulation in MATLAB using SIMULINK package.

I. INTRODUCTION

Power systems are large and complex electrical networks consisting of generation, transmission, and distribution networks along with loads that are being distributed throughout the network. In the power system, the load on system keeps changing from time to time according to the needs of the consumers. So, there is a need of properly designed controllers for the regulation of the system variations in order to maintain the stability of the power system as well as guarantee its reliable operation.The rapid growth of the industries has further led to the increased complexity of the power system. Frequency mainly depends on active power and the voltage mainly depends on reactive power. So, the control difficulty in the power system may be divided into two parts. One is related to the control of the active power along with the frequency whereas the other is related to the reactive power along with the regulation of voltage. The active power control and the frequency control are generally known as the Automatic Load Frequency Control.

1.1 Concept of control area

A control is interpreted as a system where we can apply the common generation controlscheme or the load frequency control scheme. Usually, a self-governing area is made as reference to control area. Electrical interconnection is very strong in every control area when compared to the ties in the midst of the adjoining areas. Within a control area all the generators move back and forth in logical and consistent manner which is depicted by a particular frequency. Difficulty of a bulky interrelated power system have been investigated by dividing the whole system into number of control areas and termed as multi-area.

In the common steady state process, every control area must try to counterbalance the demand in power by the flow of tie-line power through the interconnected lines. Generally, the control area encompasses only restricted right to use to the information of the total grid and they are able to manage their own respective buses however they cannot alter the parameters at the unknown buses directly. But an area is alert of the dominance of its nearby areas by determining the flow in and flow out of power by the side of its boundaries which is commonly known as the tie-line power. In every area the power equilibrium equations are computed at the boundaries, taking into consideration the extra load ensuing from the power that is being exported. Later on, the areas work out on the optimization of frequency deviation.

1.2 Objectives related to control areas

The major objectives relating to control areas are as follows:

- Each control area should accomplish its individual load demand in addition to thepower transfer all the way through the tie-lines based on communal agreement.
- Every control area must have adjustable frequency according to the control.
- To take care of the required megawatt power output of a generator matching withthe changing load.
- To take care of the appropriate value of exchange of power linking control areas.
- To facilitate control of the frequency for larger interconnection.

Modeling of GA-ANFIS Controller for DPFC coupled Solar-Wind Microgrid System

V. Sowmya Sree[1], Dr. C. Srinivasa Rao[2]

[1] Research Scholar, JNTUA and Asst Prof, GPCET, A.P.-518452

[2] Professor, GPCET, A.P.-518452

sowmya.sree14@gmail.com,csr_bit@yahoo.co.in

Abstract: A grid-connected system, in particular, relies heavily on the generation of electricity from Renewable Energy Sources. Because of the RES's connection to a grid, problems with power quality have arisen. Harmonics, voltage swells, sags and other grid concerns are caused by power quality issues. As solar and wind energy are both free and environmentally beneficial, they are regarded as the finest options for remote (or rural) electricity. The combination of solar power and wind power is a reliable source of energy creating a constant energy flow by avoiding the fluctuations. But this hybrid system gives rise to complications related to power system stability. Most of the industrial loads are controlled by power electronic converters that are sensitive to power system disturbances. Hence the power quality issues diminution is more focused in recent times as it is vital in power supply industry. A number of power semiconductor devices have been developed to overcome the above power quality issues. Distributed Power Flow Controller (DPFC), which is emerged from Unified-Power-Flow- Controller is considered as the best reliable device among the others. To report these expanded issues, the authors recognized an advanced custom power device entitled Distributed Power Flow Controller. The proposed Solar-Wind hybrid energy system is studied initially with Distributed Power Flow Controller. Later the system is examined with Genetic Algorithm based ANFIS Controller for Shunt control of Distributed Power Flow Controller. The results of the investigation demonstrate DPFC with Genetic Algorithm-AdaptiveNeuroFuzzyInferenceSystem has improved achievement in conditions of harmonics reduction and voltage compensation. MATLAB/Simulink has been used to study the anticipated integrated hybrid system under unbalanced voltage situations.

Keywords: Power-Quality, Solar-Wind System, Distributed Power Flow Controller (DPFC), Genetic Algorithm, AdaptiveNeuroFuzzyInferenceSystem (ANFIS).

I. INTRODUCTION

The swift escalation of power electronic equipment and its appliance have vividly altered the distinctiveness in distribution system. The redundant serious power-quality problems are created in recent distribution network due to power electronic device based nonlinear components. The categorization of power quality issues is shown in Fig.1. Fascinatingly, it is renowned that the same power electronic devices have the capability to shield utility grid and load either from power quality problems. The Flexible AC Transmission System (FACTS) device and Custom Power Device (CPD) are considered as the vital compensation devices to be installed in power system for finest management of reactive and active power flow. With the advancement in Flexible AC Transmission System (FACTS), several innovative concepts are turning the power system into more reliable, flexible and provide better control over power flow without altering the generation schedule.

In this work, the authors projected a novel-device called Distributed-Power Flow Controller (DPFC), an enhanced version to Unified Power Flow Controller for improving operation of power system network. The absence of DC link between the converters is the major difference between DPFC and UPFC. In DPFC, the third frequency harmonic component acts

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A Novel Method of Closed loop control of PV fed asymmetrical PWM full bridge converter

Y Sai Indira Priyadarshini
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

. **V.Sowmya Sree**
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

Abstract- This paper presented a closed loop control of asymmetrical PWM full bridge converter; Renewable energy and distributed generation are getting more and more popular, wind turbines, and fuel cells. The renewable energy sources need the power electronics interface to the utility grid because of different characteristics between the sources and the grid. No matter what renewable energy source is utilized, extended voltage and power output, less maintenance and higher fault tolerance, the asymmetrical PWM full bridge converter are good, for utility interface of various renewable energy sources. This dissertation proposes a new PWM converter topology and control scheme. Compared to traditional converter, they have enhanced system reliability to no shoot-through problems and lower switching loss with the help of using power closed loop control. The closed loop control, it theoretically eliminates the inherent current zero-crossing distortion of the single-unit asymmetrical type PWM full bridge converter. In addition, the closed loop control can greatly reduce the ripple current or cut down the size of passive components by increasing the equivalent switching frequency. An asymmetrical full bridge PWM technique is proposed for closed loop control of renewable energy sources. The proposed approach is to cut down the switching loss of power control. At the same time, this PWM full bridge leads to current ripple reduction, and thus reducing ripple-related loss in filter components. PWM with feedback controlling is employed for the voltage control of the system. A power management system is designed for the proposed system to manage power flow among different sources.

Index Terms*—*Asymmetrical pulse-width modulated (PWM), full-bridge converter, soft switching, Closed Loop Controller, PV System.

I. INTRODUCTION

An asymmetrical full bridge boost DC/DC switching converter is proposed to improve renewable systems. Such a new step-up power converter in a PV system provides a low input current ripple injected into the photovoltaic generator, and at the same time provides a low voltage ripple to the load [1-2]. Low-ripple and high boosting conditions make this converter an ideal candidate for photovoltaic systems design, in particular for grid-connected applications. The converter circuitry is analyzed, and a design procedure is proposed in terms of typical photovoltaic systems requirements [3-5]. Photovoltaic power systems are efficient alternatives to provide electrical energy providing redundancy for critical applications, energy generation, and the reduction of traditional energy generation that impacts the environment. Similarly, photovoltaic generators have been intensively used in residential applications and autonomous and portable applications. Photovoltaic systems require a power electronics interface to define their operating point at optimal conditions for any load. For that DC/DC and DC/AC converters are widely used [6-8]. The double-stage approach is widely accepted due to its application in distributed generation system based on multiple generators, as well as in stand-alone DC applications, where a single DC/DC converter is required [9-10].

