



3.3.3 Number of books and chapters in edited volumes/books published and papers published in national/ international conference proceedings per teacher during last five years

Number of papers published in national/ international conference proceedings

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2019-2020

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A Pv based Microinverter with Bidirectional Battery Charging Application in the Input Stage

Greeshma C, Shahina E P, Anu Sunny and Jarin T

Abstract—Now a days increased necessity to develop and promote various renewable sources of energy for a sustainable future. A high gain converter is necessary to boost the low output voltage of renewable sources. A cascade structure consisting of a boost and buck-boost converter is equivalent to the converter structure is put forwarded. The proposed converter has a capability to produce high output voltage with decreased transformer turns ratio and elevated potential gain value. For improving volatile performance and reduction of switching loss is achieved by the help of a double closed loop control method. Also, the converter switching pulses are generated using the double closed loop control scheme. The system is effectively integrated with a solar panel. To improve the reliability of supply of the converter, a bidirectional converter with two switches is integrated with the proposed system. The cost and complexity of the system can be reduced by integrating a bridge rectifier between the high and low voltage sides. To investigate the achievement of the scheduled structure MATLAB / Simulink software has been carry out.

Index Terms—Photovoltaic, DC-DC Converter, MATLAB

I. INTRODUCTION

THESE days for changing over one degree of electrical voltage in to another level switched mode dc - dc converters are utilized. These are the least complex force electronic circuits they can change over the voltages by exchanging activity. These converters have wide application in numerous regions like air crafts, telecommunication, DC engine drives and furthermore providing power for PC [1].

Nowadays increased on consumption of fossil fuel reserves and its eventual imminent depletion, it is imperative to constantly look for sustainable energy sources which are renewable in nature. Unlike the conventional sources, the power outputs of renewable sources are intermittent and

cannot be considered reliable for operation as an independent source of energy. The photovoltaic cells, wind turbines, tidal energy sources and many other renewable sources depend upon various environmental factors in producing their output. For applications including the spotless vitality assets DC - DC converters with unexpected potential proportions are broadly utilized [2].

Since the output voltage that can be provided by the renewable sources are very low, there is always a requirement of a high gain converter. Among different converter topologies the conventional boost converters are the simplest one to be used to step up the voltage from a renewable energy source such as PV cell into a much higher voltage which is compatible with a DC grid. However, the potential increase of the converter is limited by the impact of switches, rectifier diodes, and correspondent series resistance of inductor and capacitor alongside an unreasonably huge obligation extent. This will bring about invert recuperation issues, low proficiency and electromagnetic impedance issue. So, in order to eliminate these issues different converter topologies are being studied [3].

The main disadvantage associated with the renewable sources like PV is its reliability issues. That is, the problem in maintaining the continuity of supply from the photovoltaic (PV) cell or from the wind turbine. Different methodologies are available to improve the reliability issues. A bidirectional DC - DC converter alongside a battery backup framework is one of the strategies to keep up the progression supply of the framework [4].

This will make the power availability of the system greater which will in turn ensure the reliable operation over a wide range of external conditions. This paper manages joining a non-secluded lift converter with a segregated buck-boost converter into a solitary topology which can be utilized to supply a heap legitimately or a dc smaller scale lattice. The proposed converter is a changed converter topology. A dc-dc converter which yields a voltage which is higher than what is given at the information port is known as a boost converter. While the buck-boost converter can create either low or high yield voltage. The yield voltage is additionally expanded by utilizing a H-connect with a transformer [5].

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EM17

Macpherson strut (MPS) suspension system

Abstract: The Macpherson strut (MPS) suspension system is one of the most common independent automobile suspensions. This paper presents a kinematic analysis for the complete spatial model of the same. The presented solution is built upon two key elements in the formulation and solution stages, respectively: use of Rodriguez's parameters to develop an algebraic set of equations representing the kinematics, and computation of Groaner basis as a method " of solving the resulting set of polynomial equations. It is found that the final univariate equation representing all the kinematic solutions for a given pair of steering and road profile inputs is of 64 degree - which reflects the complexity observed in the kinematics of the mechanism. The real roots of this polynomial are extracted with high numerical precision and are validated. Finally, they are used to find the configuration of the mechanism for a particular set of road and steering inputs. Design sensitivity analysis and optimization of vehicle suspension systems is presented. The design process of suspension systems consists of pre-processing design stage, analysis stage and post-processing stage. For kinematic modeling of suspension systems, McPherson strut suspension system is adopted, where suspensions are assumed as combinations of rigid bodies and ideal frictionless joints. Constraint equations for displacement, velocity and acceleration using displacement matrix method and instantaneous screw axis theorem, sensitivities of static design factor and optimum design are obtained. The validity and usefulness of the method employed are demonstrated to yield the effective suspension layout at early design stage.

EM18

Palm Stearin Biodiesel: Evaluation of Fuel Properties and Characterization using GC-MS, Ftir and TG-DSC/DTG Techniques**¹Cijil B. John, ¹S. Antony Raja, ²Deepanraj B.**¹Department of Mechanical Engineering, Karunya Institute of Technology and Sciences, Coimbatore, TN, India.²Department of Mechanical Engineering, Jyothi Engineering College, Thrissur, Kerala, India.

Abstract: In recent times, the world has been confronted with an unprecedented energy crisis due to the depletion of fossil fuel resources, increased petroleum prices, and great environmental concerns. The situation has led to the search for alternative, sustainable and clean fuels from vegetable oils and their derivatives. This paper describes an enhanced protocol for the production of biodiesel from a new source of non-edible palm stearin (PS) through alkali catalysed transesterification. The feasibility of palm stearin biodiesel (PSB) as a sustainable and viable alternative fuel for Compression Ignition (C.I) engines is investigated in this study on the basis of a detailed physico chemical analysis. The various fuel properties like kinematic viscosity, density, cetane number, calorific value, flash and fire points etc. were tested by adopting ASTM test procedures and the estimated fuel properties were compared with the commonly used biodiesels, petro-diesel, ASTM and I.S (Indian Standard) biodiesel standards. The chemical composition and thermal stability of PS and PSB were analyzed using the spectrometric techniques like Gas Chromatography-Mass Spectrometry (GC-MS), Fourier Transform Infra-Red Spectrometry (FTIR) and Thermo Gravimetry – Differential Scanning Calorimetry/Derivative Thermogravimetry (TG-DSC/DTG). The fatty acid composition and the various functional groups in PS and PSB were acquired by GC-MS and FTIR techniques. The results of TG-DSC/DTG were also in near agreement with GC-MS and FTIR. The proximity of the estimated fuel properties of PSB with petro-diesel and the conformance with ASTM and I.S biodiesel standards indicates the potential of PSB as an alternative fuel for C.I engines.

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Keywords: Palm Stearin Biodiesel; Alternative fuel; Fuel properties; Biodiesel Characterization.

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CERTIFICATE OF PARTICIPATION

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has presented the paper on

Palm Stearin Buiduesel: Evaluation of Fuel Properties and Characterization Using Gc-Ms,

Ftir And Tg-Dsc/Dtg Techniques

in the 1st Virtual International Conference on Electrification and Digital Mobility 2020 (EDiMo-2020) held on 3-4, September, 2020 organized by the Department of Automobile Engineering, HITS in association with Trier University of Applied Sciences, Germany.

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EM01

E-Mobility Vehicle for Physically Challenged

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Abstract: According to the recent reports, about 2.21% (26.8 million) of total Indian population are differently abled, of which 15 million are males and 11.8 million are females. 20% of people out of this 15 million, have locomotive disabilities. Most of them are in need for private automotive for their daily routine. At present no such specific vehicles have been manufactured by any of the companies. The people who are in need customizes their vehicles for their own needs and commutation. The vehicles are having various shortcomings also. Even after this customization process they are facing many practical issues and problems in their daily life. By considering these aspects we are proposing a design for the easy commute of this differently abled people and provide better assistance to them in their daily life. The proposed design consists of a multi-link suspension system which adapts to all terrain conditions, driven electrically and incorporated with an accessible seating arrangement for the differentially abled ones. Thus, the proposed design can overcome the day to day problems and issues faced by them. This design would also be suitable for the present road conditions and running independently on Electric energy.

