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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FACULTY PUBLICATIONS FOR THE ACADEMIC YEAR 2022-2023

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Conference Publications:

S. No	Name of the Faculty	Title of the Paper	Conference Name	Month & Year of Publication	Vol. No., Issue No., and Page Nos.	SCI/ SCOPUS/ UGC
1	Dr. S. Vijaya Madhavi	A Novel Optimized Golden Eagle Based Self-Evolving Intelligent Fuzzy Controller to Enhance Power System Performance	IEEE 2nd International Conference on Sustainable Energy and Future Electric Transportation (SeFet-2022)	10 October 2022	Paper Id 379, at the 2022. 4-6 August 2022.	Scopus
2	Dr. N. Vengadachalam	"A novel optimized Golden Eagle based self-evolving Intelligent Fuzzy controller to Enhance Power system performance" ,	IEEE 2nd International Conference on Sustainable Energy and Future Electric Transportation (SeFet-2022)	10 October 2022	Paper Id 379, At the 2022. 4-6 August 2022.	Scopus
3	Dr. A. Ganga Dinesh Kumar	"A novel optimized Golden Eagle based self-evolving Intelligent Fuzzy controller to Enhance Power system performance" ,	IEEE 2nd International Conference on Sustainable Energy and Future Electric Transportation (SeFet-2022)	10 October 2022	Paper Id 379, At the 2022. 4-6 August 2022.	Scopus

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Design an Ant Lion-Based Yolo-V5 Model for Prediction and Classification of Paddy Leaf Disease

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Abstract: It is crucial to identify crop diseases early to educate farmers on how to stop the spread of diseases in their crops. However, the agriculture sector's output is impacted by the emergence of numerous crop-related diseases. Multiple methods for predicting paddy leaf diseases have been created, but they still suffer from overfitting, poor detection, and classification issues. To overcome these issues, design a novel Ant Lion-based YOLO-V5 (AL-YOLOv5) system to improve the system's functionality to detect paddy leaf disease. Paddy leaf photos were initially gathered from the internet and trained in the system. Brown spot, Leaf blast, Healthy, and Hispa are the four paddy leaf diseases the proposed model intends to classify better and identify. The dataset's noise is removed during the preprocessing stage, and the GrabCut algorithm is used to segment the impacted areas based on the pixels. The Grey-Level Co-Occurrence Matrix (GLCM), which extracts form, texture, and color features, is also used for feature extraction. Finally, utilize a YOLOv5 network to find and categorize the crop's affected diseases. The created model uses ant lion fitness to forecast paddy leaf diseases correctly. By achieving improved performance metrics, the experimental findings demonstrate the effectiveness of the designed model, and the obtained results are validated with other traditional models in terms of accuracy, precision, recall, F-score, and error rate.

Keywords: *Paddy Leaf Disease Detection, Grey-Level Co-Occurrence Matrix, Ant Lion Optimization, Principal Component Analysis, GrabCut, Segmentation. Deep Learning*

1. Introduction

One of the most recent agricultural research subjects is identifying and categorizing plant diseases by photographing the plant's leaves. Using image processing techniques to identify agricultural plant diseases will reduce the need for farmers to take extra precautions to safeguard their crops [1]. Agriculture is one of the most significant sources of income for people in many nations. Farmers gather various food plants based on the natural conditions of the area and their needs [2]. Yet, there are several issues that farmers must deal with, including natural disasters, a water deficit, plant diseases, etc. The majority of problems are reduced by offering some best technologies [3]. Furthermore, a timely approach to illness prevention may increase food production, negating the need for experts and saving time. Therefore, identifying plant disease is one of the crucial study areas in the agricultural sector [4].

Consequently, it has become challenging to identify and categorize plant diseases. India has a sizable population, and agriculture provides most of the country's food supply. Crop illnesses, insect infestations, and plant diseases are the leading causes of agricultural areas being destroyed [5]. Fungi, bacteria, viruses, or nematodes known as plant pathogens can harm plant parts like leaves, panicles, nodes, stems, and roots. Hence, one of the most recent agricultural studies is identifying and categorizing crop illnesses using photographs of plant leaves [6]. Using image processing techniques to identify plant diseases can assist farmers in preventing damage or destruction of their agricultural fields. Paddy is a staple crop for many of the world's population [7]. Therefore, early detection of symptoms of plant disease has substantial agrarian benefits. However, this endeavor is completed due to a need for integrated computer vision methods created explicitly for farming applications [8].

Moreover, many issues, such as a lack of water and plant disease, can affect agricultural productivity. Hence, one crucial activity for raising output is the early detection and prevention of plant diseases in the early phases of onset [9]. However, there are substantial restrictions on

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High Speed Switched Reluctance Motor for Automotive Applications

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ABSTRACT

In this paper, dynamic model of the already designed a 3 phase, high speed, Switched Reluctance Motor (SRM) is presented. This high speed SRM was designed for automotive applications. The paper begins with state of the art from the point of view of electrical machines high-speed utilization and a description of the switched reluctance motor. Simulation model of SRM is described and used for dynamic simulation. The switching angles in the simulation models are set to achieve the maximum average torque. This analysis is performed for different rotational speed. The results of the dynamic simulation are following waveforms: average torque, torque ripple, losses and efficiency as a function of rotational speed.

INTRODUCTION

Cars and electric cars use different types of auxiliary motors for various applications. Currently, efforts are made to reduce the size and increase the performance of these motors. This is achieved by using high-speed motors. At higher speeds, the machine can be much smaller and lighter at the same rated power. Another advantage of using high speed motors in certain applications is to increase reliability due to the elimination of the mechanical gear between the motor and the driven device Gerada (2014) The most important applications, where high speed motors can be used in cars and electric cars are: compressors, turbochargers and power steering. Different types of motors can be used for these applications, such as: induction machines, synchronous permanent magnet machines or reluctance machines. Each of these motors has its advantages and disadvantages. The choice of the motor type depends on its application. The switched reluctance motor (SRM) is categorized as brushless drive. This motor is suitable for high-speed

Modelling and Simulation of Step-Up Switched Capacitor Voltage Balancing Converter for NPC Multilevel Inverter-Based Solar PV System

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ABSTRACT This paper proposed a grid connected solar Photovoltaic (PV) Systems with a new voltage balancing converter suitable for Neutral-Point-Clamped (NPC) Multilevel Inverter (MLI). The switchedcapacitors used in the proposed converter is able to balance the DC link capacitor voltage effectively by using proper switching states. The proposed balancing converter can be extended to any higher levels and it can boost the DC input voltage to a higher voltage levels without using any magnetic components. This feature allows the converter to operate with the boosting capability of the input voltage to the desired output voltage while ensuring the self-balancing. In this paper the proposed converter is used for a grid connected solar PV system with NPC multilevel inverter, which is controlled using vector control scheme. The proposed grid connected solar PV system with associated controllers and maximum power point tracking (MPPT) is implemented in Matlab/SimPowerSystem and experimentally validated using dSPACE system and designed converters. The simulation and experimental results show that the proposed topology can effectively balance the DC link voltage, extract maximum power from PV module and inject power to the grid under varying solar irradiances with very good steady state and dynamic performances.

INDEX TERMS: Solar photovoltaics, NPC multilevel inverter, balancing circuit, dc-link voltage balancing, grid connected PV system.

INTRODUCTION Multilevel inverters (MLIs) are broadly used for the grid integration of solar photovoltaic (PV) systems due to several advantages such as lower harmonic distortions, less electro-magnetic interference (EMI), less standing voltage on semi- conductors, high output waveform quality and smaller filter size [1], [2]. Three principal types for MLIs are

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A UNIFIED POWER FLOW CONTROLLER USING A POWER ELECTRONICS INTEGRATED TRANSFORMER AND FUZZY CONTOLLER

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Abstract:

This paper presents a Unified Power Flow Controller (UPFC) application of the Custom Power Active Transformer (CPAT); a power electronics integrated transformer which provides services to the grid through its auxiliary windings. The CPAT structure integrates three single-phase transformers into one shunt-series combining transformer. This integration empowers a sub-station with the capability of dynamically regulating the terminal voltage and current of a transformer through isolated power electronics converters. This paper investigates the CPAT's capability to provide UPFC services which includes power flow control, reactive power compensation, voltage regulation and harmonics elimination. Simulations of the CPAT-UPFC with a stiff grid and a 5-bus power system demonstrates its functionality as an inter-bus coupling transformer that provides the required grid services. Moreover, the impact of the CPAT-UPFC during load perturbations on the power system is investigated to further validate its transient and steady-state response. Furthermore, an experimental prototype reveals the operation of the three-phase CPAT-UPFC confirming its stable operation according to the theoretical expectations.