The PV applications commonly adopt boosting converters for grid-connected applications due to the requirement of increasing the voltage to the grid connected inverter operating conditions. Other characteristics required in PV applications are a low current ripple injected to the PV and high conversion efficiency [11]. The current ripple magnitude is an important factor in the selection of power converters for PV applications because high current ripples produce an oscillation around the maximum power point (MPP) that reduces the energy extracted from the PV generator. So that most commonly employed converter is boost converter, but in such a boost converter, the current ripples injected to the PV generators depend on the inductor size, switching frequency, input capacitor, and high frequency power source impedance; therefore, in order to reduce the current ripple, it is necessary to increase the converter inductance or input capacitance [12-14]. This can be addressed by using an additional filter between the PV generator and the power converter, also increasing power losses, size, weight, cost, and the order of the system.

Improvement of Power Quality by Mitigation of Voltage Flicker in Distribution System Using Dstatcom

Y Sai Indira Priyadarshini
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

. V.Sowmya Sree
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

Abstract—A Distribution static Synchronous Compensator (D-STATCOM) is used to regulate voltage on a 25-kV distribution network. Two feeders (with different kms) transmit power to loads connected at buses. A shunt capacitor is used for power factor correction at one of the bus. The 600-V load connected to any one bus through a 25kV/600V transformer represents a plant absorbing continuously changing currents, similar to an arc furnace, thus producing voltage flicker. The variable load current magnitude is modulated at a frequency of 5 Hz so that its apparent power varies approximately between 1 MVA and 5.2 MVA, while keeping a 0.9 lagging power factor. This load variation will allow observing the ability of the D-STATCOM to mitigate voltage flicker.

Key words: power quality voltage flicker, unbalance harmonics, svc Dstatcom.

I. INTRODUCTION

In the early days of power transmission in the late 19th century problems like voltage deviation during load changes and power transfer limitation were observed due to reactive power unbalances. Today these Problems have even higher impact on reliable and secure power supply in the world of Globalization and Privatization of electrical systems and energy transfer. The development in fast and reliable semiconductors devices (GTO and IGBT) allowed new power electronic Configurations to be introduced to the tasks of power Transmission and load flow control. The FACTS devices offer a fast and reliable control over the transmission parameters, i.e. Voltage, line impedance, and phase angle between the sending end voltage and receiving end voltage. On the other hand the custom power is for low voltage distribution, and improving the poor quality and reliability of supply affecting sensitive loads. Custom power devices are very similar to the FACTS.

Most widely known custom power devices are DSTATCOM, UPQC, DVR among them DSTATCOM is very well known and can provide cost effective solution for the compensation of reactive power and unbalance loading in distribution system. The performance of the DSTATCOM depends on the control algorithm i.e. the extraction of the current components. For this purpose there are many control schemes which are reported in the literature and some of these are instantaneous reactive power (IRP) theory, instantaneous compensation, instantaneous symmetrical components, synchronous reference frame (SRF) theory, Among these control schemes instantaneous reactive power theory and synchronous rotating reference frame are most widely used. This paper focuses on the compensating the voltage sag, swells and momentary interruptions. The dynamic performance is analyzed and verified through simulation.

II. POWERELECTRONICS APPLICATIONS IN DISTRIBUTION SYSTEM

Power electronics has two faces in power distribution: (a) that consists of controllable industrial and domestic equipment to match the appliance with the power supply and (b) that helps to solve those power quality problems created by the controllers.

Examples of such applications widely used are adjustable-speed motor drives, diode and thyristor rectifiers, uninterruptible power supplies (UPSs), computers and their peripherals, consumer electronics appliances (TV sets for example), among others. Those power electronics devices offer economical and reliable solutions to better manage and control the use of electric energy. Proposed model is a combination of two existing Exponential and Hyperbolic models of EAF.

A). Review of Paper on Custom Power Devices

Various papers on custom power devices are surveyed and the basic modeling of various custom power devices like dynamic voltage regulator (DVR), distribution static compensator (DSTATCOM) and unified power quality compensator (UPQC) is analyzed. The steady state modeling of these devices are described and analyzed in various IEEE papers presented by eminent personalities. The goals of steady state model development are to allow as much simplifications as possible and still get results that are accurate enough for utility planning and maintenance purposes. The modeled devices are considered as ideal Switches and voltage, current or energy sources. Thus the detailed features and non-ideality of power electronics can be neglected in most cases.

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Power Quality Improvement by using Active Power Filters in EV Charging Stations

1 D Vannurappa, 2 A R Narendra Reddy, 3 P Praveen, 4 B Satish Babu, 5 T Tom sai,
1Assistant Professor, 2,3,4,5 B-tech student Scholar
1,2,3,4,5 Department of Electrical & Electronics Engineering,
1,2,3,4,5 G.Pullaiah College of Engineering and Technology, Nandikotkur Rd,
near Venkayapalle, Pasupula Village, Kurnool, Andhra Pradesh 518002.

Abstract: One of the primary reasons for the introduction of electric cars into the market is the concern over greenhouse gas emissions and their contribution to global warming. The purpose of creating electric cars that reduced or eliminated exhaust emissions was to help combat this issue. These EVby using Active Power Filters have a major impact on the power grid and distribution networks and due to the consequences of huge power demand to recharge their batteries. Large number of EVby using Active Power Filters charging station when integrates with the utility grid, it produces harmonics, affect the voltage profile, finally affects the power quality. In this paper, the impact of electric vehicleby using Active Power Filters charging station on distribution network is analyzed. The simulation model and the results are analyzed using MATLAB/Simulink.
Keywords: Electrical Vehicles (EV), EV charging station, Distribution network

1. Introduction

Electric vehicles (EV) represent the most likely successor to conventional internal combustionengine vehicles. Over the past few years, sales have steadily increased, and this trend is expected tocontinue over the next few years [1]. To perform the battery charging process, EVs rely on a chargingstation, which can be found at home, at work, or at a public charging station. Typically, on-boardchargers are slow chargers, while off-board chargers are fast chargers. Both solutions come withadvantages and disadvantages [2]. On-board chargers have limited power ratings due to space, weight,and cost restrictions, while off-board chargers can be designed for high charging rates with fewerrestrictions. The different charging modes and their characteristics are summarized in Table 1 (fromIEC 61851-1 [3]). Current forecasts, driven by European Distribution System Operators (DSO), suggestthat, by 2030, AC power levels are expected to increase only slightly, since they will be constrained byexisting connection points. However, fast DC chargers will grow to more than 150 kW (even up to300 kW) [4].

Although most EV charging processes today take place at homes, it is clear that access to publicfast DC charging stations could help mitigate the so-called ‘range anxiety’, which is one of the reasonsconsidered for doubting buying an electric car. Therefore, the development of a charging infrastructureis a work in progress and likely the greatest long-term challenge for electric vehicles [5]. On theassumption that vehicles served by the gas stations will be replaced by EVs in the future, EV ChargingStation facilities (CS) will be progressively built to meet this energy demand.Considering that the network inside a CS is a three-phase four-wire Low Voltage (LV) network230/400 V, which is typical in EU and permits the connection of both AC single-phase (230 V) loads andalso AC three-phase (400 V) loads. As an illustrative case, suppose that there are 10 fast DC off-boardcharging piles, which are three-phase AC/DC voltage source converters (VSC), of about 100 kW perpile. There is also a parking zone equipped with 20 AC charging piles, both 1-phase and 3-phase, ofabout 30 kW on average, and a commercial facility (about 100 square meters) for shopping and anotherservices of about 10 kW of installed power (based on an estimation of about 100 W per square meter).