Keywords: Seating arrangement, lateral displacement, physically handicapped, Electric energy

EM02

Experimental Investigation of Performance of a Compression Ignition Engine Fueled with Biobutanol with Waste Cooking Oil as Property Enhancer

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Abstract: Waste utilization is one of the methods to enhance the environmental pollution. This project deals with the utilization of Waste Cooking Oil into diesel engine as fuel to reduce the dependency of diesel into compression ignition engine. Bio-butanol manufactured from fruit wastes was used as a fuel for compression ignition engines to replace diesel. Waste cooking oil collected from the reputed kitchen of the hotels were utilized as property enhancer into biobutanol. The novelty in this study is 100% replacement of diesel by biofuels to fuel compression ignition engines. The addition of waste cooking oil into biobutanol enhances the essential properties of the final blend compared to diesel. Initially waste cooking oil was blended with biobutanol in the proportions of 0-25% in increments of 5% and the solubility of the blends were tested in a temperature range of 5-35°C, followed by the testing of properties of the fuel blends as per ASTM standards. By comparing the properties of the blends of biobutanol –waste cooking oil with diesel, an optimal blend possessing closer properties with respect to diesel as fuel was obtained. This optimal fuel blend was tested in fully instrumented direct injection diesel engine for performance. The results of the solubility test revealed that the blend containing up to 15% of waste cooking oil were found to be stable up to a temperature of 5°C. Also, the properties of this blend were found to be closer to the properties of diesel fuel. Results of the engine test showed that the thermal efficiency, ignition delay, peak in cylinder pressure, peak heat release rate, oxides of nitrogen and smoke produced by the engine fuelled with the optimal blend were found to be similar to that of diesel at higher brake powers (above 40% of rated power) compared to that of diesel. However, this fuel blend produced inferior performance and emissions at low load conditions.

Keywords: Biobutanol, Waste Cooking Oil, No modifications in the existing engine, low temperature of 5°C

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THD Reduction in Execution of A Nine Level Single Phase Inverter

Shahina E P, Aravind K and Jarin T

Abstract—Multilevel Inverters (MLI) are usually utilized in high voltage and high force applications because of their lower filtering requirements, smaller dv/dt changes and better EMI/EMC execution. This paper introduces an ideal nine level staggered inverter; by utilizing distinctive design of switch and source blend. Staggered inverter is a demonstrated technique to filter necessities or size of the filter can be decreased. Right now, sort of circuit structures has been utilized; one for reversal reason and another is utilized for level decider. The level decider circuit includes 4 numbers of sources with a fixed voltage, 4 IGBT switches and 4 diodes. The reversal circuit is an ordinary H Bridge includes 4 switches and load. In between the each level high frequency PWM additionally joined which means to diminish the essential. The MATLAB based nine level single stage inverter is tried with R and RL load detailed less THD toward the finish of the paper.

Index Terms—Keywords—MLI (Multi Level Inverter), Total Harmonic Distortion (THD), MATLAB

I. INTRODUCTION

As of late, there has been a broad increment of enthusiasm for the region of staggered power change circuits [1]. Multi-level inverter innovation has been broadly utilized for AC drive applications both such as medium and high power applications. Numerous staggered inverter arrangements are displayed accurate output voltage with reduced harmonics range and to decrease the network intricacy. In any case, as the amount of voltage levels fabricate the need of trading devices manufactures which will cause to grow the circuit multifaceted design what's more, trading adversities. The design introduced in is created with diminished number of exchanging gadgets. Staggered inverters are a savvy answer for the medium voltage vitality showcase.

They can be found in practically any medium-voltage high force engine drive application having discovered boundless nearness in the mining and concrete enterprises, motor drive, power generation and transmission, among others. A high and medium voltage application utilizes multi-level inverter (MLI).

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MLIs can accomplish practically unadulterated output pure sine voltages with low Total Harmonic Distortion (THD) in average voltage source inputs. Multi-level inverter appreciates critical focal points over the conventional two level inverters as far as less consonant issues, reduced THDs, highly effectiveness, upgraded voltage quality, and lower conversion stresses. Ongoing progressed staggered inverter gives an answer on the restrictions of customary staggered inverters. Ongoing progressed staggered inverter typologies required less number of intensity gadgets when contrasted with customary staggered inverters. Reduction of clamping diode in DCMLI is described [2]. The seven level MLI is made up of using nine switches or seven switches for obtaining desired output voltage level. In this configuration higher voltage levels are achieve with the help of less number of switches, but this topologies offers large number of sources [3-4].

Mechanical applications use staggered inverter strategies to diminish the electrical stress created on semiconductor switches which will deliver appropriate voltages with pure output. The utilization of this type of inverter is extended stunningly in different utilities like UPFC (Unified Power Flow Controller), Electrical Vehicles, sustainable based Energy sources, Industrial Drives applications, Generation and distribution system, and Active Filters. MLI's offer lower THD, voltage stress over the exchanging electromagnetic Interference sway, and higher power rating when appeared differently in relation to two-level inverter.

One of the different structures of multi-level based voltage source inverters allows them to show with low harmonics at high voltages without usage of transformers or plan related synchronized-trading contraptions. As the amount of levels voltage assembles, the harmonics substance of desired yield voltage wave structure lessens inside and out. A staggered inverter is an electronically worked gadget.

In staggered inverter we manage more than 2-level voltage to produce a smooth and ventured waveform of yield voltage, more than 2-level yield voltage is having lower dv/dt proportion just as lower harmonic twists. The smoothness of the output voltage is in extent with the levels of voltage; with increment in the voltage levels the yield waveform becomes smoother [5-8]. Multi-level inverters have a couple of focal points compared with traditional two-level inverter that uses high trading repeat PWM waves. The attributes of a multi-level inverter can be immediately consolidated as given below:

A Novel LCC-LCL Compensation WPT System for Better Performance

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Abstract— Wireless Power Transfer (WPT) is a spurring spot in the field of power transfer. It has dominance in safety, low maintenance, reliable, transmission for short distance e.t.c. Many researchers are undergoing in the field of WPT and in that compensation topology plays a central role. There are different types of compensation topology in the system. This paper compares some special compensation topologies like DS-LCL, LCL-LCC with the proposed topology LCC-LCL compensation. The different topologies are reproduced using MATLAB software and calculated the efficiency for the following system. In the projected system, it has been accomplished an efficiency of 93.98%, which is better than the conventional compensations.

Keywords— WPT, Compensation Topology, DS-LCL, LCL-LCC

I. INTRODUCTION

The world is running behind the technology. All are using electronic gadgets like mobile, laptops, tab etc. Living without these gadgets is impossible. But these gadgets should be charged for their uses. Therefore, to get the battery charged we should connect the concerned device to the wires. Carrying a charger is quite difficult but it is so sophisticatedly convenient to charge a battery without a wire. Charging without wires means the power will be transferred wirelessly. This was possible by the thought of WPT and the research was started by 19th century.

As all the fuels are getting too deprived, the vehicles are getting electrified as an alternative. Hence, the use of fuel will be reduced and there will be zero smoke emission. Therefore, in the area of electric vehicle the WPT shows a great interest. Nowadays engineers are trying to raise the power transmission efficiency without any wire and it should be commercially viable.

Fig.1 shows the WPT system and it is operated on the base of electromagnetic induction. The concept of working a WPT is, when the transmitting coil generates the magnetic field in the receiving coil, it will stimulate a current on the coil. The WPT system can be assort by distance of transmission, size, and efficiency. Classification based on transmission distance is of two types; they are far field and near field transmission. The near field transmission is said to be inside the radius of the wavelength and it is a non-radiative transmission. The distance of the field is calculated by $(D_{\text{range}}/D_{\text{ant}})^3$ since the power are proportional to square off the field strength.

The far field transmission is said to be area outside the radius of two wavelengths. The range is almost multiple kilometers range. It is a radiative technique and it is acknowledged as power beaming. In this method power is transmitted by ray of electromagnetic radiations.