1. Set the Scene

Focus on renewable energy sources is growing as a result of the global economy's heavy reliance on fossil fuels and environmental concerns. Wind power is the most rapidly expanding renewable energy source in this context of increasing energy market diversity [1].

For a long time, the most common kind of wind turbine was one with a simple control system designed to save operating expenses and upkeep [1]. Electronic converters and mechanical actuators have become more popular as a result of the growing size of turbines and the rising penetration of wind energy into the utility networks of leading nations. These active devices provide additional design flexibility that permits active regulation of the collected energy. As an interface to the power grid, static converters allow for variable-speed operation up to the rated speed.

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Design and Implementation of an Efficient Inductive Power Transfer Topology for Electric Vehicle Battery Charging

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ABSTRACTRecently available high-frequency power converter topologies for inductive power transfer (IPT) system utilize either zero voltage switching (ZVS) or zero current switching (ZCS) based power electronic converters while maintaining a near sinusoidal current for limited power transfer range. However, achieving ZVS or ZCS for all power switches simultaneously is still a challenging task in IPT systems. In this article, an improved zero-voltage zero-current switching (ZVZCS) IPT topology and its switching pattern are proposed. ZVS is achieved by optimizing the classical series compensation and additionally, an auxiliary network is employed to achieve ZCS. The proposed concept is verified by using MATLAB/Simulink based simulations for resistive and battery load. Finally, the practical viability of the proposed topology is validated by the results obtained using a laboratory prototype rated for 1.1 kW, 85 kHz. An efficiency of 91.26% is achieved with ZVZCS for a full dynamic power transfer range of 20 W–1.1 kW. Index Terms—Battery chargers, dc–dc power converters, electric vehicles (EVs), inductive charging, soft switching, wireless power transmission.

INTRODUCTION THE increasingly global economy is facing the demolition of fuel resources along with hazardous disturbances in environmental conditions. Moreover, it has spurred the emergence of sustainable technologies leading to innovations in major carbon contributors, i.e., transportation [1], [2]. Therefore, electric vehicles (EVs) are adopted as a solution to diminish the environmental effects caused by carbonbased fuels [2], [3]. Furthermore, the EVs market opens a new opportunity for human beings to expand the life expectancy of transportation at a lower cost [1], [3]. In the past, the battery technology (BT) and power shaping technologies are the

ANFIS based Torque Control of Switched Reluctance Motor

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ABSTRACTThis paper develops an ANFIS based torque control of SRM to reduce the torque ripple. The ANFIS has the advantages of expert knowledge of the fuzzy inference system and the learning capability of neural networks. This controller realizes a good dynamic behavior of the motor, a perfect speed tracking with no overshoot and a good rejection of impact loads disturbance. The results of applying the adaptive neuro-fuzzy controller to a SRM give better performance and high robustness than those obtained by the application of a conventional controller (PI). The above controller was realized using MATLAB/Simulink. Index Terms— ANFIS, Torque Control, Switched Reluctance Motor.

INTRODUCTION With concerns over energy efficient drive, Switched Reluctance Motor (SRM) has attracted the interest in fields of Electric Vehicle (EV) due to its robust construction, fault tolerant operation, high starting torque without the problem of excessive inrush current, and high-speed operation. However, SRM suffers from some drawbacks such as high torque ripple and acoustic noise which are very critical for EV applications. The research is progressing extensively for the mitigation of torque ripple and acoustic noise. In indirect torque control scheme of SRM, the torque of the motor is controlled by controlling the motor current. Due to high nonlinearity in torque and current relationship, the conversion of torque into equivalent current value is cumbersome. In the paper [1], the torque is directly proportional to the ideal phase inductance profile which increases or decreases proportionately with the angle of overlap. Due to magnetic saturation, the phase inductance varies with the motor current which leads to large amount of error in both instantaneous and average value of torque. In [2], the author had suggested a multiplication factor F to compensate for the error of torque and 'F' should be a

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HIGH PERFORMANCE FREQUENCY CONVERTER CONTROLLED VARIABLE-SPEED WIND GENERATOR

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ABSTRACT

This work proposes a design scheme for arbitrary order discrete-time sliding mode observers for input-affine nonlinear systems. The dynamics of the estimation errors are represented in a pseudolinear form, where the coefficients of the characteristic polynomial comprise the nonlinearities of the algorithm. The design process is reduced to a state-dependent eigenvalue placement procedure. Moreover, two different discrete-time eigenvalue mappings are proposed. As basis for the eigenvalue mappings serves a modified version of the continuous-time uniform robust exact differentiator. Due on the chosen eigenvalue mapping the proposed algorithm does not suffer from discretization chattering. Global asymptotic stability of the estimation errors for observers of order 2 and 3 is proven and the method to prove stability for higher order observers is demonstrated. The performance of a 3-rd order observer is illustrated in simulation. Simulation studies indicate that proposed discrete-time observer might possess an upper bound of its convergence time independent of the initial conditionsThis article proposes an optimal control strategy with a view to achieving the best performance of a wind energy conversion system (WECS). The optimal control strategy depends on the linear-quadratic regulator (LQR) algorithm, which provides fast convergence and less mathematical intricacy The machine- and the grid-side converter/inverter are adjusted using the LQR controller. In this study, the system model and its control strategies are illustrated. Practical wind speed data are considered in this study for achieving realistic responses. The system performance is evaluated by comparing the results obtained using the LQR controller with that realized when the grey wolf optimizer algorithm-based optimized proportional-integral controllers are used, taken into account severe network disturbances. The simulation studies are extensively performed through the MATLAB/Simulinkjh environment that prove the validity of the LQR controller for improving the performance of the WECS. The simulation results are compared with the experimental results for more validation.

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Solar Powered BLDC Motor with Artificial Neural Network Controller

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ABSTRACT

In this paper, the artificial neural network (ANN) closed loop controlled with DC photovoltaic solar pump is implemented in MATLAB/Simulink using Boost converter. The simulated system consists of the photovoltaic (PV) module, the Boost converter, the ANN control, and the BLDC motor. The simulated parameters are voltage, current, power, speed, and mechanical torque. A modal/sensitivity analysis is also conducted on a liberalized model of the overall system, to characterize dynamic properties of the system, to evaluate robustness of the controllers, and to identify the nature of interactions between the PV system and the network/loads. And to maximize the efficiency of the proposed PV pumping system, compare the ANN and the classical proportional integral derivatives (PID) controller. Different tests have been carried to prove the effectiveness of the proposed control system. All simulations have been done in SIMULINK software of MATLAB.

Keywords: PV module, direct control method, - PID, ANN controller, Boost converter, DC BLDC motor

INTRODUCTION Energy generated from cleans, efficient, and environmentally friends have become one of the major challenges for engineers and scientists. Among all renewable energy sources, photovoltaicpower systems attract more attention while greenhouse emissions are reduced. Regarding the endless aspect of solar energy, it is worth saying that solar energy is a unique solution for energy crisis. However, despite all the aforementioned advantages of solar power systems, they do not present desirable efficiency. Many methods and controllers have been widely developed and implemented to track the maximum power point (MPP) [2-6]. Most control schemes use the Perturb and Observe (P&O) method which is based on iterative algorithms to track continuously the MPP,

Cascaded Multi-Level Inverter for Grid Integration of Solar System

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ABSTRACT Multi-Level Inverter (MLI) are becoming popular for all type of inversion application. They inherently generates low harmonics, produces output near to sine-wave, low switching losses and zero magnetic interferences. All these features are increasing there wide-spread usage. This paper presents the application of MLI for grid integration of solar energy. The output of solar is not always constant, it depends upon the environmental conditions like solar irradiance. It is very difficult to obtain constant output as well synchronization with the grid from solar. MLI can integrate the solar with the grid effectively and can also regulate the output voltage to compensate for variable irradiance. Also, THD is very low as well as it retains the unity power factor under normal as well as harmonized loading conditions. In this paper cascaded 5-level MLI is presented for grid integration of 2 panels of 1.5KW of rating each for solar.

