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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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2	Dr. S. Vijaya Madhavi	Design and Management of an Integrated Solar-Wind Conversion System Using DFIG	International Conference on Advances in Modern Age Technologies for Health and Engineering Science (AMATHE)	Jul-2024	pp. 1-6, ISBN: 979-8-3503-7156-7	Scopus
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4	Mr.E.Venkatesh	DDSRF Theory For Power Quality In UPFC Applications	IEEE International Conference On Circuit Power And Computing Technologies	Sep-2024	DOI: 10.1109/Iccpct61902.2024.10672648 ISBN:979-8-3503-7281-6	Scopus
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Optimizing size and location of UPFC for enhanced system dynamic stability using hybrid approach

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A R T I C L E I N F O

Keywords:
Optimal location
Capacity
Generator fault
Maximum power loss line
Dynamic stability
Minimum voltage deviation

A B S T R A C T

This paper proposed a novel hybrid optimization technique, combining the Enhanced Multi-Strategic Sparrow Search Algorithm (EMSA) and White Shark Optimizer (WSO), to determine the optimal location and size of a Unified Power Flow Controller (UPFC) for enhancing power system dynamic stability. The proposed method offers improved search capabilities, reduced randomness, and lower computational complexity compared to existing approaches. Generator faults can significantly impact system dynamic stability constraints, including voltage and power loss. EMSA algorithm is employed to identify optimal location for UPFC placement by selecting bus with minimum power loss. Subsequently, WSO algorithm is used to optimize UPFC's capacity, ensuring that affected system parameters and dynamic stability constraints are restored within safe limits. Optimized UPFC is then installed at identified location, and system's power flow is analyzed. Proposed method is implemented in MATLAB/Simulink environment and tested on both IEEE 30 and IEEE 14 standard benchmark systems. Proposed method's performance is evaluated by comparison with existing methods.

1. Introduction

Customers currently have a high demand for electricity, which places a heavy load on power systems. Nonetheless, the transmission and generation networks are constrained by stringent environmental regulations and scarce resources [1]. Systems must be operated at

Abbreviations: TCSC, Thyristor-controlled series compensator; FACTS, Flexible AC transmission system; ISMA, Integrated Slime Mould Algorithm; WOA, Whale Optimization Algorithm; PQC, power quality compensation; SP-UPFC, Single-Phase Unified Power Flow Controller; VP, voltage profiles; DG, Distributed Generation; OPF, Optimal Power Flow; LCPI, Line Collapse Proximity Indexes; VSI, Voltage stability index; SSSC, Static synchronous series compensator; PQ, power quality; D-STATCOM, Distribution Static Compensator; SPV, Solar Photovoltaic; EMSA, Enhanced Multi-strategies Sparrow Search Algorithm; ABC, Artificial Bee Colony; FOAPSO, Firefly Optimization Algorithm-Particle Swarm Optimization; SSA, Sparrow Search Algorithm; 2DOF-TIDμN, Two Degree of Freedom Tilt Integral Derivative Controller with Fractional derivative and filter; GSA, Gravitational Search Algorithm; UPFC, Unified power flow controller; GTO, Gate turn-off; HPFC, hybrid power flow controller; SMA, Slime Mould Algorithm; MBO, Monarch Butterfly Optimization; GA, Genetic Algorithm; SVC, Static Var Compensator; STATCOM, Static synchronous compensator; JA-FPA, Jaya Algorithm-enabled Flower Pollination Algorithm; PLI, Power loss index; PSS, Power system stabilizers; HRESs, hybrid renewable energy systems; GWO-CS, Grey wolf optimization-Cuckoo Search; NL:MLI, Nine-Level Multi-Level Inverter; WOA, Whale Optimization Algorithm ; WS, White Shark; FF, Firefly; THD, Total Harmonic Distortion; NR, Newton-Raphson; WSO, White Shark Optimizer; CS, Cuckoo Search.

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TEMPERATURE CONTROLLING SYSTEM IN FOOD PROCESSING DRYERS USING DHT SENOR AND PELTIER

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ABSTRACT:

Humans have been storing food for millions of years once it has been dried and salted; the sun is typically the source of this process. For many years, this drying process has likewise been changing and being improved upon at every stage. A solar dryer is now a necessary piece of equipment for this sun-drying process.

This study presents the fabrication and design upgrade details based on the latest advancements in solar dryers. In order to satisfy the end product quality, this paper offers a detailed design modification from the prior one. The dryer is made out of a translucent sheet roof and a heated black box.

KEYWORDS: Solar dryer, Modification, Quality product, Arduino Uno, Automation, Multi-stacking, Solar Tracking.

I. INTRODUCTION

Drying is one of the most conventional methods used for preservation and storage, which works on the basis of reduction in the water content in the product. The reduction in the water content brings about more physical as well as chemical stability in the product. Also it reduces the weight and volume of the product and hence the transportation cost also decreases. Drying improves the quality of product and reduces product loss due to moisture content. For this process of drying and dehydration of any product several techniques have been employed which solar drying, hot air, freeze drying, osmotic dehydration, etc.

Operation of drying involves both heat and mass transfer. It changes several parameters of the product during the process such as volume, density, mass, moisture content, humidity inside, product size, chemical changes along with the product quality. It is an important time and energy consuming process which lastly improves the standard of the product.

Drying of agricultural products have been one of the most ancient skill of all time and is generally employed worldwide for better market value of the agro-based products. Direct and uncontrolled sun drying is still the most common method that is being used to preserve and process agricultural products in most countries. The key advantages of sun drying are low capital investmentsand reduced complexity. The main disadvantages of open-air sun drying, mostly are contamination,

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DESIGN AND ANALYSIS OF MULTILEVEL INVERTER USING MATLAB

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Abstract— **The inverter is an electrical power converter that converts current directly into alternating current. Traditional two-phase inverters will eventually give us a square wave, which seems to give us unsatisfactory results when compared to the sinusoidal AC waveforms needed for most products in our lives, the square wave is harmonic, thus reducing the work and other effects of the Power system. The current multiphase inverter is an improvement of the basic two-phase inverter, which uses transistors (IGBT, MOSFET) or thyristors as switches, generating a small voltage level when energized and turned on at different times of the gate voltage. More similar to the AC sinusoidal waveform, reducing the overall harmonic distortion and electromagnetic interference, thus increasing the overall efficiency of the system. The multilevel inverter control method, which will try to stabilize the output of the multilevel inverter and thus optimize the MLI process and try to predict the control model, which is a control process that can predict the future before events and therefore control according to its MLI. allows it. To maintain the voltage level regardless of load demand or interference and give us a sinusoidal AC waveform.**

Index Terms— **5-Level , Cascaded H-Bridge (CHB-MLI), Multi-Level Inverter , Power Electronics, Predictive Model Control , Harmonic Distortion .**

I. INTRODUCTION

With the advancement of Power Electronics in the last Four Decades which has led into a development in the Multi-Level Inverters especially from the 1980's [1] [2] , the Multi – Level Inverters by using semi-conductor switches can synthesize a waveform with Voltage steps which gives us a Waveform which has less harmonics and also limits the voltage stress (dv / dt) stress applied on load [3] .

As demand for electric power has soared along with the demand for Electric Power generated by Renewables which tend to produce Electric Power in DC whereas most of the load in residential , commercial and industrial requires AC Power thus more interest has been given to Inverters pecially Efficient Inverters which also should have a reduced Total Harmonic Distortion (THD) by having a better waveform . Thus Multi – Level Inverters have gotten more important . The Multi – Level Inverter has been classified into Three Main Topologies ; Diode-Clamped Multi-Level Inverter ,Flying Capacitor Type [3] and Cascaded H-Bridge Multi-Level Inverter [4]. There are other Topologies but they are the combination of the three main Topologies and thus called the Hybrid Topologies . This Research has been conducted on the base of the Five – Level Cascaded H-Bridge Multi-Level Inverter (CHB – MLI) which produces five Voltage steps . The new Control Method this research has proposed is the Model predictive Control which will be able to predict future events and be able to stabilize the output .

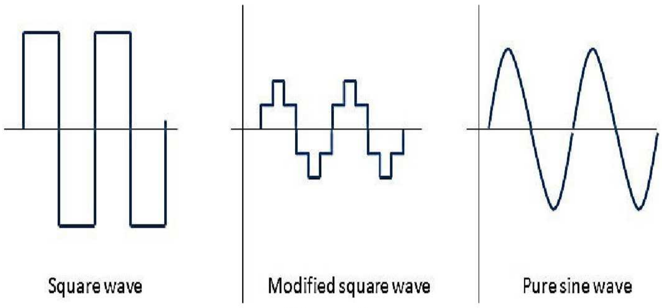

Figure 1.

Left side Waveform shows the output of a conventional Inverter , middle waveform shows the output of a Multi Level Inverter and the right side waveform shows the Pure sine wave required by most devices . As we can see from these waveforms

II. Five–Level Cascaded H-Bridge Multi-Level Inverter (CHB - MLI) :

In this research the Cascaded H-bridge Multi-Level Inverter (CHB-MLI) which is a topology of Multi – Level Inverter consisting of a cell of 4 semi - conductor switches connected to each other . These semi-conductor switches can be Transistors like MOSFETs (Metal Oxide Semi-conductor Field Effect Transistor) , IGBTs (Insulated Gate Bipolar Junction) or Thyristors like SCR (Silicon Controlled Diode) . The difference between the Transistor and Thyristors is that Thyristors are used for high power applications whereas

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Power Quality Improvement of PV fed Grid Connected System using ANN Controlled Shunt Active Power Filter

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ABSTRACT- Harmonics are common in integrated power systems, especially with the increasing use of nonlinear loads (NLL), such as those found in photo voltaic (PV) systems connected to the grid. Traditional LC filters Shunt active power filters (SAPF) have been developed to effectively correct harmonics and improve power quality performance. This study presents a three-phase voltage-fed SAPF implementation to mitigate harmonics using an artificial neural network (ANN) controller. The SAPF control system focuses on generating reference source currents to counterbalance the harmonic effects caused by NLL. The model's effectiveness is validated using experimental data gathered from a nonlinear load through MATLAB/Simulink simulations.

Keywords: Harmonics mitigation, shunt active power filter, instantaneous reactive power theory, Artificial Neural Networks.

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1. INTRODUCTION

In today's fast-paced world of electrical power systems, it is extremely important to maintain reliable and high-quality electricity. However, as more and more non-linear loads, renewable energy sources, and advanced electronic gadgets expand their influence into all sectors of modern life various problems caused by harmonic distortion, low power factor, and voltage fluctuations have appeared in front of us [1]. To address these difficulties now a new approach has been proposed that involves the use of the Shunt Active Power Filters. SAPF, an advanced pupil in power electronics, has always been deliberately designed to handle all sorts of undesired happenings to enhance the quality of electrical power [2]. These phenomena which include reactive power, voltage sags, swells, and harmonic waves, in addition to electric particulars can impair sensitive equipment and the overall effectiveness of the electrical distribution system likewise will disturb normal operation [3-4]. The SAPF basically is working as a control system that responds dynamically to any abnormality in electricity waveform, whether detected at the point of use or in transmission and distribution networks. Shunt Active Power Filters (SAPF) introduce controlled currents - all in phase with each other and large enough to cancel out the unwanted contributions - back into the electrical systems for them to normalize [5-6]. The problems are resolved by following a step-by-step approach that aims at getting these parameters back to their desired conditions. Unlike passive power filters, which are a static element possessing only limited compensatory ability, SAPF has an active form and instant power quality correction capability. The installation of renewable energy systems Surge protective devices, power factor correction equipment, uninterruptable power supplies, and active harmonic filters are all examples of SAPFs used to enhance power quality [7]. They play a critical role in protecting sensitive equipment and ensuring a stable and reliable electricity supply. SAPFs are becoming increasingly important as industrial and commercial systems grow more complex, leading to a rise in power quality

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IMPLEMENTATION OF LOW COST PESTI SPRAYING SYSTEM IN DRONE

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Abstract –

Today, agriculture includes *many* ***technologies, among which drone*** *spraying is one of the* ***new*** *technologies.* ***The use of*** *persona l* ***pesticides can be very dangerous for*** *workers involved in* ***spraying. The*** *effects* ***of infection*** *range from* ***minor*** *skin* ***lesions*** *to bi rth defects, tumors, genetic* ***changes,*** *blood and* ***nervous system*** *disorders, endocrine disorders, dehydration or death. The WHO (W orld Health Organization)* ***estimates*** *that* ***up to*** *one million* ***people have been exposed to pesticides*** *on* ***trees.*** *This* ***time it is not a n*** *aircraft* ***designed for reconnaissance, but*** *a 12 V sprayer, a 0.50 Gm* ***liter*** *tank, 4 microphones for good* ***atomization of the*** *spra y, an octocopter stop frame, a suitable* ***table*** *frame, 8 m -*
Brushless ***DC*** *(BLDC)* ***). Approximately*** *38.2 KG (100% RPM)* ***to produce the necessary thrust force, built-in propeller*** *and suitable* ***Lithium Polymer*** *(LIPO)* ***batteries*** *with a current capacity of 22000 mAh and 22.2 V to meet the current and* ***voltage requirements. First Person Monitor*** *(FPV)* ***cameras*** *and* ***transmitters*** *can be* ***set up wirelessly*** *to monitor spraying* ***progress*** *and* ***track pests*** *on* ***crops. These chemical pesticides reduce*** *the time,* ***manpower*** *and cost of* ***pesticide development.***

Key Words: Drone, Agriculture, Payload, Sensors, Pump, Spray etc.

1. Introduction

India is an agricultural-based country, where more than 50% of the population relies on the agricultural sector. Population growth leads to improved productivity and the level of agricultural protection. Insects often damage plants, reducing production and killing them by using other pesticides. Often, the agricultural field suffers losses due to plant diseases. Pesticides and fertilizers are an important part of pesticides and plant growth. Spraying with hand pesticides, as well as fertilizers Control of fertilizer Spray, and crop monitoring can be done affects people leading to cancer, allergies, asthma, and other diseases. Therefore, automatic with a quadcopter,

which is used for many programs such as search and rescue, Hazmat, police, code testing, Emergency Management, fire. Additional benefits of quadrotor are flexibility, increased charge, higher lift capacity and stability. Control of the quad copter is easier than other aircraft. Quad copter is used in dangerous areas and is used indoors and outdoors. It contains a universal sprayer that spray liquid and solid content. The global pipeline sprays both pesticides and fertilizers but a pressure pump is used for pesticide spraying, and it has not been used for fertilizer spray. GPS can be used to automatically steer the quad copter and remotely control over large areas. The quad copter controlled by automatic control and paid upload is controlled by RF Transmitter and motors. Figure 1 shows a diagram for crop monitoring using aUAV.

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RASPBERRY PI BASED ADVANCED SMART OBJECT DETECTION AND ALERTING SYSTEM THROUGH EMAIL

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Abstract-
Security is one of the biggest concerns of people afte r food and shelter. The video security monitoring sy stem proposed in this project is based on the integrat ion of cameras and Raspberry Pi Zero microcontroll er to the alarm. Raspberry Pi drives a camera to tra nsmit live video and allows access to live events. Thi s project focuses on the development of a security m onitoring system that can detect human access and r espond quickly by capturing images and sending the m to hostbased wireless modules. The Raspberry Pi Zero microcontroller is programmed using function s in Open CV. This smart monitoring system based o n Raspberry Pi comes with the idea of monitoring specific locations in remote areas. The s olution is efficient and easy to use, cost-effective maintenance.