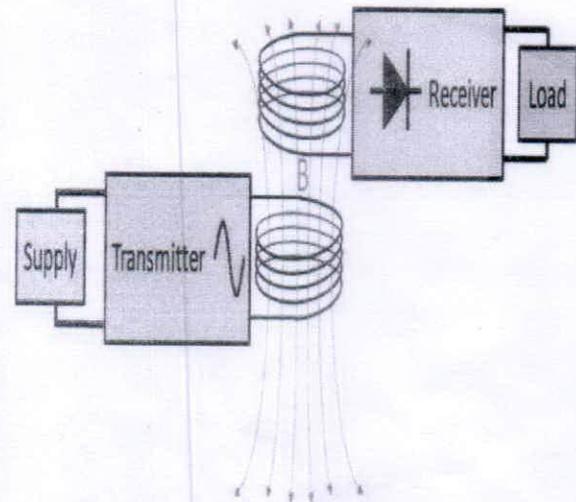


Fig. 1. WPT system

In 1981, Nicole Tesla was the foremost individual to introduce the thought of WPT. He demonstrated the concept of WPT but he was not able to complete this project since there was lack of fund. Later on William C Brown introduced great contributions to the development of microwave power conduction. He made-up the rectifying antennas, called rectenna, which can accept microwaves and alter them to DC current [3].

Control strategies, precaution perspective, optimized higher efficiency, increased coupling coefficient; methodologies of compensation and inspection of circuits are the challenging areas of wireless power transfer. Compensation technologies and circuit analysis place an in vital role in WPT due to resolution of resonant frequency, output specification, reduction of leakage inductance, power factor and output parameters and soon.

Fore mostly four centralized compensation strategies are there specifically. Parallel-Parallel, Series-Series, Parallel-Series, and Series-Parallel [2][12]. The most frequent combination of these compensational methodologies is Series-Parallel and Series-Series. This is due to square wave voltage of compensation strategy [13][6]. Due to variation in polarity, the voltage of the front or primary capacitor increases to the level of voltage of input instantaneously.

Apart from these compensations there are new techniques like inductor-capacitor-capacitor, inductor - capacitor-inductor, inductor-inductor capacitor, series on primary and series parallel in secondary etc.

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GA Based Intelligent Algorithm for Efficient Power Transfer

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Abstract— The attractive feature of the low and medium power application operational at Megahertz (MHz) is the wireless mode of power transmission (WPT). Class E rectifier along with the power amplifier with Class E (PA) makes up the converter class E². Optimal performance is enabled in fixed operating conditions, for class E² converter. However, variations in load and relative position of coil are frequent. This paper comes up with a broad-spectrum design policy for a robust Class E² for wireless power transfer applications. The bases of the system and component efficiencies have been analyzed resulting in the present parameters. The elementary matching network of power amplifier with class E has offered the requisite impedance compression capability. Thus, the procedure is developed for a strong constraint scheme by using Genetic Algorithm (GA).

Keywords— Class E² dc-dc converter; Genetic Algorithm; Matching Network; Wireless Power Transfer;

I. INTRODUCTION

Inductive resonance coupling have profoundly used nowadays in this contemporary field of WPT techniques [4][6][9]. The range of frequency has to be increased for the improvement of freeness among the coils and higher tolerance. A notable reduction in shape and weight of the entire system is achieved when designing higher operating frequency. But it increases switching losses [7]. To achieve higher frequency the Zero Voltage Switching (ZVS) besides soft switching properties of the power amplifier with Class E are the leading methods in this current scenario. The ZVS operation helps to achieve this.50% of the duty cycle of the rectification diode possess an exact resonance of the two coils[11]. Thus, the voltage stress over the diode may be reduced. A general design methodology rectifies the problem and maintains high efficiency at various loads and coil positions. The Genetic Algorithm (GA) improves circuit design and optimal design of system parameters and thus achieves robustness.

II. SYSTEM LEVEL EFFICIENCIES

Class E² DC-DC converter includes a PA type of Class E, transfer power through coupling coils and Class E resonant converter. A class E² converter is operating at 6.8MHz. It includes a half wave rectifier, PA and serially connected coupling coils which drives the current. The efficient origin of rectifier with Class E type is obtained and helps to simplify the process [10][11]. The Class E type rectifier

requires an input signal as pure sine wave. For that a series resonant coil is selected. According to the purpose, various other connections of coils can also be used (series-series, series-parallel, parallel-series and parallel-parallel). Efficiency of the whole converter for the discussed type is as follows:

$$\eta_{sys} = \eta_{pa} \times \eta_{coil} \times \eta_{rec} = \frac{W_0}{W_i} \quad (1)$$

$$\eta_{pa} = \frac{W_{zin}}{W_{in}}, \eta_{coil} = \frac{W_{recp}}{W_{zin}}, \eta_{rec} = \frac{W_0}{W_{recp}} \quad (2)$$

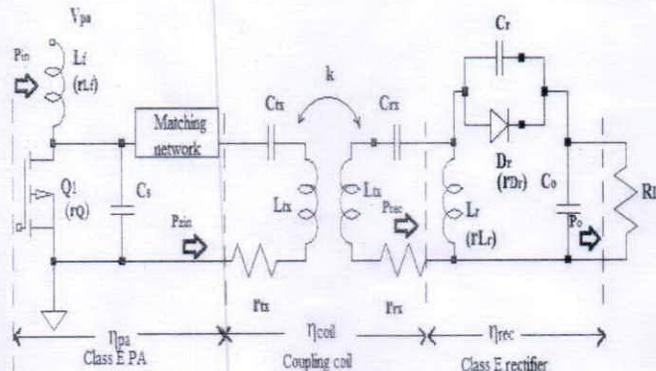


Fig. 1 Class E² DC-DC Converter

L_{x1}, L_{x2} and L_m are the inductance of the transmitting, receiving coil and mutual inductance:

$$L_m = k \sqrt{L_{x1} L_{x2}} \quad (3)$$

Efficiency of coupling coils depicted as;

$$\eta_{coil} = \frac{R_{recp} \omega^2 k^2 L_{x1} L_{x2}}{\omega^2 k^2 L_{x1} L_{x2} (R_{recp} + r_{x2}) + r_{x1} b} \quad (4)$$

Where,

$$b = (R_{recp} + r_{x2})^2 + (X_{recp} + \omega L_{x2} - \frac{1}{\omega C_{x2}})^2 \quad (5)$$

A Reliable Inverter For Wireless Power Transfer Applications

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Abstract— In wireless power transfer system, the transmitter circuit generates the high frequency signals so that the receiver can receive the signal without wire. This paper presents a new inverter which can be utilized in wireless power transfer based on the Cuk converter operating in critical conduction mode. The main feature of the proposed topology is the fact that it could be applied to either hard switching or soft switching mode of operation provided the link capacitance is negligible. This paper presents the operation, design and simulation of the inverter using MATLAB/Simulink.

Keywords— wireless power transfer, high frequency, Cuk converter, Inverter, soft switching

I. INTRODUCTION

Nowadays generation and transmission of electrical power become very challenging due to high power demand. The need for electricity is a lot more eminent than the amount being raised. The losses due to transmission through wires reduce the efficiency of transmission. Wireless power transmission technology is an efficient method for transferring power from one place to another without the use of any physical support. The efficiency of the wireless power transfer highly depends on the signal frequency in which the signals are transmitted, the size of the coils and the gap between the coils. By increasing the frequency of transmitting signal we can increase the efficiency of power transfer. [1]. In general power is transmitted in ac hence the wireless power transfer scheme should incorporate DC to AC power conversion stage followed by the transmission of this energy through the radiation. At the designated target, the reverse process occurs where the AC energy is rectified and converted into DC energy which is then used as power. The simplified wireless power transfer can be summarized as in Fig.1. This paper primarily focuses on the inverter which is employed in transmitting section.

