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3.3.2 Number of books and chapters in edited volumes/books published and papers published in national/ international conference proceedings per teacher during a year 2020-21					
Sr. No.	**Name of the teacher**	**Title of the book/chapters published**	**Title of the paper**	**Title of the proceedings of the conference**	**Name of the conference**
1	Amol Ubale, Parmeshwar Ritapure	Techno-Societal 2020	Dynamic Modeling and Experimental Study of Forced Convection Evacuated Tube Solar Collector Used for Grape Dryer	Proceedings of the 3rd International Conference on Advanced Technologies for Societal Applications—Volume 2	International Conference on Advanced Technologies for Societal Applications
2	Parmeshwar P Ritapure, Amol Ubale, B.D. Aldar	Techno-Societal 2020	Effect Analysis of Process Parameters on Lubricated Sliding Wear of Al–25Zn–2Cu-2.5 Si Alloy for Plain Bearing Application	Proceedings of the 3rd International Conference on Advanced Technologies for Societal Applications—Volume 2	International Conference on Advanced Technologies for Societal Applications
3	Dr. Jagtap H. P.	Reliability Management and Engineering: Challenges and Future Trends	Reliability analysis using condition monitoring approach in thermal power plants	NA	NA
4	Dr. Jagtap H. P.	Nature Inspired Optimization in Advanced Manufacturing Processes and Systems under series AI in Engineering CRC Press	Application of particle swarm optimization method for availability optimization of thermal power plant	NA	International Conference on Advanced Technologies for Societal Applications
5	Rajan K Petkar	Lecture Notes in Mechanical Engineering book series (LNME)	Investigation of Thermal Desalination System Using Heat Recovery		Advances in Mechanical Engineering

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Sr. No.	**Name of the teacher**	**Title of the book/chapters published**	**Title of the paper**	**Title of the proceedings of the conference**	**Name of the conference**
6	Prof. Magade P. B.	Techno-Societal 2020	"Structural analysis of novel mini horizontal axis wind turbine (NMHAWT)," Springer International Publishing AG 2020, Techno-Societal 2020	NA	International Conference on Advanced Technologies for Societal Applications

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Babruvahan P. Ronge ·
Santosh B. Salunkhe · Anup S. Vibhute ·
Bhuwaneshwari Melinamath *Editors*

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Proceedings of the 3rd International Conference on Advanced Technologies for Societal Applications—Volume 2

Springer

Dynamic Modeling and Experimental Study of Forced Convection Evacuated Tube Solar Collector Used for Grape Dryer

Amol Ubale, Dilip Panghavhane, and Parmeshwar Ritapure

Abstract The two dimensional performance model, analyzing evacuated tube solar collector system, used for grape drying is developed. A Solar collector is designed and fabricated to dry 10 kg of Thompson seedless grapes efficiently, under the forced convection heat transfer. But this article is restricted to discussion on solar collector and its thermal performance only. The collector setup consists of ten evacuated tubes of outer diameter 58 mm and length 1800 mm arranged parallel. This solar system's performance is tested experimentally and an analytical thermal model is developed by solving coupled linear differential equations using Rung-Kutta's fourth order method. The experimental data of the solar collector is compared with the analytical data of thermal model. It is observed that the developed model predicts the behavior of the actual system accurately with average percentage error in the range of 2.45−4.6% with coefficient of determination $R^2 = 0.957-0.98$. The experimental thermal efficiency of the system is observed as high as 31.2% which is higher than the thermal efficiency of the flat plate collector solar system (15%). Theoretically calculated and experimentally measured results of air outlet temperature from solar collector shown a good agreement.

Keywords Evacuated tube solar collector · Forced convection · Runge–kutta method

Nomenclature

C_f	Sp. Heat of working fluid (J/kgK)
H_{con}^{r-f}	Heat transfer coeff. betn absorber and working fluid (W/m^{2}k)
T_r	Absorber surface temperature (k)

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Effect Analysis of Process Parameters on Lubricated Sliding Wear of Al–25Zn–2Cu-2.5Si Alloy for Plain Bearing Application

Parmeshwar P. Ritapure, Y. R. Kharde, Amol Ubale, and B. D. Aldar

Abstract The present study is an attempt to model lubricated sliding wear of Aluminum Zinc alloy and wear parameters. The effect of wear parameters like applied load, sliding speed and sliding time (distance) on the lubricated sliding wear of the alloy have been investigated using pin-on-disc tribometer with EN24 shaft steel disc as per Taguchi L_9 orthogonal array. The analysis of variance and developed regression equations were used to investigate the influence of parameters on the wear of alloy. The pin temperature is identified as the most influencing factor for the wear and friction characteristics of the composites. The developed linear and Non-linear regression models were found capable for predicting the lubricated sliding wear behavior of the alloy. Finally, confirmation tests were conducted to verify the experimental results foreseen from the mentioned correlations.

Keywords Aluminium Zinc alloy · Analysis of variance · Confirmation test · Orthogonal array · Sliding wear · Wear parameters

1 Introduction

Implementation of Tribology provides economic and environmental benefits by reducing energy loss due to friction and wear, loss due to breakdowns, depreciation of machinery and overall global carbon emissions. The wear and friction at tribo-contact can be reduced successfully by the use of novel materials, low viscosity lubricants, material treatment, surface modification and material coating [1].

Tribological performance of Zn-Al alloy have been tested and applied in a variety of engineering applications. These alloys were found to be superior to the traditional bearing materials including bronze [2], cast iron [3], steel, plastics etc. as far as their high resistance to wear, high strength, low density, low cost and low coefficient of

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ADVANCED RESEARCH IN RELIABILITY AND SYSTEM ASSURANCE ENGINEERING

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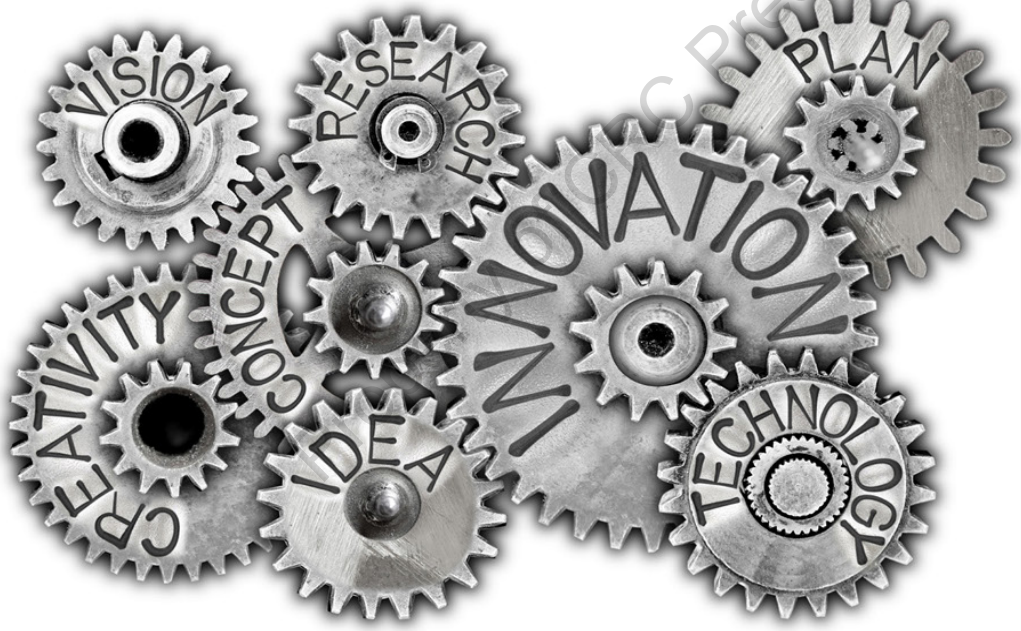

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5 Reliability Analysis Using Condition Monitoring Approach in Thermal Power Plants

Hanumant Jagtap, Anand Bewoor, Ravinder Kumar, Mohammad H. Ahmadi, and Dipen Kumar Rajak

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5.1 INTRODUCTION AND BACKGROUND