KEYWORDS: Cascaded 5-level MLI (C-5-L-MLI) Multi-Level Inverter (MLI), Power Electronics Converters, PV-Panel, Voltage Source Inverter (VSI), Total Harmonic Distortion (THD).

I. INTRODUCTION The For integrating RR with the utility system either 2-level or multi-level inverter (MLI) is employed. 2-level inverter has high THD content as compared to MLI in the AC output voltage hence MLIs are preferred. Tremendous research work is available to improve the performance of the system in a way to reduce losses, distortion and to enhance the efficiency by using different topologies of MLIs. In general MLIs are broadly classified as flying capacitor type, neutral point clamped and cascade Hbridge. The classification of MLIs is shown in Fig. 1. In the first two types the series of switches shares the common DC supply while cascaded type required separate DC sources for individual units which is shared according to the generated output voltages. The two most favored topologies are neutral point clamped (NPC) and cascade H-bridge (CHB) since these

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A SINGLE DC SOURCE NINE-LEVEL SWITCHEDCAPACITOR BOOST INVERTER TOPOLOGY

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ABSTRACT:

Multilevel inverter configurations are a suitable candidate for medium and high power applications. This study presents a new one-capacitor-based five-level (2Vdc, Vdc, 0, −Vdc, − 2Vdc) boost multilevel inverter. The single-phase version of the proposed formation has one dc-source, eight switches and one capacitor. To provide boosting ability, the inverter is operating based on charge-pump theory, where the capacitor is charging in parallel and discharging in series connections to provide a higher output voltage. The proposed configuration requires simple control tasks, and for this purpose, level-shift pulse width modulation strategy, where the reference signal is compared with four carriers, is implemented to drive the switches and generates the required pulses pattern. The developed inverter has some distinct features like the usage of only one dc-source and one-capacitor, compact size, simple control requirements and boosting ability. The system is simulated with MATLAB/ Simulink and a hardware prototype is developed to verify the performance of the developed five-level configuration. The results show that the developed five-level multilevel inverter reaches the expected performance

INTRODUCTION

Multilevel inverters (MLIs) have emerged and evolved as a perfect solution for the medium and high voltage/power applications where high-quality dc-ac power conversion is needed. The classical topologies for the MLIs are neutral point clamped (NPC), flying capacitor (FC) and cascade H-bridge (CHB). These topologies are widely researched and are well established in industrial applications. However, for a higher number of output levels, the increased in the number components required for NPC and FC becomes quixotic. Similarly, for CHB, the higher number of isolated dc voltage sources for a higher number of levels limits its applications [1]–[5]. One category of the MLI topologies has been based on the multiple isolated dc voltage sources.

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AN LCL-LC POWER FILTER FOR GRID-TIED INVERTER

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Abstract

This paper presents a new topology of higher order power filter for grid-tied voltage-source inverters, named the LCL-LC filter, which inserts an extra capacitor connected in parallel to the Lf-Cf series resonant circuit of LLCL filter Particularly, it can strongly attenuate the harmonic currents around the switching frequency, and the attenuation rate become -60dB at high frequency which leading to a decrease in the total inductance and volume of the filter. The parameters design criteria of the proposed LCL-LC filter is also introduced. The comparative analysis and discussions regarding the traditional LCL filter, LLCL filter and the proposed LCL-LC filter have been presented and evaluated through simulation on a 5-kWsingle- phase grid-tied inverter prototype.

I. INTRODUCTION

The grid-tied inverter has seen widespread use [1]-[3] due to the growing popularity of renewable energy sources. It is common practice to install a low-pass power filter between a voltage-source inverter (VSI) and the grid to restrict the injection of excessive current harmonics brought on by the sine pulse width modulation (PWM), which is the most common kind of PWM. The rising cost of copper has necessitated a number of changes to the power filter's design in order to keep prices low. One solution is to suggest alternative topologies. Third-order LCL filters [4] are the most often used option. Because the highest harmonics of the inverter output current are clustered around the switching frequency, it is this frequency that primarily constrains the design of the inverter's characteristics. To reduce the grid-side inductor L2, an LLCL filter is proposed to realize the zero impedance of the Lf-Cf series resonant circuit at the switching frequency [5]. This can significantly dampen the harmonic currents in the vicinity of the switching frequency.

In this study, we present the LCL-LC filter, a novel low-pass power filter architecture achieved by adding a parallel-connected capacitor to the LLCL filter's Lf-Cf series resonant circuit. The grid-side inductor L2 may be further minimized because of it's near-zero impedance at the switching frequency and its substantial attenuation of the harmonic currents around the switching frequency, which reaches -60dB at high frequency. The following is the outline for this paper.

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Grid-Connected Wind-Photovoltaic Cogeneration Using Back-To-Back Voltage Source Converters

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ABSTRACT: With developing concerns, in renewable energy sources can improve which is an increasing amount. This paper reviews both the vitality of the wind and the photovoltaic (PV) energy conversion strategies. And their maximumpower-point tracking (MPPT) methods. Then, a new Grid tied wind–PV cogeneration generation using back to back voltage source converters system is proposed. For the wind power generation permanent-magnet synchronous machine is used to capture the maximum wind power by using optimum speed control. For the PV power generation boost converter is adopted to harness the maximum solar power by tuning the duty cycle.

Keywords: AC-DC power converters, DC-AC power converters, maximum power point trackers, permanent magnet machines, solar power generation, wind power generation

INTRODUCTION: Because of the preferences of nature natural energy sources practically no pollutants, renewable energy wellsprings need pulled in broad consideration. Wind energy is a standout amongst the renewable energy guaranteeing clean energy sources on account of it might be effectively caught toward a wind generator for delivering power into electric energy. Photovoltaic (PV) control is an alternate guaranteeing clean energy wellspring a result it will be worldwide Furthermore could a chance to be utilized without utilizing a rotational generator. Clinched alongside fact, wind energy the more PV control need aid to some degree reciprocal Similarly as solid winds happen basically toward evening and shady days same time sunny days need aid frequently cool for powerless winds. To change over wind energy to electrical energy, two type of wind turbines need aid employed; altered variable velocity wind

Modelling and Simulation of Microgrid Power System Including a Hybrid Energy Storage System

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ABSTRACT. Microgrid technology is evolving rapidly with increased use Renewable energy (RE) in electricity sector. In this paper, an isolated DC microgrid is simulated with solar photovoltaic (PV) as the RE source to supply power to resistive DC charges along with a hybrid energy storage system (HESS) for battery and supercapacitor. Various cases of load and solar insolation variability are simulated to validate the proposed power management strategy for controlling the DC bus voltage. The output waveforms are compared with and without HESS, and beneficial reduction in transient voltage is observed when using the HESS. A case using IEEE 9bus is also simulated to evaluate device output with a constant demand for load. It is found that in all cases HESS helps to minimize transients of the DC bus voltage effectively. The HESS also compensates for very large transients resulting in sudden changes in the output of PV or load demand.

Keywords: DC microgrid, HESS, renewable energy, IEEE 9bus, Battery

INTRODUCTION May be microgrid described as "an integrated, widely distributed energy distribution network characterized by a two-way electricity and information flow, capable of monitoring and reacting to changes in everything from power plants to consumer preferences to individual appliances."[1] Most of the electronic charges connected to the current power grid are DC charges. AC-DC power conditioning units are needed to link them to the AC grid which creates additional system losses. The losses are easily minimized by using a DC microgrid. Owing to isolation from fault, islanded DC microgrids also provide power to critical loads when input from the main grid is inaccessible. Different researchers focused

Power Factor Correction using SEPIC DC-DC Converter in Industrial Motor Drives

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ABSTRACT Brushless DC electric motors (BLDC electric motors), Power Factor Correction (PFC), and speed control with a Single-Ended Primary Inductor Converter (SEPIC) are all articulated. An innovative method for controlling motor speed and PFC using SEPIC and managing DC link voltages is proposed, as well as a viable solution for driving applications. SEPIC in discontinuous mode is used to achieve power factor correction for speed control over a wide range. The system is simulated in MATLAB, and the results show that it is valid and feasible. SEPIC converter can be used in power factor correction circuits. The conventional SEPIC converter was primarily designed to provide a non-pulsating input current, operating in continuous current mode with both inductors, and only DC-DC conversion was considered. The modified SEPIC converter is designed to operate as an ACDC converter and can be viewed as a cascade of a modified boost converter and a buck-boost converter. The modified SEPIC converter is intended to operate as an AC-DC converter and is composed of a modified boost converter and a buck-boost converter in series. The boost converter uses discontinuous current, whereas the buck-boost converter uses continuous current. Since a high power factor is achieved naturally in this manner, a simple feedback control technique is required to regulate the output voltage