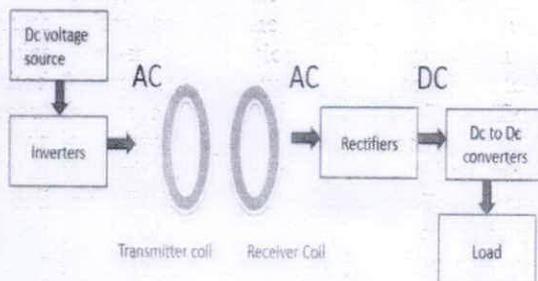


Fig. 1. Basic wireless power transfer scheme

The inverter is an electronic circuitry which converts direct current to alternating current. The input voltage, output voltage and frequency depend on the design of the inverter. An inverter is termed as a voltage fed inverter if the input voltage remains steady, a current fed inverter if the input current is kept as steady, and a variable DC linked inverter if the input voltage is regulated. Considering configuration and control schemes voltage Source Inverter (VSI) and Current Source Inverter (CSI) are the major classes of inverters. But they have limited voltage gain ratio [2, 3]. The input to Voltage Source Inverter can be a battery or a controlled rectifier which provides constant DC voltage supply. Both Single phase and three phase Voltage Source Inverters find application in industries.

Voltage Source Inverter can be considered as a DC source with small or negligible impedance. A Current-fed Inverter or Current Source Inverter is fed with a variable current source. In Current Source Inverter, output current waves are independent of the load variations. If the power requirement is large, then three phase inverter can be applied. When three Single phase inverters are connected in parallel, we can get the three phase inverter. The gating signals for the switches will have a phase difference. Usually a large capacitor is provided at the input terminals to keep the input DC voltage constant. This capacitor can suppress the harmonic feedback to the source. Therefore the Voltage Source Inverter can either be a buck (step down) inverter operation or boost (step up) operation for DC to AC power conversion.

When the available DC voltage is limited, an extra DC - DC boost converter is essential to achieve a desired AC output. This additional power conversion stage increases the system cost and reduces efficiency. The upper and lower switches of a phase leg cannot be gated on together by force or by any other noises. The shoot through problems with Electromagnetic interference noise is a major concern to the inverter reliability. Dead time provided to eliminate shoot through problem can cause the waveform distortion. Output LC filters are necessary to provide a sinusoidal voltage compared to Current Source Inverter which introduces power loss and control complexity to the circuit.

Certain above shortcomings can be eliminated by the parallel ac-link universal converter [4] which is an extension of the dc-dc buck-boost converter. It can be utilized for either rising-up or falling-down the voltage, also the harmonic distortion factor present in its input and output currents will be low. But the switches must be bidirectional since the input current and output current are not continuous. Hence the conduction losses will be higher.

The concept of this inverter is based on the novel class of universal converters which offers convincingly high

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CSI based Analytical Model for evaluation of DC Characteristics in AlGa_N/Ga_N/AlIn_N MOS-HEMT using high-k dielectrics

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Abstract—An analytical model is used for evaluating the DC characteristics of AlGa_N/Ga_N Metal Oxide Semiconductor-High Electron Mobility Transistor (MOS-HEMT) having an AlIn_N back-barrier. The behavior of various parameters such as charge density, carrier concentration, drain current, trans-conductance, and gate capacitance of the device have been computed by using Cubic Spline Interpolation (CSI) model. Different high-k dielectric materials like Aluminum oxide (Al₂O₃) and Zirconium dioxide (ZrO₂) were considered as oxide layers. A comparison is performed between the IV characteristics of Al₂O₃ and ZrO₂ MOS-HEMT with the conventional SiO₂ device by deriving its mathematical dependence. Due to the high-quality interface between ZrO₂ and the AlGa_N barrier layer, the proposed structure has shown to demonstrate excellent current drives. The modeled outcomes match exactly with the experimental results from literature, using the cubic spline interpolation. The proposed device displayed a 28% and 18% enhancement in drain current for ZrO₂ and Al₂O₃ dielectrics respectively. Due to its high current drive and trans-conductance factor, ZrO₂ could be considered as an efficient alternative for high power applications like high energy RF acceleration and Radar.

Keywords—AlGa_N/Ga_N, MOS-HEMT, AlIn_N, back-barrier, Cubic spline, Al₂O₃, ZrO₂.

I. INTRODUCTION

There has been a remarkable amount of research being carried out in silicon-based devices, since it being an abundant and significant semiconductor material. Silicon based device have been of much importance in research area considering its applications in circuitries like multipliers and in mobile phone networks like MANET [1]-[2]. However, silicon material risks performing at high frequencies as the transistor scaled down further. Several other materials address the high frequency issues by incorporating elements from III-V group semiconductors [3]. Significant research was carried

out for III-V Metal-oxide Semiconductor Field Effect Transistors (MOSFETs), by analyzing its performance metrics using specific materials for forming channels with high mobility and gate dielectrics as oxides [4]. Gallium Nitride (Ga_N) based HEMTs have captivated interest as crucial devices for high-frequency millimeter-wave applications [5-6]. Ga_N can also be utilized as a last barrier layer for multiple quantum barrier structures, thereby allowing finer carrier confinement and increased hole transportation/injection in the quantum well [7].

II. LITERATURE SURVEY

Ga_N materials have also gained wide acceptance among researchers around the world since it could achieve charge densities in the range of 10^{13} cm⁻² in the potential well [8]. AlGa_N material provides proper confinement for electrons from the top towards the channel such that the Ga_N channel receives a considerable number of electrons without intentional doping [9]. The current collapse scales down to negligible levels upon incorporation of an AlN stack layer [10]. AlGa_N/Ga_N HEMTs have also proved its likely potential in millimeter-wave applications by benefiting from low gate leakages and low switching losses [11]. AlIn_N is one of the materials which has a strong mismatch with Ga_N and causes a negative polarization charge [12]. AlIn_N can also be considered as a back-barrier material due to its ability to prevent forming a parasitic electron channel because of its negative polarization charge [13].

Gate leakage is one of the recurring issues in HEMTs degrading the performance of the device. Oxide or dielectric layers were incorporated near the gate and barrier regions to overcome gate leakage effects. A high-k dielectric material could considerably reduce the gate leakage and power dissipation of the device and also enhance gain and output resistance [14]. HfO₂ is a high dielectric and high band-gap material used as an oxide layer

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Dry powder fire extinguisher robot

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Abstract

Now a days fire accidents are increasing due to increased population & use of electrical equipment's. It's been a challenging task for human to risk their life to extinguish fire in very risky environments. Where there is a chance of losing their life. In this stage the need of fire extinguisher find its necessity. By the use of robots the protection of human lives and surrounding can be ensured. Fire extinguisher robot is the hardware model which can be used during fire accidents to extinguish fire. Robotics are machines that plays an important role to performing dangerous tasks which humans can't reach. Robots can perform in extreme conditions it is accurate so that the errors and limitations of humans during fire extinguishing can be reduced. We are using Thermocouples to sense temperature so that at a cut off temperature robots starts responding to the fire. So that fire extinguishing technics can be done by the robot. For the safety purposes we are also using a temperature sensor to provide a backup to the Thermocouple. The fire extinguisher robots find its applications in rescue operations during fire accidents where the service men can't reach the fire prone area. We are using dry powder fire extinguisher instead of water so that complexity of carrying water to remote areas can be reduced

Keywords: Fire Extinguisher Robot; Fire-fighting Robot; Autonomous Fire Extinguisher Robot.

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Modelling of surveillance hovercraft

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Abstract

A hovercraft-also known as air cushion vehicle /ACV is an amphibious craft capable of travelling over land, water, mud, ice and other surfaces where boat have no access and road don't reach. The project focuses on helping the humanity in case of flood and the detection of dead bodies underwater. the hovercraft is attached to a camera rotating in 360 degrees to scan the area where the people are trapped at the time of flood along with voice recognition technique to sense the sound of the people trapped in the house or any other location there by guiding the rescuers to reach the place as soon as possible. In addition to that the hovercraft sets for underground surveillance to detect the dead bodies underwater by image processing. the processed images of dead bodies will be depicted on the screen there by helping the rescuers to reach at the correct place where the dead bodies lies. Guess the approximate dimensions of the body by the method of image processing system detect the dead bodies easily.

Keywords: Hovercraft; ACV; Surveillance; Image Processing.