Indexed Terms- security, surveillance, raspberry pi, motion detection, open CV, e-mail notification

I. INTRODUCTION

Security is one of the major concerns that affect our day-to-day life. Everyone wants to be secure. Recently, the world has experienced an exponential increase in crime rate. Criminals break into houses daily around the world carting away huge amounts of money and precious items. Sensitive and confidential documents, materials and equipment in corporations are constantly declared missing from where they are kept. So there is a need to provide a device that can detect unauthorized persons in an environment. Surveillance involves monitoring behaviour, activities, or other changing information for the purpose of influencing, managing, directing, or protecting. This involves observation from a distance by means of electronic equipment or interception of electronically transmitted information (i.e. internet traffic or phone calls).

In recent years, there has been an increase in video surveillance systems in public and private environments due to a heightened sense of security[1, 2]. The next generation of surveillance systems will be able to annotate video and locally coordinate the tracking of objects while multiplexing hundreds of video streams in real time. Video surveillance systems play an increasingly important role in the maintenance of social security. It has been widely used in many settings such as finance, public security, banking and homes. Traditional video surveillance can generally achieve close-distance monitoring by using the PC as a monitor host connected to a monitor camera with a coaxial cable [3].

Initially, it was dominated by analog cameras connected using coaxial cables. For cost and performance reasons, there was a change in preference for digital switching systems and now IP-based delivery of data [1].Detection and tracking of moving objects are important tasks for computer vision, particularly for visual-based surveillance systems. Video surveillance application, most times requires the system to monitor a wide area, so multidirectional cameras or mobile cameras are generally used [4].

Commercial spaces, universities, hospitals and factories require video capturing systems that have the ability to multitask objectives such as alerting and recording live video of an intruder. The advancements in video surveillance technology have made it possible to view your remote security camera from any internet-enabled PC or smart phone from anywhere in the world. This encompasses the use of CCTV (DVRs) systems and IP cameras. This technology is impressive but the price of implementation has proven to bean obstacle, especially for a small home application.

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FARMER FRIENDLY BASED LOW COST SOLAR DRYER FOR FRUITS AND VEGETABLES

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ABSTRACT:

India is one of the **world's major producing** countries and has the **second largest share of** agricultural **income, accounting for** 61% of the **country's total income.** The most valuable **groups will plan** this **progress correctly, making** their **entire country** one of the **world's major producing regions. For** a long time, **many developing countries** and **the youth have been facing shortages of special crops** and vegetables due to **disasters such as earthquakes, heavy rains** and other unforeseen events. **The main problem at present in this article is ensuring** the **safety** of **food** to the **consumer after harvest,** which **accounts for** 60% of **the situation** due to the **method** of **isolating additional goods.** This **article focuses on traditional techniques for drying special crops and vegetables using solar dryers. One of** the **problems they face is the change in exposure price. Tomatoes can be sold at Rs** 80 per **kilo in** one month and **Rs** 20 per **kilo the next month. However, farmers cannot guarantee food** for more than 1 to 2 weeks **due to transportation** costs, **financial difficulties** and **the need for capital** to **build capacity** in **existing facilities.** When **prices** are **too high,** farmers **often** have to **stop producing, causing great suffering.** The **next promise will cause some farmers** to commit suicide. **I found an affordable dryer to solve** this **problem. Made entirely** from bamboo, **the machine is very cost-effective and can produce** bamboo in **the field, allowing farmers to dry their rustic products** and **bring** them **back after** a **minimum** of six **months of finishing, coloring** and **testing.**

INTRODUCTION:

Drying has long been utilized as a method to extend the shelf life of food products, dating back to ancient times. Harnessing the sun's heat and wind, this age-old technique remains a cornerstone of food preservation. However, its energy-intensive nature, coupled with the increasing scarcity and cost of fossil fuels, has spurred a shift towards renewable energy sources. Among these, solar energy stands out for its environmental friendliness and minimal ecological footprint. Various types of solar dryers have been developed and tested across different regions, primarily falling into two categories: natural convection and forced convection. Natural convection dryers rely on buoyancy-induced airflow, while forced convection dryers employ fans, typically powered by electricity, solar modules, or even fossil fuels.

Solar thermal technology, rapidly gaining traction in agricultural applications, offers distinct advantages over other alternatives like wind or shale. Abundant, inexhaustible, and clean, solar energy presents a sustainable solution for food preservation needs. Addressing the pressing issue of agricultural produce preservation, particularly in developing countries, holds significant importance. Inadequate infrastructure, limited processing capacities, and market challenges contribute to substantial post-harvest losses, exacerbating food security concerns. Drying emerges as a viable solution, not only curbing spoilage but also bolstering income opportunities and supply stability.[1]

At the farm level, drying immediately post-harvest, especially during peak harvest periods, helps manage surpluses and extends storage capabilities. Thermal energy-based drying facilitates longer shelf lives and easier transportation by reducing moisture content. Moreover, when executed correctly, drying preserves nutritional quality and inhibits the proliferation of harmful pathogens. While energy-intensive, drying efficiency hinges on several factors such as produce type, size, arrangement on drying racks, and frequency of rotation. Optimal drying necessitates avoiding overcrowding and ensuring regular turning to achieve uniform drying.

Literature Review:

Crop drying is a vital process in agriculture, aimed at reducing moisture content to ensure safe processing and prolonged storage of produce. It is estimated that a significant portion of global vegetable production—about 20%—is lost post-harvest due to inadequate handling and suboptimal postharvest technology implementation. Typically, vegetables and

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FABRICATION OF A DRONE USING APM ADVANCED DEVELOPMENT BOARD

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Abstract.
This **work demonstrates** the development of a **quadcopter** drone **that can track** the **location** of a cert ain area on autopilot. The system includes Ardupilot Mega (APM) 2.8 flight controller, Ublox NEO M8 N GPS module with compass, Racerstar 920kV 2-4S **brushless motor,** Flysky **receiver** FS-iA6B with FSi6 **remote control transmitter, Landing Tool** DJI F450 **Quadcopter Frame Kit Skate board** and **Lithium battery** 3300 mAh 35C. **Ground** control is set up and **operated** through **open sou rce** software **called** Mission Planner. The tracking system **turned into** a **payment system** with BME28 0 **sensor** controlled **by** Arduino Uno R3 SMD. Google Maps **in** Mission Planner **is organized accordin g to** waypoints. The **reading** from the BME280 barometer sensor **is** used to **check** the **accuracy of** the **orientation.** This correction **will** be **important when using** a drone **for delivery.** The results show that the average error **for each orientation** is 5%, **indicating** that **orientation** can be **important in downgr ading the product** for **the customer.**

Keywords: Quadrotor, Ardupilot, Arduino Uno, BME280, Position tracking

1. Introduction

Unmanned aerial systems (UAVs), commonly known as drones, are becoming increasingly popular in modern logistics operations. In recent years, due to the rapid spread of online ordering and the boom in the e-commerce industry, labor demand for shipping operations has doubled. This, coupled with the COVID-19 pandemic, has accelerated the need to find alternative safe and contactless delivery models [1]. Road traffic congestion in urban areas, especially road traffic that is being used beyond capacity, is spurring the development of drone delivery technology. As a result, many retail and logistics industries such as Amazon, DHL, FedEx, Google, PizzaHut, UPS, and Walmart have invested in and used drone technology to implement alternative scalable delivery models [2- 4]. All of the above industries such as Flirtey, Matternet, Volansi, Wing and Zipline are supported by specialized drone suppliers and technology providers. With the advancement of drone technology and increasing commercial use, quadcopters with stable vertical flight capability or VTOL (Vertical Takeoff and Landing) can be used to fly luggage, parcels, fast food, groceries, medical products or other destinations 's product. These drone delivery operations are gaining traction in last-mile delivery due to their improved accuracy, ease of operation, faster delivery times, and lower operating costs [5]. According to analysts, operating costs for drone delivery services are 40% to 70% lower than traditional vehicle delivery service models. This will increase the global demand for drone delivery services and the drone parcel delivery market is currently growing from US$228 million in 2022 to US$5.556 billion in 2030, at a CAGR of 49.0% expected to grow [6].

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POWER FACTOR CORRECTION SYSTEM USING MATLAB WITH DIFFERENT LOADS

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Abstract
Energy efficiency improvements can provide significant cost savings from reduced energy consumption. These savings are often the reason why electric companies charge customers. This review of high-efficiency, state-of-the-art active power factor correction (PFC) technology for high-power, single-phase applications is now available. The advantages and limitations of many PFC technologies used to make switching efficient in modern network servers and telecommunications equipment. The technology includes a variety of zero-voltage and zero current transformers, active biasing methods to reduce back-coupled switching, and techniques to reduce losses. Finally, the impact of recent advances in semiconductor technology (mainly silicon carbide technology) on the performance and design of PFC converters is also discussed.

Keywords: Power, Filter, Rectification, Simulation, Power Factor

1. INTRODUCTION

Any end equipment powered from AC supply represents a complex load where the input current is not always in phase with the instantaneous line voltage. And so, the end equipment consumes both real power as well as reactive power from the supply. The ratio between real, usable power and the total real plus reactive power is known as Power Factor. Laptop Adapters can be the perfect example of end equipment.

PFC (Power Factor Correction) circuit intentionally shapes the input current to be in phase with the instantaneous line voltage and minimizes the total apparent power consumed. Power Factor is a parameter to measure the energy efficiency of the circuit. [15] It shows the efficiency of the circuit and power losses and power consumption of the same.

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ORIGINAL PAPER

Modified puma-optimized novel control strategy for seven-level modular multilevel converter-based static synchronous compensator in grid-connected photovoltaic systems

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Abstract
The use of standalone microgrids has increased because they are more flexible to supply energy as per consumer needs and increase pollution. Integrating renewable energy sources with different loads will increase power quality issues in grid-connected systems. Therefore, this paper proposes a novel control strategy to reduce the power quality problems in microgrids. A standalone solar photovoltaic (PV) system is used in this work for generating input power. The seven-level modular multilevel converter is designed to work with grid-tied renewable sources, with the DC supply powered by a solar-connected power generation system. Power quality issues are solved with the help of a seven-level modular multilevel converter (MMC)-based static synchronous compensator (STATCOM) device. The performance of STATCOM is improved by integrating the tilt integral–tilt derivative (TI-TD) controller with an improved puma optimization algorithm. This controller in a shunt active power filter diminishes current and voltage power quality issues. The Simulink platform is used for the implementation of the proposed work. The performance of the proposed work is validated by including disturbances in the system. The total harmonic distortion (THD) obtained for the proposed model is 0.52%. Performance of the proposed controller is evaluated using different controllers and optimization algorithms. Findings of the simulation and the experiment show better performance of the proposed method.

Keywords Cascaded controller · Puma optimization · Static synchronous compensator · Tilt derivative controller · Tilt integral controller

Abbreviations

PV	Photovoltaic
STATCOM	Static synchronous compensator
TI-TD	Tilt integral–tilt derivative
THD	Total harmonic distortion
CHB	Cascaded H-bridge converters
D-STATCOM	Distribution static compensation
UPQC	Unified power quality conditioners
DVR	Dynamic voltage restorers
SM	Submodules
HBSM	Half-bridge submodules
FBSM	Full-bridge submodule
ASO	Atom search optimization
PSO	Particle swarm optimization
THD	Total harmonic distortion
PI-MR	Proportional–integral multi-resonant
BHO	Black hole optimization
IGBT	Insulated gate bipolar transistor
PID	Proportional–integral–derivative

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SURVEILLANCE MONITORING DRONE WITH LIVE AND ALERTING SYSTEM

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Abstract -
This research paper investigates real-time target detection and video surveillance in UAV systems and focuses on computer vision models and deep learning algorithms. The first part examines computer vision algorithms such as Haar cascades, HOG, template matching, edge detection, and optical flow, while the second part focuses on deep learning algorithms, especially region-based detection and YOLO. Due to low power consumption, the use of deep learning in drones will cause problems. To solve this problem, this paper proposes a cloud computing system that can achieve the purpose of video detection and imaging. The results show that traditional computer vision algorithms are not fast enough for real-time tracking and deep learning algorithms are a suitable alternative system. These research papers contribute to the performance of unmanned aerial vehicles and instantaneous object searching through new ideas that can be used for various applications including vigilance, saving and protection, and agricultural inspection. The scheme can be extended to other applications that need to detect objects in resource-limited areas in real time.

Key Words: *Object-Detection, UAVs, Cloud Tracking, Drone, Region based detection, YOLO, SSD, Traditional computer vision algorithms, Deep learning.*

1. INTRODUCTION

Computer vision has improved significantly in recent years as a result of the advancement of deep learning algorithms [11], advances in hardware capabilities, and more data availability. Detecting items in a specific category such as people, cars, or animals within an image and reporting the location and extent of each object instance is one of the most commonly studied aspects of computer vision.Object detection, including object finding, scene assessment, crowd monitoring, segmentation, image captioning and activity recognition are key elements of a wide range of extremely complex computer vision tasks. Despite significant progress in developing broad object detection systems that can distinguish a wide range of items, there is still a need for precise and efficient object detection in the context of drone applications [14].

Drones are becoming more and more popular in a vast range of timely applications such as surveillance [26], delivery services [27], traffic tracking [28], agriculture [29], disaster management [30], and maritime security [31]. Amazon, for example, has been given federal authorisation to deploy drones as part of its delivery service and there are reports that drones may be an acceptable means of transporting medicinal products in rural areas. In the area of precision farming, drones are also expected to have a significant impact since they can assist farmers in tasks such as crop monitoring, analyses, and management, including selection of effective pesticides and optimisation of water supply. DJI, the world's leading drone maker, is developing drones that are equipped with sensors specific to protect agricultural crops from insects and weeds.

The history of drones dates back many years and it is possible to classify them on the basis of their flight speed, ability to stabilise position, hovering or loitering capability, environmental conditions as well as other characteristics. Various types of Unmanned Air Vehicles, each having its own.

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SMART PHONE CONTROLLED ROBOT USING ARDUINO

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Abstract -
Robots are machines that continuously perform differe nt tasks with high efficiency. They spent a lot of time c ollecting information and exploring places that are too dangerous to send humans. The design concept can sto re and drop items from one place to another. The robo tic arm was designed using Aurdino to pick up and pla ce items via Bluetooth commands. The robot gripper is a cable that holds an object in its jaw and places it fro m one place to another. The robot is powered by an An droidbased smartphone. The robot receives command s from the app. All actions or functions are controlled b y the Aurdino microcontroller and a pair of drives. The robot has four motors; one pair is used to control the direction, one motor is used to compress and release t he clamp, and another motor is used to open and close the clamp.

Key Words: SMS- Short Message Service, GSM- Global System for Mobile, RF- Radio Frequency, IC- Integrated Circuits, USB- Universal Serial Bus, USART-Universal Synchronous/Asynchronous Receiver/Transmitter.

1. INTRODUCTION

Robot is a machine that performs work to assist people. It deals with the design of robots manufacture and applications. Robots consist of five major components, they are- computer which acts as the brain, effectors which are arms and legs of the robot, actuators that activate physical action and sensors that receive information about the surrounding environment and mechanical fixtures which performs overall robot hardware. Robots play very important role in the modern world as they are involved in assisting laborer's in industry to involving in human rescue operations under critical situations. Now-a days in the modern world, industries are focusing of unmanned or an computerized devices to operate to increase productivity and delivery of the final products with greater quality in a shorter period of time. These robots can be fast, accurate and with almost zero error in performing the task. It cost less to operate than a human labor to do the same task. The proposed robot model can pick and place objects from source to destination. The movement of robot is controlled using android based smart phone. The android device has a Bluetooth controller application installed. Robot will operate based on the Bluetooth commands. The over all actions of motor drivers, Bluetooth controller is controlled by Aurdino microcontroller.