The global power will be about 1500 to 2000 kW, which is about the same as a residential building oroffice building [6].A load of this magnitude is expected to require a connection to the Medium Voltage (MV)distribution network. Therefore, distribution system operators need to be informed in order tocoordinate and facilitate the connection of these stations. However, the impact is not only in

A Novel Method of Predictive Control with Different Controllers for Industrial Applications

D Vannurappa
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near
Venkayapalle, Kurnool, Andhra Pradesh 518002.

. Y Hazarathaiah
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near
Venkayapalle, Kurnool, Andhra Pradesh 518002.

Abstract: This paper presents a new control method for a matrix-converter-based induction machine drive. The switching state that optimizes the value of a quality function, used as the evaluation criterion, is selected and applied during the next discrete-time interval. Experimental results confirm that the proposed strategy gives high-quality control of the torque, flux, and power factor with a fast dynamic control response. Predictive control represents an optimization oriented alternative for the control of power converters and drives. Predictive torque control of induction machines has been shown to achieve excellent initial results. The objective of this paper is to help develop this promising control approach by introducing new elements to improve its performance. The resulting algorithm improves the efficiency of the converter from 91.1%to 92.6%and achieves a common-mode voltage mitigation of 50%, compared to the basic control method. A tradeoff is observed in the power quality.

Index Terms—AC–AC power conversion, matrix converter (MC), motor drives, predictive control, torque and flux control.

I. INTRODUCTION

The MATRIX converter (MC) is a single-stage power converter, capable of feeding an m-phase load from an n-phase source without using energy storage components [1]. The MC represents an alternative to the back-to-back converter in applications where size and weight are important. The absence of large capacitors or inductances allows the MC to give a compact solution [2], [3]. Several modulation techniques have been developed for MCs. These can be classified into two main groups: scalar and space vector methods [4]–[7]. The higher number of switching states and the direct interaction between the source and load introduces a certain amount of complexity into the analysis and implementation of an MC-based induction motor drive [8]–[12]. Predictive control is a control theory that was developed at the end of the 1970s [13]. Variants of this type of control strategy, associated with modulation techniques, have been used for power conversion and motor drive control [14]–[18]. The application of this family of nonlinear control techniques for torque and flux control in induction machines (IMs) has received attention from researchers due to the techniques' qualities of fast dynamic torque response, low torque ripple, and reduced switching frequency [19]–[23]. Model-based predictive control (MPC) has been introduced for motor current control [24], [25] and implemented on a variety of converter topologies [26]–[32]. An alternative technique for controlling the torque and flux of an IM has also been investigated [33]. The method has been considered for MCs through simulation studies [34], [35]. Both approaches share a common element: a quality function, which is evaluated for every valid switching state of the converter based on predictions obtained from a model of the system. The objective of this paper is to develop and experimentally validate an MC-based IM drive control method using MPC. This method features fast dynamic response, low torque ripple, and reactive input power control. The simple approach is based on the evaluation of an objective function through a unified switching-state selection criterion. This use of quality functions allows further attributes to be added to the method [24], such as reduction of switching losses, common-mode voltage control, spectrum regulation, etc. The method does not require additional modulation stages and can utilize all the allowable space vectors generated by the MC, including the rotating vectors.

The main contribution of this paper is to introduce the use of the predictive techniques in order to control the switching frequency, increase efficiency, and mitigate CMV in the PTC of an IM fed by a direct MC. The predictive techniques presented here can be extrapolated to more complex IMs such as multiphase IMs. In [47], a PTC of five-phase IM is implemented. Furthermore, in [48], a PTC with

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Improvement of Power Quality by Using Facts Controllers

Y Hazarathaiah
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

D Vannurappa
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

Abstract- Implementation of intelligence controller by using speed as feedback for significantly improving the dynamic performance of D-Statcom and voltage sag/swell conditions of the DVR, the comparative analysis of several control strategies fed D-Statcom for power quality improvement features is presented. Due to the sensitivity of consumers on power quality and also advancement in power electronics may attain the power quality concerns. D-Statcom technology is the most efficient way to compensate reactive power and cancel out low order harmonics generated by nonlinear loads. An D-Statcom is a device that is connected in parallel to and cancels the reactive and harmonic currents from the group of nonlinear loads so that the resulting total current drawn from the ac main is sinusoidal and also The Dynamic Voltage Restorer (DVR) is fast, flexible and efficient solution to voltage sag problem. The DVR is a power electronic based device that provides three-phase controllable voltage source with impedance circuit, whose voltage vector (magnitude and angle) adds to the source voltage during sag event, to restore the load voltage to pre-sag conditions. The DVR can restore the load voltage within few milliseconds. This paper discussed abc to dq0 base new control algorithm to generate the pulse. The simulation results are obtained through MATLAB/SIMULINK software.

***Key words- Power Quality, Voltage sags /swells, DVR,* D-Statcom.**

I.INTRODUCTION

There are different ways to improve power quality problems in transmission and distribution systems. Among these, the D-STATCOM is one of the most effective devices. A new PWM-based control scheme has been implemented to control the electronic valves in the D-STATCOM. The D-STATCOM has additional capability to sustain reactive current at low voltage, and can be developed as a voltage and frequency support by replacing capacitors with batteries as energy storage [6-7].

Advances in semiconductor device technology have fuelled a revolution in power electronics over the past decade, and there are indications that this trend will continue. However these power equipments which include adjustable-speed motor drives (ASDs), electronic power supplies, direct current (DC) motor drives, battery chargers, electronic ballasts are responsible for the rise in related PQ problems. These nonlinear loads are constructed by nonlinear devices, in which the current is

not proportional to the applied voltage Conventional passive filters are the earliest solution to mitigate the harmonics currents drawn by the non-linear loads, but due to its heavy in size and resonance with the impedance [3], its applications have becomes very limited in use.

One of the power electronic solutions to the voltage regulation is the use of a Dynamic Voltage Restorer (DVR). DVRs are a class of custom power devices for providing reliable distribution power quality. They employ a series of voltage boost technology using solid state switches for compensating voltage sags/swells. The DVR applications are mainly for sensitive loads that may be drastically affected by fluctuations in system voltage. Power Quality problems encompass a wide range of disturbances such as voltage sags/swells, flicker, harmonics distortion, impulse transient, and interruptions.

- Voltage sag :

Voltage sags can occur at any instant of time, with amplitudes ranging from 10 – 90% and a duration lasting for half a cycle to one minute.

- Voltage swell:

Voltage swell is defined as an increase in rms voltage or current at the power frequency for durations from 0.5 cycles to 1 min.

- Harmonics:

The fundamental frequency of the AC electric power distribution system is 50 Hz. A harmonic frequency is any sinusoidal frequency, which is a multiple of the fundamental frequency. Harmonic frequencies can be even or odd multiples of the sinusoidal fundamental frequency.

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Power Quality Improvement in Power System with PMSM Drive

1 Dr.D. Vannurappa, 2 M.Chiranjeevi, 3.B Himavanth, S.Ashfaq, N.MD.Abrar Rizwi,
1 Asst. professor, 2,3,4,5 B-Tech student scholar
1,2,3,4,5Department of Electrical & Electronics Engineering,
1,2,3,4,5, G. Pullaiah College of Engineering and Technology, Nandikotkur Rd,
Venkayapalle, Pasupula Village, Kurnool, Andhra Pradesh 518002

Abstract: The main perceptive predicament in power system is power quality issue. Majority of the power system contamination is due to the presence of non-linear quality of loads. Increase in the usage of non-linear type of loads leads to rise in power quality issues and becoming serious crisis with time. A power quality improvement device for medium-voltage distribution network is developed, whose power unit and topology of charging circuit is designed and a fixed voltage slow closed loop control strategy is proposed in this paper.The simulation model and the results are analyzed using MATLAB/Simulink.
Keywords: power quality, closed loop, non-linear.