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Automatic seat belt release system

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Abstract

An automatic seat belt release system is provided for installation in conjunction with the seatbelt system of the vehicle so that, in the event of vehicle is sustaining an impact of sufficient magnitude as to warrant emergency release of the seatbelt system, an electrically operated actuator near the seatbelt is actuated to release the seatbelt system a short predetermined time interval after the vehicle comes to rest. The emergency release system includes an accelerometer, a gyroscope, a developer board and a solenoid actuator. Sensor accelerator is responsible of determining the collision of the vehicle, and gyroscope sensor determines the orientation of the vehicle after the collision, if there is no change in orientation in the gyroscope it causes the predetermined time in the developer board to actuate. After the predetermined time expires, the solenoid is actuated to release the seatbelt. This fast release action can give much time for the passengers to get to safety.

Keywords: Automatic seat belt; Actuator; Emergency release system; Safety.

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Investigation of mechanical properties of ecofriendly composite prepared from saw dust

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Abstract

The threats caused by plastic wastes to the environment are very hazardous that we need to minimize its production and usage. Sustainability should be ensured in everyday life so that we can handover the planet to the next generation in a more prosperous manner. To beat the problem of plastic wastes, we design a new ecofriendly composite named as Plasaw. It is made from grains of used plastic materials and saw dust. The binding medium used is epoxy adhesive. While testing, the new composite has notable and improved mechanical properties. It ensures a check on the generation of plastic wastes and help in present as well as future waste management process. The techniques use reuse and recycle strategy of existing plastic wastes. Widely used items in our day to day activities can be redesigned using this composite material. This composite has the capacity to compete with the present used materials equally or in greater level in all aspects.

Keywords: Eco friendly composite; mechanical properties; reuse; epoxy medium.

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Characterisation of titanium aluminide (Ti-Al) based alloys prepared by spark plasma sintering method

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Abstract

Ti-Al alloys are generally used in aerospace and automotive industries where there are high temperature applications. They also have low density, high specific strength, and high specific stiffness. The spark plasma sintering (SPS) technique used for the preparation of Ti-Al alloys have found to be capable of increasing the mechanical properties and a greater improvement in reproducibility. Functional simplicity, control of sintering parameters, exceptional sintering speeds, high reproducibility, consistency and safety are the main benefits of spark plasma sintering (SPS) over conventional methods, unlike other sintering techniques such as hot iso-static pressing and hot pressing, SPS compacts the materials in shorter time (< 10 min) with a lower temperature and leads to highly dense products. In titanium aluminum alloys, Kirkendall diffusion pores will influence the density of final products due to difference between the partial diffusion coefficient of Ti and Al. SPS is found to be reducing this effect due to its greater efficiency in densification during the preparation of Ti-Al alloys. Due to its versatility and short process time (typically 100 times faster than the shortest routes used until now) together with the large variety of available microstructures; SPS appears to be an important process to develop in materials science, especially for promoting the use of Ti-Al alloys.

Keywords: Spark plasma sintering (SPS); Titanium Aluminide; Iso-static pressing; Hot pressing.

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Simulation, development and characterization of tunable capacitor (Part 1:- Linear mechanical drive)

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Abstract

In this paper a linear tunable capacitor is introduced. Even though rotary tunable capacitor is commercially available in industry, a new step to provide tunable spacing between the plates in linear direction can contribute a lot in the circuit domain. Multiple plates used in rotary variable capacitors, often affects the physical stability of the device. More over the sharp entry of the mating plates is vulnerable for spark and causes fire in the system. Based on the simulation result obtained from COMSOL, development and characterization of the linear tunable capacitor is carried out in this work. To demonstrate the performance, a systematic assessment of energy storing ability and discharge rate also investigated in the real environment. Two identical 20 x 20 mm brass plates of thickness 3 mm are placed at the two ends. Using feed drive mechanism having 1.5mm pitch an angular sensitivity of 0.01 mm/rad is obtained. The experimental studies are planned in 25 combinations. The effect of play of the contact elements are also assessed in the work. A range of capacitance from 100 μ F to 500 μ F is obtained in the proposed configuration. The tunable capacitor finds applications radio, aerospace (transmitters & receivers), signal splitters etc. The ability of the device to maintain different capacitance during charging and discharging opens vast applications in filters. In the second phase of the work, the potential of Smart materials and MEMS are incorporated.

Keywords: Variable capacitor; linear control; dielectric; spindle; Smart Material; COMSOL.

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PRODUCTION OF DIESEL FROM LOW DENSITY POLYETHYLENE

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Abstract

All plastics have to be disposed after their use as waste. They need to manage their waste as plastic become apparent. This leads to pyrolysis which is a way of making to become very useful to us by recycling them to produce fuel oil. In this study, plastic wastes were used for the pyrolysis to get fuel oil that has same properties as the fuel in aviation industry. Thus, the problem faced by the increasing fuel crisis can be eliminated by making a system which can decrease the pollution due to plastic and increasing availability of alternating fuel. This was made by converting the plastic waste into useful alternative oil by means of pyrolysis process.

Keywords: Plastic wastes, Pyrolysis, Fuel oil.

DEVELOPMENT OF A ENVIRONMENT FRIENDLY MINI-COOLING SYSTEM

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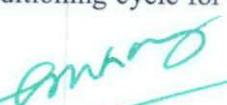
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Abstract

Every year the demand for cooling system is increasing due to weather conditions. In recent years, living in a hot country like Middle East countries has always led people prefers to use the air conditioner. This is because the air conditioning provides comfort to the user to do a proper daily routine work by controlling the temperature and humidity. A little background about the air conditioner is that it can produce the comfort when the user adjusts the temperature on the air conditioner. This is typically done by using of simple air-conditioning cycle for comfort cooling

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caustic soda is the effective combination of chemical agents for efficient flux recovery. During filtration experiment it was observed that this filtration experiment gives very impressive permeate quality. From this result we can conclude that this PVDF tubular membrane can be used for many industrial applications for suitable effluents.

Keywords: Membrane filtration, PVDF Membrane, Tubular membrane, flux behaviour, Chemical cleaning, flux recovery.

DESIGN AND FABRICATION OF AYURVEDIC TABLET MAKER

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Abstract

Ayurvedic tablet maker is an ayurvedic tablet making machine which produces tablets at high rates of production and finishing. The tablet maker working involves both electrical and mechanical process. The machine will be highly usable for ayurvedics centers which are at the verge of extinction. The idea of project is from a detailed study on tablet making processes at Keraleeya Ayurveda Samajam Hospital, Shoranur, Kerala. All the process including both mechanical and electrical were done separately which increased the workload of the employees. Their problems were analysed and introduced the concept of ayurvedic tablet maker in which all the processes of tablet making were assembled in a single machine. Thus helping the employees reduce their workload. With the help of electrical and mechanical actuators the tablet maker has completed. For mechanical part used rollers for making the tablet size and shape, the rollers rotated with the help of AC Motors. Drying unit is separately installed with the table for the final drying process. The design of the machine based on the requirements for the hospital and cost effective one.

Keywords: Ayurvedic tablets, Electrical and Mechanical actuators, Rollers, AC motors, etc.

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MULTIPURPOSE AIR COOLING SYSTEM

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Abstract

Air conditioner has become a necessity of all households in 21st Century. In all metropolitan cities, environment degradation due to automobile other factors is on the rise, therefore the requirement of air-conditioner has already been felt. The new technological advancements and the needs of the people have made us think about this project. If a domestic air cooler, water heater and refrigerator can be combined, only one set of their key components like the compressor, the heat exchangers, etc is used, the primary cost will be reduced considerably when compared with using three separate units and thus the new equipments becomes multifunctional. This project aims on achieving this by using a multi evaporator with single compressor for operating air cooler and refrigerator. The waste heat from the condenser is used to heat the water. This ultimately leads to reducing the monthly tariff and also having very less effect to the environment.

Keywords: Domestic Refrigerator, Air conditioner, Affordable, Productivity, Portability, Environment Degradation.