2. LITERATURE REVIEW

- Mohamed et.al. introduced a Pick and place robotic arm controlled by Computer vision. Here the robot picks the object at a specific orientation only. The gripper used here is a mechanical gripper. So it can't handle the object safely. Objects in a specific orientation is only picked up by the robotic arm.
- T Yoshimi et.al. introducing a system for picking up operation of thin objects by robotic arm with two fingered parallel gripper. Thin objects like paper and plastic cards are picked up by this robotic arm. The objects may slide down due to the use of parallel gripper. This method does not provide safety of the object.
- Anush et.al introduced design and fabrication of pick and place robotic arm to be used in library. Here the robots pick the books from library and places it in the destination. RFID tags are used to identify the books. The system is capable of doing when it is a line following robot, each RFID has its own path and this makes the robot complex.
- N F Begum et. Al introducing an autonomous android controlled robot design using wireless energy. In this system works according to voice commands or speech delivered by the user and the robotic arm is capable of picking the objects of any type orientation. RF technology is used so line of sight is a major constraint in communication.

3. BLOCK DIAGRAM

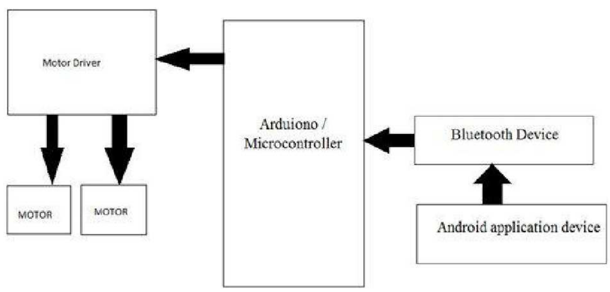

Fig-1: Block diagram of Pick and Place Robot

The proposed model is designed to control the pick and place robot using android based smart phone. Bluetooth is interfaced to the control unit for sensing the signals

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DESIGN AND FABRICATION OF TWO WHEELER BASED ELECTRICAL VEHICLE

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Abstract - *India is the world's second largest producer and exporter of two-wheelers. It ranks second after China and Japan in both domestic production and sales. This article discusses the following functions of an electric two-wheeler. The chassis is an existing two-wheeler (110cc bicycle). The engine is replaced by a battery-powered motor. Perform various calculations such as power, energy, battery and motor, and driving range. Electrical wiring is for electric two-wheelers. Select a source such as a 60V electric motor and connect the battery connection to the battery control unit of the electric motor. The motor is assembled with motor control, digital display, electric throttle, etc. The production of electric two-wheelers is done using equipment with the help of calculations to calculate the output of the vehicle. The cars are tested and compared with different engines.*

Key Words: **Electric vehicles, Battery, Chassis, IC Engine, Fabrication, Testing, Motor, Controller.**

1. INTRODUCTION

India is one among the highest automotive markets within the world these days and having extremely increasing class population with shopping for potential and therefore the steady economic process. However, gasoline value has multiplied over 50% in thirteen completely different steps in last 2 years. Here comes the potential need for various technologies in vehicles like electrical vehicles (EV) in India. though the initial investment is around 1.5 times than standard IC engine, however time has come back once price of setting is currently additional concern than the price of car the aim of this report is to explain the technology accustomed manufacture an electrical vehicle and explain why the electrical engine is best than the interior combustion engine. It includes reasons why the electrical vehicle grew apace and therefore the reason it's a necessity to raise the planet these days. The report describes the foremost necessary components in an electrical vehicle and hybrid vehicle. It compares the electrical to the hybrid and burning engine vehicle. It conjointly includes the long run of the electrical vehicle. The general impact of the electrical vehicle ultimately advantages the individuals. Compared to gasoline steam-powered vehicles, electrical vehicles square measure thought of to be cardinal cleaner, manufacturing no piping emissions that may place stuff into the air.

Environmental problems caused by fossil fuel run vehicles and fuel economy have become a very serious issue in the recent years which has led to the earth's temperature to increase and also causing various global warming effects. It is a necessity to find an alternate to these fossil fuel run vehicles which have a significant role in being green, environmentally friendly and economical and most importantly leaves no carbon footprint behind. Electricity powered vehicles, meet these conditions and because of this, it has become the important goal for all vehicle manufacturing companies to manufacture vehicles with new energy which is green, environmentally friendly and economical. Being an e-scooter, the electrical system plays a promising role in its designing and creation. The electric system consists of battery, motor, motor controller and other equipment. The most important thing that electric system does is that it gives power to the motor which helps within the running of the scooter. E-vehicles now include cars, transit buses, trucks, and even big-rig tractor trailers that are a minimum of partially powered by electricity. Electric vehicles have a very negligible amount of carbon footprint than gasoline-powered cars, no matter where your electricity comes from. It can easily be said that EV is better to the environment taking into considerations the advantages it poses over internal combustion engines. Since it run on batteries, it needs to be charged if exhausted and this can be done at any place, provided there is an electrical outlet, be it an office or at home.

2. LITERATURE REVIEW

Patent drawing for an "Electric Bicycle" (1895)

The history of electrical motorcycles is somewhat unclear. On 19 September 1895, an application for an "electrical bicycle" was filed by Ogden Bolton Jr. of Canton Ohio. On 8 November of an equivalent year, another application for an "electric bicycle" was filed by Hosea W. Libbey of Boston. At the Stanley Cycle Show in 1896 in London, England, bicycle manufacturer Humber exhibited an electrical tandem. Powered by a bank of storage batteries, the motor was placed ahead of the rear wheel. Speed of the tandem was controlled by a resistance placed across the handlebars. The main intend of this electric bicycle was mainly for racetrack use.

The October 1911 issue of standard Mechanics mentioned the introduction of an electrical motorbike. It claimed to own a speed of seventy five miles (121 km) to a hundred miles (160 km) per charge. The motorbike had a three-speed controller, with speeds of four miles (6.4 km), fifteen miles (24 km) and thirty five miles (56 km) per hour.

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DESIGN OF QUARD COPTER USING KK MULTICOPTER UNIT

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ABSTRACT

Drone (drone) is a remote controlbased electronic device used to maintain vertical stability using the KK2.1.5 board, can b e used for social media nature or to capture images using a camera, and can be great in technology to improve performance and reduce the cost of microcontrollers so that citizens can make their own drones. The equipment is connected to the spe ed control, transmitter, receiver, lithium battery and camera. All products are controlled and controlled. The PID controller is adjusted and calibrated to ensure stability for each axis. Now the drone balances itself normally. The purpose of the proj ect has been achieved, the image is stabilized and captured.

Keywords: *Drone, KK2.1.5 board, Transmitter, Receiver, Motors, Camera. for Surveillance.*

1. INTRODUCTION

A Drone has the potential for performing many tasks where humans cannot enter, for example, high temperature and high altitude surveillance in many industries, rescue missions. A Drone has four propellers with motors that generate, the thrust for lifting the aircraft. A drone is also called as the Quadcopter. The basic principle behind the quadcopter is, the two motors will rotate in the clockwise direction the other two will rotate in an anticlockwise direction allowing the aircraft to vertically ascend. While taking the flight with the help a camera we can have live streaming and capture images.

2. SYSTEM OVERVIEW

The system consists of KK2.1.5 Multi-rotor board, transmitter, receiver, Lipo battery, electronic speed controllers, motors, and frame.

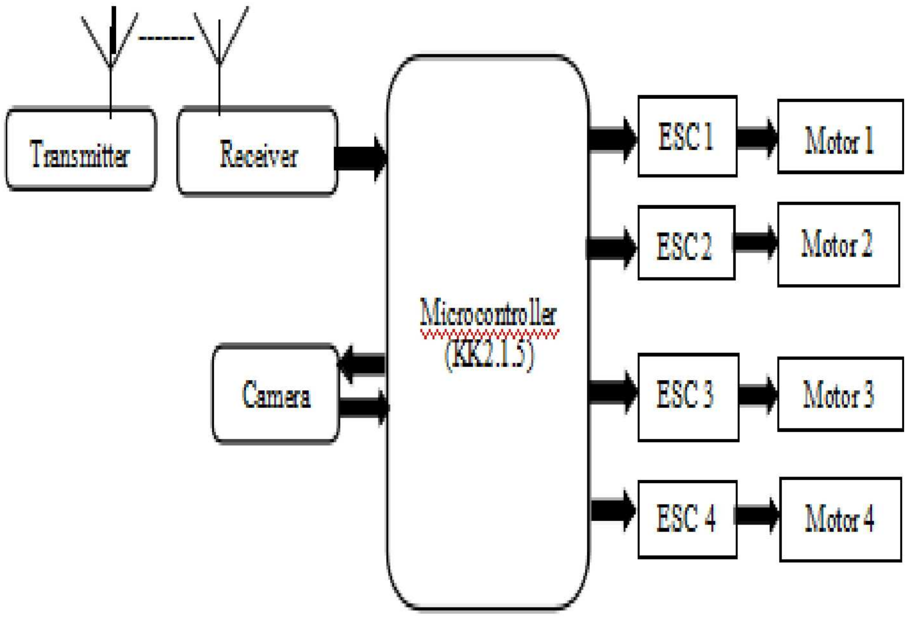

Fig 1: Block Diagram of the Drone

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DESIGN AND FABRICATION OF SEED SOWING ROBOT

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Abstract:
A planting machine should be suitable for every farm and every type of soldier and should be financial, that is, it should be believed that this is what is needed fo r the seed. We have also made a drill that is done ma nually but reduces the effort of the farmer, thus incre asing the planting efficiency and reducing the proble ms encountered in manual planting. With this machin e, we can plant different types and sizes of seeds, and we can change the position of the two seeds during pl anting. This also improves planting and accuracy. Sin ce we produce from raw materials, it is very cheap an d very useful for small farmers. We simplified its desi gn to ensure that any farmer or untrained worker ca n operate the machine efficiently. It is also easy to mo dify and maintain.

***Keyword**: Seed, Sowing, Planting, agriculture, efficiency*

1. INTRODUCTION

Cropping is important and tedious activity for any farmer, and for large scale this activity is so lengthy also it needs more workers. Thus agriculture machines were developed to simplify the human efforts. In manual method of seed planting, we get results such as low seed placement, less spacing efficiencies and serious back ache for the farmer. This also limited the size of field that can be planted. Hence for achieving best performance from a seed planter, the above limits should be optimized. Thus we need to make proper design of the agriculture machine and also selection of the components is also required on the machine to suit the needs of crops.

The agriculture is the backbone of India. And for sustainable growth of India development of agriculture plays vital role. The India has huge population and day by day it is growing thus demand of food is also increasing. In agriculture we saw various machines. Also there traditional methods are there. Since long ago in India traditional method is used. Also India has huge man power. This manual planting is popular in villages of india. But for large scale this method is very troublesome. The farmer has to spend his more time in planting. But time available is less for him. Thus it requires more man power to complete the task within stipulated time which is costlier. Also more wastage happens during manual planting. Hence there is need of developing such a machine which will help the farmer to reduce his efforts while planting. This process of using machines is called as mechanization. Along with mechanization automation also

Here is the block diagram of the machine and working of it. It also tells the hardware implementation, selection of components and controllers. this system is nothing but 4wheel robot system on which seed tank, sowing mechanism and metering device is installed to turn it into automatic operated vehicle.

This article represents the advanced system for improving the agricultural processes such as cultivation on ploughed land, based on robotic assistance. We developed a vehicle having 4wheels and operated by DC motor. The machine will cultivate the farm by considering particular column at fixed distance depending on crop.

2. PROPOSED WORK

This machine has very less cost. This planter is very simple to use hence, unskilled farmer is also able to handle this machine. We simplified the design also made it cheaper and affordable to every rural farmer. We made various adjustments and simplified it from controlling and maintaining point of view. In this design we connected drive shaft to metering mechanism which eliminates the attachments such as pulleys and belts system. DC motor drives the shaft of motor which is coupled with battery bank. As motor starts it moves this robot as well as operates the metering mechanism. Seed storage tank is connected at the top of the robot near rear wheels. The sensor is fitted to it which senses the level of seed in it and gives the alarm when the tank is empty. Front sensor serves the function of guiding the robot. As any obstacle comes in front of robot it gives the signal to the robot and diverts the path of robot. For every rotation of the wheel according to the adjustment it allows the definite seed to fall into the hoper so that there is no wastage of the seeds also the sowing process does smoothly. When the robot reaches at other end and when it completes task it creates an alarm so that we can provide required facility.

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FABRICATION OF IOT BASED POWER FACTOR CORRECTION SYSTEM USING ARDUINO

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Abstract-

It is well known that when inductive loads enter the market, power consumption decreases. If the voltage drops, the elec tricity bill will increase. In our system, when the voltage drops, the automatic capacitor bank opens and the voltage retu rns to the set level. The unique aspect of our research work is the use of Internet of Things (IoT) technology to achieve t his. In addition to monitoring with the search function, it can also monitor and search from anywhere in the network. It uses the Arduino Uno microcontroller as a programming tool. PFs can be adjusted to increase current carrying capacit y, increase power supply, reduce power loss and reduce energy costs. The reactive current generator is a PF correction capacitor. We improve the power factor by helping to balance the idle power used by inductive loads. In this article, the power of the load is measured using the Arduino Uno microcontroller and then the necessary electronic devices are use d to compensate the reactive power and bring the power closer to 1.

Keywords Arduino Uno, power factor, active power, reactive power, voltage converter, relay module.

1. Introduction

Industrial and commercial firms competing in today's competitive marketplaces place a premium on electrical energy efficiency. One of the primary problems that companies strive to reconcile with vitality effectiveness for both reasonable and eco-friendly reasons is the optimal utilization of plants and equipment. Reduced energy usage is becoming increasingly important as society becomes more mindful of its environmental control, and it is a goal that everyone can achieve. Power factor adjustments are optimized by the use of measurements such as electricity usage, resulting in lower energy consumption and lower CO2 greenhouse gas emissions. Its use, however, is contingent on the dimension of the fixing and the range to which the factor of power adjustment is required. By keeping the system reliable, automatic power factor adjustment procedures may be used in power systems, industrial units, and even households. Therefore, the system develops more steadily and the structure's and apparatus' efficiency improves [1].

Capacitor sets for 1 phase use in industry and household solicitations were developed in response to saving power and management of reactive power issues. The goal of the research work is to build a microprocessor-based control system to improve and advance the functioning of 1 phase capacitor sets. The capacitor set will be controlled by the control unit. The current converter is familiar to measure the load current for the sampler, and it plays a significant part in this process. The unique element of our research work is that we used IoT (Internet of Things) technology to complete it. We will be capable to monitor and operate the research work from anywhere over the Internet, in addition to monitoring from the research work display. This microcontroller control unit's intelligent control guarantees even capacitor step use reduces the amount of switching tasks and improves power factor correction [2].