With the rapid growth of modern technology, maintenance of machineries plays a critical role in many industries. The objectives of a maintenance-related decision-making process are selection and implementation of condition monitoring techniques (CMT) for industrial applications, which can be categorized and reviewed on the basis of maintenance scheduling, reliability improvement, and availability improvement. One of the major sources of electricity generation in India is the thermal power plant (TPP). Continuous electricity generation from TPPs depends on the increased availability of its major systems, subsystems, and the equipment used. High availability of TPP equipment is associated with its reliability and

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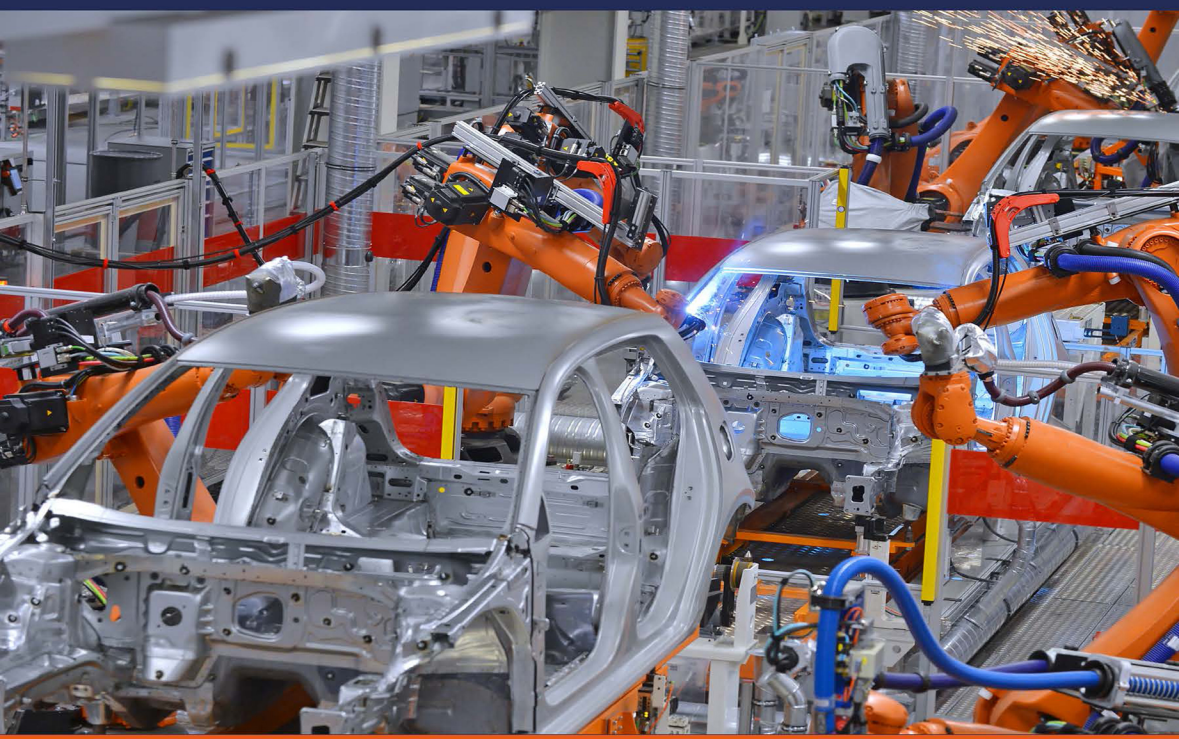

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7 Application of Particle Swarm Optimization Method to Availability Optimization of Thermal Power Plants

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Cummins College of Engineering for Women

Firozkhan Pathan
D. Y. Patil Institute of Technology

Ravinder Kumar
Lovely Professional University

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Vilas R. Kalamkar
Katarina Monkova *Editors*

Advances in Mechanical Engineering

Select Proceedings of ICAME 2020

Springer

Investigation of Thermal Desalination System Using Heat Recovery

Rajan K. Petkar, Chandrakant R. Sonawane, and Hitesh N. Panchal

Abstract The work presented in this paper is an attempt to investigate the performance of thermal desalination system using heat exchanger. Helical coil heat exchanger has been used as a condenser to condense vapors passing over the coil where cooling water in the coil absorbs latent heat of condensation as well as sensible heat of vapors. Experiments were conducted for different initial temperature of water. Results have shown that application of a separate condenser for thermal desalination system augments rate of distillate output. Condenser also performs the function of heat recovery. In present work, heat recovery has augmented distillate output by 50%. Use of warm water for desalination improved vapor generation and its temperature. This has improved heat recovery of the system.

Keywords Condenser · Distillate output · Warm water · Heat recovery

1 Introduction

Studies have revealed that freshwater available on earth for human consumption is only about 1%. Developments in social life have boosted use of freshwater. Freshwater is also required for industrial applications. Desalination process is worldwide used for conversion of saline water into potable water. Most of desalination techniques use electricity. Solar still is a low-priced device for thermal desalination which can be used without electricity. Researchers have investigated solar stills incorporated with different energy storage materials to use solar stored energy during night time [1].

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Structural Analysis of Novel Mini Horizontal Axis Wind Turbine (NMHAWT)

Pramod Magade, S. P. Chavan, Sushilkumar Magade, and Vikram Gaikwad

Abstract The wind energy is most of the promising renewable energy source. In wind turbine technology, the turbine blades play an important role as it directly comes in contact with the wind. Many researchers have concentrated on improving the aerodynamic performance of wind turbine blade through testing and theoretical studies. In general, moderate to high-speed winds, typically from 5 m/s to about 25 m/s are considered favourable for most wind turbines in India. But in rural areas, wind speed is near about 3–9 m/s. The present investigation aims is to compare the performance of eight blade novel mini Horizontal Axis Wind Turbine (NMHAWT) blades of novel airfoils over National Advisory Committee for Aeronautics (NACA) eight blade profiles in terms of loads and performance. Therefore blade design of well known series of NACA airfoil was selected from Q blade and Mat-Lab software. Analytical calculations are help out for the selection of NACA 4418 is suitable for the comparison. The objective of this paper is to decide the novel profile of the blade for the development. The comparison is done through software for predicting the performance of a novel mini horizontal axis wind turbine.

Keywords Wind speed · NACA airfoil · Blade structural analysis

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3.3.2 Number of books and chapters in edited volumes/books published and papers published in national/ international conference proceedings per teacher during a year 2020-21					
Sr. No.	Name of the teacher	Title of the book/chapters published	Title of the paper	Title of the proceedings of the conference	Name of the conference
1	Prof. Sachin Kolekar	Software Testing and Quality Assurance	NA	NA	NA

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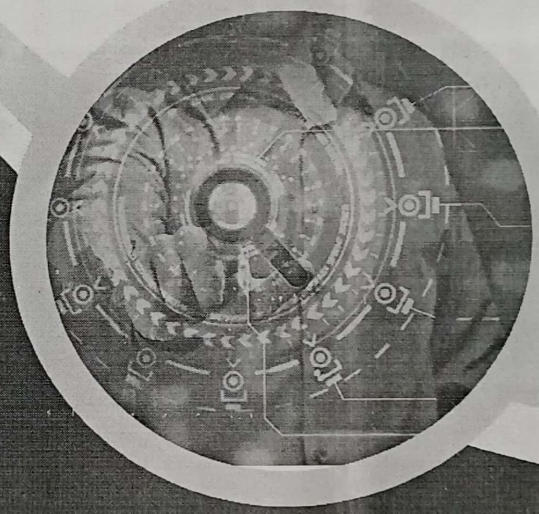

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Sr. No.	Name of the teacher	Title of the book/chapters published	Title of the paper	Title of the proceedings of the conference	Name of the conference
6	Prof. M. R. Hans	NA	Battary used in evolutionary algorithm by using adaptive current charging controller	2021 Fourth International Conference on Inventive Systems and Control (ICISC)	2021 Fourth International Conference on Inventive Systems and Control (ICISC)
7	Prof. M. R. Hans	NA	Implementation of switched mode power supply with power quality enhancement using Zeta Converter	International Conference on Smart Electronics and Communication (ICOSEC 2020)	International Conference on Smart Electronics and Communication (ICOSEC 2020)
8	Prof. M. R. Hans	NA	IOT based hybrid green energy driven street lighting system	2020 Fourth International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC)	2020 Fourth International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC)
9	Prof. M. R. Hans	NA	Implementation of fuzzy logic for modern E vehicles using super capacitors and Li-ion Battary	International Conference on Smart Electronics and Communication (ICOSEC 2020)	International Conference on Smart Electronics and Communication (ICOSEC 2020)
10	Prof. M. R. Hans	NA	Simulation based reactive power compensation by using TBSC/TBSR for dynamic load	2020 Fourth International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC)	2020 Fourth International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC)