(1) Introduction

Power quality started to gain high importance for powersupply companies and low voltage consumers since thelate 1980s. In this regard, the power distribution companies tried to improve power quality following the consumers'requests. The reasons behind the increasing attention on thisissue can be as follows: If a component fails, severe consequence will emerge due to the complex interconnection of thesystems- significant increase of harmonics in power systems -power supplier companies pay more attention to power quality due to increasing knowledge of the consumers about powerquality issues- higher sensitivity of the existing electricalequipment against the different kinds of disturbances manifested in power distribution networks[1,2,7].Today,electricalequipment producers present their products based on thepower quality level. Based on the available standards in thisregard, development of power electronic devices and the offered models to compensate for the variations in power distribution networks aim to provide the highest level of powerquality for the consumers. These power quality equipment'sare the power electronics devices which are connected together either in series or shunt and their performance is monitoredby an intelligent digital control system [3,4,9].

Permanent magnet synchronous motor (PMSM's) are finding application in air conditioning system, refrigerators, washingmachines equipment due to their high efficiency, small size and fast dynamics response[1-3]. The control schemes used forPMSM's include direct torque control (DTC) technique [3].By using this scheme electrical power conversion is performed byconverting the AC mains voltage to a DC voltage is converted into a variable frequency; variable voltage AC by means of voltagesources inverter to feeds the PMSM.

In normal cases AC-DC conversion is carried out by simply rectifying the AC input and the rectifier output is filtered by means of alarge valued capacitor to get a nearly constant DC voltage output. In this conversion the input AC supply current is drawn in narrowpulses since the capacitor voltage variation is nearly constant. This large peak narrow pulse current causes power quality problemsto nearly consumers, which includes a high values of Total harmonic distortion(THD)of supply current, high THD of input supplyvoltage ,low value of power factor (PF) and displacement factor (DPF) and poor distortion factor(DF).

In this paper, a Power Quality Improvement in Power System with PMSM Drive topology is used for providing regulated DC voltage to feed the voltage source inverter (VSI)employed in the direct torque controlled PMSM drive [4-9]. The proposed system provides improved power quality in terms of lowtotal harmonic distortion (THD), reduced crest factor (CF) of the AC supply current, high power factor of the AC mains andregulated output DC voltage.

2 Topology of Power Quality Improvement Device

The structure block diagram of the multi-objective power quality control device is shown in Figure 1. It consists of overvoltage protection device, step-down transformer, soft charging circuit, phase-shifting transformer, power unit, grounding resistance and system controller.

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Power QualityImprovementby using D-STATCOM in Combination with WIND ENERGY BASED SYSTEM

1Y Sai Indira Priyadarshini,2A Lavanya,3Y Indu,4S Meghana,5A Hindu,6C Likhitha
1Assistant Professor, 2,3,4,5,6B-tech student Scholar
1,2,3,4,5,6 Department of Electrical & Electronics Engineering,
1,2,3,4,5,6 G. Pullaiah College of Engineering and Technology, Nandikotkur Rd,
near Venkayapalle, Pasupula Village, Kurnool, Andhra Pradesh 518002

Abstract - Application with renewable energy sources such as solar cell array, wind turbines and diesel generator have increased significantly during the past decade. To obtain the clean energy, the hybrid solar–wind power generation is used. Consumers prefer quality of power from suppliers. The quality of power can be measured by using parameters such as voltage sag, harmonic and power factor. To obtain the quality of power different topologies are used. Due to diesel generator the harmonic disturbance in the transmission line will be increased. By implementing the D-STATCOM harmonics compensation technique, the harmonics are reduced. The several different aspects of the PV systems and the most widely addressed technical scope is on developing various PV models integrated with the maximum power-point tracking (MPPT) function. Maximum Power Point Tracking (MPPT) control is attained by intellectual controller. Intellectual controller is controlled by optimal utilization control. Wind power, solar power, diesel engine and an intellectual controller are used in existing method. The MPPT technique has a lot of limitation, so PQ theory with hysteresis loss current control algorithm is introduced to overcome this problem. In this work, D-STATCOM voltage source inverter (PWM-VSI) is connected between diesel generator and load which compensates harmonics in the AC grid. Implementation of the harmonics compensation by using DSTATCOM in the hybrid distribution system is used to attain the voltage stability.

Keywords - Diesel Generator, D-STATCOM, MPPT, Power Quality, hysteresis current controller (HCC), total harmonic distortion (THD), Wind Generating System (WGS).

I. INTRODUCTION

Renewable Energy Sources are those energy sourceswhich are not destroyed when their energy is harnessed.Human use of renewable energy requires technologies thatharness natural phenomena, such as sunlight, wind, waves,water flow, and biological processes such as anaerobicdigestion, biological hydrogen production and geothermalheat. Amongst the above mentioned sources of energythere has been a lot of development in the technology forharnessing energy from the wind. Wind is the motion ofair masses produced by the irregular heating of the earth'ssurface by sun [1]. These differences consequently createforces that push air masses around for balancing the globaltemperature or, on a much smaller scale, the temperaturebetween land and sea or between mountains. Wind energyis not a constant source of energy[2].It varies continuouslyand gives energy in sudden bursts.

Recently, wind power generation has attracted specialinterest, and many wind power stations are in servicethroughout the world. In wind power stations, inductionmachines are often used as generators, but thedevelopment of new permanent magnet generators, theimprovement of the AC-DC-AC conversion and itsadvantages for output power quality make other solutionspossible [3].A recent solution is to use a permanentmagnet synchronous generator with variable speed and aconversion stage, which is studied in this paper.

Most of the more important international standards define power quality as the physical characteristics of theelectrical supply provided under normal operating conditions that do not disrupt or disturb the customer's processes.Therefore, a power quality problem exists if any voltage, current or frequency deviation results in a failure or in a bad operation of customer's equipment. However, it is important to notice that the quality of power supply implies basicallyvoltage quality and supply reliability. Voltage quality problems relate to any failure of equipment due to deviations of the line voltage from its nominal characteristics, and the supply reliability is characterized by its adequacy (ability tosupply the load), security (ability to withstand sudden disturbances such as system faults) and availability (focusingespecially on long interruptions) [4-5].

Power quality problems are common in most of commercial, industrial and utility networks. Natural phenomena,such as lightning are the most frequent cause of power quality problems. Switching phenomena

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A Novel Method of Closed loop control of PV fed asymmetrical PWM full bridge converter

Y Sai Indira Priyadarshini
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

. **V.Sowmya Sree**
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

Abstract- This paper presented a closed loop control of asymmetrical PWM full bridge converter; Renewable energy and distributed generation are getting more and more popular, wind turbines, and fuel cells. The renewable energy sources need the power electronics interface to the utility grid because of different characteristics between the sources and the grid. No matter what renewable energy source is utilized, extended voltage and power output, less maintenance and higher fault tolerance, the asymmetrical PWM full bridge converter are good, for utility interface of various renewable energy sources. This dissertation proposes a new PWM converter topology and control scheme. Compared to traditional converter, they have enhanced system reliability to no shoot-through problems and lower switching loss with the help of using power closed loop control. The closed loop control, it theoretically eliminates the inherent current zero-crossing distortion of the single-unit asymmetrical type PWM full bridge converter. In addition, the closed loop control can greatly reduce the ripple current or cut down the size of passive components by increasing the equivalent switching frequency. An asymmetrical full bridge PWM technique is proposed for closed loop control of renewable energy sources. The proposed approach is to cut down the switching loss of power control. At the same time, this PWM full bridge leads to current ripple reduction, and thus reducing ripple-related loss in filter components. PWM with feedback controlling is employed for the voltage control of the system. A power management system is designed for the proposed system to manage power flow among different sources.

Index Terms*—*Asymmetrical pulse-width modulated (PWM), full-bridge converter, soft switching, Closed Loop Controller, PV System.