The major goal of this scheme has to develop a spontaneous power factor control system for the goal of making a smart system that will allow us to reap many advantages from a single undertaking. (a) The power quality is improved by continually monitoring the load power factor. (b) Construct an Arduino Uno type correction device for raising the system power factors to the target value close to 0.95. (c) To diminish the penalty. (d) To detect the anomaly before it occurs. (e) Using (IoT) concept, monitor the system's parameters using an online program. (f) A system for checking and adjusting IoT devices.

The active power (kW) is required for accomplishing the real job, and the reactive power (KVAR) is required for

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FET BASED SINE WAVE CONTROLLED MULTI LEVEL INVERTER WITH REDUCED THD

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Abstract—
The use of solar power plants for electricity generation is incr easing day by day in order to reduce the environmental impac t. The generated DC power needs to be converted to AC powe r to power AC loads or to connect to the grid without interferi ng with the operation of the grid. Multi-level inverters are a good choice because the output voltage of the multilevel inverter is a step waveform close to a sine wave, which provides fewer harmonics. As the number of levels incr eases, harmonic distortion decreases, but at the same time, the number of required switching points and DC voltage sources increases, thus increasing the complexity of system design and control. The multi level inverter proposed in this paper can provide 15-level output power for renewable energy applications such as solar photovoltaics using only 7 switches. Complexity and cont rol are reduced because fewer keys are used.

Keywords—Multilevel inverter; 15 level MLI; reduced number of switches; total harmonic distortion.

Abbreviations: *MLI, Multievel Inverter; EMI, Electro Magnetic Interference; PV, Photo Voltaic; NPC, neutral point clamped; PWM, Pulse Width Modulation; THD, total Harmonic Distortion.*

I. INTRODUCTION

Power generation using renewable energy resources is increasing rapidly due to the fast depleting fossil fuel and their impact on the environment. When multiple renewable generation units are interconnected and integrated with the grid, proper synchronization is an important requirement. To connect to the grid an AC is required which is obtained by connecting an inverter in case of solar PV system, as the generation is DC. If the output of the inverter contains harmonics the power injected in the grid pollutes the power system. Thus a proper design of inverter, with reduced harmonic distortion, is a mandate.

In recent years, multilevel inverters have gained more scope as multilevel inverters are able to give out their high operating capability, low switching losses, and higher efficiency with lower output Electromagnetic Interference (EMI). The term 'Multilevel inverter' was first introduced by Nabae et al in the year 1981 with the first concept of the Three-level Multilevel Inverter [1]. Multilevel inverter is gaining its prominence because of its ability to meet the increasing demand of high power rated applications and also the power quality associated with its reduced total harmonic distortion. Multilevel inverters have gained a number of their applications such as UPS, power grid, solar inverter, induction heating and industrial applications with highly powered instruments. Multilevel inverters are nearly able to produce a sinusoidal output-voltage waveform using fundamental frequency switching scheme. A sine wave output is more desirable since many electrical products will be engineered to work at their best with input as sine wave AC power source. In multilevel inverters, multiple voltage sources are added to obtain a stepped waveform. As the number of steps are increased, the waveform looks more close to a sinusoid, thus reducing harmonic content.

II. MULTILEVEL INVERTER TOPOLOGIES

Multilevel Inverters [MLI] are the ones which can give out a stepwise output waveform with the use of power electronic switches, power diodes and some DC voltage source which might be a series/parallel connected PV cells, a renewable source or a battery. Multilevel inverters not only produce low harmonic distortion but also decrease the dv/dt stresses on the equipment [2]. In turn the Electromagnetic compatibility can also be reduced.

Three different types of topologies are available in MLIs. They are diode clamped, Flying Capacitor and Cascaded Multilevel Inverters [3]. In diode clamped MLI, a diode transfers a limited amount of voltage, thereby reducing the stress on other electrical devices [4]. The maximum output voltage is half of the input DC voltage. The diode clamped multilevel inverter was also called the neutral point clamped (NPC) inverter. Cascaded multilevel inverter topology is based on the series connection of each sub cell of the multilevel inverter. Flying capacitor was first introduced by Meynard. This topology has reduncies in inner voltage levels; in other words, two or more valid switch combinations can produce the desired output voltage waveform [5]. Cascaded H Bridge MLIs can be either symmetrical or asymmetrical type. In symmetrical cascaded H-Bridge all the voltage sources used are of same magnitude while in asymmetrical the voltage sources used have unequal magnitudes. Advantages of asymmetrical is that a higher number of levels can be obtained with reduced number of voltage sources. Few researchers have proposed solar based MLI in different literatures [6-8].

III. PROPOSED MULTILEVEL INVERTER

In this paper a hybrid technology is proposed where higher numbers of levels are obtained with reduced number of switches and lesser no. of DC voltage sources. In cascaded MLI using 8 switches we can obtain 7 levels, 12 switches are required for 9 levels and so on. The proposed topology uses only 7 Mosfet switches and three DC voltage

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ORIGINAL PAPER

Modified puma-optimized novel control strategy for seven-level modular multilevel converter-based static synchronous compensator in grid-connected photovoltaic systems

V. Naresh[1] · P. Balachandar[1] · T. S. N. G. Sarada Devi[2] · T. R. Bhuvaneshwari[2]

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Abstract

The use of standalone microgrids has increased because they are more flexible to supply energy as per consumer needs and increase pollution. Integrating renewable energy sources with different loads will increase power quality issues in grid-connected systems. Therefore, this paper proposes a novel control strategy to reduce the power quality problems in microgrids. A standalone solar photovoltaic (PV) system is used in this work for generating input power. The seven-level modular multilevel converter is designed to work with grid-tied renewable sources, with the DC supply powered by a solar-connected power generation system. Power quality issues are solved with the help of a seven-level modular multilevel converter (MMC)-based static synchronous compensator (STATCOM) device. The performance of STATCOM is improved by integrating the tilt integral–tilt derivative (TI-TD) controller with an improved puma optimization algorithm. This controller in a shunt active power filter diminishes current and voltage power quality issues. The Simulink platform is used for the implementation of the proposed work. The performance of the proposed work is validated by including disturbances in the system. The total harmonic distortion (THD) obtained for the proposed model is 0.52%. Performance of the proposed controller is evaluated using different controllers and optimization algorithms. Findings of the simulation and the experiment show better performance of the proposed method.

Keywords Cascaded controller · Puma optimization · Static synchronous compensator · Tilt derivative controller · Tilt integral controller

Abbreviations

PV	Photovoltaic
STATCOM	Static synchronous compensator
TI-TD	Tilt integral–tilt derivative
THD	Total harmonic distortion
CHB	Cascaded H-bridge converters
D-STATCOM	Distribution static compensation
UPQC	Unified power quality conditioners
DVR	Dynamic voltage restorers
SM	Submodules
HBSM	Half-bridge submodules
FBSM	Full-bridge submodule
ASO	Atom search optimization
PSO	Particle swarm optimization
THD	Total harmonic distortion
PI-MR	Proportional–integral multi-resonant
BHO	Black hole optimization
IGBT	Insulated gate bipolar transistor
PID	Proportional–integral–derivative

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SIMULATION OF WIND TURBINE SYSTEM WITH POWER QUALITY ANALYSIS USING MATLAB

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Abstract **– With growing electrical energy demand, wind power capacity has experienced tremendous surge in the past decade, thanks to wind power environmental benefits. Direct driven permanent magnet synchronous generator (PMSG) with a full size back-to-back converter set is one of the promising technologies employed with wind power generation. Wind grid integration brings the problems of voltage fluctuation and harmonic pollution. In the present study, a filter is placed between the wind system and the network to reduce the total harmonic distortion (THD) and enhance power quality during disturbances. The models of wind turbine, PMSG, power electronic converters and the filter are implemented in Matlab/Simulink environment.**

Keywords – wind energy conversion system, PMSG, PWM, THD, power quality, passive filter.

I. Introduction

Worldwide concern about environment has led to increasing interest in technologies for generation of renewable electrical energy. The ever-rising demand for conventional energy sources has driven society towards the need for research and development of alternative energy sources. Several new forms of renewable resources such as wind power generation systems (WPGS) and photovoltaic systems (PV) to supplement fossil fuels have been developed and globally integrated. However, the photovoltaic generation has low energy conversion efficiency and is very costly compared to the wind power. In recent years, wind energy has been regarded as one of the most significant renewable energy sources. Wind energy can be captured and transformed to electric energy by using a wind turbine and an electric generator [1].

Many generators of research interests and for practical use in wind generation are induction machines with wound-rotor or cage type rotor. Recently, the interest in permanent magnet synchronous generators (PMSG) is becoming significant. The desirable features of the PMSG are its compact structure, high air-gap flux density, high power density, high torque-to-inertia and high torque capability. Moreover, compared with an induction generator, a PMSG has the advantage of a higher efficiency due to the absence of rotor losses and lower no-load current below the rated speed, and its decoupling control performance is much less sensitive to the parameter variations of the generator. Therefore, a high performance variable speed generator including high efficiency and high controllability is expected by using a PMSG for a wind generator system [2].

Power quality has also been a growing concern in recent years with many researches done in this area. Harmonic emissions are recognized as a power quality problem [3,4]. For this reason relevant standards require the measurement of harmonics [5]. In this paper, the wind energy conversion system with passive filter capable of reducing Total Harmonic Distortion (THD) noticeably during disturbances is modeled [6].

II. System description

The wind turbine with PMSG is connected to the AC grid through two back-to-back full converters, which consist of an uncontrolled diode rectifier, an internal DC-Link modeled as a capacitor and a PWM (Pulse Width Modulation) voltage-source inverter (VSI) [7]. The filter is connected between the inverter and the grid. The layout of the electrical part is depicted in Fig. 1.

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FABRICATION AND DESIGN OF VERTICAL AXIS WIND TURBINE

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Abstract:
The aim of this **project is to utilize** wind energy in **the best possible way for maximu m energy, so we chose the highway as the installation location** to get **a good effect f rom** the **vehicles** moving on both sides of the road. In the **current study, the** turbine is **designed** and **built according to** the specifications, the blades used are **semicircular** a nd are **attached to the disk** connected to the **shaft. Then the shaft** is connected to the **t raction through bearings** and **the** pulley is connected to the **alternator that produces electricity.** The **electricity produced** is stored in **batteries** and can **later** be used for **li ghting, signaling** or **searching.** In this **project,** a small **prototype was produced** for te sting **purposes. The most important** project **is to produce at the lowest** cost so that th e **state** can **evaluate** this project and **use** vertical axis wind **turbines** on **the highway** at low cost.

Keywords: Vertical axis wind turbine, design, fabrication.

I. INTRODUCTION

Electricity plays and vital role for development of the country, so the production of electricity is one of the main aims of the country. About 68% of the production of electric energy is based on thermal power plant, where fossil fuels, coals, diesel are used for power generation and which is very less available and this fuels also creates pollution, greenhouse effect and global warming. Therefore power generation with the help of non-conventional resource such as wind is increasing day by day and this type of power generation is very clean and safe. The wind turbines are basically of two types 1) Horizontal axis wind turbine (HAWT). 2) Vertical axis wind turbine (VAWT). HAWT has successfully evolvedin making of electricity from wind. However, recently working on VAWT has also been started due to its additional advantage over HAWT such as it does not require yaw mechanism because it can produce power independent of wind direction. VAWT can be produced at low cost then HAWT and also affordable maintenance cost.

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SIMULATION OF DIFFERENT SPEED CONTROL TECHNIQUES OF DC MOTOR (SHUNT, SERIES, AND COMPOUND) USING MATLAB

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Abstract: In this paper we learn about soft computing methods of speed control of direct current (DC) motor. In the past years so many techniques buildup for controlling names are Artificial Neural Networks (ANN's), Fuzzy Logic (FL) algorithm, Grey Wolf Optimizer (GWO), Particle Swarm Optimization (PSO) and so on. These techniques also used with conventional methods by hybridization of any two. In conventional methods, (P, PI, PD and PID) taking so much time for tuning its parameter. So we use these algorithms for tuning a parameterofconventionalcontroller.

***IndexTerms*-PIDalgorithm,Speedcontrol,PIDcontroller,DCmotor,Response**

I. INTRODUCTION

The principle of soft computing techniques is to achieve approximation and getting a better performance. From few years ago so many control techniques are developed for control problem of DC motor. Because of the conventional techniques are used for control the DC motor, which are time taking and poor in performance. The conventional method, i.e. PID controller, is used for control of DC motor. In PID controller having a parameter is difficult to tune, so we use algorithms for tuning and getting a fast responses compare to conventional tuning method.

There are many varieties of control techniques, such as proportional P, proportional integral PI, proportional derivative (PD), proportional integral derivative, adaptive, genetic algorithms, particle swarm optimization (PSO), artificial neural networks (ANN's), fuzzylogic(FL's),cuckoosearch(CS)meta-heuristicoptimizationtechniques,greywolftechniques(GWO)andcombinationofthem.

TheblockdiagramfortheclosedcontrolsystemofDCmotorisgivenbelow.

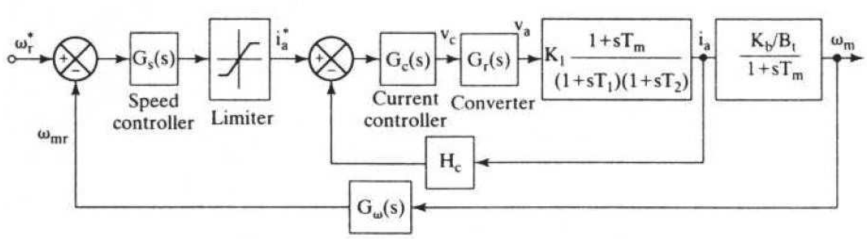

Fig.1.BlockdiagramofSpeedcontrolofDCmotor

As it can be seen from block diagram, there is two loops i.e. inner current loop and outer speed loop. The design of control loops starts from the innermost (fastest) loop and proceeds to the slowest loop which in this case is the outer speed loop. The reason to proceed from the inner to the outer loop in the design process is that the gain and time constant of only on controller at a time are solved, instead of solving for the gain and time constant of all the controller simultaneously.

II. EXPERIMENTALDETAILS

TheclosedloopcontrolsystemofseparatelyexcitedDCmotorissimulatedbyusingMATLAB-2017simulink.

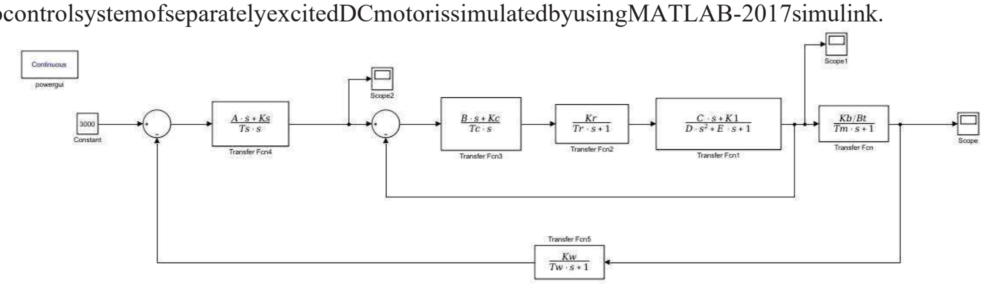

Fig.2.SimulationcompletemodelofDCmotorspeedcontrol

This paper includes two simulation models. The complete model of DC motor speed control is simulated without any approximation i.e. overall exact model of DC motor speed control loop.