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Sr. No.	Name of the teacher	Title of the book/chapters published	Title of the paper	Title of the proceedings of the conference	Name of the conference
1	Dr. Mahadev G. Unde, Prof. M. R. Hans	NA	Closed-Loop Design of Fuzzy Logic Controller in Solar Power Generation	2020 Fourth International Conference on Inventive Systems and Control (ICISC)	2020 Fourth International Conference on Inventive Systems and Control (ICISC)
2	Dr. Mahadev G. Unde	NA	Grid Tie PV Inverter Using Buck-Boost Based Converter Maximizing Power Yield in Mismatched Environmental Condition Controlling Two Solar PV Arrays	2020 IEEE International Symposium on Sustainable Energy, Signal Processing and Cyber Security (iSSSC)	2020 IEEE International Symposium on Sustainable Energy, Signal Processing and Cyber Security (iSSSC)
3	Prof. M. R. Hans	NA	Peak Load Management in Smart Grid – Integration of Rescheduling & Cloud Computing	2021 Fourth International Conference on Inventive Systems and Control (ICISC)	2021 Fourth International Conference on Inventive Systems and Control (ICISC)
4	Prof. M. R. Hans	NA	Analysis of rectiifier load for electric vehicle wireless charging system	International Conference on Smart Electronics & Communication (ICOSEC 2020)	International Conference on Smart Electronics &Communication (ICOSEC 2020)
5	Prof. M. R. Hans	NA	Implementation of hybrid STATCOM system for power system performance enhancement	International Conference on Smart Electronics and Communication (ICOSEC 2020)	International Conference on Smart Electronics and Communication (ICOSEC 2020)

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Sr. No.	Name of the teacher	Title of the book/chapters published	Title of the paper	Title of the proceedings of the conference	Name of the conference
11	Prof. M. R. Hans	NA	Implementation of SPV for Performance Enhancement in Water Pumping System using Motor Drive	2021 International Conference on Intelligent Technologies (CONIT)	2021 International Conference on Intelligent Technologies (CONIT)

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(4)

Closed-Loop Design of Fuzzy Logic Controller in Solar Power Generation

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***Abstract*—This paper presents the designing of the MATLAB model for a closed-loop fuzzy logic controller in solar power generation. To reduce harmonics generated by non-linear loads, a reference signal of the load is given to a fuzzy controller in order to make the system as a closed loop. The main objective of the proposed method is to improve the efficiency of the system by reducing Total Harmonic Distortion (THD) in the source current. When Photo-Voltaic (PV) module produces more amount of power, the battery is charged through the bi-directional converter. The load is supplied by the battery when solar irradiation is less. Complete discharge of the battery is prevented by using the State of Charge (SOC) control on the battery. To obtain an extent power from the PV unit, the battery charging circuit is attached closer to the source instead of connecting before load, it minimizes the stages of power conversion. By using fuzzy-based PWM method power is controlled through a DC-DC converter. AC load is powered by using DC-AC inverter. Also, to control the bi-directional DC-DC converter PID controller is utilized along with switches. The parameters we have taken for obtaining THD are, the number of cycles is 1 at starting time 0.15 sec and the fundamental frequency is 60 Hz, for these values THD comes 1.47%. The result reveals that in closed-loop fuzzy logic controller total harmonic distortion is less than 5%.**

Keywords*— *Photo-voltaic (PV) Panel, Maximum power point tracking (MPPT), Fuzzy-Logic-Controller (FLC), State of charge (SOC), Proportional-Integral-Derivative (PID), Pulse- Width Modulation (PWM)

I. INTRODUCTION

To avoid energy crises, the energy available on the earth has to be used as maximum as possible. One day non-renewable energy sources are going to vanish. So, interest in renewable energy sources has been promptly increasing [1]. Solar power is simply available amid all renewable energy sources. Other noted utilities are, set up of solar power generation unit is done in corresponding to need, also it has little maintenance, no noise, no pollution, etc. Stand-alone PV units are a convenient option for the non-urban sector where rare power supply is present [2].

To obtain optimal power as well as efficiency from PV cell, hence the losses are less is a tough job and different techniques are accessible. Generally, the solar power generation method uses two steps configuration [3]. In one step power is extracted from the PV panel and stored it into battery by DC-DC converter and second is DC-AC inverter which is used to provide power to AC load [4]. There are different methods to use optimal power produced by a solar system such as Maximum Power Point Tracking (MPPT) in [5], [6], [7] which captures maximum power produced, PWM (Pulse Width Modulation). By using conventional control methods such as PI controller [8] and hybrid PI controller [9], PWM control of DC-DC buck-boost converter is achieved. As stated in [10], FLC (Fuzzy Logic Controller) provides a more desirable outcome than the further conventional controller. To store energy Li-ion battery is used, to pass the current from and to the battery bi-directional converter is used. It is controlled by a microcontroller and connected to inverter; double boost bi-directional is proposed in [11]. By using PID and manual switches [12], controlling the bi-directional converter is achieved through an operational amplifier as well as MUX [13].

The paper is spotlighted to enhance the performance of the system by making it a closed loop to reduce harmonics using the fuzzy controller.

The residue of the paper is arranged as follows. The explanation of the block diagram for the proposed system is given in section II. Controllers such as PID, FLC are depicted and the theory of battery storage system is given in section III. In section IV simulation model is discussed. Section V presents the simulation result and the specification chart is listed. At the last concluding part is depicted in VI.

II. BLOCK DIAGRAM OF THE PROPOSED SYSTEM

Fig.1 shows a block diagram of the PV generation system along with a fuzzy controller. The power produced by the PV system is given to the buck-boost converter as well as a bi-directional converter. The bi-directional converter is located near to the source. It conducts in two ways due to which charging and discharging of battery is done. Fuzzy logic based PWM controller is used for controlling both the bi-directional converter and buck-boost converter to improve the performance of the system, then fed to the inverter to convert it into AC form.

The voltage of the PV system is 220V, when a voltage is more than 220V battery is charged through excess power by using a bi-directional converter. When produced voltage is fewer than 220V at that point battery gets discharged through bi-directional converter along with

Grid Tie PV Inverter Using Buck-Boost Based Converter Maximizing Power Yield in Mismatched Environmental Condition Controlling Two Solar PV Arrays

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Abstract*—Renewable energy is a future of electricity generation in coming years. Photovoltaic generation is being clean method always at the center of renewable energy generation practices in India. Despite of the high cost of installation and lower efficiency, still solar is one of the trusted sources of electricity generation due to its better availability over the year and being clean method of electricity generation. Grid connected solar systems are common now a days so, need to improve different technologies to maximize power yield from solar arrays. The problems related with grid connected PV system are generation of variable voltage and less efficiency. Buck and boost converter-based system is use to produce constant voltage and increase efficiency due to this it will reduce PV modules for grid connection of multiple solar arrays. Buck-boost converter-based system for grid connection of multiple solar arrays is implemented and presented in paper. Authors have proposed maximizing power yield in mismatched environmental condition controlling two solar PV arrays is implemented and presented in this paper in simulation environment by MATLAB-R2016a Simulink tool. The simulation results for the same are presented in this paper for two solar arrays.

Keywords*— Photovoltaic Arrays, Mismatched Environmental Condition, Grid Connected Solar System, Maximizing Power Yield, etc.

I. INTRODUCTION

Photovoltaic based electricity generation contribution in India is increasing every year with the new projects supported by India government. India is looking forward to become next solar hub in Asia with the new installations. The clean energy generation is important as per the sustainable development. Solar energy generation capacity of India is more than 30GW holding 5th position globally.