INTRODUCTION In recent years, it has become increasingly important to improve power quality (PQ) at supply A.C mains, and to do so in accordance with International Power Quality paradigms. Typically, power factor corrected (PFC) converter fed D.C motor drive applications maintain a power factor greater than 0.9 and THD less than 5% for class- (D) applications. The diode bridge rectifier based PFC fed D.C motor drive flows nonsinusoidal current from the supply side;

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A Switched-Capacitor 13-level Inverter Using Series-Parallel Conversion with Reduced Components

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ABSTRACT

A new triple voltage boosting switched-capacitor multilevel inverter (SCMLI) is presented in this paper. It can produce 13-level output voltage waveform by utilizing 12 switches, three diodes, three capacitors, and one DC source. The capacitor voltages are self-balanced as all the three capacitors present in the circuit are connected across the DC source to charge it to the desired voltage level for several instants in one fundamental cycle. A detailed comparative analysis is carried to show the advantages of the proposed topology in terms of the number of switches, number of capacitors, number of sources, total standing voltage (TSV), and boosting of the converter with the recently published 13-level topologies. The nearest level control (NLC)-based algorithm is used for generating switching signals for the IGBTs present in the circuit. The TSV of the proposed converter is 22. Experimental results are obtained for different loading conditions by using a laboratory hardware prototype to validate the simulation results. The efficiency of the proposed inverter is 97.2% for a 200 watt load.

Keywords: switched-capacitor; voltage boosting; multilevel inverter; nearest level control; modulation index

INTRODUCTION

In recent times, multilevel inverters (MLIs) have been used as a potential solution for DC to AC conversion for various applications such as renewable energy conversion systems, high power drives, a high-voltage direct current (HVDC) transmission system, a distributed power generation system, etc. The main advantages of MLIs are lower dv/dt stress, higher operating voltage with lower rating devices, and near to sinusoidal output voltage, which in turn reduces total harmonic distortion (THD) and fault-tolerant capability [1–3]. Conventional MLIs such as the neutral point clamped (NPC) inverter, flying capacitor (FC) inverter, cascaded H-bridge (CHB) inverter, and modular multilevel converter (MMC) have replaced the conventional two-level inverter for medium and high voltage applications [4,5].

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Switch Process Based on Boundary Round Oscillator-FLL for UPQC-S with Optimized PI Gains

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ABSTRACT:A frequency lock loop (FLL) based steady state linear Kalman filter (SSLKF) for unified power quality conditioner (UPQC) control in three-phase systems is introduced. The SSLKF provides a highly accurate and fast estimation of grid frequency and the fundamental components (FCs) of the input signals. The Kalman filter is designed using an optimized filtering technique and intrinsic adaptive bandwidth architecture, and is easily integrated into a multiple model system. Therefore, the Kalman state estimator is fast and simple. The fundamental positive sequence components (FPSCs) of the grid voltages in a UPQC system are estimated via these SSLKF-FLL based filters. The estimation of reference signals for a UPQC controller is based on these FPSCs. Therefore, both active filters of a UPQC can perform one and more functions towards improving power quality in a distribution network. In addition to the SSLKF-FLL based algorithm, a bat optimization algorithm (based on the echolocation phenomenon of bats) is implemented to estimate the value of the proportional integral (PI) controller gains. The bat algorithm has a tendency to automatically zoom into a region where a promising alternative solution occurs, preventing the solution from becoming trapped in a local minima. The complete three-phase UPQC is simulated in the Matlab/Simulink platform and the hardware is tested under various power quality problems. **Keywords:** Damping factor, echo-location, FPSC, harmonics, ITSE, SSLKF-FLL, power quality

INTRODUCTIONThe fast development of nonlinear loads in electrical systems is resulting in a deterioration of both the voltage and current power quality (PQ) at the point of common coupling (PCC)[1]. The nonlinear loads are mostly based on power electronics devices[2]. Similarly, the growth of digital electronics and microprocessorbasedcontrol has increased the number of critical loads that require ideal sinusoidal input signals to function appropriately[3]. Disruptions to the grid voltage affect the critical industrial load, resulting in frequent tripping[4]. Power electronics based flexible AC transmission system (FACTS) devices are attractive tools for enhancing the reliability and control of reactive power in transmission systems[5]. These devices offer greater system flexibility and respond quickly toany disturbances[6]. The unified power flow controller (UPFC) is chosen for regulation of bus voltage and control of power flow in a transmission system via a common DC link[7]. Similar FACTS devices is configured, such as shunt, series, and hybrid, for improving the PQ in distribution power system[8]. In these systems, a unified power quality controller (UPQC) is a hybrid device configured similarly to a

Advanced Voltage Support and Active Power Flow Control in Grid Connected Voltage Source Converters under Unbalanced Conditions

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ABSTRACT A new control algorithms dedicated towards improving the reliability, computational burden and stability in gridconnected and stand-alone based power electronic converter systems applicable for ac microgrids. Supporting the grid and improving its reliability have recently become major requirements for large distributed generation units. Under most grid faults, the accuracy of the traditional voltage support schemes (VSSs) is dramatically affected due to the existence of the zero-sequence voltage. Also, the traditional VSSs have been used only in the STATCOM applications where the active power is zero. An advanced VSS in the converter-interfaced units, called zero-sequence compensated voltage support (ZCVS), to accurately regulate the three-phase voltages of the connection point within the pre-set safety limits. The proposed scheme not only compensates the zero-sequence component but also considers the active power injection. Unlike the traditional methods, the proposed VSS is adapted even in resistive distribution systems. As the second contribution, the limited active power oscillation (LAPO) is proposed to be augmented to the ZCVS. This feature limits the oscillation to a specified value which provides an adjustable dc-link voltage oscillation setting while simultaneously supporting the ac host grid, even under severe unbalanced faults. Third, the maximum active power delivery (MAPD) to the ac grid is also formulated for the ZCVS. It is demonstrated that the proposed compensators are immune to grid fluctuations and ensure stable operation controlling the desired power flow to and from the grid. Matlab/simulink simulations are presented in order to show the outstanding performance of the proposed design approach.

Design of Energy-Saving Driver Circuit LED Using Flyback Converter

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ABSTRACT Due to numerous features such as compact size, longevity, mercury-free start, and higher color rendering index, the introduction of light-emitting diode (LED) lights has changed residential and commercial lighting systems worldwide. There are two main types of LED driver configurations: single-stage (SS) and double-stage (DS). Low-power systems employ SS configuration converters, while high-power commercial systems use DS configuration converters. This study presented a discontinuous conduction mode (DCM) flyback converter with a PI controller for LED lighting, replacing double-stage converter systems. The proposed DCM-based flyback AC-DC converter includes fewer components, lower total harmonic distortions (THD), improved power factor, and high efficiency. The hardware prototype was created and tested at various AC main voltages to ensure the feasibility of the proposed model. At rated voltage 230 V, system THD is 5.2 %, power factor is 0.995, and efficiency is 92.1 %. The whole system efficiency meets the Energy Star standards. **Keywords:** PFC, LED Lighting, DC-DC Converter, Power Quality

INTRODUCTION Solid-state lighting (SSL), commonly known as the light-emitting diode (LED), was introduced in 1970. Despite being just a decade old, this technology has proven to be better than traditional lighting systems. Furthermore, when compared to traditional sources, it is simple to use and attracted much interest due to several benefits such as lightweight, compact size, high luminous efficiency, energy savings, prolonged lifetime, and availability in various colours (Y. Wang, et al., 2017). LEDs used for commercial purposes (office and shopping mall lighting; interior decoration and street lighting etc.) commonly have 10 to 200 Watts of output power with high luminous efficiency, more than 50,000 hours of service life, mercury-free content, less emission of carbon dioxide, low response time, negligible pollution and approved

PV Based Off Board Electric Vehicle Battery Charger

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AIM:

Ever increasing effects of green house gases from the conventional IC engines lead to environmental concerns. This paved to the booming of pollution free electric vehicles (EVs) in the automobile industry [1–3]. However, EV battery charging from the utility grid increases the load demand on the grid and eventually increases the electricity bills to the EV owners which necessitate the use of alternate energy sources [4, 5].