The second model is speed control of DC motor with approximation. The current control loop is reduced to second order system taking following two assumptions:

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IOT INTEGRATD CONTROL STRUCTURE OF SPEED MEASUREMENT AND SPEED CONTROLLING STRUCTURE OF DC MOTOR USING BLYNK SERVER

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ABSTRACT

ThispaperintroducesaninnovativeInternetofThings(IoT)basedsystemdesignedtocontrolthespeedanddirectionofaDC motor using the Blynk mobile application. The system integrates an OLED display (SSD1306), an ESP8266 microcontroller,a300RPMDCmotor,andanL293Dmotordriver.Withthissystem,userscanremotelymanagethespeed and direction of the DC motor through the Blynk app, accessible on smartphones or tablets. Real-time feedback on the motor's speed and direction is provided via the OLED display, enhancing user interaction and experience. The ESP8266 microcontrolleractsasthecorecontrolunit,interfacingwiththeBlynkappviaWi-Fitoreceiveusercommandsandadjustthe motor'soperationaccordingly.ThebidirectionalcontrolfeatureoftheL293Dmotordriverenablesprecisemanipulationof the motor's speed and direction. By leveraging IoT technology and the Blynk app, users gain the flexibility to control the motorfromanylocationwithinternetconnectivity,offeringconvenienceandaccessibility.Additionally,theOLEDdisplay enhancestheuserinterface,enablingintuitivemonitoringandadjustmentofmotorparameters.Inconclusion,this system offers a versatile and user-friendly solution for remotely managing DC motor speed and direction, with potential applicationsspanningacrosshomeautomation,robotics,andindustrialcontrolsystems.

Keywords:InternetofThings(IoT),DCmotorcontrol,Blynkmobileapplication,OLEDdisplay(SSD1306),ESP8266 microcontroller,L293Dmotordriver,Remotecontrol,Real-timefeedback,Wi-Ficonnectivity,HomeAutomation, Robotics,IndustrialControlSystems https://zenodo.org/records/14632244 Vol.14, Issue No 4, Dec 2024

HIGH EFFICIENCY BIDIRECTIONAL LLC+C RESONANT CONVERTER WITH PARALLEL TRANSFORMERS FOR SOLAR-CHARGED ELECTRIC VEHICLES

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ABSTRACT: Electric vehicles (EVs) are considered to be the means of transportation of the future. They are more efficient and they don't have as many emissions compared to fossil fuel-powered vehicles. However, electric vehicles are currently charged from the grid. Its fuel structure is mainly based on fossil fuels. To make electric vehicles sustainable, charging them from a sustainable source of electricity is essential. Therefore, charging electric vehicles from photovoltaic (PV) panels is a suggestion for the future. At the same time, photovoltaic power generation has the characteristics of daily and seasonal changes. This requires a grid connection to ensure a reliable power source for charging electric vehicles. Office buildings, factories and other workplaces like industrial areas are ideal places to facilitate the charging of solar-powered electric vehicles and can be installed on the roofs of buildings and parking lots. With photovoltaic (PV) panels there are several advantages to charging electric vehicles. Since photovoltaics generate charging power locally, they reduce the grid's demand for electric vehicle charging power. EV batteries can be used as photovoltaic energy storage to reduce the negative impact of large-scale photovoltaic grid connections in the distribution network. Electric vehicles are parked for a long time in the workplace, and the energy consumption for charging is low, allowing VehicletoGrid (V2G) technology in which electric vehicles act as controllable generators.

I. INTRODUCTION

A. Review

To charge EV from PV, the separate converter of EV and PV connected to the AC grid can be used. Alternatively, a single integrated converter connected to the EV, PV and the grid can be used. Several studies have proposed a three- port power converter for charging electric vehicles from PV. Direct DC charging for electric vehicles in the PV of the interconnected ZVTPWM buck converter is entered on the 210 V DC bus. A closed-circuit control was developed and a 2.4kW prototype was built to provide EV charging but not V2G. In the DC, the nanowire is used to charge photovoltaic electric vehicles, fuel cells and AC grids and 1.5 kW DC\/DC full-bridge LLC resonant converters. The basic components of the system are used. A three-port 3.3 kW bidirectional 380 VDClink converter integrates electric, photovoltaic and single-phase AC power grids. The efficiency of the built-in converter has been increased by 7 Compared with separate converters for EV and PV, which is up to 15%. Two DC\/DC converters for charging electric vehicles PV on the 48V backup battery in the 3.3kW system have no two-way power flow and are connected to the grid or isolated with the EV. A solar charging system for single-phase V2G\/V2H scooters was developed. Functionally, it uses 2x12V low-voltage batteries, buck and boost converters for DCDC power conversion and a Hbridge for inverter operation. In previous studies, these designs were not suitable for high power (> 5 kW) three-phase applications. Consider electric vehicle charging standards in terms of charging current ripple, EMI, and\/insulation. Similarly, after reviewing various EVPV topologies, the conclusion drawn is that most designs ignore the EV isolation requirements. High-frequency AClink based on multi-winding transformers is used to integrate EV, battery Storage and renewable energy. Although the topology provides the benefit of isolation between all ports and is suitable for high power, it is not suitable for EVPV applications for two reasons. European regulations have stipulated that photovoltaic energy and the grid need to be isolated. Secondly, PV and EV are essentially CC, so a link will cause unnecessary conversion steps. A 10 kW non-isolated bidirectional converter was proposed for charging EV from PV. Use of 575 V DC bus, integration and closed-loop control of EV, PV, and network are designed to reduce PV intermittently. Symmetrically, an isolated 5kW Zsource converter is used to charge electric vehicles from PV. Performance comparison of transformerless and isolated high-frequency transformer topologies show the overall advantages of the Zsource converter. Similarly, the

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ELECTRIC VEHICLE-TO-VEHICLE ENERGY TRANSFER USING ON-BOARD CONVERTERS

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Abstract - - *People's desire to buy pure battery electric vehicles is hindered by the delayed development of energy storage technology, combined with the limited number of plug-in charging points. Due to the limited number of charging stations available, this technology can be used to expand charging options through vehicle-to-vehicle (V2V) charging. The vehicle-to-vehicle (V2V) wireless charging system offers a flexible and fast energy exchange method for charging electric vehicles (EVs) without the need for charging stations. A new framework for vehicle-to-vehicle wireless charging technology is introduced that can work with or without plug-in electric cars. V2V charging requires overcoming various technological hurdles, including the angular displacement of the resonant coils of wireless power transfer. The mutual inductance of the two resonant coils is an important characteristic for high performance and efficient power transfer.*

***Key Words*: Wireless charging system, vehicle-to-vehicle (V2V) charging, the mutual inductance of the two resonant coils, flexible and fast energy exchange method, charging electric vehicles (EVs)**

1. INTRODUCTION

Transportation is an important aspect of our lives, just like food and water. It affects our daily lives, but it must be controlled by intelligent systems; one day in the future it will be completely controlled by things, not people. To improve safety, we need to start and improve V2V and Vehicle-to-Infrastructure "V2I" technologies. Intelligent Transportation Systems (ITS) is a broad and evolving field, with some components converging or overlapping. For example, traffic and travel information can be considered part of the Smart Cities agenda, and similarly "connected cars" are a combination of Machine-to-Machine (M2M) and Internet of Things (IOT) communication, while V2V communication is typically developed as part of Intelligent Transport Systems (ITS)[3].

The implementation of this technology is more environmentally beneficial than the use of fossil fuels, which contribute to the greenhouse effect. This alternative technology is developing rapidly and will soon become the current transportation system. The electric car can be further upgraded to become a self-driving vehicle.

One of the challenges of electric vehicles is the energy management system, which involves charging and discharging the car. Examples of new technologies (V2V) are vehicle-to-grid, smart grid and vehicle-to-vehicle charging. V2V can be particularly useful because charging can happen anywhere without having to travel to a specific charging station; currently there are not as many charging facilities for electric cars as there are for traditional fossil fuel charging stations (gas stations).

The V2V system can be further enhanced by using a wireless charging system in which the source car charges the other vehicle without using a physical wire. Because it does not require stopping or standing still, this wireless charging solution is more promising and efficient. In this study, the concept of wireless charging of a real-time inter-vehicle charging system is discussed.

Wireless technology allows a vehicle such as a bus or an automated vehicle to continue driving; therefore, this system does not interfere with the automatic vehicle planning system. In this study, inter-vehicle charging is replicated using two mobile robots displaying an automated vehicle. This study is a continuation of our previous research that underlies the wireless system. It discusses the concept of an automatic vehicle.

1.1 Methodology

1.1.1 Existing system

In the existing systems of EV charging grid to vehicle charging is present. Mostly plug-in EV chargers are implemented. Wireless chargers are not yet implemented commercially since plug-in chargers are simple to design and more affordable.

1.1.2 Proposed System

Due to limited availability of charging stations, charging of EVs will be a major problem [5]. In case of emergency charging requirements, the availability of grid connected charges is very limited and in case of charge down situations vehicles are unable to move from that spot to the charging stations. For that we propose a wireless charger which serves dual purpose.

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SIMULATION OF BUCK CONVERTER USING SIMULINK AND SPICE TOOL

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This article looks at how the power converter designer can use the system-level and detailed models together to enable exploration of the design space and also achieve high confidence in the results. An example of this process will be shown using MathWorks system- level modelling tools Simulink® and Simscape™ with detailed SPICE subcircuitsrepresentingInfineonAutomotiveMOSFETs.

Introduction

Duringthedevelopmentofelectricalpowerconverters,numeri- cal simulations are typically used during the concept and feasibil- ity study.Thesimulationmodelsneedtoincludeboththeanalogcircuit and the corresponding digital controllers. Examples of the design questionsthatmodelscanhelpanswerinclude:

Whichtopologyshouldbeused?

- Foragiventopology,whatperformancecanbeachieved?
- WhatPWMswitchingfrequencyshouldbeused?
- What values and ratings are required for the passive compo- nents?
- Whatkindofpowerswitchshouldbeused:
  - type(likeMOSFETsorIGBTsorBJTs)?
  - technology and voltage ratings (like Infineon's OptiMOS™ or CoolMOS™)andmaterials(likeSiorSiCorGaN)?
- What are the requirements on the gate driver circuits including minimumrequireddead-time?

Finally,basedonpreviousassessments:

- System efficiency and component losses may be estimated, and subsequentlyasuitablecoolingsystemcanbedeveloped;
- The trade-off of system efficiency with EM compatibility can be investigated. Switching losses and EMI are both dependent on switchingfrequencyandpowerswitchslewrate.

SPICE simulation tools are the go-to solution for circuit designers. However,thedesignstepsdescribeddependonbeingabletosim-ulate thepowerconverterinreasonabletime.Circuitsimulation toolslike Simscape™Electrical™havesimpledevicemodelsthatareessentially idealswitchesplustabulatedswitchinglosseswhichmeetthis efficient simulation need. Moreover, tight integration withSimulink® means thatthedigitalcontrollerisalsoincludedinthesimulationwithnoneed for co-simulation. However, the ideal switch assumption creates some uncertainty for the later design steps focused on determining efficiency and fine-tuning the design. This uncertainty can be addressed by using detailed SPICE device models developed by the component manufacturer. In this paper, a process is defined that enables fastexplorationofthedesign spacewhilstalsocapitalizingon thedetailedfoundrySPICEcompo- nentmodels.Centraltotheprocessis makinguseofmultiplemod-elswithdifferinglevelsoffidelity,matching themodelthespecificdesignquestiontobeanswered.Alsoimportant is the use of low- fidelity levels to pre-initialize detailed simulation modelstherebyreducinginitializationtime.

Buckconverterdesignexample

A48V/12VDC/DCstep-downbuckconvertershowninFigure1isused astheexampleinthispaper.Abuckconverterstepsdowntheinputvoltage (V_IN) to a lower-level output voltage (V_OUT), and the main equation characterizingitsbehaviorisgivenby:

Equation1

$$d=\frac{V\_OUT}{} \Rightarrow V\_OUT=d*V\_IN \quad V\_IN$$

where d represents the duty cycle of the high side power switch (HS_SW).Thedutycycleofthelowsidepowerswitch(LS_SW)isgiven byd' definedby:

Equation2

$$d' = 1-d$$

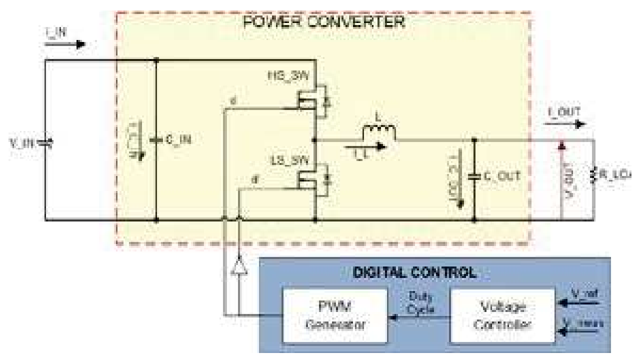

Figure 1: Structure of buck (Step-Down) DC/DC power converter

Basedonthereferencevoltage(V_ref)andmeasuredoutputvolt- age (V_meas), the discrete-time proportional plus integral voltage controllercalculatesrequireddutycycle(d).

Infineon SPICE MOSFET model

SPICE ("Simulation Program with Integrated Circuit Emphasis") sim- ulators are the most commonly-used technology for analog circuit simulation. Therefore, as de-facto industrial standard, many semi- conductor manufacturers develop SPICE models of their products to supportcircuitdesign.

Infineon's portfolio of automotive qualified OptiMOS™ power MOS- FETs offer benchmark quality in a range from 20V-300V, diversified packages and an $R_{ds(on)}$ down to 0.55 mΩ. Structure of typical Infi- neon'sSPICEmodelofMOSFETisshownonFigure2.Thisbehav- ioral MOSFETmodel[1]describesboththeelectricalandthermal characteristicsofthepowerswitch.

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MULTIPLE-SOURCE SINGLE-OUTPUT BUCK-BOOST DC–DC CONVERTER WITH INCREASED RELIABILITY

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ABSTRACT

DC-DC converters provide a major contribution in today's power electronics world. They find use in many applications like renewable energy resources which include solar, wind, fuel cell and so on. Renewable energy sources mainly depend on climatic conditions and will be varying in nature. To get a stable DC voltage, we can use various kinds of renewable sources simultaneously. Among the different kind of DC-DC converters, multiport DC-DC converter is a kind of DC-DC converter which becomes popular in use because of its efficiency, reliability, use of less number of components, reduced cost and also due to the production of more number of outputs with either a single input or by multiple inputs. By using a multiport DC-DC converter we can obtain different levels of voltages from a single converter itself which finds its usage in applications like an electric vehicle, renewable energy, etc. In this paper, a study regarding different topologies of multiport DC-DC converters with single input and multiple outputs is discussed. These converters are compared at the end and their advantages and disadvantages are also explained.

KEYWORDS:Voltagegain,Zerovoltageswitching,Coupledinductor,MPPT,SEPICconverter.

I. INTRODUCTION

Nowadays, DC-DC power converters play main role in the field of power electronics. During the last years in the power electronics field & the progresses marked in this field paved the way for the progress of multiport converter (MPC) topologies [1]. They have single or multiple inputs & output ports to which power supplies & loads can be connected as in Figure 1. The basic criteria for MPCs include high efficiency, reduced size & cost. MPCs are widely demanded in renewable energy resources (RES), electric vehicles (EV) personal computers & provides energy flow, voltage regulation between various inputs & outputs which makes the whole system simpler & more compact with reduced no. of components [2]. MPCs may be grouped as the function of input & output numbers as multi input-multi output (MIMO), multi input-single output (MISO) & single input-multi output (SIMO) converters. Second classification of MPCs include isolated type & non-isolated type. There is no galvanic isolation for non-isolated MPC within different ports & depending on the number of inductors they can be further categorized into single inductor MPC (SI-MPC) or multiple inductor MPC (MI-MPC). Multiport converters with only one input source has been investigated in this study on the basis of voltage gain, duty ratio, switching frequency, power conversion efficiency & no. of power switches used [3].