The analysis of series connected solar arrays is carried out with different conditions of atmosphere. The magnitude of the output power the depended on the capacity and number of cells connected in each array [1]. With the increasing awareness of environment and the initiatives taken by different countries in improving on the pollution, renewable energy is the future of electricity generation [2]. MPPT technique founds suitable to get maximum power generation from solar systems [3]. The solar photovoltaic system is developing in terms of performance and efficiency with the researcher's contribution in last decade [4]

Distributed generation and grid connected both the systems are important for the developing countries like India for electrification of villages [5]. The limitation of grid connected system is design of high performing inverter and better [6]. The design of the system should take into consideration the effect of the grid faults.

The voltage ride through capacities of such system will be improved over last decade to enhance the performance [7]. Series parallel capacitor switching system when connected with photovoltaic system helps in improving performance of the system and makes it useful for grid connection [8]. Development of power electronic systems has proposed various configurations of the inverters. Pulse width modified inverters are found suitable for the solar systems [9]. Leakage current of the inverter can be controlled with leakage capacitor. The capacitors have improved the lifespan of the system [10].

H-bridge inverters implemented for the photovoltaic generation with control strategies to control the output and the harmonic profile [11-12]. Various factors such as weight, dimensions and performance are improved over the years with research carried out [13]. The capacity to convert the power ac to dc and dc to dc makes the converter suitable for the grid connection [14]. Inverter topologies have been serving the grid connection requirement of the photovoltaic system [15]. Solutions proposed for the renewable systems have been found suitable over the years and hence photovoltaic installations are increasing in the developing countries.

II. MOTIVATION OF RESEARCH

Contribution of renewable sources around 20% of total generation in power system. Solar photovoltaic generation is suitable to fulfill the increasing demand of electricity over the world.

Solar is one of the trusted sources of electricity generation due to its better availability over the year and being clean method of electricity generation in the developing countries like India with increase in demand the need of alternate generation technique leads to development to the solutions. The problems associated with mismatched environmental condition in PV solar system So, there is need of solar system which is capable to produce high voltage when PV arrays are operating at less temperature then it will get high efficiency. The greenhouse gases generated during electricity generation is hazardous to the environment. Reducing the carbon footprint is very important and hence we have to reduce the fuel combustion. The grid connected system to be tested under different environments. The performance enhancement of the solar system is possible with validation of performance

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Peak Load Management in Smart Grid – Integration of Rescheduling & Cloud Computing

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***Abstract*— Ever-increasing demand for power has motivated researchers to come up with methodologies for meeting the demand. A smart grid is one of the solutions to minimizing the issue. A smart grid has become a proven way to optimize the load flow, hence the balance between the demand and supply of power is maintained. Though the problem of demand and supply is resolved to some extent still problems persist. The efficiency of the system i.e. end to end must be high. The quality of power must be intact. Considering above mentioned factors there can be checkpoints at three different levels. Remedial measures can be at the utility or the consumer end. As much can't be done at the utility side due to several constraints hence there is a need for implementation of remedial measures on the consumer end, also known as the Demand Side Management (DSM). The demand-side management must be given emphasis because of several advantages it serves to the consumer as well as to the utility. DSM has been implemented at the Institute premises with the application of cloud computing. Communication of data between the cloud and the microgrid at the institute has been monitored and analyzed in the experimentation. Through analysis has been presented in the paper.**

Keywords*— *Smart Grid, Demand Response, Load Shifting, Cloud Computing

I. INTRODUCTION

A mix of the electrical networks, data technology, and communication infrastructure makes a Smart Grid. With the application of information management which is two-way communication, the grid offers benefits like reliable, cost-efficient, self-monitoring, self-healing and two-way communication for management of energy generation, transmission, distribution. It's necessary to manage several meters in a very grid with safe means. The utility provides the management of all the information within the data center. The smart grid will run efficiently if the meters present throughout the network are accurate and in healthy condition to be able to exchange data continuously. Moreover, when we talk about the effectiveness of Smart Grid, load management plays a vital role. Load at the consumers has always been variable and partially unpredictable. Thus for load management rescheduling of loads has to be done. Rescheduling of the load must be done in consideration of the tariff during the day [1]. Considering many factors the rescheduling of the load experimented in the institute. The major advantage is the reduction in electricity bills. Above mention strategy can work only on the radially available data or the real-time data. Managing huge data at a data center is a dangerous and bulky affair. Hence cloud was thought as an alternative for the same [2-5]. The essential goal of planning communication system for the facility grid is to form information accessible once and wherever required.

To perform the communication among the various components of the smart grid and application of computing techniques for providing real-time data, cloud computing is employed. A rising technology of on-demand network access to shared computing resources is cloud computing. With computing techniques in the cloud will get easy access to the data saved on the cloud hence will gain access from any place through the connected device to the network [6]. This information is going to be useful for coordinated outage designing of line, correct measurement, and communication to LDC's from the station [7]. An electrical station consists of 4 basic levels: method level, bay level, station level, and management level. The utility power part in India has one National Grid with an introduced limit of 350.162 GW as of 28 February 2019 [8]. Natural and vitality security issues are progressively moving to the cutting edge. Vitality creation and utilization are broadly viewed as a supporter of anthropogenic environmental change [9-11]. The International Vitality Agency (IEA) gauges that ~70% of world vitality generation is created through the consuming of petroleum derivatives, basically gas (21%) and coal (42%), and vitality represents 40% of anthropogenic carbon dioxide and other ozone-depleting substance discharges (CO_2e). The interest for vitality is developing as national populaces extend, especially in rising economies, and the development of devices and innovation in the public arena proceeds (IEA). Adjusting vitality free market activity has been an intricate test in numerous nations, with back-up supply edges of ~20% usually used to manage crest requests [12-14].

The entire world is confronting numerous issues identifying with power like generation, vitality utilization, and so forth. The past power lattice is unidirectional. Late frameworks give bidirectional correspondence. The Grid is expected to make up consistency, adaptability, wellbeing, and cost-effectiveness. Accommodating the prerequisites of clients, we tend to require load booking and vitality the board. Brilliant meters are reachable inside the network which is utilized to store the data in the cloud. Because of distributed computing, various capacities can be performed inside the matrix [13]. Distributed computing gives a few capacities like bidirectional correspondence, which infers correspondence among client and utility. It furthermore gives the vitality the executives; data the executives and so on to conquer the issue of a client, the utility should keep balance in the middle of requests and supply of client. Amid this undertaking top, vitality the board is doable by recognition timespan readings of entire burdens among the school premises reschedules this timetable burdens, in this

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Analysis of Rectifier Load for Electric Vehicle Wireless Charging System

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***Abstract*—Electric vehicles(EV's) will replace the present fuel combusting vehicles in coming years. These are becoming popular as the awareness amongst the users in increasing clean energy and environmental impacts of fuel consumption. Electric vehicles are facing challenges with the enhancement of battery capacity. Wireless charging of the batteries can enhance the performance of the vehicles as the time consumed during charging the batteries will be reduced. A rectifier is needed basically as a charger of the battery to convert the energy from AC to DC. The equivalent impedance of the network is considered in the analysis of rectifier. Further compensation components are taken into consideration. The parameters of the systems will be varied in order to overcome enhance the performance of the system.**

Keywords—Wireless charging, rectifier loads, compensation network design, load estimation.

I. INTRODUCTION

Electric vehicles in India are implementing innovative technologies in order to improve the reliability and end-user experience. The enhancement of battery capacity to overcome the limitations like size and weight to capacity proportion is one of the areas of enhancement; on the other hand, the time taken to charge the battery is the other concern to be addressed.

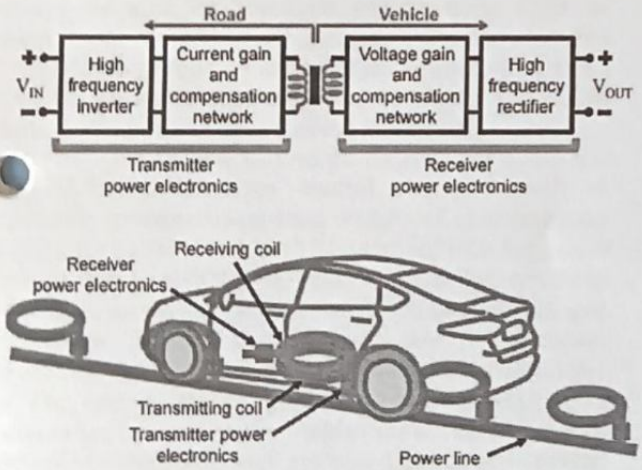

Fig.1: Basics block diagram of a wireless charging system

The figure above shows the basics of the wireless charger for the e-vehicle. The transmitter and receiver of electricity are the main blocks of the system. The receiver of electricity is installed on the vehicle while the road will act as a transmitter of energy. The electricity transmitted will be in the form of AC which latter needs to be converted in DC form to charge the battery.