PROBLEM STATEMENT

Due to inexhaustible and pollutionfree nature of renewable energy sources (RESs), it can be used to charge the EV battery. Thus, RES driven EV can be termed as 'green transportation' [6]. Solar is one of the promising RESs which can be easily tapped to utilise its energy to charge EV battery [7, 8]. Hence, PV array power is used to charge the EV battery in the proposed system with the help of power converter topologies

ABSTRACT- Research on renewable energy based Electric Vehicle battery charging system is booming in the automobile industry in the recent years. The intermittent nature of the renewable energy sources leads to the grid connected renewable energy systems for Electric vehicle battery charging applications. Hence, an Electric Vehicle battery charger using grid connected PV system is proposed in this paper. The proposed system is capable of charging the EV battery continuously irrespective of solar irradiations using dc-dc converter and bidirectional ac-dc converter. Sepic converter is preferred for dc-dc converter and Line commutated converter is used as a bidirectional ac-dc converter with the help

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A ROBUST CONTINUOUD TIME MPC OF A DC-DC BOOST CONVERTER INTERFACED WITH A GRID CONNECTED PV SYSTEM AND PR CONTROLLER

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Abstract

The main function of the dc-dc converter in a gridconnected photovoltaic system, is to regulate the terminal voltage of the PV arrays to ensure delivering the maximum power to the grid. The purpose of this paper is to design and practically implement a robust continuous-time model predictive control (CTMPC) for a dc-dc boost converter, feeding a three-phase inverter of a grid-connected PV system to regulate the PV output voltage. In CTMPC, the system behavior is predicted based on Taylor series expansion, raising concerns about the prediction accuracy in the presence of parametric uncertainty and unknown external disturbances. To overcome this drawback, a disturbance observer is designed and combined with CTMPC to enhance the steady-state performance in the presence of model uncertainty and unknown disturbance such as the PV current, which varies nonlinearly with the operating point. An interesting feature is that the composite controller reduces to a conventional PI controller plus a predictive term that allow to further improve the dynamic performance over the whole operating range. The effectiveness of the proposed controller was tested numerically and validated experimentally with the consideration of the gridconnected PV inverter system and its controller

INTRODUCTION

In order to make the most of PV power production in either grid-connected or stand-alone applications, power electronic converters are required. Focusing on grid-connected applications, the PV unit is often linked to the host grid through a DC-link capacitor and a single/three phase inverter. In addition, a dc-dc converter and PV array are often connected with an input capacitor [1]. The inverter's primary function is to ensure that the PV system's power flow is controlled and within grid standards. Active power is managed by adjusting the DC-link voltage in such a topology [2], while reactive power is kept within a range that is determined primarily by the need to connect to the grid [3]. By investigating the switching devices' control potential, the dc-dc converter is thought to allow for the highest possible power to be extracted from the PV generator [4]. Boost converters have largely supplanted other dc-dc converters as the go-to for powering grid-connected inverters. Unlike other dc-dc converters, such as a quadrature boost converter or an interleaved boost converter [5, 6], the main benefit of utilizing a boost converter is its comparatively simple architecture. Boost converters are often used in low-power single-phase systems, however the DC-link voltage fluctuations they create are a matter for worry. Despite the fact that this issue highlights the need of creating an adequate control of the grid-tied single-phase inverter system, the primary emphasis of this work is on the control of the boost converter regardless of the inverter type. However, for some low power PV applications like the residential PV installed system, a three-phase inverter may provide smaller DC-link ripples with a conventional Proportional-Integral (PI) controller.

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Control of a Bidirectional Z-Source Inverter for Electric Vehicle Applications in Different Operation Modes

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ABSTRACT This paper proposes two control strategies for the bidirectional Z-source inverters (BZSI) supplied by batteries for electric vehicle applications. The first control strategy utilizes the indirect field-oriented control (IFOC) method to control the induction motor speed. The proposed speed control strategy is able to control the motor speed from zero to the rated speed with the rated load torque in both motoring and regenerative braking modes. The IFOC is based on PWM voltage modulation with voltage decoupling compensation to insert the shoot-through state into the switching signals using the simple boost shoot-through control method. The parameters of the four PI controllers in the IFOC technique are designed based on the required dynamic specifications. The second control strategy uses a proportional plus resonance (PR) controller in the synchronous reference frame to control the AC current for connecting the BZSI to the grid during the battery charging/discharging mode. In both control strategies, a dual loop controller is proposed to control the capacitor voltage of the BZSI. This controller is designed based on a small signal model of the BZSI using a bode diagram. MATLAB simulations and experimental results verify the validity of the proposed control strategies during motoring, regenerative braking and grid connection operations.

INTRODUCTION With increasing oil prices and global warming, automobile manufacturers are producing more hybrid electric vehicles (HEV) and electric vehicles (EV). In hybrid and electric vehicles, the motor drive comprised of an electric motor, a power converter and an electronic controller, is the core of the EV propulsion system. Many research efforts have been focused on developing new

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PFC OF THREE PHASE PWM AC CHOPPER FED IM DRIVE SYSTEM

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Abstract

In this paper, a new control strategy for an induction motor (IM) drive system fed from threephase pulse width modulation (PWM) AC chopper is proposed. The main objective of the proposed control scheme is to achieve input power factor correction (PFC) of the IM drive system under different operating conditions. PFC is achieved by continuously forcing the actual three-phase supply currents with the corresponding reference currents, which are generated in phase with the supply voltages, using hysteresis band current control (HBCC) technique. The proposed control strategy has two loops; inner and outer loop. Output of the outer loop is the magnitude of the supply reference current resulting from either speed controller or startup controller, whereas output of the inner loop is PWM signals of the AC chopper. The proposed AC chopper features a smaller number of active semiconductor switches; four IGBTs, with only two PWM gate signals. As a result, the proposed system is simple, reliable, highly efficient and cost-effective. Mathematical analysis of the drive system is presented. Components of the input LC filter are designed using frequency response. The IM drive system is modeled using MATLAB/SIMULINK and a laboratory prototype was built and tested. Simulation and experimental results confirm validity and robustness of the proposed control strategy.

The First Chapter: An Overview

The most common kind of electric motor seen in commercial applications is an induction motor. There is no kickstart circuit required. Induction motors are the electric motors that have seen the most widespread use in the business world. A starting circuit is unnecessary. Due to the highly inductive nature of the motor, the power factor is initially fairly low. Thus, reactive power is the most useful element in raising the power factor of the system while a motor is being started. Initiating a motor strategy has drawn scientific attention in recent years. Methods for starting induction motors include the Direct On-Line technique, Star-delta, Auto-transformer, soft starter, and variable frequency drive (VFD). The negative effects of a low power factor may be analyzed and mitigated in a variety of ways. In this discussion, we suggest feeding the IM with a three-phase pulse width modulation (PWM) alternating current chopper (voltage regulator).

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AN LLC AND LCL-T RESONANT TANKS BASED TOPOLOGY FOR BATTERY CHARGER APPLICATION

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Abstract:

To achieve the constant current (CC) and constant voltage (CV) charge of the lithium battery, the traditional LLC resonant converter requires the switching frequency varies in a wide range, which brings difficulty to the magnetic components design, and the system efficiency would also be degraded. In this article, a novel topology based on LLC and LCL-T resonant tanks is proposed to reduce the range of operating switching frequency. During the CC charge state, the proposed converter is operating with the LCL-T resonant tank, and it can be regarded as a current source, which provides constant charging current to the battery. During the CV charge state, the LCL-T resonant tank is bypassed and the structure of the proposed converter is modified to a traditional LLC resonant converter, and it is functioning as a CV source. Owing to the high accuracy of the CC and voltage sources, the required operating switching frequency range can be significantly reduced when compared with traditional LLC approaches. Operational principles and design guidelines for the proposed converter are described. Experiment and simulation results from a 180 W prototype are provided to validate the theoretical analysis.

Introduction

Growing economies bring with them more pollution and power shortages. The major emphasis of new energy development has shifted to affordable, zero-emission electric automobiles. vehicles, which the government has been encouraging and assisting financially [1,2]. The on-board charger (OBC) is a crucial component of electric vehicle technology and has garnered a lot of attention as a result. The AC/DC front-end converter and DC/DC back-end converter are its primary building blocks [3]. To convert and exchange DC voltages [4,5], a bidirectional DC/DC converter is required. Non-isolated bidirectional DC/DC converters and isolated bidirectional DC/DC converters [6] are two common ways to categorize this device based on its converter design.