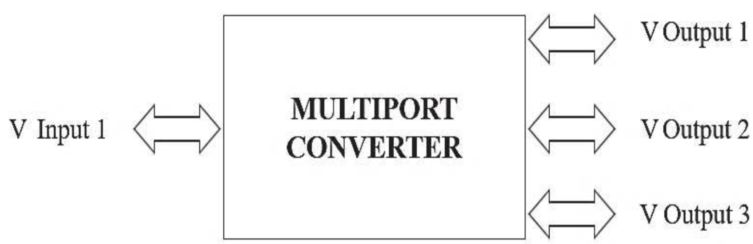

Fig-1: Basicblockofmultiportconverter(SIMOTopology)

II. DUALOUTPUTDC-DCCONVERTERWITHFLYBACKTOPOLOGY

In [4], a novel integrated DC-DC converter section which produces a step-up output & a step-down output is discussed. Both the outputs are regulated simultaneously by establishing a better controlling strategy. Comparing with discrete type configurations, here this converter prefers reduced count of switches. For boost stage, the converter offers an increased boost ratio & is able to clamp the switch voltage spikes. For step-down stage, steady state performances & the dynamic performances same as that of conventional type buck converter

UNIVERSAL BRIDGELESS NON ISOLATED BATTERY CHARGER WITH WIDE OUTPUT VOLTAGE RANGE

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ArticleInfo

Abstract

Background and Objectives: Increasing environmental problems have led to the spread of Electric Vehicles (EVs). One of the attractive research fields of electric vehicles is the charging battery of this strategic product. Electric vehicle battery chargers often lack bidirectional power flow and the flexibility to handle a wide range of battery voltages. This study proposes a non-isolated bidirectional DC-DC converter connected to a T-type converter with a reduced number of switches to solve this limitation.

Methods: The proposed converter uses a DC-DC converter that has an interleaved structure along with a three-level T-type converter with a reduced number of switches and a common ground for the input and output terminals. Space vector pulse width modulation (SVPWM) and carrier based sinusoidal pulse width modulation (CBPWM) control the converter for Vehicle to grid (V2G) and grid to Vehicle (G2V) operation, respectively.

Results: Theoretical analysis shows 96.9% efficiency for 15.8kW output power and 3.06% THD during charging with low battery voltage ripple. In V2G mode, it achieves an efficiency of 96.5% while injecting 0.5 kW of power into the 380V 50Hz grid. The DC link voltage is stabilized. The proposed converter also provides good performance for a wide range of battery development.

Conclusion: The proposed converter offers high efficiency and cost reduction. It provides the possibility of charging a wide range of batteries and provides V2G and G2V power flow performance. The proposed converter is capable of being placed in the fast battery charging category. The ability to charge two batteries makes it a suitable option for charging stations.

Keywords:
Electricvehicle
Batterycharger
Non-isolatedbidirectionaldc-dc converter
T-typethree-levelconverter
Chargingstation

Introduction

Electric vehicles (EV) play an important role in transportation and automotive related markets. The expansion of electric vehicles (EVs) is an ongoing trend in today's society, with the EV market growing at a very fast rate [1]. Therefore, to fully employ the potentially great number of EVs, proper charging infrastructure is a necessity [2]. This is especially crucial in terms of the ability to charge the EVs rapidly, e.g., on highways, where the utilization of highly-performant fast and ultra-fast charging stations is required. There is a large variety of approaches that can be employed to construct fast charging stations that differ in the voltage levels, the presence of additional battery energy storage, as well as the grid structure (unipolar vs. bipolar) [3], [4]. Here, an EV charging system with a bipolar DC grid with +/-750 V and extra battery energy storage is considered, as such a system is considered advantageous compared to more conventional approaches [5]-[7]. Increasing demand in the transportation industry with electric vehicles requires a suitable charging infrastructure for this demand.

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CASCADED H-BRIDGE MOSFET-BASED VOLTAGE SOURCE INVERTERS WITH 7 LEVEL

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Abstract: This research on cascade H-Bridge multilevel inverter in these days for various sectors goes on rapidly due to its systematic operation. This paper proposes a harmonic minimization in distribution network by using power converter. This project deals simulation and experimentation of 7-level inverter. It presents 7-level inverter with harmonics reduction along with the reduction in number of switches. The percentage (%) total harmonic distortion is calculated for 7-level inverter. A standardcascademultilevelinverterrequiresnDCsourcesfor2n+1level.Thefunctionalityverificationofthe7-levelinverteris doneusingMATLABandHARDWARE.Theresultofsimulationisverifiedbyexperimentation.Theharmoniccomponentsof theoutputvoltageandswitchinglossescanbediminishedconsiderably.

Keywords: Harmonic,inverter,voltage,DcSource.

I. INTRODUCTION

Tremendous industrial applications have initiated using high power conversion tenders in recent decades. Nearly low and medium voltage motor drives and efficacy applications require low, medium voltage and high power level for a mediumvoltagegrid;itisworryingtoconnectdirectlyasingle switch.Asaresult,multilevelpowerconverter(bothrectifiers and inverters), has been introduced as an alternative in high powerandmediumvoltagesituations.

The model of multilevel inverters has been introduced later 1975.The term multilevel starts with the three level inverters. Multilevelinvertersincludeanarrayofpowersemiconductors and capacitor voltage sources, the output of which generates voltages with stepped waveforms with less distortion, less switchingfrequency,higherefficiency,lowervoltagedevices and better electro-magnetic compatibility. A multilevel inverter not only archives high power ratings, but also enables the use of renewable energy sources. Renewable energy sources such as photo voltaic, wind and fuel cells can be easily interfacedtoamultilevelinverter(converter)systemforahigh power application. The multilevel power converters can be referredasvoltagesynthesizersinwhichhighoutputvoltageis synthesizedfrommanydiscretesmallervoltageslevels.

The advantage of multilevel converters when compared to other converters can be listed as follows: they can generate output voltages with extremely low distortion and lower (dv/dt), they draw input current with very low distortion, they can operate with a lower switching frequency, their efficiency is high (>98%) because of the minimum switching frequency, they are suitable for medium to high power applications, multilevel waveform naturally limits the problem of large voltage transients. The selection of the best multilevel topologyforeachapplicationisoften not clear and is subject to various engineering tradeoffs. The differentmultileveltopologiesare,Diode-clampedmultilevel inverter, Capacitor-clamped multilevel inverter and Cascadedmultilevelinverter.

II. KINDS OFMULTILEVELINVERTER

1. DiodeClampedMultilevelInverter

The first practical multilevel topology is the neutral point clamped PWM technology first introduced by Nabe.etal in 1980. For m-level inverter, dc bus voltage is splits into ‗m' levelsby(m-1)seriesconnectedbulkcapacitors.Here,diodes clamp the switch voltage to half the level of the dc bus voltage, which is an added advantage of this type. This multilevel inverter has some disadvantages than the cascade multilevel inverter.Butithassomeadvantagesasfollows.Thismultilevel inverter is difficult compare than cascade multilevel inverter. Excessive clamping diodes are required when levels are high. The issue of maintaining the charge balance of the capacitors is still an open issue for NPC topologies with more than three levels.

2. FlyingCapacitorMultilevelInverter

Thistopologywasfirstproposedin1992andisconsideredtobe the serious alternative to the diode clamped topology. In addition to improving the waveform quality, these multilevel inverters substantially reduce voltage stress on the devices. Howeverinthistypeofinvertersthe required voltage blocking capabilities of the clamping diodes at higher levels is high. So an alternative multilevel structure where the voltage across an open switch is constrained by clamping diodes has been proposed by Meynard. These inverters are commonly known asflyingcapacitor.Thismakesthetopologyattractiveevenfor the dc/dc conversion. At the present time it seems that this topology has few advantages like: Large amount of storage capacitors can provide capabilities during power

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SUPER TWISTING SLIDING-MODE CONTROL OF GRID-TIED QUASI-Z-SOURCE INVERTERS UNDER DISTORTED GRID VOLTAGE

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Abstract

The quasi-Z-source inverter (qZSI) with the proposed battery operation can balance the turbulence of photovoltaic (PV) power injected to the load as in the existing topology, but overcomes the limitations in the rating, size and life of battery. This paper proposes a new topology that is optimized for off grid applications. The characteristics of the proposed idea are analyzed in detail. In the proposed model, voltage boost and inversion are integrated in a single-stage inverter. A prototype is built to experiment the proposed circuit and to test the control methods. The results obtained are verified with the theoretical analysis and proves the effectiveness of the proposed control of the inverter's input and output power and battery power. The PV panel and energy-stored qZSI, setup used in the experiment demonstrates three operating modes that make it suitable for off grid applications.

1. Introduction

The rapidly increasing environmental degradation across the globe is posing a major challenge to develop commercially feasible alternative sources of electrical energy generation. Thus, a huge research effort is being conducted worldwide to come up with a solution in developing an environmentally benign and long-term sustainable solution in electric power generation. The major players in renewable energy generation are photovoltaic (PV), wind farms, fuel cell, and biomass.

These distributed power generation sources are widely accepted for micro grid applications. However, the reliability of the micro grid relies upon the interfacing power converter. Thus the proper power regulation from the

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MODIFIED DEADBEAT PREDICTIVE CURRENT CONTROL METHOD FOR SINGLE-PHASE AC–DC PFC CONVERTER IN EV CHARGING SYSTEM

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Abstract—

Nowadays, use of conventional vehicles is increasing rapidly, which cause to rise pollution and dangerous environmentaleffects.Hence,Electricvehiclecomesintoapicture,becausetheyrunsonnoorverylessfuel.Thisvehicle totallyrunsonbattery,sobatterychargersystemshouldbefastandworkeffectively.So,hereinourpaperwehaveuse boost converter to charge our battery. Along with this we have also used rectifier circuit, CT, PT, micro-controller. We usedboostconverterbecauseitischipandboostoutputvoltagethat'swhyefficiencyofbatterychargerincreases.Here, we try to maintain power factor at AC side near to unity that's why losses in system decreases and ultimately efficiency increases.Simulationinthepapershowsthepracticaloutputofourtopic,whichisnearlyunityandoutputwaveformis almostripplefree.So,wegetalmostDCwaveforbatterycharging.

Keywords— Electric vehicles (EV), Proportional Integral Derivative (PID), Metal Oxide Semiconductor Field Effect Transistor(MOSFET,Boostconverter,Comparator, PowerFactorCorrection(PFC).

INTRODUCTION

Emerging trends in vehicles nowadays have created huge progress in a field of automobiles, but rapid increase in a number of conventionalvehiclesleadstoincreaseinpollutionandalsouseoffuel.Thisbothfactorshaveveryharmfulanddangerouseffect economy as well health too. So to overcome all these challenges there is a invention of Electric Battery vehicle. Electric vehicle includes Electric- lorries, electric trains, electric cars, Electric-trucks. Battery is virtual soul or heart of EV. The design of the batteryshouldbesuchthatitshouldabletochargeitselffastandWorkefficientlyEVhaszerofuelemission.EVworksonveryless or no fuel, so it is a green energy. EV runs on battery so the battery needs to charge daily. Hence we need efficient as wall as fast batterycharger.Hencethistopiccomesintoapicture.

Here transformer to step down the voltage of 230v to 12v. We have use rectifier to convert AC-DC as battery needs DC supply. Capacitors are also used here as a filter to remove the distortions in a signal. And due to this EV battery chargers have very high efficiency. Here we have used a Boost converter because it is the cost-effective and most reliable solution for both input current shapingcapabilityandvoltageregulation.BoostconverterisDC-DCtypeofconverter.

Whichisusedtostepupthevoltageattheoutputside.

BLOCKDIAGRAMANDWORKING

TheBlockdiagramfortheproposedworkisshowninthebelowfigure(3)thisprojectconsistsofthreemaincircuitsthose circuits are:

STABILITY ANALYSIS FOR DFIG-BASED WIND FARM GRID-CONNECTED SYSTEM UNDER ALL WIND SPEED CONDITIONS

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Abstract— **The proposal of this project addresses the reactive power generation of offshore wind parks using double fed induction generators (DFIG) connected to the main grid with long cables. During steady state operation, reactive power can be generated with minimum power loss of wind energy system while meeting the grid code requirement. During grid disturbance, the windpowergeneratorshavetoprovidevoltagesupportbyincreasing reactive current supply. DFIG are the machines of choice for large wind turbines. The doubly fed induction generator system is investigated as viable alternative to adjust speed over a wide range while keeping cost of the power converters minimal. Decoupled controlofactiveandreactivepowercanberealizedusingthedynamic model of the DFIG. The modeling and control of DFIG and the simulation was done in MATLAB Simulink environment and the resultsareverified.**

Keywords—**Double fed induction generator, Wind turbine, Grid fault,Reactivepowergeneration.**

I. INTRODUCTION

Electrical power can be alternatively generated by renewable energy. There are various renewable energy sources available and one of the well advanced sources is wind energy also commonly used for generating electrical power.Windenergyisconvertedintoelectricalpowerusingwind turbine(WTs)anditcanbeoperatedateitherfixed(or)variable speed.Thegeneratedofthefixedandvariablespeedwind turbines are controlled by electrical grid and power electronicequipmentrespectively.

The Variable speed wind turbines are most commonly used because it has characteristics of noise reduction, active and reactivepowercontrolandreductionofmechanical[8].

In recent years, for large wind turbines double-fed induction generators are mostly used by industries. Double- fed induction generator has the advantage of handling fraction (20-30%)ofthetotalpowerbyitspowerelectronic equipment,which madeitsverypopular.

In direct-driven synchronous generator the power electronic equipment has to handle the total system power so the losses in its power electronic equipment can be higher than the double- fed inductiongenerator.

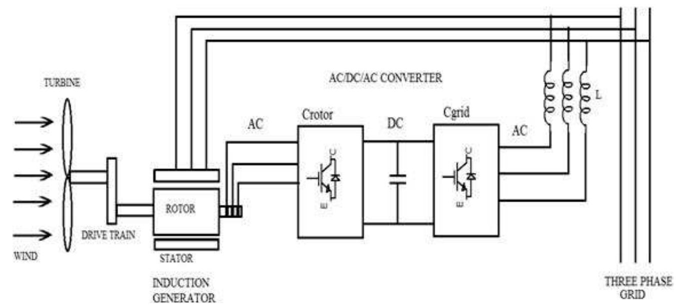

Fig.1.WindturbinebasedDFIG.

So,themainobjectiveofthispaperis

- To study reactive power performance of the DFIG under steadystateandtransientsconditions.
- DFIG operation for variable speed and its corresponding capacitytowardsthereactivepowercontrol.

In this paper presents real and reactive power control of DFIG during normal and faulty conditions. Integration of wind energy into existing power systems leads to various power quality problems. During grid faults DFIG can able to inject reactive powertothegrid.

II. DOUBLEFEDINDUCTIONGENERATOR

The A standard double fed induction generator consists of wound rotor induction machine and IGBT-based PWM converter. The stator and rotor windings of the doubly fed induction generator is connected to the 50Hz grid through AC/DC/AC convertor connected to rotor winding and DC/AC converter connected to gridiscalledgridsideconvertor.