Analysis of the rectifier load and associated compensating network will be useful in the design of the system. Rectifier load along with the secondary load including inductive and capacitive components will be utilized the power electronics components, to transfer the power with proper control at high frequency [2]. Capacitor based system is capable of large air gap power transfer.

The distance between the transmitter and receiver degrades the performance of charging as the parasitic capacitances introduced in the system [3]. A magnetic coupled coil mainly plays a vital role in this power transfer. The study and analysis of the static and dynamic performance of this power transfer circuit help in developing a better system for charging the electric vehicle [4]. The conventional charging methods of the batteries of electric vehicle imply the use of power pads or the connecting chargers. Whereas the effectiveness of such a system is still the point of discussion as it needs the vehicle to be in standstill condition during charging. This also consumes the time in charging as compared to the high frequency dynamic and fast charging systems [5].

Compensation circuit with a different combination of the compensating devices can provide improved stability to the system [6]. The wireless system despite losses is considered better in terms of safety. The researchers are working on wireless technology since the last decade to improve upon the efficiency to make it a viable solution in battery charging [7].

The main concern observed in the wired charging of electric vehicles is manual charging switch connection. If a person forgot to plug it in, it becomes a severe problem as the battery will not charge and the vehicle may not be available for a drive when needed. Again to charge, it takes the time of 4 to 6 hours [8]. The design of charging pads was one of the most challenging phases in the design of wireless charging systems [9]. High-frequency wireless transmission has made it possible to design such a charging system for electric vehicles [10]. Selection of the electrical circuit components properly can make the system reliable [11]. The flexibility of charging the once of the most appealing technology, while the problems associated with it such as electromagnetic and cybersecurity are to be addressed with proper care [12]. Effective control of power transferred is an important aspect of the wireless charging system design [13]. Load scheduling techniques in domestic loads can also be implemented in the electric vehicle to enhance performance [14]. Performance of the battery and management of the power can be implemented to utilize the power effectively [15].

II. MOTIVATION OF THE WORK

Electric vehicles are supposed to replace the present vehicles by 2030 in India. The governments all over the world are nowadays worried about the environmental impact of combustion of fuel such as diesel and petrol. Limited availability and huge per day consumption of fuel has

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Implementation of Hybrid STATCOM System for Power System Performance Enhancement

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***Abstract*—Renewable sources are the future of electricity generation in the coming years. The grid-connected renewable systems have created the unbalance of the power in the grid as the power is inserted in grid from several places. It deteriorates the quality of power delivered to the consumer. Stability enhancement is the only choice to make the system reliable. Use of static compensators (STATCOM) has become mandatory at the point of grid connection of the renewable source. It responds fast and tries to enhance power supply quality by suppressing the disturbances in power. The recent development in this technology suggests the use of hybrid models of STATCOM with mechanically operated capacitors. Authors have developed the simulation to realize the hybrid STATCOM in thes Simulink environment. The performance with respect to the harmonic distortion is studied and presented in this paper.**

Keywords— Power Supply, Grid Connected Renewable System, STATCOM, Hybrid STATCOM.

I. INTRODUCTION

Renewable systems have grown up in past the decade to contribute to India's electricity demand. Electrical energy in India is contributing to about 21% of the total electricity demand. The input point to the grid has increased with distributed generation through renewable sources. The major contribution in the renewable generation is by solar photovoltaic. However the efficiency of these systems was always the topic for discussion and the major steps are taken by the researchers to enhance it. Compensation has become a very important aspect of the power system with a the huge number of sources coming in. Mainly STATCOM finds application in AC ends of the inverters [1].

HVDC systems with various power electronics also use STATCOM with various control strategies such as converter commutation control. Failure of communication and supply fluctuations can also be avoided with the proper use of these devices [2].Wind systems for electricity generation at remote places have also increased with grid connection. Voltage and frequency are the important parameters to be controlled for the enhancement of stability of the system [3].The generation through distributed sources has increased in the world in the last decade. Actual generated energy from such systems depends upon several factors right from the environment, whether to the time of the day. It results in need of STATCOM to improve the performance of the system by avoiding the impact of uncertainties created by the renewable sources [4].

A voltage of the system must be maintained in the specified limits as per the standards. This leads to the need for voltage to maintain it in the specific limits [5]. The control of such systems is effective if provided locally at the point of generation. It helps in reducing the power loss when a power control is provided with the help of power converters and batteries [6]. The real-time monitoring of the parameters and enhancement according to the standards [7].Various combinations of the compensating devices can also be used simultaneously to get the better quality of power [8].

Control of power flowing through the network has become very important for the network managers. It needs to control active and reactive both powers to enhance the performance [9]. The fluctuated generation must not create the fluctuations in output and hence it becomes important to implement the control effectively [10]. Converters with developments in power electronic devices are fast responding devices for handling the power control issues [11]. The awareness of governments of various countries and the efforts taken by the world organizations to improve the environmental conditions has promoted the use of renewable energy [12]. In India, the government is providing the subsidy on the renewable power station installations.

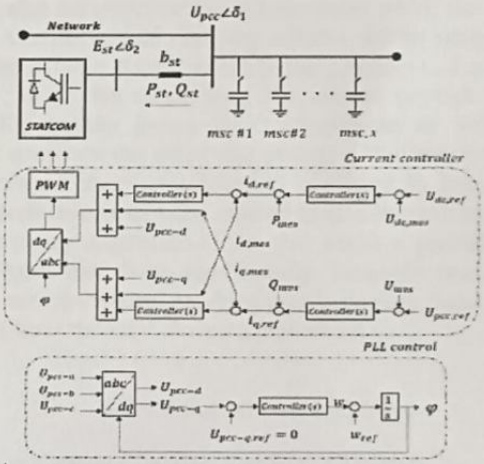

Fig.1: Simplified representation of Hybrid STATCOM

The hybrid model is represented to realize the STATCOM with conventional STACOM and the mechanically operated switches connected to the capacitors [13]. Voltages based sensitivity control method is useful to avoid the impact on the devices sensitive to voltage changes [14]. Various control methods such as predication control are useful with fuel cell models in renewable systems [15]. The power consumption was strong compared to the other methods[16].The system has been implemented using Simulink software[17].

II. BASIC STATCOM DESIGN

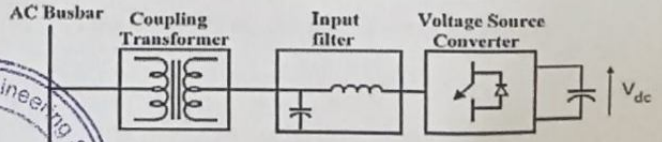

Fig.2: Connection STATCOM to ac Busbar

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Battery used in Evolutionary Algorithm by using Adaptive Current charging controller

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***Abstract*—In the presented paper charging of battery programmed to scale down charging loss occurred in a Li-ions battery for Electric Vehicle (EVs) has been investigated. This suggested adaptive-current analysis depends on the deviation of internal resistance of the battery is employed for this suggested charging programmed as an objective of the charge rate and (SOC) State of Charge. To locate the issues for searching the ideal current set of suggested schemes, an Evolutionary Algorithm (EA) is a form of problematic access, is enforced. A plan for choosing the number of the ideal charging intervals is also conferred, to obtain a settlement among the computational burden and loss minimization. The prime objective of this proposed strategy is to reduce the charging losses and to enhance efficiency through varying internal resistance of battery as well as by employing PWM switching for converters.**

***Keywords*—ElectricVehicles(EVs), Lithium-ion Batteries(LIBs) State of Charge(SOC), Evolutionary Algorithm(EA), Pulse Width Modulation(PWM), Electromagnetic Interference(EMI), Third Harmonic Distortion(THD).**