Buck/boost, buck-boost, Cuk, Sepic-Zeta, etc. are all examples of popular non-isolated bidirectional DC/DC converter topologies. The disadvantages are offset by the benefits, which include but are not limited to lack of electrical isolation, unstable equipment, and inefficient transmission [7]. The DC/DC converter can switch between resonant and non-resonant modes, making it suitable for a variety of applications. The dual active bridge (DAB) DC/DC converter [8,9] is the most common kind of non-resonant bidirectional DC/DC converter. It has a number of limitations, including power backflow, high current stress, and the inability to accomplish soft-switching at a light load [10,11], despite its straightforward design and zero-voltage soft-switching (ZVS) capabilities. Throughout a broad voltage and load range, the resonant DC/DC converter beats the DAB in terms of zero-voltage switching of the main switches and zero-current switching (ZCS) of the secondary switches, resulting in lower losses, higher voltage gain, and higher efficiency [12-14]. The LLC bidirectional resonant converter is one of the most researched [15] because of the simplicity of its circuit construction and the ease with which soft switching can be implemented. However, the conventional LLC bidirectional resonant converter has a restricted voltage gain adjustment range with high input or output voltages. Similar to an LC series resonant converter, but in reverse. The forward operating mode is incompatible with the resonant state.

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Grid-Interfaced PV Driven Rechargeable Vehicle Battery System with Novel Adaptive Digital Control Algorithm

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ABSTRACT A solar-powered drive for the separately excited DC (SEDC) motor drive system has been proposed and validated. The proposed system uses a set of two cascaded series compensated buck boost converters (SCBBCs) and a push pull DC to DC converter. The maximum power point tracking (MPPT) for the solar PV energy harvesting system is based on a sliding mode controller (SMC) and the SCBBC next to the solar PV source is used for this purpose. The armature winding of the SEDC motor receives the required isolated DC voltage from a push pull converter that is powered from a common DC link that carries a battery. The field winding of the SEDC motor is fed by the second SCBBC. The speed of the SEDC motor is regulated by a separate sliding mode controller implemented in the second SCBBC. A detailed state space analysis of the SCBBC and related mathematical modelling of the complete system are presented. The simulations were carried out in the MATLAB SIMULINK environment, and an experimental prototype was developed utilizing a 200 W 110 V SEDC motor.

INTRODUCTION Industrial drives benefit greatly from DC motors. They have practical control capabilities that allow the user to manage the speed and torque independently. With independent windings for the armature and field systems, the SEDC motor allows for easy and decoupled speed and torque control. The motor's speed can be adjusted while keeping a steady torque, and the torque can be adjusted for a constant speed. Fixed torque variable speed mode (also known as variable power mode) and variable torque variable speed mode (also known as fixed power output mode) are the two operational modes. The amount of power delivered to the motor varies with speed and torque. It is possible to drive with constant power delivered to the motor while speed and torque are adjusted in a linked way using the SEDC motor.

Multiport Converter based EV Charging Station with PV and Battery

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ABSTRACT The main Moto of this paper is a modeling of proposed system smart charging for electrical vehicle insuring minimum stress on power grid. The large scale development of electrical vehicle we need electric charging station for example fast charging station and superfast charging station . During a peak demand load , large load on charging station due to the voltage sag , line fault and stress on power grid . At this all problem avoid by multiport converter based EV charging station with PV and BES by using analysis of MATLAB simulation . Result and conclusion of this paper to reduce loses improving efficiency of solar energy , no pollution (reduce) fast charging as possible as without any disturbance.

Keywords: EV Charging Station , PV , BES , Grid , MATLAB

I. INTRODUCTION Now a days the pollution increase the environment , conventional vehicle emission carbon dioxide , carbon monoxide , sulphur dioxide , gases in environment due to greenhouse gases increases , ozone layer create in atmosphere causes fast acid rain .In india 27% pollution create through conventional vehicles .This all problem avoided by electrical vehicles . Now a day , the development of electrical vehicles become trends while increasing number of electrical vehicle we need electrical charging station . examples, fast charging station , super- fast charging station . The set of multiport converter based EV charging with PV and Battery energy sources and equipment used in this system is PV, BES, MPPT , DC link , AC grid and charging .

- The set of multiport converter based EV charging with PV and Battery energy sources and equipment used in system photovoltaic (PV) , battery energy source (BES) , maximum power point tracking (MPPT) , DC link , AC grid and Charger.

- The charging system of electric vehicles (EV) in method. AC Bus and DC Bus. In DC bus are more essential than AC Bus.

Fuzzy Logic based Wind Turbine Driven DFIG Interfaced to Utility Grid

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ABSTRACT In this paper an impact method of wind energy conversion systems with doubly-fed induction generator to interfaced using fuzzy logic is designed. A doubly fed induction generator (DFIG) whose stator is directly connected to the grid and the rotor is connected to the grid through a back-to-back AC-DC-AC PWM converter by mean of proposed control method. To ensure a smooth DC voltage and sinusoidal current within the grid side is achieved by means of the grid side converter (GSC). The system is modeled and simulations are carried out in MATLAB using Sim Power Systems tool box.

Key Words: Doubly fed induction generator (DFIG), power quality, Fuzzy Logic Controller, Utility grid, wind energy conversion system (WECS).

INTRODUCTION Wind industry is becoming one among the world's fastest growing energy sectors nowadays, offering the simplest opportunity to unlock a replacement era of environmental protection, helping to satisfy global energy demand and starting the transition of sustainable energy to a worldwide economy. Variable speed constant frequency operation, reduced flicker and independent control capabilities for active and reactive powers are often achieved by Wind turbines supported doubly fed induction generators have attracted particular attention due to their advantages. Active power from the generator is decided by the turbine control and must in fact be within the potential of the turbine generator system. The development caused by doubly fed induction generator features a good performance without losing any equilibrium when the voltage reduction occurs in these conditions; it will remain connected to the power system. DFIGs are variable speed generators with controlled power electronic converters are used for improving the efficiency and power quality. The main components of a wind turbine system that including the turbine rotor, gearbox, generator, transformer and possible power electronics. Wind turbines

Steadiness Enhancement of DC Supremacy Arrangements in an All-Rechargeable Ship Using Hybrid SMES/Battery

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ABSTRACT: Energy storage systems are used in various applications to compensate for a fluctuating power demand. The combination of a prime mover and an energy storage device for reduction of fuel consumption has been successfully used in the automotive industry. As the capacity of all-electric ships (AESs) increases dramatically, the sudden changes in the system load may lead to serious problems, such as voltage fluctuations of the ship power grid, increased fuel consumption, and environmental emissions. In order to reduce the effects of system load fluctuations on system efficiency, and to maintain the bus voltage, we propose a hybrid energy storage system (HESS) for use in AESs. The HESS consists of two elements: a battery for high energy density storage and a superconducting magnetic energy storage (SMES) for high power density storage. A dynamic droop control is used to control charge/discharge prioritization. Maneuvering and pulse loads are the main sources of the sudden changes in AESs. There are several types of pulse loads, including electric weapons. These types of loads need large amounts of energy and high electrical power, which makes the HESS a promising power source. Using Simulink/MATLAB, we built a model of the AES power grid integrated with an SMES/battery to show its effectiveness in improving the quality of the power grid. **INDEX TERMS -**All-electric ship (AES), hybrid energy storage system (HESS), superconducting magnetic energy storage (SMES), pulse load.

INTRODUCTION Recent research has resulted in wide use of energy storages (ES) for several applications such as electrical vehicles, diesel electric ships, or in relation with renewable energy production. There has also been an increasing attention around energy use in the oil and gas industry. Offshore drilling rigs are mobile units that perform exploration to develop new oil or gas

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COORDINATED DAMPING OPTIMIZATION CONTROL OF SUB-SYNCHRONOUS OSCILLATION FOR DFIG AND SVG

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Abstract

Currently, the power electronics-based devices, including large-scale non-synchronized generators and reactive power compensators, are widely used in power grids. This helps introduce the coupling interactions between the devices and the power grid, resulting in a new sub-synchronous oscillation phenomenon. It is a critical element for the stability operation of the power grid and its devices. In this paper, the sub-synchronous oscillation phenomenon of the power grid connected with large scale wind power generation is analyzed in detail. Then, in order to damp the sub-synchronous oscillation, a coordinated damping optimization control strategy for wind power generators and their reactive power compensators is proposed. The proposed coordinated control strategy tracks the sub-synchronous oscillation current signal to correct the corresponding control signal, which increases the damping of power electronics. The response characteristics of the proposed control strategy are analyzed, and a self-optimization parameter tuning method based on sensitivity analysis is proposed. The simulation results validate the effectiveness and the availability of the proposed control strategy.