The main application of double-fed induction generator (DFIG) is the high-power wind application. DFIG has an advantage of control rotor current flows which leads to two main functions namely reactive power control and variable speed operation. By this featured it can works at the wide range of the wind speeds with maximum efficiency. The AC/DC/AC conversion is normally PWM convertors, which reduces the harmonics, present in the wind turbines driven DFIG system using sinusoidal PWM technique. Here C_{rotor} represents rotor side convertor and C_{grid} represents grid side convertor. The speed of the wind turbine can be controlled by electronic control (or) gear boxes.

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A SINGLE INDUCTOR MULTI-PORT POWER CONVERTER FOR ELECTRIC VEHICLE APPLICATIONS

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ABSTRACT

DC-DC converters provide a major contribution in today's power electronics world. They find use in many applications like renewable energy resources which include solar, wind, fuel cell and so on. Renewable energy sources mainly depend on climatic conditions and will be varying in nature. To get a stable DC voltage, we can use various kinds of renewable sources simultaneously. Among the different kind of DC-DC converters, multiport DC-DC converter is a kind of DC-DC converter which becomes popular in use because of its efficiency, reliability, use of less number of components, reduced cost and also due to the production of more number of outputs with either a single input or by multiple inputs. By using a multiport DC-DC converter we can obtain different levels of voltages from a single converter itself which finds its usage in applications like an electric vehicle, renewable energy, etc. In this paper, a study regarding different topologies of multiport DC-DC converters with single input and multiple outputs is discussed. These converters are compared at the end and their advantages and disadvantages are also explained.

KEYWORDS:Voltagegain,Zerovoltageswitching,Coupledinductor,MPPT,SEPICconverter.

I. INTRODUCTION

Nowadays, DC-DC power converters play main role in the field of power electronics. During the last years in the power electronics field & the progresses marked in this field paved the way for the progress of multiport converter (MPC) topologies [1]. They have single or multiple inputs & output ports to which power supplies & loads can be connected as in Figure 1. The basic criteria for MPCs include high efficiency, reduced size & cost. MPCs are widely demanded in renewable energy resources (RES), electric vehicles (EV) personal computers & provides energy flow, voltage regulation between various inputs & outputs which makes the whole system simpler & more compact with reduced no. of components [2]. MPCs may be grouped as the function of input & output numbers as multi input-multi output (MIMO), multi input-single output (MISO) & single input-multi output (SIMO) converters. Second classification of MPCs include isolated type & non-isolated type. There is no galvanic isolation for non-isolated MPC within different ports & depending on the number of inductors they can be further categorized into single inductor MPC (SI-MPC) or multiple inductor MPC (MI-MPC). Multiport converters with only one input source has been investigated in this study on the basis of voltage gain, duty ratio, switching frequency, power conversion efficiency & no. of power switches used [3].

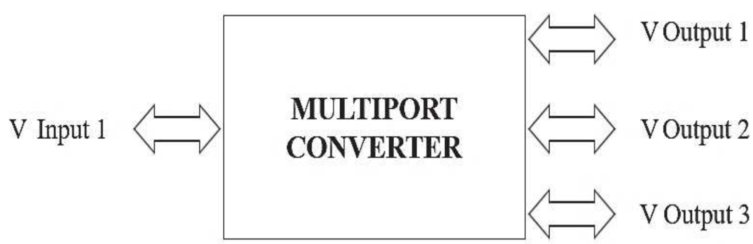

Fig-1: Basicblockofmultiportconverter(SIMOTopology)

II. DUALOUTPUTDC-DCCONVERTERWITHFLYBACKTOPOLOGY

In [4], a novel integrated DC-DC converter section which produces a step-up output & a step-down output is discussed. Both the outputs are regulated simultaneously by establishing a better controlling strategy. Comparing with discrete type configurations, here this converter prefers reduced count of switches. For boost stage, the converter offers an increased boost ratio & is able to clamp the switch voltage spikes. For step-down stage, steady state performances & the dynamic performances same as that of conventional type buck converter

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FABRICATION OF SOLAR MPPT SYSTEM USING LDR SENSOR WITH VOLTAGE MONITORING SYSTEM FOR BETTER ACCURACY

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Abstract: In this paper a Maximum Power point (MPP) tracking system is developed using dual-axis DC motor feedback tracking control system. An efficient and accurate DC motor system is used to increase the system efficiency and reduces the solar cell system coast. The suggested automated DC motor control system based on the photovoltaic (PV) modules operated with the µ-microcontroller. This servo system will track the sun rays in order to get MPP during the day using direct radiation. A photometric cell is used to sensor the direct sun radiation and to feed a signal to the µ microcontroller and then select the DC motor mechanism to deliver optimum energy. The proposed system is demonstrated through simulation results. Finally, using the proposed system based on microcontroller, the system will be more efficient, minimum cost, and maximum power transfer is obtained.

Keywords: DCmoto, LDR, MPPT, µ-controller, Photovoltic

I. INTRODUCTION

PV cells are made of semiconductor materials, such as silicon. For solar cells, a thin semiconductor wafer is specially treated to form an electric field, positive on one side and negative on the other. When light energy strikes the solar cell, electrons are knocked loose from the atoms in the semiconductor material. If electrical conductors are attached to the positive and negative sides, forming an electrical circuit, the electrons can be captured in the form of an electric current and generate electric power. This electric power can then be used to power a load [1-3]. A PV cell can either be circular or square in construction. The power that one module can produce is not sufficient to meet the requirements of home or business. Most PV arrays use an inverter to convert the DC power into alternating current that can supply loads such as motors, lights etc. The modules in a PV array are usually first connected in series to obtain the desired voltages; the individual modules are then connected in parallel to allow the system to produce more current [4]. The different PV system configurations are displayed in Figure 1. Photovoltaic (PV) cells are basically transducers that directly convert solar energy into electrical energy. The physics behind such cells is similar to that of the basic p-n junction [6, 7]. It follows that an appropriate model of the PV cell should be able to predict its electrical characteristics under different irradiance and temperature levels.

Most of the widely used models of PV cells follow the equivalent circuit approach where a PV cell is represented by an equivalent circuit that consists of one or two diodes [6,8,9].

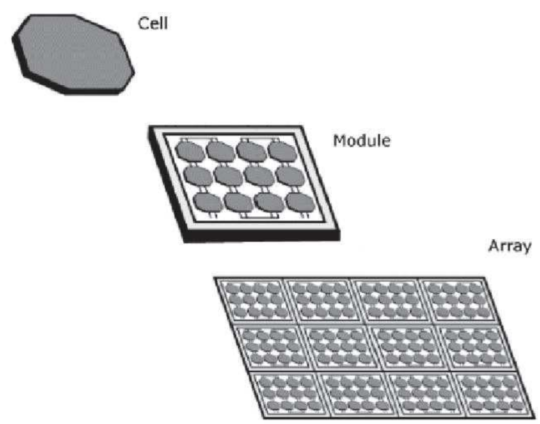

Figure1:Photovoltaicsystems[5]

A simple and popular model of the PV cell is the one representing it with an equivalent circuit consisting of a single diode [10-12]. In such a model, the ohmic losses can be taken into consideration by including a series resistance and/or a shunt resistance. When both the series and shunt resistances are considered, the model of the PV cell, which is shown in Figure 2 (a), requires computation of five parameters in order to establish the current-voltage relationship that characterizes the cell [13]. The number of parameters becomes four when only the series resistance is taken into consideration [5, 14-17]. The four parameters model is shown in Figure 2 (b). An attractive feature of the aforementioned models is that most of the calculations only rely on the data provided by the manufacturer. Another important feature is the fact that these models can be used in representing a single cell, a module of connected cells, or even an array of modules. The single diode model is suitable for system-level designs. However, experiments requiring high accuracy at the expense of complication can use more complicated models such as the two diodes model [11, 18].

ANFIS Controller for Hybrid Power Generation with Bidirectional VSC

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This research propose the design and execution of an Adaptive Neuro-Fuzzy Inference System (ANFIS) controller for a hybrid power generating system that combines solar and wind energy sources with a bidirectional Voltage Source Converter (VSC). The suggested system seeks to improve power quality, optimize energy usage, and provide uninterrupted bidirectional power flow among renewable sources, the load, and the grid. The ANFIS controller integrates the learning abilities of neural networks with the decision-making skills of fuzzy logic, allowing it to dynamically adjust to changing renewable energy inputs and diverse load circumstances. The bidirectional VSC enables efficient energy transfer with the grid, provides reactive power correction, and maintains voltage stability. The simulation findings illustrate the efficacy of the ANFIS controller in attaining rapid response, little harmonic distortion, and stable operation, establishing it as a formidable option for contemporary renewable energy systems. Below, we propose the ANFIS controller for regulating generation and grid. The primary purpose is integrated application of renewable energy concepts and control systems for the qualitative and measurable improvement of electrical power generated from solar and wind resources. The power produced from basic solar and wind resources is typically at a particular level. Yet the addition of solar and wind sources and control systems will definitely be extra in quantity and by the application of power digital converters, the power generated will be a lot more efficient.
Keywords: ANFIS, PV, Wind, Dc-Dc converter, Grid, BtB.

1. Introduction

1) The importance of renewable resource sources is growing rapidly in the modern world. Since these sources will undoubtedly produce much less air pollution than other conventional (non-renewable) energy sources, their use is generally encouraged. When weighed against traditional energy sources, non-conventional ones consistently come out on top when it comes to cost savings, reduced contamination levels, fuel preservation, maintenance requirements, and simple disposal of old gas. But because of their cyclical nature, they can't be there whenever you need them. The use of such resources to meet the need for energy supply

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Intelligent Fault Detection and Shading Analysis in Photovoltaic Arrays: A Fuzzy Logic Approach for Enhanced Performance and Reliability

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***Abstract* – Among various renewable energy resources, solar power holds tremendous potential to address the challenge of depleting non-renewable energy sources. In contemporary times, an increasing number of households are embracing photovoltaic (PV) systems. As the adoption of these systems grows, it becomes crucial to monitor them effectively to safeguard against weather and atmospheric conditions. This study proposes an innovative technique for fault detection in photovoltaic arrays through the application of a fuzzy logic controller. Utilizing a simulation model, the voltage and current variations are analyzed under eight distinct fault scenarios, including open circuit, short circuit, partial shading, bypass diode failure, snow accumulation, and faults such as bird droppings or tree leaves. The simulated attributes are then input into the fuzzy logic controller, enabling it to predict the type of fault occurring within or between photovoltaic modules.**

***Keywords* - Solar power, photovoltaic array, fault detection, fuzzy logic controller**

I. INTRODUCTION

Renewable energy sources, including wind energy, solar Photovoltaic (PV), and hydropower, are lauded for being environmentally friendly, free, clean, and virtually inexhaustible [1, 2]. In the realm of electrical markets, PV has witnessed remarkable growth, propelled by factors such as the decreasing cost of solar panels, prolonged panel lifespan, and the simplicity of installation and maintenance [3]. Amidst these advantages, the importance of maintenance has escalated to optimize energy extraction from solar panels over their operational lifespan, with Maximum Power Point Tracker (MPPT) playing a pivotal role in ensuring Maximum Power (Pm) extraction.

Exploration of MPPT has been extensively documented in the literature [4-6]. The global proliferation of PV systems across diverse applications, ranging from space to residential, commercial, and industrial domains, attests to the widespread adoption of PV panels [7]. However, this increased adoption has also brought about a higher incidence of PV component failures, stemming from factors such as module cuts, open circuits in different strings, and more. These failures significantly impede the operational efficiency of PV generation systems, impacting overall system performance.

In response to these challenges, research and development efforts [8] have made notable strides in implementing online fault detection mechanisms to identify issues early on. This forward-thinking strategy seeks to improve the efficiency and reliability of PV systems, underscoring the ongoing dedication to advancing renewable energy technologies.

Challenges within PV clusters fall into two main categories: temporary and permanent faults, both leading to decreased output power and diminished solar energy generation compared to optimal conditions [9]. While temporary faults are brief, they require safety mechanisms to distinguish them from permanent faults and avoid unnecessary shutdowns [10]. Enhancing stability, minimizing downtime, and optimizing the efficiency of PV systems necessitate the implementation of various fault resolution and detection methods to ensure a seamless flow of solar generation [11]. Ground-Coupled Photovoltaic (GCPV) systems utilize various methodologies for fault detection. In one method [12], automatic oversight employs OPC technology-based monitoring to calculate Voltage and Current Ratios, effectively identifying a range of faults within the system. Other approaches, discussed in references [13-14], rely on real-time assessments of environmental conditions and specific photovoltaic parameters to detect potential issues. However, a notable drawback of these methods is the substantial cost associated with the required equipment. To address

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Design and Management of an Integrated Solar-Wind Conversion System Using DFIG

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***Abstract*— Wind energy plays a crucial role in the global pursuit of sustainable and renewable energy sources. The need for wind energy is driven by its environmental benefits, economic advantages, job creation potential, and its role in diversifying the energy mix towards a more sustainable and resilient future. Solar energy is a critical component of the global shift towards sustainable and renewable energy sources. The need for solar energy is driven by its sustainability, environmental benefits, economic viability, job creation potential, and its role in diversifying the energy mix towards a cleaner and more sustainable future. Designing and controlling a Solar-Wind Integrated Conversion System with a Doubly Fed Induction Generator (DFIG) involves combining both solar and wind energy sources to generate electricity, and utilizing a DFIG as a key component in the power conversion process. Power conversion from solar and wind sources for a home user is essential for several reasons, contributing to the advancement of sustainable and decentralized energy systems. Power conversion from solar and wind to home users is critical for promoting sustainability, reducing reliance on traditional energy sources, lowering costs, and contributing to a more resilient and environmentally friendly energy infrastructure. It aligns with the global transition towards cleaner and decentralized energy systems.**

Keywords*— *Rotors, Doubly fed induction generators, Mathematical model, Generators, DFIG, boost converter.

I. INTRODUCTION

The idea behind solar power generation is to harness the energy from the sun and convert it into usable electricity. This process primarily involves the use of solar photovoltaic (PV) cells or solar thermal systems. While the initial investment in solar infrastructure can be significant, the long-term benefits, including reduced operating costs and environmental advantages, make solar power an increasingly attractive option for electricity generation. This method uses mirrors or lenses to concentrate sunlight onto a small area, usually a receiver. The concentrated sunlight is used to generate heat, which is then used to produce steam and drive a turbine connected to a generator. Different solar thermal technologies exist, such as parabolic troughs that focus sunlight along a line, solar towers where sunlight is focused on a central receiver at the top of a tower, and dish-Stirling systems that use a parabolic dish to concentrate sunlight onto a small receiver. Electricity is generated by solar power without releasing carbon dioxide or other air pollutants or greenhouse gases into the atmosphere. It lessens the environmental damage caused by conventional fossil fuel-based power generation and helps to slow down climate change. Solar energy systems have a low carbon footprint compared to conventional energy sources. Using solar power helps reduce overall greenhouse gas emissions, contributing to efforts to combat global warming [1-2].

This enhances energy security for countries and reduces vulnerability to geopolitical uncertainties. Once installed, solar photovoltaic (PV) systems have relatively low operating and maintenance costs. With no fuel costs and minimal ongoing expenses, solar power becomes economically competitive, especially as technology costs continue to decline [3]. The solar industry creates jobs in manufacturing, installation, operation, and maintenance of solar power systems. This job creation stimulates economic growth and supports the transition to a more sustainable energy economy [4].