EFFECTIVENESS OF ALGAE BIOFUEL IN CI ENGINE ATTACHED WITH EXHAUST GAS RECIRCULATION SETUP

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Abstract

Modern diesel engines tend to utilize significantly large quantities of Exhaust Gas Recirculation (EGR) and high intake pressures across the engine load range to meet NOx targets. At such high EGR rates, the combustion process and exhaust emissions tend to exhibit a marked sensitivity to

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efficient and quick enough. We have designed an effective device which collects waste from water bodies in the most efficient way. A unique technology has been used to collect waste while the device is still floating in the water surface. Only the surface waste can be collected which accounts to more than 50% of the waste in the water bodies. An Archimedean screw is used to provide suction of waste in to the device. An electric motor powers the Archimedean screw and the collected waste is pushed back to fine meshed nets which can later be collected and segregated. In addition, a control module was attached so that the people who were engaged in collecting wastes earlier, now feel just like playing computer games.

Keywords: Waste Collection, Floating Wastes, Aquatic Lives, Archimedean Screw, Floating Waste Collector.

DESIGN AND FABRICATION OF SEA WATER PURIFICATION SYSTEM

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Abstract

Water is a fundamental need for all living things. The goal of our project is to design and test a portable water desalination unit capable of producing drinkable water in emergency situations. For everyday use, the mechanism uses solar energy as a renewable energy source.

Electric current is run to a heating element located in the contaminated water, transferring heat, causing it to boil. The evaporated water leaves behind 99.9% of contaminants in the boiler producing mostly uncontaminated vapor. The water vapor created then condenses through a concentric copper tube heat exchanger and the result is potable water. This system will efficiently transmit heat to the water and all components of the device will be cost efficient and require minimal maintenance.

Keywords: Sea water, Purification, Solar energy, Renewable energy.

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impact test and corrosion and wear studies. The distribution of reinforced particulates in the matrix is studied with the help of micrographs taken from the optical microscopes. It is concluded that, when compared with mono composite, hybrid composite produces better mechanical properties. Inclusion of solid lubricant enhances the corrosion and wear resistance of the hybrid AMMC.

Keywords: Stir casting technique, HAMMC, solid lubricant, corrosion, wear study.

BIODIESEL PRODUCTION FROM USED COFFEE GROUNDS

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Abstract

The project mainly aims on lowering the depletion of natural resources and promote the use of waste materials for maintaining sustainable development. Biodiesel is an alternative for petroleum products made from natural resources. Usage of biodiesel shows huge reduction in chemical contents such as toxic and hydrocarbon species in the air. Biodiesel can be mixed in any suitable proportion with the conventional diesel. The production of biodiesel from used coffee grounds under transesterification process is experimented. Transesterification process with methanol and KOH as appropriate catalyst is employed for biodiesel synthesis from spent coffee oil. Primarily oil extraction from coffee grounds was done using solvent hexane. The oil will remain leftover while the solvent gets evaporated. Nearly 85% oil-to-biodiesel conversion was obtained through transesterification process. The process was maintained at 60-65°C and 1:3 oil-to-methanol molar ratio. The procured biodiesels properties were checked and resulted in high energy content biodiesel with similar properties to that of conventional diesel and the engine performance test proved to be efficient.

Keywords: Biodiesel, Coffee oil, Transesterification, Diesel engine.

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AUTOMATED CRACK DETECTION USING MOBILE ROBOTS

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Abstract

Different engineering structures like bridges, beams, concrete structures, etc. are subjected to different problems due to the improper construction method adopted and carelessness during initial construction. They are also often subjected to fatigue stress, cyclic loading and other environmental changes, which creates breaks on the structures called cracks that results in the reduction of stiffness in the structure as well as creates deformities in the structure. Thus, it is necessary to detect and take preventive measures against cracks in order to prevent further damage and possible failures of the structures in order to avoid accidents and for easy maintenance and there requires the need of automated crack detection scheme. The proposed system consists of a robot, a high resolution camera to collect images of surfaces and a global map for locating the position of cracks. The robot will navigate on the surface of the structure like bridges to collect the surface image data at predetermined locations. An image processing technique is also used for processing the image.

Keywords: Mobile robots, Crack detection, Image processing.

SOLAR POWERED VEHICLE CABIN COOLING SYSTEM

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Abstract

Today, an automobile is a necessity for everyone. For a long time, people need car regard to the safety, environment and most important comfort. Owing to these reasons, many vehicles are equipped with heating, ventilating and air conditioning system. The major problem

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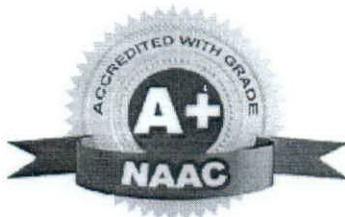
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Paper ID: MD112

DEVELOPMENT OF ACTIVE HEALTH MONITORING SYSTEM FOR TWO WHEELER

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ABSTRACT

In this paper we considered to study the Active health monitoring system for two wheeler's driver. India is highly populated country with majority of young working force. Two Wheelers are the predominant mode of transport used by majority of people for day to day business or work due to cost effective, passion towards riding, easy accessibility etc., over period of years. Due to Dynamic and raced life style we are not taking care of our health which leads to stress and obese. Driver fatigue and drowsiness have been also major reason for serious road accident, which need to be considered as major concern and to avoid such incident. In 2017 there were over 500000 accident registered in India with 146377 fatalities, among which two-wheelers accounted for the highest share in total road accidents (28.8%). Active Health monitoring system may be useful sign for driver's health condition monitoring by implementation of Heart beat sensor in two wheeler handle bars.

Keyword : *Heartbeat sensor, Health monitoring system, Fatigue, Drowsiness*

Paper ID: MD113

ANTI-DROWNING SYSTEM FOR CARS

NishaSherif, Akshay B S, Akhilesh P, Jithin P Mohan, John Dennis

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ABSTRACT

The state of Kerala was struck by a natural calamity which came in the form of flood, covering almost 11 districts out of the 14 district in Kerala, rendering lakhs of people homeless. The flood also wiped out nearly 17,500 cars which was around Rs.1,000 crores. This huge loss was of both personal and market significance as cars of individuals as well as of different car showrooms was equally affected. The main objective of this project is to develop a simple system to prevent the entry of water into the parked cars during floods. This can be done by lifting the vehicle above the water level with the help of compressed air lifting bags. The main components of the system includes a water level sensor, control unit, air compressor, airlifting bags, solenoid valves and the frame(acts as a water column).

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Paper ID: MS111

Eco-friendly composite material from saw dust

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Abstract:

The threats caused by plastic wastes to the environment are very hazardous that we need to minimize its production and usage. Sustainability should be ensured in everyday life so that we can handover the planet to the next generation in a more prosperous manner. To beat the problem of plastic wastes, we design a composite PLASAW. Plasaw is made from grains of used plastic materials and saw dust. The binding medium used is epoxy adhesive. The new composite has notable and improved mechanical properties. It ensures a check on the generation of plastic wastes and help in present as well as future waste management process. The techniques uses reuse and recycle strategy of existing plastic wastes. Widely used items in our day to day activities can be redesigned using this composite material. The new composite concept has the capacity to compete with the present used materials equally or in greater level in all aspects.

Key words: Composite, mechanical properties, reuse, recycle, binding medium.

Paper ID: MS112

Utilization of Grey-Taguchi Method to Optimize the Mechanical properties of Hemp and Coconut shell powder Hybrid Composites under Liquid Nitrogen conditions

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Abstract: In this research an attempt has been made by using a method called Grey-Taguchi for optimizing the mechanical properties of composite materials. Hand layup method was adopted for the fabrication. Here, Woven Hemp fiber diameter, Number of hemp layer, contents of the coconut shell powder and cryogenic temperature ranges at different levels were incorporated as outcome parameter. For the fabricated laminates ASTM standards were set for conducting the mechanical tests. Hemp and content of coconut shell powder underwent treatment with 5 % NaOH to develop the interfacial exchange between the matrix and fiber. Taguchi method is combined with Grey relational analysis was applied for optimizing composite. Mechanical properties that include compressive strength, tensile strength, impact strength, and flexural strength are set as quality targets. This study involved nine experiments on L9 (3⁴) Taguchi method's orthogonal array. The optimal parameter were obtained by the combination of the composite, Grey relational analysis was applied. Optimal parameters results were verified with the help of Confirmation test. The study results obtained proves the impact strength, flexural strength, tensile strength as well as the compressive strength of the samples. This is improved parallelly over ideal combination of composite parameters secured from the contemplated method.