I. INTRODUCTION

An asymmetrical full bridge boost DC/DC switching converter is proposed to improve renewable systems. Such a new step-up power converter in a PV system provides a low input current ripple injected into the photovoltaic generator, and at the same time provides a low voltage ripple to the load [1-2]. Low-ripple and high boosting conditions make this converter an ideal candidate for photovoltaic systems design, in particular for grid-connected applications. The converter circuitry is analyzed, and a design procedure is proposed in terms of typical photovoltaic systems requirements [3-5]. Photovoltaic power systems are efficient alternatives to provide electrical energy providing redundancy for critical applications, energy generation, and the reduction of traditional energy generation that impacts the environment. Similarly, photovoltaic generators have been intensively used in residential applications and autonomous and portable applications. Photovoltaic systems require a power electronics interface to define their operating point at optimal conditions for any load. For that DC/DC and DC/AC converters are widely used [6-8]. The double-stage approach is widely accepted due to its application in distributed generation system based on multiple generators, as well as in stand-alone DC applications, where a single DC/DC converter is required [9-10].

The PV applications commonly adopt boosting converters for grid-connected applications due to the requirement of increasing the voltage to the grid connected inverter operating conditions. Other characteristics required in PV applications are a low current ripple injected to the PV and high conversion efficiency [11]. The current ripple magnitude is an important factor in the selection of power converters for PV applications because high current ripples produce an oscillation around the maximum power point (MPP) that reduces the energy extracted from the PV generator. So that most commonly employed converter is boost converter, but in such a boost converter, the current ripples injected to the PV generators depend on the inductor size, switching frequency, input capacitor, and high frequency power source impedance; therefore, in order to reduce the current ripple, it is necessary to increase the converter inductance or input capacitance [12-14]. This can be addressed by using an additional filter between the PV generator and the power converter, also increasing power losses, size, weight, cost, and the order of the system.

Improvement of Power Quality by Mitigation of Voltage Flicker in Distribution System Using Dstatcom

Y Sai Indira Priyadarshini
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

. V.Sowmya Sree
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

Abstract—A Distribution static Synchronous Compensator (D-STATCOM) is used to regulate voltage on a 25-kV distribution network. Two feeders (with different kms) transmit power to loads connected at buses. A shunt capacitor is used for power factor correction at one of the bus. The 600-V load connected to any one bus through a 25kV/600V transformer represents a plant absorbing continuously changing currents, similar to an arc furnace, thus producing voltage flicker. The variable load current magnitude is modulated at a frequency of 5 Hz so that its apparent power varies approximately between 1 MVA and 5.2 MVA, while keeping a 0.9 lagging power factor. This load variation will allow observing the ability of the D-STATCOM to mitigate voltage flicker.

Key words: power quality voltage flicker, unbalance harmonics, svc Dstatcom.

I. INTRODUCTION

In the early days of power transmission in the late 19th century problems like voltage deviation during load changes and power transfer limitation were observed due to reactive power unbalances. Today these Problems have even higher impact on reliable and secure power supply in the world of Globalization and Privatization of electrical systems and energy transfer. The development in fast and reliable semiconductors devices (GTO and IGBT) allowed new power electronic Configurations to be introduced to the tasks of power Transmission and load flow control. The FACTS devices offer a fast and reliable control over the transmission parameters, i.e. Voltage, line impedance, and phase angle between the sending end voltage and receiving end voltage. On the other hand the custom power is for low voltage distribution, and improving the poor quality and reliability of supply affecting sensitive loads. Custom power devices are very similar to the FACTS.

Most widely known custom power devices are DSTATCOM, UPQC, DVR among them DSTATCOM is very well known and can provide cost effective solution for the compensation of reactive power and unbalance loading in distribution system. The performance of the DSTATCOM depends on the control algorithm i.e. the extraction of the current components. For this purpose there are many control schemes which are reported in the literature and some of these are instantaneous reactive power (IRP) theory, instantaneous compensation, instantaneous symmetrical components, synchronous reference frame (SRF) theory, Among these control schemes instantaneous reactive power theory and synchronous rotating reference frame are most widely used. This paper focuses on the compensating the voltage sag, swells and momentary interruptions. The dynamic performance is analyzed and verified through simulation.

II. POWERELECTRONICS APPLICATIONS IN DISTRIBUTION SYSTEM

Power electronics has two faces in power distribution: (a) that consists of controllable industrial and domestic equipment to match the appliance with the power supply and (b) that helps to solve those power quality problems created by the controllers.

Examples of such applications widely used are adjustable-speed motor drives, diode and thyristor rectifiers, uninterruptible power supplies (UPSs), computers and their peripherals, consumer electronics appliances (TV sets for example), among others. Those power electronics devices offer economical and reliable solutions to better manage and control the use of electric energy. Proposed model is a combination of two existing Exponential and Hyperbolic models of EAF.

A). Review of Paper on Custom Power Devices

Various papers on custom power devices are surveyed and the basic modeling of various custom power devices like dynamic voltage regulator (DVR), distribution static compensator (DSTATCOM) and unified power quality compensator (UPQC) is analyzed. The steady state modeling of these devices are described and analyzed in various IEEE papers presented by eminent personalities. The goals of steady state model development are to allow as much simplifications as possible and still get results that are accurate enough for utility planning and maintenance purposes. The modeled devices are considered as ideal Switches and voltage, current or energy sources. Thus the detailed features and non-ideality of power electronics can be neglected in most cases.

Advanced battery technologies related to electric vehicle applications

. K. Venkateswaramma[1]
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

K Jaya Sree[2]
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

Abstract:

Electricity is the most adaptable and widely used form of energy on the world, as illustrated by its development over the last century. We can store electrical energy as chemical energy in batteries and then use that chemical energy as electricity. The capacity of mobile device batteries is frequently a significant constraint. The battery life of a device determines how long it can be used. Battery modelling can help predict and possibly to extend the battery's lifetime. Several different battery models have been developed over time. This paper gives an overview of the various types of batteries that are available.Comparisons of different types of batteries are studied based on the parameters like charging, discharging, life time, and cost. Among these li-ion battery is preferred due to high energy density and power density and high efficiency.

Keywords: Battery, Electric vehicle, Energy sources, Controller, Alternator

1. Introduction:

Environmental vehicles are currently undergoing research and development in preparation for commercialization [1]. When it comes to these modern vehicles' powertrains, it's critical to ensure that there's enough power output to meet the vehicle's power performance requirements while it also maximizing energy efficiency[2-3]. To achieve this, drivetrain components must perform better and resistance losses must be drastically reduced. The device's rate of energy consumption is the primary determinant of battery life[4]. However, reducing average consumption isn't the only way to extend battery life [5-6]. Because of nonlinear physical effects in the battery, the usage pattern has an impact on the battery's lifetime. The effective battery capacity degrades during periods of high energy consumption, reducing the battery's lifetime [7-8]. The primary function of a battery is to store energy and use it for a variety of purposes. We primarily employ primary and secondary batteries [9-10]. Primary batteries, or non-rechargeable batteries, are used for low-power applications, while second-hand or rechargeable batteries can be found for a wide range of applications [11-12].In terms of efficiency, speed, and loss, lithium-ion batteries are currently improving. However, there are still problems with lithium-ion batteries in a variety of fields, with varying degrees of difficulty [25]. One of the most significant reasons is the lack of good exterior characteristic models of lithium-ion batteries in various operating situations. The lithium battery modelling is more precise in this paper[26].

The structure of the paper is summarized below; Section 2 provides an overview of different types of batteries and their materials compares the batteries based on their characteristics. Section 3 provides the advanced technologies of li-ion battery. Section 4 of the paper summarizes the importance of the battery.
So many types of battery technologies are available for the applications of electrical vehicles. Based on the different types of material Lithium-ion batteries are used. Li-ion batteries are used for high energy density and high specific energy. It is more reliable, long cycle life is more compared to the other material types of batteries.