Solar power can be utilized for off-grid applications, providing electricity in remote or rural areas where traditional power infrastructure is unavailable or impractical. It helps bridge the energy access gap. Ongoing research and development in solar technology continue to improve efficiency, reduce costs, and enhance the overall performance of solar power systems. Innovations include advanced materials, higher efficiency solar cells, and improved energy storage solutions. Advances in energy storage technologies supplying electricity during periods of high demand [5-6].

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IoT Interfaced Improved Smart P&O MPPT Assisted PV-Wind Based Smart Grid Monitoring System

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Abstract*—As the world's energy needs rise and fossil fuels run out, scientists are searching for new sources of energy. When it comes to electricity generation, solar and wind energy are the most promising. Double fed induction generator (DFIG)-based wind turbine and solar panel (PV) make up the recommended system. Improved Perturbation & Observation (P&O) Maximum Power Point Tracking (MPPT) technique is used to maximize power, while Cuk converter is utilized to raise the DC voltage in solar PV. With a DFIG base, a wind turbine's AC output voltage is transformed to DC. The DC voltage is received by the three-phase Voltage Source Inverter (VSI) from the hybrid system, which then transforms it to AC voltage. The grid side voltage is stabilized by the use of a PI Controller. The obtained AC electricity is ultimately supplied to the grid for other purposes. The hybrid system's simulation model is made with MATLAB. The PV-Wind grid system's properties are tracked via the Internet of Things (IoT).

***Keywords*—IoT, PV-Wind monitoring, DFIG, Cuk converter, Improved P&O MPPT, PI Controller**

I. Introduction

Internet of Things (IoT) is a setup that links electronic, digital, and mechanical devices that can transport data over a network without human assistance. Its advantages are numerous and includes increased accuracy and efficiency, decreased reliance on human involvement, and lower costs. IoT can open doors for new business models, enable the creation of smart homes, smart grids, and smart cities, and is used in all sectors of society [1]. Due to the world population's rapid growth, the power consumption has been increasing daily which increases the demand for electricity production. At the current rate, exploitation of fossil resources like coal, oil, and natural gas causes environmental degradation. The ecology suffers greatly as a result of effects and pollution. Due to this, a lot of research is being done on renewable energy sources and systems in an effort to come up with an affordable, effective, reliable, and ecologically friendly solution [2]. As a result, sustainable and eco-friendly substitutes for traditional energy resources have evolved. The most preferred electrical energy sources are solar and wind power due to their availability and steadily declining investment prices. [3].

However, the comparatively lower solar cell conversion efficiency of PV is a major disadvantage. The effectiveness of solar cells usually varies from 9% to 17%, and this is dependent on the weather. Additionally, solar energy production depends on PV systems (unreliable due to weather conditions). Therefore, effective control methods are essential to guarantee the efficiency and dependability of the PV system operation [4]. To effectively capture solar energy, DC-DC converters are widely used in both stand-alone and grid-connected installations. Many topologies have been shown to be less successful with converters, including Boost and Buck-Boost [5, 6]. To obtain the optimal value, MPPT algorithms are used as crucial components. The main use of MPPT, is to make use of the solar panel to its maximum capacity. Some of the, MPPT techniques are Optimal Torque Control (OTC), the Generator Signal Feedback (GSF), Hill Climbing (HC), Tip Speed Ratio (TSR), and Wind Turbine Power Curves (WTPC) techniques. But they increase computational time [7]. In solar energy systems, P&O approach becomes unstable under abrupt irradiance fluctuations and the tracking performance gets affected [8, 9]. The PWM generator controls the power flow by altering full power transmission and no power transmission [10]. DFIG is a tool that transforms kinetic energy into mechanical form and then converted to electrical energy. As wind energy is increasingly used to complement conventional power generation, the associated grid's stability and Power Quality (PQ) are significantly harmed by the stochastic wind behavior. A PI controller is used to prevent significant disturbance and noise during its operation [11]. The PWM rectifier converts AC voltage to dc. A high-voltage DC link is created by connecting the rectifier's DC output [12]. Its output is sent to a 3-phase VSI which converts DC current to AC current [13]. This PV-Wind based smart grid system is tracked using IoT. The main use of IoT is to enable industrial automation, smart energy monitoring, and a wide range of

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DDSRF Theory for Power Quality in UPFC Applications

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***Abstract*—The electrical method's power quality is critical for businesses, factories, and residential applications. Users and utilities have been more concerned about the quality of power as the demand for high-quality electrical power has increased, as has the number of distortion loads. In this paper proposed the Decoupled Double Synchronous Reference Frame (DDSRF) model for the power quality in unified power flow controller (UPFC) applications also the FACTs parts that controls the communication line's active and reactive power flow. This article attempted to improve power superiority by using a fuzzy logic controller (FLC) and boost converter with solar system founded UPFC to regulator both active and reactive supremacy movement, adjust power issue, control line power, and increase passing steadiness. The DDSRF generates an annular harmonic that is diametrically opposed to the load harmonic. The frequency is then injected into electricity systems, reducing the influence of harmonics. The THD value comparison has the value of 2.2% using DDSRF theory.**

***Keywords*—Decoupled Double Synchronous Reference Frame, unified power flow controller, Pulse Width Modulation (PWM), Boost converter, FLC.**

I. Introduction

Power integrity is a set of electric limits that enables a piece of gear to operate in its intended manner any substantial loss of efficiency or life span. The nature of the relationship among power quality and vulnerable equipment explains the difficulty in measuring power quality problems. What is considered "good" vitality for a single piece of gear may be measured "bad" energy for another. Due to changes in production or part tolerance, several identical gadgets or sets of gear may react significantly to the same power quality parameters [1]. Electrical services are no longer self-contained entities; instead, they are part of a huge network of utilities linked together in a sophisticated grid [2]. The amalgamation of these elements has resulted in power grids that require high-quality electricity. The quality of electrical electricity is the primary priority of power providers and their clients. Since the late 1980s, the phrase "power quality" has been a buzzword in the power business. There are multiple descriptions of power quality. One of the most applicable is that any potential, current, and/or frequency changes that cause an accident or problem in the consumer's electrical equipment are regarded a power quality concern. [3, 4]. Power quality decline is commonly caused by load switching, system failures, motor starts, load changes, unpredictable loads, periodic loads, and arc furnaces. Surges, drops, sinusoidal distortions, delays, flicker, and signaling levels are all caused by such disturbances [5].

It is triggered by an unexpected spike in demand, a voltage drop in the power supply, or a system malfunction. Voltage swell is a brief rise in voltage above normal that lasts a few rounds to a brief period. It is triggered by sudden shifts in load or when a system malfunction is cleared [6]. Power quality is an indicator of how near an electrical voltage is to ideal at any particular moment or position. A sine wave of high quality electrical voltage reflects precisely what is required in both frequency and voltage [7]. The above mentioned power quality issues are controlled by the control approaches. Vector the present control also known as dq present control) is a popular three-phase AC current control method that employs a revolving base frame that is synchronized with the grid voltage dq-frame [8].The main disadvantages of the control structure implemented in synchronous reference frame are its reliance on voltage feed-forward and cross-coupling blocks. To diminish this SRF theory is implied to control the power quality issue, a flexible control strategy based on SRF theory is provided for DVR to alleviate the voltage drop problem for sensitive loads in the transmission system [9]. The drawback of SRF theory is less flexible, more complex also having the low efficiency power to control the power quality issue. In this paper proposed the DDSRF theory is used to control the power quality issue and enhancing the power [10].

The proposed converter employs DDSRF theory to generate the reference current from the alternating current supply. When the demands are imbalanced and nonlinear, DDSRF theory may extract the sequence elements that make up currents and avoid double frequency oscillations caused by injecting positive as well as negative-sequence currents. [11]. To increase this performance, a UPFC controller type

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Improved SEPIC Converter for PFC Correction in Industrial AC And DC Drive Application

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***Abstract*—In this context, examinations and evaluations of an Improved SEPIC Converter, powered Brushless DC motor (BLDC) drive is presented. The Improved SEPIC (Single-Ended Primary-Inductor Converter) minimum signal and circuit analysis evaluates variations at resonance frequencies. Also included is a control strategy for controlling the DC link voltage. It is recommended to use a bridgeless AC-DC power factor in power supply and battery chargers. The BLDC motor may function in a variety of phases, but the most popular is the 3-phase since it is more effective and produces very little torque. The motor needs the right speed controllers to work at the optimum level. The major speed management approach used with BLDC motors is PI control with hysteresis or pulse width modulation shifting. The Hall detector system detects the velocity of the BLDC motors. Hysteresis current control (HCC) is one of the most basic PWM techniques. The system is strengthened by utilizing PWM to combine the benefits of PWM with the hysteresis controller. Using MATLAB - SIMULATION, the different dynamic properties of BLDC motors, including speed, current, and back emf are analyzed. The Efficiency of the Improved SEPIC Converter is 98.7% respectively.**

***Keywords*— BLDC, PI, HCC, PFC and PWM.**

I. INTRODUCTION

A crucial component of commercial battery chargers is the AC-DC PFC converter. To fulfil the regulatory criteria of input current, output voltage, and PFC implementation in these applications is crucial [1]. If the right control is applied, the boost PFC topology realizes virtually unity power factor. Contrary to the boost PFC converter, bridgeless boost converter topologies do not use a diode bridge rectifier [2]. As a result, the input rectifier bridge's conduction losses and related heat management problems are decreased by the bridgeless converter. Inrush currents happen when the PFC circuit is connected to an input voltage in these converters that has a peak bigger than the instantaneous DC voltage [3]. The complexity and extra circuitry needed to address these issues in boost-derived converters typically compromise system efficiency. As a result, these converters need inrush current for practical applications and to guard against damage when connected to AC power.

The AC-DC converter architecture suggested in achieves bridgeless converter operation and allows for the limitation of the start-up inrush current without the use of an additional circuit [4]. Additionally, complicated variable frequency digital control is needed for this converter. The name of the BLDC motor implies one of its main distinctions from the DC motor. Unlike the "brushes" DC motor, the typical DC motor has brushes connected to its stator [5]. Since BLDC motors are electronically commutated, no brushes are required for commutation [6]. Stability is taken into consideration when doing the open loop analysis.

Using different kinds of PWM and a PI controller, the computational model and simulation of BLDC motor speed and the impact it has on torque are examined. In order for the BLDC motor to rotate, the stator wounds are sequentially energized [7].Despite the fact that it is well-known, basic, and has been in use for a long time, it can be easily implemented on conventional or electronic parts. It employs a computerized system to switch direct current (DC) currents to the motor winds, which generate fields of magnets that circle in space and are caught by a permanent magnet rotor [8]. A BLDC motor speed controller adjusts PWM duty cycles to generate sine impulses. According to the task at hand, the switching frequency of PWM may vary. It should, however, be adequate to prevent power loss. The mechanical constraints of the stator define the highest possible speed range [9].

The HCC features a straightforward implementation, quick transient response, and direct peak current limiter. Additionally, the vector control drive arrangement only needs one PI controller [10]. When working with high computation controllers, such as artificial intelligent control, this PWM approach typically becomes a preferred option. The instability of the band directly affects the frequency of the switch in alongside conductivity and loss of switching. By expanding the hysteresis band (HB), the switching rate can be lowered [11]. The HCC methodology outperforms conventional current control techniques like sinusoidal PWM [12]. However, the HCC's bandwidth affects the acceptable current shaping error [13]. The SEPIC output is controlled by the command switch's duty cycle [14]. In comparison to a fly back converter (isolated buck-boost) that uses transformers for isolation, the SEPIC converter

IoT Interfaced Improved Smart P&O MPPT Assisted PV-Wind Based Smart Grid Monitoring System

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***Abstract*—As the world's energy needs rise and fossil fuels run out, scientists are searching for new sources of energy. When it comes to electricity generation, solar and wind energy are the most promising. Double fed induction generator (DFIG)-based wind turbine and solar panel (PV) make up the recommended system. Improved Perturbation & Observation (P&O) Maximum Power Point Tracking (MPPT) technique is used to maximize power, while Cuk converter is utilized to raise the DC voltage in solar PV. With a DFIG base, a wind turbine's AC output voltage is transformed to DC. The DC voltage is received by the three-phase Voltage Source Inverter (VSI) from the hybrid system, which then transforms it to AC voltage. The grid side voltage is stabilized by the use of a PI Controller. The obtained AC electricity is ultimately supplied to the grid for other purposes. The hybrid system's simulation model is made with MATLAB. The PV-Wind grid system's properties are tracked via the Internet of Things (IoT).**

***Keywords*—IoT, PV-Wind monitoring, DFIG, Cuk converter, Improved P&O MPPT, PI Controller**

I. Introduction

Internet of Things (IoT) is a setup that links electronic, digital, and mechanical devices that can transport data over a network without human assistance. Its advantages are numerous and includes increased accuracy and efficiency, decreased reliance on human involvement, and lower costs. IoT can open doors for new business models, enable the creation of smart homes, smart grids, and smart cities, and is used in all sectors of society [1]. Due to the world population's rapid growth, the power consumption has been increasing daily which increases the demand for electricity production. At the current rate, exploitation of fossil resources like coal, oil, and natural gas causes environmental degradation. The ecology suffers greatly as a result of effects and pollution. Due to this, a lot of research is being done on renewable energy sources and systems in an effort to come up with an affordable, effective, reliable, and ecologically friendly solution [2]. As a result, sustainable and eco-friendly substitutes for traditional energy resources have evolved. The most preferred electrical energy sources are solar and wind power due to their availability and steadily declining investment prices. [3].

However, the comparatively lower solar cell conversion efficiency of PV is a major disadvantage. The effectiveness of solar cells usually varies from 9% to 17%, and this is dependent on the weather. Additionally, solar energy production depends on PV systems (unreliable due to weather conditions). Therefore, effective control methods are essential to guarantee the efficiency and dependability of the PV system operation [4]. To effectively capture solar energy, DC-DC converters are widely used in both stand-alone and grid-connected installations. Many topologies have been shown to be less successful with converters, including Boost and Buck-Boost [5, 6]. To obtain the optimal value, MPPT algorithms are used as crucial components. The main use of MPPT, is to make use of the solar panel to its maximum capacity. Some of the, MPPT techniques are Optimal Torque Control (OTC), the Generator Signal Feedback (GSF), Hill Climbing (HC), Tip Speed Ratio (TSR), and Wind Turbine Power Curves (WTPC) techniques. But they increase computational time [7]. In solar energy systems, P&O approach becomes unstable under abrupt irradiance fluctuations and the tracking performance gets affected [8, 9]. The PWM generator controls the power flow by altering full power transmission and no power transmission [10]. DFIG is a tool that transforms kinetic energy into mechanical form and then converted to electrical energy. As wind energy is increasingly used to complement conventional power generation, the associated grid's stability and Power Quality (PQ) are significantly harmed by the stochastic wind behavior. A PI controller is used to prevent significant disturbance and noise during its operation [11]. The PWM rectifier converts AC voltage to dc. A high-voltage DC link is created by connecting the rectifier's DC output [12]. Its output is sent to a 3-phase VSI which converts DC current to AC current [13]. This PV-Wind based smart grid system is tracked using IoT. The main use of IoT is to enable industrial automation, smart energy monitoring, and a wide range of

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