I. INTRODUCTION

The business for electric vehicles is reaching a tipping point, as importance in green innovation has been rising, by reason for the shortage of fossil fuels and environmental issues. Most EVs usage Lithium-ion Batteries (LIBs) as a source of energy. LIBs have greater power density than almost different feasible batteries such as nickel-cadmium or lead-acid.[1] The level of interest is increasing for EVs, which influenced the performance of the Electric Vehicle charging system has been attended. After all, the utmost ordinary way depends on novel topologies are concerning EVs battery charger as well as the control methods and excellent model [2],[3], although the truth that the EVs charging framework isn't as it was made up of a charger but moreover a battery. The "steady-voltage and steady current" charging method is extensively utilized charging profile, while this approach is particularly employed in most of the fields, owing to its integrity.[4][5] A current with a variable amplitude is applied which looks to the divergence of resistance of the battery. As ohmic losses of the battery which appear at the charging time are corresponding to the square of the amplitude of the current and the battery's internal resistance, employing charging current magnitude which is conversely relative over the resistance of the battery can devote to diminishing charging losses of the battery.[6][7]

Reduction of charging losses arising out into a battery few analysts offers a charging strategy rest on its inner resistance. Further deviation of the battery inner resistance has affection on the rate of charge is overlooked, remaining a further probability for loss minimization in batteries.[8][9] A study of the response of modern charging procedure on an Electric vehicle charger completely lost in these past considers the study, also the effectiveness enhancement within the stage of whole electric vehicle charging scheme not be examined. Further, the authors do not simplify the procedure of getting the ideal profile for minimizing the refined through what medium the battery losses are accomplished as well as correlated confer on the collection of cells of the battery. The adaptive-current charging scheme is conferred to boost the charging performance of LIBs utilized in electric vehicles.[10] An Evolutionary Algorithm (EA), that needs a problematic way to figure out those algebraically incurable issues, is utilized to secure the ideal charging profile through finding the final result from the ideal charging current set.

II. METHODOLOGY IMPLEMENTED

A. *Adaptive-Current Charging System for Batteries*

The losses of Lithium-ion battery (E^{B}_{Loss}) during charging are computed as the amount of every ohmic loss in every State of Charge (SOC) interval, is given by

$$E^{B}_{Loss} = \sum_{i=1}^{N} E^{B}_{i} = \sum_{i=1}^{N} i^{2} \cdot R_i \cdot t_i \qquad (1)$$

where,

E^{B}_{Loss} - The charging loss of the battery within i^{th} interval

R_i - internal resistance of the battery

t_i - charging time

i_i - the square of the discretized charging current

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Implementation of Switched Mode Power Supply with Power Quality Enhancement using Zeta Converter

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***Abstract*— In this digital era, the developments in computer hardware have resulted in the availability of user friendly devices, where computers remain one of the best examples in the history of electronics. Computers should always be supplied with good power quality as it has many electronics components, which may get damaged due to fluctuations in the supply. Maintaining the power quality has always been on priority for the power managers. The electronics devices and microcontrollers are sensitive to the changes in voltage; hence it becomes more important to maintain power in the personal computers. Authors have implemented the simulation model for SMPS by using the zeta converter with the objective to enhance the power quality. The improvements in the harmonic distortion are observed and presented in this paper with the implementation of zeta converter topology.**

Keywords— Power Quality Enhancement, Switched Mode Power Supply (SMPS), Zeta Converter

I. INTRODUCTION

Performance of the converter is the deciding factor to decide the quality of power supplied to the different parts of the computer. Power supply need to maintain the constant voltage against variations in input and output [1]. ZETA technology is found suitable for converting the power in such situation with effectiveness. These converters are implemented for buck or boost conversion of power [2]. Power factor correction plays an important role in the power quality enhancement practices. These methods implemented on AC side in order to reduce the harmonic distortion from the power [3]. The major problems faced in power quality are due to the nonlinear characteristics of rectifier when it comes to conversion of power from AC to DC and vice versa [4].

Duty cycle control approach is mainly used in converters to control output. The ZETA topology has become popular due to the capacity to step up or down the voltage [5].These converters found applications in computers, electric vehicles, and LED lights etc. to improve the power factor [6-7]. The balancing of current is used with ZETA converter in order to achieve control of the power [8]. When compared to the other types, the Zeta converter without bridge found suitable for retaining the power factor on supply side when used with DC motor [9-10]. Capacitor and inductors are the basic components used in the converter to enhance the power quality [11]. With variations in speed of the motor, it becomes difficult to avoid the voltage fluctuations [12].

Computers have made it possible to carry out many tasks in short time. Now a day, we could not imagine our day

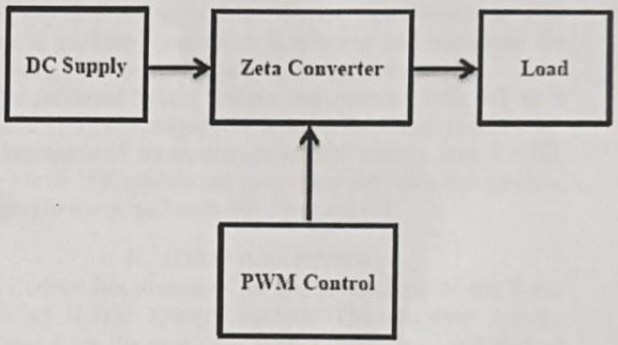

Fig.1: Basic Block Diagram of Zeta Converter Topology

The basic block diagram of Zeta converter is shown. This converter is basically used for conversion of voltage from AC to DC and vice versa. Pulse width is modified for achieving the proper output.

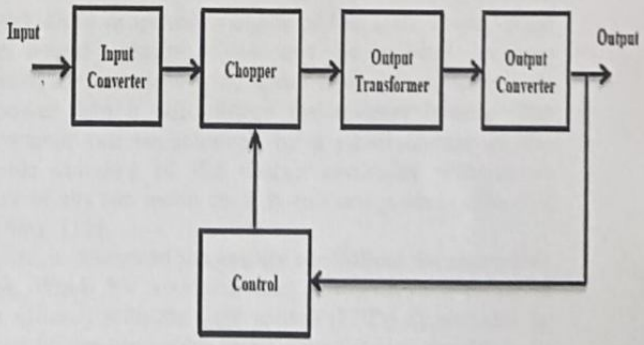

Fig.2: Block Diagram of SMPS

SMPS is basically used to convert the supply from AC to DC. It converts the input AC voltage to DC, while the chopper helps in step up or down the voltage as per the control of duty cycle. Output transformer is mainly for isolation purpose and the output converter again converts it to DC. These are generally works in two stages viz. AC to DC.

SMPS is the important component in the computer needed for conversion of power from AC to DC. The fluctuating voltage may damage various parts of computers and hence it is necessary to maintain the power within the limit for better quality. Different combination of voltage and current is needed for various parts of the computers. In order to achieve this, converters are used in the circuit [13]. Zeta converters when operate on the low power results in flicker free operation with better performance [14,15].

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IoT based Hybrid Green Energy driven Street Lighting System

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***Abstract*— In this paper, a hybrid energy solution is implemented for trivial scale green energy generation as an option for limited conventional energy source, standalone and manual system for the street illumination system and emergency e-vehicle charging. This hybrid energy system consists of two renewable energy sources as Solar PV panel and VAWT along with IoT based control method with the co-ordination of microcontroller provides effective controlling, monitoring, fault detection and preventive maintenance alert which makes the system intelligent and energy-efficient, resulting in less manpower requirement automation and saving in energy. The Solar PV Panel utilizes the photon energy from sunlight and VAWT utilizes the aerodynamic losses produced by moving vehicles for the generation of power. It provides the real-time monitoring of all connected street lights. Also, it can be an efficient, automated and attractive option for the development of smart cities.**

Keywords—Internet of Things (IoT), Vertical Axis Wind Turbine (VAWT), Photovoltaic (PV).

I. INTRODUCTION

Day by day, increasing population and industrial growth increases the energy demand and due to dependency and the limited conventional sources creates the thrust of energy for which renewable energy is a great option. But as the standalone renewable energy source is not a reliable source, so that, our hybrid system implemented with IoT configuration.