Keywords: Coconut shell powder; Hemp fiber; Cryogenic, Strength, Grey-Taguchi method.

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Paper ID: MT114

ESTIMATION OF PARAMETER IN LAMINAR NATURAL CONVECTION HEAT TRANSFER PROBLEM IN HORIZONTAL PLATE FACING UPWARD BY USING LEAST SQUARE RESIDUAL METHOD

Mr.P.Balakrishnan¹, D.YogaVignesh, M.VisuBalaji, R.PravinKumar²

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ABSTRACT

Natural convection heat transfer occurs in many engineering applications such as heat exchangers, nuclear reactor fuel elements, and dry cooling towers, and geophysical flows. The present work discusses about the experimental study of natural convection heat transfer in a horizontal plate facing upward in which two walls are adiabatic and other two ends are open to the ambient. The goal is to compare the value of C in the Nusselt number with available correlation using least square residual method where air is used as a working medium. The experimental setup has been designed and fabricated.

Keywords: Natural Convection, Horizontal Plate, Least square residual

Paper ID: MT115

Solar Tracking – A Novel Approach

ArunShaju K, AugasthyaKuruville, Don A Kakkassery, Febin Sebastian, Deepanraj B

Department of Mechanical Engineering, Jyothi Engineering College, Thrissur, Kerala, India

Abstract:

Demand for electricity and its price are continuously increasing over the time. Solar energy has become a preferred alternative to meet the increasing electricity demand because of its abundance, ubiquity and sustainability, regardless the intermittency of sunlight, solar energy is widely available and completely free of cost. Solar photovoltaic are solid state devices that simply make electricity out of sunlight, silently and with little to no maintenance, no pollution and no significant depletion of material resources. However, it is costly to install but in a long term it can save more energy and offers more reduction in cost. Solar tracker is a simple mechanism that is to be attached to pre-existing solar panels. The main objective of a solar tracker is to position solar panel according to the path of solar radiation and thereby to increase its output. We obtained the idea of auto rotating solar panel from the nature itself, eg: the sunflower. We observe in nature, how a sunflower changes its position upon movement of sun. This is to catch maximum radiation so as to attain maximum photosynthesis process. We use the same objective of sunflower to obtain the maximum light from sun to maximise current generated. Sunflower use its hormone control and water level concentration to track sun. We need to find a system that is to be attached to solar panel rather than an electronic

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circuit and an electric motor, which consumes the energy which was just harvested by solar panel. This in turn reduces efficiency of the panels. We developed an idea which causes weight imbalance by the change in liquid level in tube mechanism to track the sun. The requirements are vacuum tubes and 2 tanks. This type of solar tracking can increase efficiency of present day solar panels.

Keywords: Solar energy, Solar tracker, Photovoltaics.

Paper ID: MT116

**A REVIEW ON
SOLAR COOKER WITH SUN TRACKING SYSTEM
S.GOWTHAM, G.HARIHARAN, R.HARIHARAN**

ABSTRACT

One of the methods to reduce household energy consumption is to use solar cookers. It can be most useful for cooking and baking in villages of sunny developing countries. The parabolic solar cooker with sun tracking system helps to reduce the need for frequent manual tracking and standing in sun and it increase the efficiency of the solar cooker with constant heating process. Sun tracking with the help of sensors, parabolic reflector, microcontroller. Parabolic reflector helps to concentrate the light into a single point of the cooker and the light energy converted into heat energy. Due to this heating process food is cooked in the pot.

Keywords: parabolic reflector, solar radiation, tracking system.

Paper ID: MT117

**Biodiesel Production from Mixed Elengi and Pongamia Oil using Calcined
Waste Animal Bone as a Novel Heterogeneous Catalyst**

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Abstract

Recently, researchers have shown more interest towards biodiesel production from non-edible vegetable oils. The main advantages of biodiesel as a fuel include biodegradability, non-toxicity, renewability and low emission profiles. In this study, crude mixed oil was used as feedstock for biodiesel production using heterogeneous catalyst synthesized from waste animal bone. Initially, mechanical extraction process was used to extract the crude mixed oil from the seeds of *Mimusopseleugi*, and *Pongamiapinnata*. The crude oil collected from different plant species was characterized using GC-MS spectral data to identify their fatty acid composition. Consequently, the mixed crude oil was converted into biodiesel in the presence of calcinated heterogeneous catalyst obtained from

homogenous base catalyst. Further, the trans-esterification reaction was optimized using the following condition reaction like temperature at 60°C, reaction time ~1.5 h, molar ratio 9:1 (oil: methanol) and 3% catalyst (w/w). The waste engine oil was distilled using fractional distillation process to produce fuels which is used in engines using inert silica granules. The bio-oil, bio-diesel and diesel samples were characterized using FT-IR and GC-MS spectroscopic techniques. Based on the spectral data, fatty acids, fatty acid methyl ester and hydrocarbon derivatives were identified. Similarly, physical properties were analyzed for the produced fuel and biodiesel such as density, viscosity, flash and fire point and calorific value and the results are comparable with ASTM standards. In this study three blends were analysed (B10,B20,B30), from the performance analysis it was reported that mechanical efficiency was found to be higher for B20 blend.

Keywords : Hevea Brasiliensis, waste engine oil, biodiesel, and performance analysis.

Paper ID: MT135

PROCESS OPTIMISATION AND KINETICS OF BIODIESEL PRODUCTION FROM DAIRY WASTE SCUM USING ZNO HETEROGENEOUS NANOCATALYST

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Abstract:

An effluent from the dairy industry, waste scum oil containing triglycerides was selected as a potential feedstock for biodiesel production in the presence of Zinc oxide nanocatalyst. Zinc oxide nanostructures was synthesised by sol-gel method and characterised using particle size analyser, X-ray diffractometer and thermogravimetric analyser. Synthesised heterogeneous ZnOnanocatalyst was used for transesterification of dairy waste scum. The maximum biodiesel yield of 94.8% was obtained at the optimised reaction conditions, 0.8 wt.%, methanol to oil molar ratio 9:1, reaction time 40 min, reaction temperature 65 °C, and mixing speed 300 rpm. The methyl ester production reaction follows a first order reaction rate. This research work shows that synthesised ZnOnanocatalyst was an effective catalyst to produce biodiesel from dairy waste scum.

Keywords: Dairy waste, Scum oil, Transesterification, Kinetics, ZnOnanocatalyst.

Paper ID: MT136

Potential of soil microbes derived bio pesticides with orange peel extract

in agriculture for crop improvement: Ecological perspective

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Biodiesel Production from Mixed *Elengi* and *Pongamia* Oil using Calcined Waste Animal Bone as a Novel Heterogeneous Catalyst

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Abstract: Recently, researchers have shown more interest towards biodiesel production from non-edible vegetable oils. The main advantages of biodiesel as a fuel includes biodegradability, non-toxicity, renewability and low emission profiles. In this study, crude mixed oil was used as feedstock for biodiesel production using Heterogeneous Catalyst synthesized from waste animal bone. Initially, mechanical extraction process was used to extract the crude mixed oil from the seeds of *Mimusops elengi*, and *Pongamia pinnata*. The crude oil collected from different plant species was characterized using GC-MS spectral data to identify their fatty acid composition. Consequently, the mixed crude oil was converted into biodiesel in the presence of calcinated heterogeneous catalyst obtained from waste animal bone and the catalyst was characterized by SEM, XRD and FTIR spectral data. The effect of variables including methanol to oil molar ratio, catalyst concentration, reaction temperature, reaction time and rate of mixing on the biodiesel yield was evaluated and optimized. The characteristics biodiesel obtained from mixed oil were close to commercial diesel fuel and used as an alternative to diesel in near future.

Keywords: *Mimusops elengi*, *Pongamia pinnata*, Biodiesel, CaO Heterogeneous Catalyst.