2. Battery types:

Primary and secondary batteries, super capacitors, fuel cells, electrolyzes, and other energy storage systems based on electrochemistry have all been manufactured. The categorization of electrochemical batteries is depicted in Table 1.

2.1 Advanced Battery technology

2.1.1 NanoBolt lithium tungsten batteries

Working on battery anode materials, N1 Technologies, Inc. researchers added tungsten and carbon multi-layered nanotubes that bond to the copper anode substrate and form a web-like nano structure. This creates a large surface for more ions to attach to during recharge and discharge cycles. This speeds up the charging of the NanoBolt lithium tungsten battery while also storing more energy.

2.2.2 Zinc-manganese oxide batteries

Department of Energy's Pacific Northwest National Laboratory discovered an unexpected chemical conversion reaction in a zinc-manganese oxide battery while investigating conventional assumptions. If that process can be controlled, conventional batteries' energy density can be

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Implementation of Fuzzy Controller Based Brushless DC Motor Drives

K Jaya Sree
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

. K. Venkateswaramma
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

Abstract: This paper aims at the design and simulation of hybrid PI-fuzzy control system for the speed control of a brushless dc motor. The performance of the fuzzy logic controller (FLC) is better under transient conditions, while that of the proportional plus integral (PI) controller is superior near the steady-state condition. The combined advantages of these two controllers can be obtained with hybrid PI -fuzzy speed controller. Both the design of the fuzzy controller and its integration with the proportional-integral (PI) controller is to be done. In this paper, design and implementation of hybrid fuzzy controller is presented and its performance is compared with pi and fuzzy controller to show its capability to track the error and usefulness of hybrid fuzzy controller in control applications.

***Index Terms*—Brushless dc (BLDC) servomotor drive, fuzzy controller, modeling, PID controller, transient and steady-state performance.**

I. INTRODUCTION

In recent years, brushless dc (BLDC) machines have gained widespread use in electric drives. These machines are ideal for use in clean, explosive environments such as aeronautics, robotics, electric vehicles, food and chemical industries and dynamic actuation. Using these machines in high-performance drives requires advance and robust control methods. Conventional control techniques require accurate mathematical models describing the dynamics of the system under study. These techniques result in tracking error when the load varies fast and overshoot during transients. In lieu of provisions for robust control design, they also lack consistent performance when changes occur in the system. If advance control strategies are used instead, the system will perform more accurately or robustly. It is therefore, desired to develop a controller that has the ability to adjust its own parameters and even structure online, according to the environment in which it works to yield satisfactory control performance. An interesting alternative that could be investigated is the use of fuzzy logic control (FLC) methods. In the last decade, FLC has attracted considerable attention as a tool for a novel control approach because of the variety of advantages that it offers over the classical control techniques.

They are electronically commutated [3]. For the variable speed applications of BLDC motor, Proportional, Integral and Derivative (PID) motor control is commonly used control [4].Because; it has simple design and ease of control. However, its performance depends on proportional, integral and derivative gains [5- 6]. When the operating condition changes, the re-tuning process of control gains is necessary for dynamically minimize the total controller error. The various algorithms are used to find optimal PID controller parameters such as Genetic Algorithm (GA) and Particle Swarm Optimization (PSO) [7-10].Particle Swarm Optimization (PSO) and genetic algorithm (GA) is given based on population size, generation number, selection method, and crossover and mutation probabilities. There is no guarantee for finding optimal solutions for controllers within a finite amount of time. To overcome the problems in PID controller, fuzzy logic controller and hybrid fuzzy PID controllers can be designed for the speed control of BLDC motor. In this proposed research work, the speed control of BLDC motor was analyzed and its performance has been observed by using fuzzy logic controller and hybrid fuzzy PID [11- 13].The simulation results of two methods are studied and compared with conventional PI controller by using MATLAB/SIMULINK computational software. The simulation results of proposed controllers are used to show the abilities and shortcomings of conventional PI controller.

II. MODELING OF BLDC SERVO MOTOR DRIVE SYSTEM

The BLDC servomotor drive system consisting of BLDC servomotor and IGBT inverter is modeled [1]–[4], [15] based on the assumptions that all the stator phase

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A High-Gain DC-DC Converter featuring Progressive Gain for Fuel Cell Vehicles in Automobiles

E Sivakumar goud[1]
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

D RAZIYA[2]
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002

Abstract: For fuel cell vehicles, the DC-DC converter should have a high gain, low voltage stress, small size, and high efficiency. Conventional two-level, three-level, and cascaded boost converters, on the other hand, are unable to match the requirements. This work proposes a new non-isolated DC-DC converter with switched-capacitor and switched-inductor, which has a high gain, a wide input voltage range, low voltage stresses between components, and a common ground topology. The operating principle, component parameter design, and comparisons with other high-gain converters are all discussed in this paper. To obtain the dynamic model of the converter, the state-space averaging method and small-signal modeling method are used. Finally, simulation and experimental data back-up the proposed topology's usefulness. The experimental prototype's input voltage varies from 25 to 80 volts. The rated output voltage is 200V, with a 100W rated power. Under the rated state, the maximum efficiency is 93.1 percent. Fuel cell vehicles can use the suggested converter.
Keywords: DC-DC converter, Cascaded boost converters, Switched-capacitor, Fuel cell vehicle.

I. INTRODUCTION

The development of the transportation industry plays a vital role in the national economy. However, an increase in the number of fuel vehicles not only consumes a large amount of oil resources, but also causes serious environmental pollution problems. Therefore, all countries turn their attention to clean energy. The development of the new energy vehicle industry provides new ideas to solve these problems. Fuel cell vehicles have become a very promising development direction in the new energy vehicle industry due to its advantages of zero emissions, no pollution and high efficiency. The typical system structure of a fuel cell vehicle is shown in Fig.1 The low output voltage of the fuel cell makes it difficult to meet the demand of DC bus voltage in front of the inverter. Moreover, the fuel cell has a "soft" output voltage characteristic, i.e., the output voltage drops too fast with the increase of the output current. Therefore, the DC-DC converter with high-gain, wide input voltage range and small size should be applied to fuel cell vehicles to raise the fuel cell voltage to a higher voltage level and ensure the stability of the DC bus voltage.

Closed control of Asymmetrical Half-Bridge Flyback DC-DC Converter with PI and fuzzy Controller

D RAZIYA [1]
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

E Sivakumar goud [2]
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002

Abstract — among various kinds of soft-switching converters, asymmetric PWM half-bridge converters havedrawn attention due to their simplicity, inherent zero voltageswitching (ZVS) capability, and fixed-frequency operation.This paper presents an analysis and reviews practical designconsiderations for an asymmetric half-bridge converter. Itincludes designing the transformer and selecting components.A step-by-step design procedure with a design example willhelp engineers design an asymmetric half-bridge converter. To provide condition of ZVS for switches in this model, we use a simple auxiliary circuit included one inductor coil coupled to the main coil and auxiliary coil. Because of the operation of ZVS switches, the diode reverse recovery problem does not occur. In addition, to provide a soft switching in this circuit, any additional switches are not used. Therefore, circuit becomes easier to implement and control. This work deals with design, modeling and simulation of the PI & Fuzzy controlled Asymmetrical Half-Bridge Fly back DC to DC converter systems. Open loop system is simulated with step change in input voltage. The output voltage in closed loop system is regulated using PI and Fuzzy controllers. The response of these two systems are compared. This converter has advantages like low EMI,less switching loss and improved dynamic response. The simulation results of PI & FLC Asymmetrical Half-Bridge Fly back DC to DC converter systems are presented in this paper.In order to confirm the theory analysis of Asymmetrical Half-Bridge Fly back dc-dc converter offered and simulation is done by Matlab/Simulink.