1. Introduction

There is now widespread agreement that new forms of energy production, such as wind power, must be developed to address energy issues and modify the energy supply [1]. Sub-synchronous oscillation (SSO) has to be controlled in the power system [2] when a large amount of wind power is connected to it. The current suppression techniques for SSO of power systems with wind power may be broken down into three categories, according on the control methods employed: Additional damping control [3, 4], improved system control [5], and additional auxiliary equipment [6, 7]. Most of the prior research has concentrated on the converter in terms of extra damping control from the installation location of the controllers' standpoint. Additional techniques of damping control using GSC are proposed, for instance, in [3] and [4] for DFIG and PMSG, respectively. Moreover, from a standpoint of maximizing the control of the system as a whole. Parameters for the HVDC (voltage source converter) technology used in wind farms to reduce SSO were improved in [5]. The majority of these supplementary tools rely on FACTS or similar technology [6, 7].
However, in nonlinear control, feedback linearization control (FLC) is utilized to stabilize the system by first transforming it into a linear system through coordinate transformation and state feedback. In light of the above, the DFIG system with SVG is examined in this study, and the feedback linearization Controller for the DFIG's RSC is developed. The DFIG system with SVG is modeled using a 22-order state-apse in the first part. Section 2 examines its stability under weak signals. Section 3 designs the FLC for the RSC's inner loop. Section 4 also includes simulations using eigenvalue analysis and time-domain simulation to validate the performance of the proposed technique under mild disruption. Section 5 provides the final analysis.

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DESIGN FOR VARIABLE SPEED WIND TURBINE ENERGY SYSTEM USING PSO

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Abstract:

Renewable energy from wind is the safest form of energy. Wind turbine based energy generators have the potential to generate high amount of electric power if there is a proper wind velocity and control mechanisms. This can certainly reduce the dependency on solar photovoltaic based energy systems, which needs huge space to install the solar photovoltaic panels. However, the output power of wind turbine is affected by the uncertain wind velocity. The output mechanical power has to be properly controlled. Hence, the wind energy system efficacy depends on how well this uncertainty is addressed. The major challenge is to design and control the wind turbine systems that has a suitable mediator between the power generator and the load, which counters the damage to the load due to variable voltages produced by the varying wind velocity. Keeping this in view, this paper implements all-important PID control design methods for wind energy application and recommends the most suitable method for its controller design. The overall analysis is presented via detailed quantitative results that are evaluated with the help of time-domain performance index parameters

Introduction

The overwhelming reliance of the global economy on fossil fuels and environmental concerns have prompted a shift in attention toward nonconventional means of producing power. Wind power is the most rapidly expanding renewable energy source in this context of increasing energy market diversity [1]. For a long time, the most common kind of wind turbine was one with a simple control system designed to save operating expenses and upkeep [1]. Electronic converters and mechanical actuators have become more popular as a result of the growing size of turbines and the rising penetration of wind energy into the utility networks of leading nations. In order to actively regulate the absorbed energy, these devices integrate additional design degrees of freedom. As an interface to the power grid, static converters allow for variable-speed operation up to the rated speed. Variable speed control seems to be a viable alternative for improving the functioning of wind turbines in the face of environmental disturbances including random wind variations, wind shear, and tower shadows [2]. From a control system perspective, wind energy conversion systems provide unique difficulties. Due to their nonlinear nature and susceptibility to significant cyclic disturbances, wind turbines may experience excitation of the weakly damped vibration modes of the drive-train and tower (see [1,3]). Furthermore, because to the unique working circumstances, it is challenging to construct mathematical models that effectively represent the dynamic behaviour of wind turbines.

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AN IMPROVEMENT OF ADDITIONAL GRID-VOLTAGE REGULATION USING IUPQC CONTROLLER AS A STATCOM

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ABSTRACT

This project presents an improved controller for the dual topology of the interline unified power quality conditioner (iUPQC) extending its applicability in power quality compensation, as well as in microgrid applications. By using this controller, beyond the conventional UPQC power quality features, including voltage sag/swell compensation, the iUPQC will also provide reactive power support to regulate not only the load-bus voltage but also the voltage at the grid-side bus. In other words, the iUPQC will work as a static synchronous compensator (STATCOM) at the grid side, while providing also the conventional UPQC compensations at the load or microgrid side. By using the MatlabSimulation we get the results.

Keywords: Interline Unified Power Quality Conditioner (iUPQC), Power Quality Compensation, Microgrid Applications, Reactive Power Support, Voltage Regulation, Static Synchronous Compensator (STATCOM)

INTRODUCTION

The introduction to the project sets the stage by outlining the significance of the research endeavor within the realm of power quality enhancement and microgrid applications [1]. It provides context for the project's objectives and introduces the concept of utilizing an improved controller for the Interline Unified Power Quality Conditioner (iUPQC) to extend its functionality beyond conventional applications [2].In recent years, the growing demand for electricity, coupled with the increasing penetration of renewable energy sources, has underscored the importance of addressing power quality issues in modern electrical grids [3]. Power quality disturbances such as voltage sags, swells, harmonics, and fluctuations can lead to operational inefficiencies, equipment failures, and compromised system reliability [4]. Therefore, there is a pressing need for innovative solutions that can mitigate these disturbances and enhance the overall performance of the grid [5].

The Interline Unified Power Quality Conditioner (iUPQC) represents a promising solution for addressing power quality challenges and improving grid stability [6]. Unlike traditional Unified Power Quality Conditioners (UPQCs), the iUPQC offers a dual topology that enables it to provide comprehensive power quality compensation while also facilitating reactive power support [7]. This unique capability allows the iUPQC to regulate not only the voltage at the load-bus but also at the

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CHARGING OF ELECTRIC VEHICLES BATTERY USING BIDIRECTIONAL CONVERTER

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ABSTRACT

In this system the single-phase ac is supplied to load. The non-linear load generates harmonics in the input signal. Enhanced phase locked loop (EPLL) provides sinusoidal current from distorted waveform. The charger is connected through this supply for charging the EV battery. The charger has two stage (a)1- Øbidirectional AC-DC converter (b) three level DC-DC buck boost converter. The AC-DC converter provides DC-link voltage to 3-level buck boost converter. The electric vehicles battery is chargedin buck mode for grid-to-vehicle application and discharge in boost mode for vehicle-to- grid application. This integration of bidirectional ac-dc converter with the proposed three-level bidirectional dc-dc converter provide path for the flow of power to determines the state of charge (SOC) of EV batteries for charging mode. The single-phase AC input generating the harmonics for nor-linear loads. And using Enhanced phase locked loop to eliminating the generation of harmonics. The charger is connected through this supply for charging the electric vehicle battery. The charger has two stage single phase bidirectional AC-DC converter. Three-level DC-DC buck boost converter. The electric vehicles batterycharged single phase AC-DC buck mode for grid-to-vehicles. The AC-DC converter provides DC-link voltage to 3-level buck boost converter. The electric vehicles battery is charged in buck mode for grid-tovehicle application and discharge in boost mode for vehicle-to-grid application by using bidirectional Converter.

Keywords:Harmonics, Enhanced Phase Locked Loop (EPLL), Bidirectional AC-DC Converter, Three-level DC-DC Buck Boost Converter, Electric Vehicle (EV) Battery Charging, Grid-to-Vehicle Application, Vehicle-to-Grid Application

INTRODUCTION

Electric vehicles (EVs) have emerged as a promising solution to address environmental concerns and mitigate the adverse effects of vehicular emissions on air quality and climate change [1]. However, the widespread adoption of EVs is contingent upon the availability of efficient and reliable charging infrastructure capable of meeting the increasing demand for electric mobility [2]. Conventional charging methods typically involve the direct connection of EV chargers to the power grid, resulting in unidirectional power flow from the grid to the vehicle battery [3]. While this approach facilitates battery charging, it presents challenges related to grid stability, power quality, and energy management, particularly in scenarios involving high penetration of EVs [4].