IoT has provided a new developing technique relates to all fields which replaces an old manual controlling structure with the automated system that helps to achieve the maximum efficiency in used services. Therefore, it implemented for public lighting installation i.e. for street lighting. It will provide real-time monitoring of the all-battery parameters and outputs of solar panel, wind generator, LED lamp luminance which will be useful for effective controlling, preventive maintenance and to increase the overall system life.

As the necessity of electricity in our daily life, it becomes added with our essentials such as food, clothes, and shelter. Nowadays the main source of energy is conventional energy sources such as thermal, diesel, nuclear, etc. which is limited and creates pollution. The conventional energy sources are harmful to nature so that the sustainable and eco-friendly sources required. The non-conventional energy sources are abundant, pollution-free, economical, and ecofriendly so it will be a good alternative to conventional energy sources.

This Hybrid lighting system is self-sustaining and it reduces the transmission and distribution losses as it installed near to the load. The main downside of solar energy is that it cannot generate electrical power at night, in the rainy season and cloudy season therefore to overawe this shortcoming wind energy is used in combination with solar energy. So that when one source unavailable then another source generates the electrical energy and in good weather conditions both sources can be utilized for a generation [6].

Public lighting services are one of the most suitable applications for implementing this proposed system. As the street lighting system has a near about 30-40% of the whole city's energy consumption [2]. The hybrid lighting system generates electrical energy by using solar energy at day time and the VAWT generates energy by using the aerodynamic losses of moving vehicles obtained with slight disruption during day time and night time. Vertical axis Savonious wind turbine is preferred because it is efficient and beneficial for small scale (low or moderate speed) applications [1].

The proposed hybrid system implemented with IoT as it provides energy management and performance monitoring. The incorporated methodology of PV energy and VAWT energy with IoT established governing provides automation, energy efficiency, and cost-effectiveness [1].

II. LITERATURE REVIEW

J. Godson has presented an implementation of the Solar PV Wind Hybrid Energy System. The electrical energy produced from the wind and solar sources has provided as per the energy required for a local house, farmhouse, an educational institution, a small company or an apartment house. It has augmented the steadfastness by utilizing both resources and it also lessens the reliance on one single source. But it will be implemented at own use individually [13].

Vivek Dixit proposed analysis of the solar source-wind source hybrid system which can be utilized by any residential user at a low wind speed sites. When there is no grid power then it will charge the inverter battery. The improvement can be achieved by a small change to the electronic circuitry of the charge controller without an increase in any too much cost. It will not provide effective controlling. [12].

S.Selvam discussed the energy controlling for renewable sources, Wind- PV source hybrid power system to mend energy efficacy with the light source (LED). It provides an incessant power generation by PV Panel during the day light and wind turbine generates the energy as the vehicles pass through the path but it doesn't include the component specifications [10].

Ashish S. Ingole proposed the integration of two energy sources (wind energy and solar energy). This hybrid system provides continuous power due to the integration of two energy systems. PV panels are utilizing solar energy and wind turbines are utilizing wind energy to generate electrical energy. This paper doesn't include implementation [9].

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(13)

Implementation of Fuzzy Logic for Modern E-Vehicles using Super Capacitors and Li-ion Battery

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***Abstract*— It is anticipated that, in the near future Electric vehicles will occupy an indispensable part in the emerging modern vehicular system. One of the major problems to be addressed in electric vehicles paradigm is its energy storage capacity enhancement. Researchers all over the world are working to enhance the capacity of batteries to store energy with small size, weight and reduced cost. The fuel demand is continuously increasing with number of vehicles. India is dependent on other countries for fuel supply. Also, there are no facilities available yet for charging or replacing the batteries during the long journey. It is necessary to improve the capacity of batteries or design a new system as an alternative. Dual energy storage system using a super capacitor and battery helps to develop a modern E-vehicle as premeditated in this paper to ensure a long lasting functionality and cut down the cost of transportation facilities. In the near future, Li-on batteries are seeming to be used for all E-vehicles due to better capacity at small sizes. Control of these batteries with the help of super-capacitors is designed and presented in this paper. With this, the size of the battery has been made to be compact enough to occupy smaller space. Herewith, the proposed system has proven to be effective by presenting simulation and experiment.**

Keywords*— *Modern E-Vehicle, Li-ion battery, Super-capacitor, Interleaved Bidirectional dc/dc converter, etc

I. INTRODUCTION

Fuel is one of the major components that affect the economies of all countries. Consumption of diesel and petrol is increasing day-by-day, which results in high cost. As global warming is causing a worldwide effect on all sorts of day-to-day activities, the need of the hour is to arrest the pollution caused by all means. One of the major reasons of pollution is fuel emission. To arrest the contamination caused by fossil fuel, new energy sources [1-2] are endlessly developed.

Most of the electric vehicles tend to use the Li-ion batteries. The better energy density with long life has made it more popular in the E-vehicle segment. Super capacitors with outstandingly fast charging capacity can advance the enactment of vehicles when used with batteries. The dynamic need of torque and acceleration can be fulfilled with this system to make the vehicle capable and compare with conventional vehicles [3-4].

A hybrid arrangement of the storage with a combination of battery and super-capacitor makes vehicle eligible to handle the energy requirement for long distance running [5].

While fabricating electrical vehicles and its energy storage device, a few points have to be taken care of; especially size and weight must go down for maintaining a better charging rate [6-8] and battery capacity.

For the selection of suitable DC-DC converters for dual energy storage system: There have been quite remarkable innovations and were possible to be used by the Scholars in the field of DC to DC Converters, as it play an important role in dual energy storage system.

To name a few, the following DC/ DC Converters are used:

An interleaved bidirectional DC/DC converter with zero voltage switching and high voltage gain [9] has achieved a better control and effective conversion. Bi-directional isolated converter [10] is used to handle large power conversion. S. Cuk has proposed the use of ripple less switching converter with magnetic technology [11-13].

While selecting DC-DC converters for dual energy storage system, they must be incorporating the energy management strategies [14-17], which have been extensively reported in the literature.

Authors have implemented the system for energy storage with improved capacity. The system is useful to handle the requirement of vehicles. The long-distance travel requires better charge storing capacity on the other hand the requirement of the current will be different every time as there are many fluctuations in the vehicle speed. Performance of the system is verified with the help of simulation model.

II. MOTIVATION

Energy in any form will be always useful for human beings, when it is controlled. The conventional fuel is consumed in huge amount, where it leverages various impact on environment apart from its limited availability. Around 20% of air pollution in India is due to the petrol-diesel operated vehicles. Electric vehicle usually demands an effective battery and the system to fulfill the acceleration demand. Problems associated with present configuration can overcome the challenge by developing a dual energy storage system that implements a potential solution for electric vehicles. Authors have presented the solution with a dual energy storage resource.

III. OBJECTIVES

The work is carried out with following objectives, which has to be achieved throughout the study.

- Developing dual energy storage system.
- Validating its implementation for E-vehicles.
- Developing software model for verifying the same.

IV. ANALYSIS OF DUAL ENERGY STORAGE SYSTEM

Fig.1 is presenting an anticipated system for storage of energy to be designed with super capacitor, battery (Li-ion) and the converter (DC/DC).

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Simulation based reactive power compensation by using TBSC/TBSR for dynamic load

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***Abstract*—The advanced control method for electric reactive power compensation with the help of electronics components is binary current control method. This method allows a sufficient number of compensating branches to establish a fine and precise control of reactive power in electrical system. This method consists of Thyristor binary switched capacitor (TBSC) and Thyristor binary switched reactor (TBSR), which are based on the series of Thyristor switched capacitor (TSC) and Thyristor controlled reactor (TCR). The bank of TSC, TCR arranged in binary form i.e. split bank in multiple of two. For harmonic elimination use transient free switching of TBSC, TBSR. In this paper three topologies are explained 1) TBSC 2) TBSR 3) TBSC-TBSR for reactive power compensation of dynamic load. In the third topology excessive KVAR given by TBSC is absorbed by TBSR. The simulation results show that the proposed topologies can achieve reactive power compensation.**

Keywords: Electric reactive power compensation, Binary current generation, electronics switches, TBSC, TBSR, TBSC-TBSR, transient free switching, simulation.