Keywords—hybrid-switching technique; asymmetrical halfbridge flyback converter; universal input voltage range

I. INTRODUCTION

The effort to obtain ever-increasing power densityof switched-mode power supplies has been limitedby the size of passive components. Operation athigher frequencies considerably reduces the size ofpassive components, such as transformers andfilters; however, switching losses have hinderedhigh-frequency operation [1-3]. To reduce switchinglosses and allow high-frequency operation, resonantswitching and soft-switching techniques have beendeveloped [4-7].The resonant switching method processes powerin a sinusoidal manner by utilizing the resonanceduring the entire switching period. Generally, theoutput voltage is regulated by variable frequencycontrol and the current or voltage waveform in theresonant network has a sinusoidal shape.

Meanwhile, soft-switching techniques utilize theresonance operation only during the switchingtransition to soften the switching characteristics ofthe devices. When the switching transition is over,the converter reverts to Pulse-Width-Modulation(PWM) mode [8-9]. Since resonant operation only occursduring the switching transition, the parameters ofresonant components are not as critical as in aresonant converter. Moreover, the switchingfrequency is fixed and easily synchronized to theother power stages to minimize EMI.

However, the asymmetrical half-bridge flyback converter has several advantages over the active-clamp flyback converter. First, the voltage of the blocking capacitor is smaller. Second, the voltage stress of the two active switches is lower. And third, not only the magnetizing inductor and the leakage inductor of the transformer, but also the blocking capacitor of the converter store energy when the output diode is off, thus we have more energy-storing elements inside the circuit and consequently, the size of the transformer can be shrunk [10-12].

In this paper, the hybrid-switching technique is employed in the control of the asymmetrical half-bridge flyback converter. Hybrid-Switching is a technique that incorporates resonant operation into the conventional pulse-width modulation (PWM) circuit. This means there would be both resonant current and linear current within one switching cycle. The result of this is zero-voltage-switching (ZVS) can be achieved on the active switches and zero-current-switching (ZCS) can be achieved on the output diode [13-14].

Among various kinds of soft-switchingconverters, the asymmetric PWM half-bridgeconverter has drawn attention due to its simplicityand inherent zero voltage switching (ZVS)capability.

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A High-Gain DC-DC Converter featuring Progressive Gain for Fuel Cell Vehicles in Automobiles

E Sivakumar goud[1]
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

D RAZIYA[2]
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002

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Keywords: DC-DC converter, Cascaded boost converters, Switched-capacitor, Fuel cell vehicle.

I. INTRODUCTION

The development of the transportation industry plays a vital role in the national economy. However, an increase in the number of fuel vehicles not only consumes a large amount of oil resources, but also causes serious environmental pollution problems. Therefore, all countries turn their attention to clean energy. The development of the new energy vehicle industry provides new ideas to solve these problems. Fuel cell vehicles have become a very promising development direction in the new energy vehicle industry due to its advantages of zero emissions, no pollution and high efficiency. The typical system structure of a fuel cell vehicle is shown in Fig.1 The low output voltage of the fuel cell makes it difficult to meet the demand of DC bus voltage in front of the inverter. Moreover, the fuel cell has a "soft" output voltage characteristic, i.e., the output voltage drops too fast with the increase of the output current. Therefore, the DC-DC converter with high-gain, wide input voltage range and small size should be applied to fuel cell vehicles to raise the fuel cell voltage to a higher voltage level and ensure the stability of the DC bus voltage.

Closed control of Asymmetrical Half-Bridge Flyback DC-DC Converter with PI and fuzzy Controller

D RAZIYA [1]
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002.

E Sivakumar goud [2]
Assistant Professor
Department of Electrical & Electronics Engineering,
G. Pullaiah College of Engineering and Technology,
Pasupula Village, Nandikotkur Rd, near Venkayapalle,
Kurnool, Andhra Pradesh 518002

Abstract — among various kinds of soft-switching converters, asymmetric PWM half-bridge converters havedrawn attention due to their simplicity, inherent zero voltageswitching (ZVS) capability, and fixed-frequency operation.This paper presents an analysis and reviews practical designconsiderations for an asymmetric half-bridge converter. Itincludes designing the transformer and selecting components.A step-by-step design procedure with a design example willhelp engineers design an asymmetric half-bridge converter. To provide condition of ZVS for switches in this model, we use a simple auxiliary circuit included one inductor coil coupled to the main coil and auxiliary coil. Because of the operation of ZVS switches, the diode reverse recovery problem does not occur. In addition, to provide a soft switching in this circuit, any additional switches are not used. Therefore, circuit becomes easier to implement and control. This work deals with design, modeling and simulation of the PI & Fuzzy controlled Asymmetrical Half-Bridge Fly back DC to DC converter systems. Open loop system is simulated with step change in input voltage. The output voltage in closed loop system is regulated using PI and Fuzzy controllers. The response of these two systems are compared. This converter has advantages like low EMI,less switching loss and improved dynamic response. The simulation results of PI & FLC Asymmetrical Half-Bridge Fly back DC to DC converter systems are presented in this paper.In order to confirm the theory analysis of Asymmetrical Half-Bridge Fly back dc-dc converter offered and simulation is done by Matlab/Simulink.

Keywords—hybrid-switching technique; asymmetrical halfbridge flyback converter; universal input voltage range

I. INTRODUCTION

The effort to obtain ever-increasing power densityof switched-mode power supplies has been limitedby the size of passive components. Operation athigher frequencies considerably reduces the size ofpassive components, such as transformers andfilters; however, switching losses have hinderedhigh-frequency operation [1-3]. To reduce switchinglosses and allow high-frequency operation, resonantswitching and soft-switching techniques have beendeveloped [4-7].The resonant switching method processes powerin a sinusoidal manner by utilizing the resonanceduring the entire switching period. Generally, theoutput voltage is regulated by variable frequencycontrol and the current or voltage waveform in theresonant network has a sinusoidal shape.

Meanwhile, soft-switching techniques utilize theresonance operation only during the switchingtransition to soften the switching characteristics ofthe devices. When the switching transition is over,the converter reverts to Pulse-Width-Modulation(PWM) mode [8-9]. Since resonant operation only occursduring the switching transition, the parameters ofresonant components are not as critical as in aresonant converter. Moreover, the switchingfrequency is fixed and easily synchronized to theother power stages to minimize EMI.

However, the asymmetrical half-bridge flyback converter has several advantages over the active-clamp flyback converter. First, the voltage of the blocking capacitor is smaller. Second, the voltage stress of the two active switches is lower. And third, not only the magnetizing inductor and the leakage inductor of the transformer, but also the blocking capacitor of the converter store energy when the output diode is off, thus we have more energy-storing elements inside the circuit and consequently, the size of the transformer can be shrunk [10-12].

In this paper, the hybrid-switching technique is employed in the control of the asymmetrical half-bridge flyback converter. Hybrid-Switching is a technique that incorporates resonant operation into the conventional pulse-width modulation (PWM) circuit. This means there would be both resonant current and linear current within one switching cycle. The result of this is zero-voltage-switching (ZVS) can be achieved on the active switches and zero-current-switching (ZCS) can be achieved on the output diode [13-14].

Among various kinds of soft-switchingconverters, the asymmetric PWM half-bridgeconverter has drawn attention due to its simplicityand inherent zero voltage switching (ZVS)capability.

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Thermal management of electric vehicle batteries: a parametric study and optimization of a micro channel heat sink

J. Praveen Kumar[1], T Nishanth[2]
[1&2]Assistant Professor,Department of Electrical & Electronics Engineering, G. Pullaiah College of Engineering and Technology, Pasupula Village, Nandikotkur Rd, near Venkayapalle, Kurnool, Andhra Pradesh 518002.