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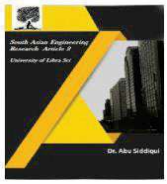

DYNAMIC VOLTAGE RESTORER AS POWER QUALITY CUSTOM POWER DEVICE

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ABSTRACT

Power Quality is an essential concern in the modern power system that can affect consumers and utility. The integration of renewable energy sources, smart grid systems and extensive use of power electronics equipment caused myriad problems in the modern electric power system. Current and voltage harmonics, voltage sag, and swell can damage the sensitive equipment. These devices are susceptible to input voltage variations created by interference with other parts of the system. Hence, in the modern age, with an increase in sensitive and expensive electronic equipment, power quality is essential for the power system's reliable and safe operation. Dynamic Voltage Restorer (DVR) is a potential Distribution Flexible AC Transmission System (D-FACTS) device widely adopted to surmount the problems of non-standard voltage, current, or frequency in the distribution grid. It injects voltages in the distribution line to maintain the voltage profile and assures constant load voltage. The simulations were conducted in MATLAB/Simulink to show the DVR-based proposed strategy's effectiveness to smooth the distorted voltage due to harmonics. A power system model with a programmable power source is used to include 3rd and 5th harmonics. The systems' response for load voltage is evaluated for with and without DVR scenarios. It has been noted that the proposed DVR based strategy has effectively managed the voltage distortion, and a smooth compensated load voltage was achieved. The load voltage THD percentage was approximately 18% and 23% with insertion 3rd and 5th harmonics in the supply voltage, respectively. The inclusion of the proposed DVR has reduced THD around less than 4% in both cases.

Keywords: Power Quality, Modern Power System, Renewable Energy Sources, Smart Grid Systems, Power Electronics Equipment, Current Harmonics, Voltage Harmonics, Voltage Sag, Voltage Swell, Sensitive Equipment, Input Voltage Variations, Dynamic Voltage Restorer (DVR), Total Harmonic Distortion (THD)

INTRODUCTION

In the contemporary landscape of power systems, the quest for maintaining optimal power quality has become paramount, driven by the integration of renewable energy sources, the advent of smart grid systems, and the widespread deployment of power electronics equipment. These advancements have ushered in a new era of electricity generation, transmission, and distribution,

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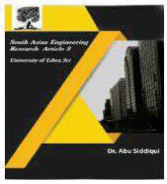

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Keywords: Power Quality, Modern Power System, Renewable Energy Sources, Smart Grid Systems, Power Electronics Equipment, Current Harmonics, Voltage Harmonics, Voltage Sag, Voltage Swell, Sensitive Equipment, Input Voltage Variations, Dynamic Voltage Restorer (DVR), Total Harmonic Distortion (THD)

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A Novel Optimized Golden Eagle Based Self-Evolving Intelligent Fuzzy Controller to Enhance Power System Performance

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***Abstract*— The basic goal of power system is to ensure that all users in the system receive a consistent supply of electricity of acceptable quality. Whenever there is equilibrium between the power requirements and the generated power, the network is said to be in equilibrium. Different control strategies have been provided in prior studies, but little attention has been devoted to how they work in the face of non-linearity. Thus, this work proposes a mathematical strategy for increasing the performance by using the Hierarchical Golden Eagle based self-evolving intelligent fuzzy controller (HGE-SIFC). Furthermore, a fuzzy interference hysteresis controller is used to generate switching pulses using the PWM approach. The main purpose of the proposed approach is to enhance response time, minimize steady-state fluctuations in injected active and reactive powers, and improve power quality regardless of changes in load as well as supply voltage parameters. MATLAB/SMULINK is used to display the results of the simulation. The proposed control method outperforms over conventional method in terms of controller execution time, increased power quality, Total Harmonic Distortion (THD) and stability.**

Keywords— Hierarchical Golden Eagle based self-evolving intelligent fuzzy controller, PWM, Total Harmonic Distortion, Neural Network, Fuzzy Logic and Power quality.

I. INTRODUCTION

Electricity demand has risen dramatically over the years, necessitating the expansion of power infrastructure in both value and performance [1]. Photovoltaic (PV), Wind, hydrogen fuel, and bioenergy are all examples of renewable energy sources that are utilized to generate electricity [2]. One of the most significant characteristics of a power system is service continuity. This implies that the average system must continue to function as a dependable power source even if it is disrupted or if a malfunction occurs [3]. As a result, the voltage profile between the RESs as well as the grid at the point of common coupling (PCC) will vary. Voltage variations have a negative impact on the performance of power system, such as power factor, system stability, and power quality [4].

Furthermore, if not effectively regulated, these voltage variations will reach unfavorable levels, causing these RESs to be disconnected from the system owing to a lack of maintaining the system's reactive power throughout these failures [5]. As a result, a technique for dealing with harmonics difficulties without jeopardizing the operation of power electronic equipment in power systems is necessary. There are several approaches for investigating and enhancing the effectiveness of power systems under various operating situations. For reference current generation, technologies such as flux-based controllers [6], sliding mode controllers [7], and PI controllers [8] are often utilized.

Furthermore, ANN learning takes a while, which has an impact on dynamic performance. In industry, fixed-gains PI controllers are the most frequent [9]. Numerous investigations have employed this style of control to enhance the dynamic efficiency of PV systems; however, its design is based on trial and error, that is not an accurate technique for control algorithm [10]. For obtaining the optimal controller parameters that offer us the optimal recovery circumstance of a power system after just a disruption, strategies range from advanced control theory to arbitrary meta-heuristic algorithms such as rule based bacteria foraging [11], Tabu search, chaotic optimization algorithm, genetic algorithms [12], and teaching and learning based optimization [13], particle swarm optimization [14], and bat optimization [15] As a result, an algorithm's effectiveness in effectively addressing set of issues does not imply that it will solve all optimization issues of all types and natures. The following is a summary of the research's key contribution:

- The goal is to improve system performance by using an optimum control approach.
- The control approach is based on HGE-SIFC techniques, which are a mixture of heap, Golden eagle, and self-evolving intelligent fuzzy controller.
- The SIFC controller's settings are ideally computed using the HGE method, which is employed as a support tool.
- The suggested controller's efficacy is compared to that of several traditional control techniques.
- The suggested system's validity is confirmed by simulation results.

The entire article will be delivered in the order listed below. The Section 2 discusses recent control methods. The recommended control methods are described in Section 3. The suggested research and comparison's results and analyses are presented in Section 4, and the conclusions are presented in Section 5.

II. RECENT CONTROL METHODS

The following are some of the most recent papers linked to this research: Li, Jiawen, Tao Yu, and Li, Jiawen[16] offer an intelligent automatic generation control (IAGC) architecture to handle the coordination challenges amongst AGC controllers in multi-area power systems. Every adaptive PI controller's tuning uses the IGE-MATD3 method, which is an imitation guided based exploration with multi-agent twin based delayed deeply deterministic policy gradient technique.

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A Novel Optimized Golden Eagle Based Self-Evolving Intelligent Fuzzy Controller to Enhance Power System Performance

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***Abstract*— The basic goal of power system is to ensure that all users in the system receive a consistent supply of electricity of acceptable quality. Whenever there is equilibrium between the power requirements and the generated power, the network is said to be in equilibrium. Different control strategies have been provided in prior studies, but little attention has been devoted to how they work in the face of non-linearity. Thus, this work proposes a mathematical strategy for increasing the performance by using the Hierarchical Golden Eagle based self-evolving intelligent fuzzy controller (HGE-SIFC). Furthermore, a fuzzy interference hysteresis controller is used to generate switching pulses using the PWM approach. The main purpose of the proposed approach is to enhance response time, minimize steady-state fluctuations in injected active and reactive powers, and improve power quality regardless of changes in load as well as supply voltage parameters. MATLAB/SMULINK is used to display the results of the simulation. The proposed control method outperforms over conventional method in terms of controller execution time, increased power quality, Total Harmonic Distortion (THD) and stability.**

Keywords— Hierarchical Golden Eagle based self-evolving intelligent fuzzy controller, PWM, Total Harmonic Distortion, Neural Network, Fuzzy Logic and Power quality.

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