I. Introduction

To improve the performance of AC system reactive power compensator is used [1]. In recent year we have to face problem related to the voltage stability and voltage regulation due to increase in demand of reactive power.

In this paper dynamic load is used to check the performance of SVC. In dynamic load three states of reactive power present Qmin that is minimum reactive power, Qbase that is base/constant reactive power and Qmax that is maximum reactive power. So reactive power required at Qmax and Qmin state to reduce / increase Q up to its base value.

The binary current control method is more dependable, technically strong, quick response and economical [2]. The capacitor and reactor bank split into the multiple of two. Reactor generate harmonics in the system to reduce the harmonic reactor and capacitor split into binary form and use transient free operation to switch ON and OFF. To avoid drawbacks of TSC – TCR use TBSC – TBSR technique for reactive power compensation. In this paper capacitor bank split into five parts and reactor bank split into four parts.

For switching ON and OFF switches use transient free switching due to this switching method harmonics are reduces, reduces voltage drop, power factor of system will improve and overall efficiency of system will increase.

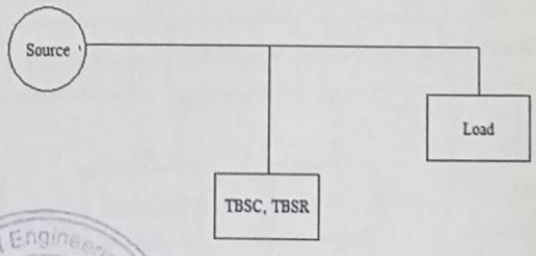

Fig. 1 Proposed topology

Implementation of SPV for Performance Enhancement in Water Pumping System using Motor Drive

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Abstract - **In this paper independent photovoltaic (SPV) frameworks are introduced for water siphoning. Because of the shortfall of energy transmission lines associated with the water siphoning destinations in distant territories, issues identified with the electrical blackouts and the ecological debasement brought about by petroleum products. For overcoming the scarcity of electricity availability in isolated or areas this best alternative is Sun Power (SPV). The system draws the maximum power from the PV system. The system voltage is maintained by controlling the electric speed. To adjust the duty cycle as per necessity, INC- based MPPT based tracking employ. The system output is a continuous monitor with the feedback loops, it also takes corrective action as required in this regard.**

Keywords — Standalone PV Cell (SPV), MPPT-based tracking system, INC algorithm, IM drive, V/F control.

I. INTRODUCTION

The configuration of photovoltaic power via solar cells can transform heat energy directly into electricity potential to be a spotless, easily suitable new energy source. Excessive concentration on photovoltaic skills consumed by presentation completed the previous times. For farmers, solar water pumps can be a blessing. Quite low operating cost, comparatively low cost, easy and highly reliable; the advantages are environment conscious. [1]. The motor functioning is adopted as per to give photovoltaic source requires creative ability to deal with the challenge of working under variable power constraints and to optimize the module's use of sources required. [2]. It has always been a challenge that provide water in far electricity areas that require water and energy distribution systems. Water pumping is the only effective way of ensuring a minimum supply of water even during water shortages in those areas, usually hilly areas not easily accessible by traditional means of transport. [3]. A designed PI controller and V/F scalar control promote the performance of related to different parameters of electric motor. A scalar control is a simple method and in steady speed application it is operated to control the magnitude of the different quantities. Scalar control V/F was incorporated and compared with the PI controller [4]. A dc-dc system is generally required in solar PV fed water pumping, to maximize the solar photovoltaic (PV) power generated using a MPPT tracking technique. [5]. The system consists of SPV cell to energized water pumping based on reduced sensors. The system aims to reduce money burden and cascading even when ensuring optimum PV array energy consumption at the same time. [6]. The solar systems are used for water pumping, is chosen to compare with other systems to determine which option is good. [7]. The general consideration used of solar SPV power is water pumping, which in rural areas also has tremendous potential for agricultural irrigation, because it provides water for small scale regions to satisfy the needs.

[8]. This PV energy system used in general for domestic and small countries. [9]. In India, both of these resources can be used in remote areas where one or both of them are available for different power applications and there may be no electrical connectivity. Rural pumping systems for agricultural irrigation are one such major application. [10]. This paper proposes an SPV (Solar Photovoltaic) water pumping system use of an intelligent power sharing concept IMD (Induction Motor Drive) [11]. Electricity produced by the SPV array, is now major attention due to large scale degradation of conventional energy sources. [12]. Around 90 percent of solar energy consists of direct solar radiation. PV panels must be placed in such a way that sun ray appears in right angle to it for better utilization and efficiency of system [13].

II. TOPOLOGY DESCRIPTION

The block diagram given for the solar water pumping system, Fig. 1. The Solar system array, Converter Unit, Induction Drive, PI controller, SPWM and centrifugal pump are used.

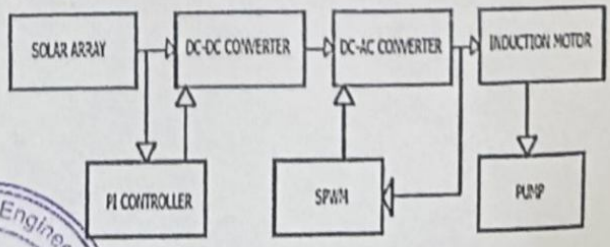

Fig. 1. Schematic Diagram of the system

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3.3.2 Number of books and chapters in edited volumes/books published and papers published in national/ international conference proceedings per teacher during a year 2020-21				
Sr. No.	**Author's Name**	**Title of Paper**	**Title of the proceedings of the conference**	**Name of the conference**
1.	Dr. A A Khandekar	Design, Analysis and Motion Control of Hydraulic Excavator using Discrete Sliding Mode Control with Inertial Delay	International Conference on Advanced Computing & Communication Systems	IEEE Explore

H.O.D.
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Design, Analysis and Motion Control of Hydraulic Excavator using Discrete Sliding Mode Control with Inertial Delay

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***Abstract*—The hydraulic excavator is subject to large disturbance forces during interaction with the environment. Hydraulic excavators have complex nonlinear operation. In this design, a robust adaptive control is applied to the hydraulic excavator for its arm, boom and bucket movement. A robust control consisting of discrete model independent control with Time Delay Control (TDC) plus Integral Sliding Mode Control (I-SMC) is designed and implemented. The designed controller formation includes TDC excluding dynamics of acceleration and Terminal Sliding Mode Control (T-SMC) with nonlinear dynamics of expected error and minimum execution efforts. In this design, signal measurement is considered to decrease noise impact by excluding dynamics of acceleration. The conventional controller technique failed to provide consistent performance over the whole operation region of the excavator. In order to evaluate designed integral sliding mode controller, a prototype simulation of excavator is used and the results are compared with those of a T-SMC and an SMC. The presented method achieved better transient performance and tracking accuracy in the company of environmental unreliability and non-linearities.**

***Keywords*—Integral Sliding Mode Control, Hydraulic Excavators, Time Delay Control, Non-linearities, uncertainty, discrete model.**

I. Introduction

The model-based framework configuration approach takes into account an effective method of structuring and creating complex building frameworks in an implicit situation [1], [2]. A structured framework on the basis of model are ordinarily utilized: (1) demonstrating a process; (2) combining a controller for the process; (3) re-enacting the controller and process together; and (4) incorporating a general framework. In this manner, framework demonstrating is a significant initial phase in model-based framework plan. Instances of the frameworks that can profit by model based structure incorporate off-thruway development and mining hardware just as car and aviation frameworks. By utilizing the model- based framework configuration approach, item advancement cost and time can be effectively decreased. Pressure driven excavators are generally from the prime utilized earth-moving hardware in development and mining industry and they will keep on assuming a significant job amid off-thruway vehicles in future [3], [5].Common tasks of water powered excavators incorporate reviewing, burrowing, and stacking, manipulating the boom coordinates, bucket, and arm. Because of the significant level of aptitude required for the planned activity of the controller framework, working an excavator proficiently isn't a simple assignment. Consequently, considering the mechanization of pressure driven excavators is vital for

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