ABSTRACT
The use of fin shapes and their arrangement inside micro channels has a significant impact on improving micro channel thermal performance. To improve thermal performance, this research employs microchannel heat sinks with three distinct fin configurations (circular, square, and rhombus). ANSYS Designmodeler created the microchannel heat sink. ANSYS Fluent does CFD simulations, whereas Design Expert performs parametric DOE. Twelve CFD simulations using RSM (Response Surface Methodology) are used to investigate the effect of factors (coolant velocity and fin shape) on the thermal performance of microchannel heat sinks. Temperature and pressure differences are evaluative measures. The rhombus-shaped fin outperformed other forms in terms of temperature difference and pressure drop.

Keywords: ***RSM, DOE, Microchannel, Heat sink, Fin geometry.***

I. INTRODUCTION

Due to increasing global pollution and diminishing fossil fuel supplies, the car industry is rapidly switching from internal combustion engines to electric engines.
ADVANCED BATTERY TEMPERATURE CON
Existing heat management systems include thermoelectric, forced air, and liquid [1]. Among the technologies, liquid cooling has the most potential. The liquid coolant is in indirect contact with the battery and removes heat produced during operation. The main difficulty with liquid cooling is designing a practical, small, and effective heat exchanger. A few researchers have studied the cross-sectional geometry of MCHSs (circular, rectangular, triangular, and trapezoidal) [1- 4]. Several writers [4-9] advocated increasing surface area and heat transfer coefficient by adding strips and flips to the channel. Some writers have focused on flow entry features in serpentine designs for microfluidic cooling, such as wavy [4], crisscross [5], and divergent-convergent [6].
Xia et al. [7] investigated the optimization of microchannel geometric parameters using offset fan-shaped reentrant grooves, triangular reentrant grooves, and modified fan-shaped reentrant grooves. In their review, Steinke and Kandlikar [8] summed up the

different works made by scientists across the globe on single- phase heat transfer in the miniature or microchannel. They explored the influence of various parameters, like, thermal resistance, Nusselt number, Reynolds number, friction factor, with regards to fluid flow using experimental studies.

Transverse Micro Channels (TMC) for enhancing heat transfer rate in a heat sink were studied numerically by Esmail Ghasemisahebi et al. He employed 3D conjugate heat transfer for this. Modeling heat transport in both fluid and solids. He studied the impact of characteristics such transverse microchannel density, height, and Reynolds numbers on the decline inside the heat sink. The final findings showed that the temperature distribution and hotspot location were solely dependent on the number and size of transverse microchannels. Muhammad Noor Afiq Witri Muhammad et al (MCHS). Active and passive cooling methods were used to cool the microprocessor chip. A dynamic cooling system consumed energy, but passive cooling required no electricity. He evaluated the cooling systems to see which was more dependable. Finally, he discovered that passive cooling was not only cheaper but also more robust and dependable than active cooling with moving components. MCHS was one of the high-tech devices that used passive cooling to cool electronics. In addition, he examined the impacts of channel type, surface roughness, fluid additives, and Reynolds number in a microchannel heat sink.
Tingzhen Ming et al. [11] employed dimple features to increase the heat transfer rate of a microchannel heat sink using impinging jets (MIJ). His work investigated MIJs with and without dimples (mixed dimples, convex, concave) using numerical simulation. Among all tested cases, using MIJs with convex dimples outperformed MIJs without dimples, mixed dimples,

An Improved Perturb and Observe Based MPPT Algorithm for PV System under varying Irradiation.

T Nishanth[1] and J Praveen Kumar[2]

[1&2]Assistant Professor,Department of Electrical & Electronics Engineering, G. Pullaiah College of Engineering and Technology, Pasupula Village, Nandikotkur Rd, near Venkayapalle, Kurnool, Andhra Pradesh 518002.

Abstract:- **In terms of renewable energy sources, photovoltaic (PV) electric power production is one of the most promising because of its eco-friendly and independent nature. Photovoltaic energy is a promising alternative to conventional sources of energy because it is free, less operational, and requires minimal maintenance Photovoltaic (PV) systems employ MPPT tracking techniques to continuously increase the output power of the PV array. As a result of its simplicity and low implementation costs the Perturb and Observe (P&O) technique is the most widely used in commercial MPPT systems.**

1. INTRODUCTION

Humans and nature both use energy as a primary and most universal metric for assessing the effectiveness of their various endeavours. Everything that happens in the world is a manifestation of the flow of energy in some form. Electrical energy is one of the most essential forms of energy that people require on a daily basis. Non-renewable energy sources have become increasingly popular as a replacement. In this chapter, we'll take a look at how much people know about the benefits of generating electricity using various forms of renewable energy. Photovoltaic (PV) is the most popular renewable energy source because of its ease of installation, low maintenance, and ability to generate power in an isolated mode in rural areas. A photovoltaic system with a maximum power point tracking (MPPT) algorithm is presented, which improves the system's overall efficiency.

The output power of a PV system is largely determined by the amount of sunlight, or insulation and temperature, that is absorbed by the solar cell. Due to the PV system's non-linear characteristics, the output power is less efficient. Maximum power point tracking techniques have been introduced to improve the PV system's efficiency. A variety of MPPT techniques have been developed in recent years to achieve high tracking efficiency and good PV system performance. These techniques include curve fitting, open-circuit voltage and current, and short-circuit current to track the maximum power in a PV system.

Techniques such as incremental conductance, perturb and observe are very popular among others. One of the most common methods is perturbation and observation.

The P&O technique is used in this study to demonstrate PV modelling in MATLAB/SIMULINK with maximum power point tracking. As a consequence of this comparison, it is possible to determine the PV system's overall performance.

2. SYSTEM CONFIGURATION

The system consists of a PV module, DC/DC converter, P&O MPPT block and load. Let us see the each block in detail.

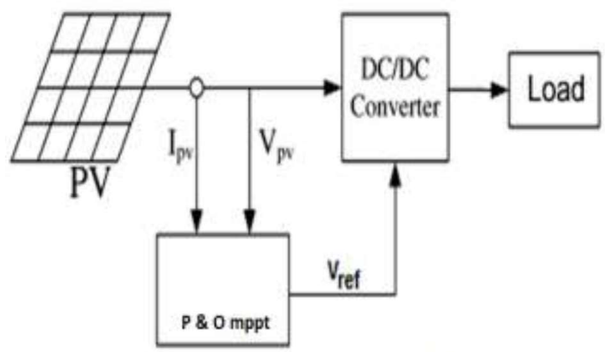

Fig.1. Block diagram of proposed system configuration

Multi-solar cell PV modules are shown in Fig.1. Except for the difference in the magnitude of current and voltage, the characteristics of a PV module and a solar cell are identical. A typical solar module has between 36 and 72 cells [6] - [7]. To create an array, PV modules are connected in series or parallel.

Cell temperature and irradiation affect the cell's nonlinear I-V and P-V properties. Figure 2 depicts the PV cell's typical I-V and P-V properties.

All that a solar panel can do is create electricity and is reliant on how bright the sun is while it is shining. Irradiance results in inconsistent and inefficient power generation. It has a significant impact on the solar module's output. Irradiance changes according to the location of the sun and the angle of the rays.

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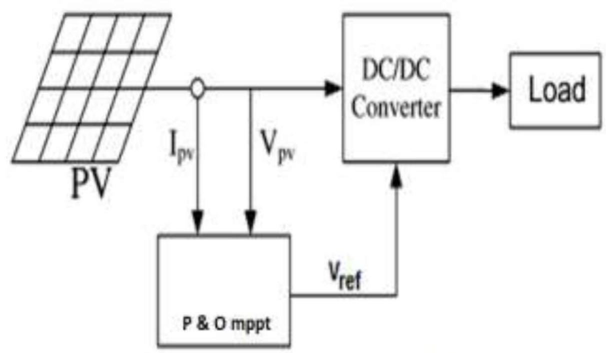

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