1. Introduction

Most of the researchers have gain interest and entered the field of alternative fuel is due to the depletion of fossil fuel resources and the increasing cost of petroleum product. The main reason is greenhouse gas effects and the environmental concerns [1-2]. Some of the hazardous gasses emitted from vehicles are always threats to the human beings. Qiu *et. al.* [3] studied the biodiesel production from the mixed oil of rapeseed and soybean through transesterification reaction in the presence of base and acid catalyst and obtained the optimized conditions as mole to methanol ratio is 5.1:1, reaction time is 2 hours and temperature is 55°C with the maximum biodiesel yield of 94%. In the transesterification of soybean oil - Mg-Al hydrotalcites used as a catalyst along with methanol, resulting in the negative effect of Mg/Al ratio on the basicity and catalytic activity. In addition, the catalyst reuse and the effect of calcinations temperature were addressed [3-5]. The calcium oxide supported on mesoporous silica to enhance the catalytic activity, as determined by the percentage yield and rate of the reaction involved in the transesterification of soybean oil [6]. The advantage of base (alkali) catalyst is requiring a small quantity in catalysis and to increase the activity of KI support catalyst by using mesoporous silica as a supporter [7, 8].

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Distributed State Estimation of a Non-linear process system with interconnected subsystems

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Abstract. In this paper authors propose a distributed state estimation scheme for the hybrid system with interconnected subsystems to estimate the states. The system considered in this work has different subsystems which can interact with each other via their states over a communication network. The objective is to implement the distributed state estimation scheme for interconnected subsystems in which each subsystem sensors are connected to the communication network, the estimator has been used for each subsystem to estimate the current states by utilizing the states of the neighboring subsystems over the communication network. The proposed state estimation framework utilizes unscented Kalman filter algorithm. Unscented Kalman filter has been designed for each subsystem to estimate the current state estimates which corrupted by state and measurement noise. The benchmark system taken to implement distributed state estimation is continuous stirred tank reactor units which are strongly interconnected via their neighboring states. The reactors temperature is maintained at unstable operating point by a decentralized proportional integral controller for each subsystem by utilizing the measurements of the sensors from the network. The estimation framework has been verified in the absence of the network failure to stabilize the plant at unstable operating point. The estimate of the corresponding subsystems is used to compute the controller output in the absence of the network failure with minimal sharing over the network.

Keywords: Distributed state estimation, interconnected systems, network estimation.

1. INTRODUCTION

In [1] the authors have proposed a robust unknown input observer for state estimation and fault detection using linear parameter varying model is proposed. The parameters of the Unknown Input Observer (UIO) are obtained by solving the linear matrix inequalities (LMIs) and linear matrix equalities (LMEs) and also convergence of the UIO is analyzed through Lyapunov theory. The state of a nonlinear dynamical system is estimated through consensus-based networked estimation. It is mainly focus on a family of distributed state estimation algorithms which relies on the extended Kalman filter linearization paradigm. The effectiveness of the nonlinear consensus filter is analyzed with target tracking applications [2]. A mathematical model of distributed state estimation is constructed for nonlinear networked systems against denial-of-service attacks. The feasibility of the distributed state estimation is confirmed and a sufficient condition of the proposed estimation method is tested [3]. An



Luminous power improvement in InGaN V-Shaped Quantum Well LED using CSG on SiC Substrate

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Abstract. This paper presents the design and simulation of Silicon Carbide (SiC) based technology, Indium Gallium Nitride (InGaN) Multiple Quantum Well (MQW) Light-Emitting Diode (LED) with a Compositionally Step Graded (CSG) InGaN barrier and V-Shaped well in the active region. The simulations are obtained in Silvaco Computer Aided Design simulator and parameters such as Internal Quantum Efficiency (IQE) with respect to input current, spontaneous emission in regard to wavelength and power versus current in the device are theoretically studied. The CSG InGaN barrier LED with V-shaped quantum well shows substantial growth in output power when compared to the CSG GaN barrier structure with conventional MQW. The high carrier confinement in the V-shape well causes, transportation/injection of hole and change in band bending due to polarization effect. Moreover, lattice-matched SiC substrate over GaN material increases the InGaN V-shaped MQW LEDs radiative recombination rate which in turn leads to high output power. The optical luminous power of 160mW and 82% of peak IQE, emitting wavelength at 460 nm and 200mA of injection current is obtained for the proposed LED. The enactment of the V shape MQW CSG-InGaN device technology is a good alternative choice for commercial and industrial lighting applications.

1. Introduction

Among various semiconductor materials, III compound group Nitride materials plays a vital role in Nano scale lighting and display due to their tunable and direct energy bandgap from 0.7eV to 6.2eV [1]. GaN-based LEDs are mainly used in visible light communication, television display and mobile platforms. There are several factors which degrades the performance (in terms of emission efficiency) of the device mainly electron leakage [2]-[7], current crowding [8], auger recombination [9]-[11], poor injection of hole carrier [12], [13], polarization effect [14], [15] and defects [16]. Xuna Li et al. proposed a structure using P-type aluminium gallium nitride Electron Blocking Layer (EBL) to reduce the electron leakage which intern leads to less hole injection efficiency [17]. Yen et al. proposed n-type aluminium gallium nitride EBL structure which increases the output power, hole injection efficiency & photoelectric performance [18]-[20]. Due to strong electric field the position of electron and hole wave function in MQW may get change which leads to more time consumption for carrier recombination. Due to strong electric field the carriers, may spill out from the active region. To overcome this MQW technique is proposed [17]. This paper focuses comparison

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Automatic solar tracker

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Abstract An automatic solar tracker system is proposed in this paper so as to improve the efficiency of solar energy system. The importance of such a system is significant as the usage of electric energy is increasing in the modern era. So, the need for producing electricity with a reliable method is important. In the present condition, experiments on renewable resources to produce electric energy are common in literature. Over the past two or three decades, solar energy system have emerged as a viable source of renewable energy and now extensively used for a variety of applications. Sun tracking paves a way for efficient solar energy absorption. But the present situation is that, the tracker uses the energy that is stored to orient the tracker. To solve this problem an automatic solar tracker, which is a no-motor, no-gear tracker is introduced in this paper. The main objective of this paper is to design an automatic solar tracker system that can collect maximum amount of sun rays and convert into electricity. The tracker system contains frame and non volatile fluid and works based on the vaporization property of fluid in the frame. The frame reorients along with the movement of the sun due to the gravity of the fluid in the conduit and it makes the rays to fall normal to the panel.

Keywords Solar energy system, Solar tracker, Canister.

I.INTRODUCTION

With the increase in the need for electric energy, the renewable sources started to perform a tremendous role in energy production sector. Researchers commented that 85% of energy production is dependent on fossil fuels[1]. To provide a sustainable power production, there is a growing demand for energy from renewable sources like solar, wind, geothermal and ocean tidal wave. And of these, solar energy became a flexible mode of energy conversion through solar panels. Due to the surplus and environment friendly nature, solar energy is becoming one of the most reliable source of energy[2]. It is the Energy derived from the sun's radiation. It is used as a passive source of energy, for example, in the form of sunlight that comes through a window and heats up a room, or as an active source, as in the conversion of sunlight to electrical energy in solar cells. It doesn't require any outside supply to work, so its maintenance and energy production costs are practically zero. It is an inexhaustible source of energy that is not subject to market fluctuations or the effects generated by speculation.

Solar panels absorb sunlight as a source of energy to generate direct current electricity. It directly convert solar radiation into electrical energy and is mainly made from semiconductor materials. Silicon is the major component

in solar cells. It has a p-type of silicon layer placed in contact with an n-type silicon layer and the diffusion of electrons occurs from the n-type material to the p-type material through junctions. There are holes for accepting the electrons in the p-type layer. Performance of the panel depends on a number of factors like climate, conditions of the sky, orientation of the panel, intensity and duration of sunlight and its wiring connections. Maximizing the cell efficiency, increasing the power output and manipulating a tracking system with solar panel are three ways to increase the overall efficiency of the solar panel. It is a renewable resource for energy production and is clean, economical. And also it produces less pollution compared to other resources and energy[3]. A photovoltaic (PV) module is a well packaged, connected assembly of solar cells available in different voltages and wattages. As an alternative source for power utility, photovoltaic cells are an integral part of solar-electric energy systems[4][5].

Earlier solar panels that are stationary on the rooftops are mainly used. According to the Government of India's policy for the solar sector – Jawaharlal Nehru National Solar Mission (JNNSM) – a maximum of 20 GW of solar installations will be set within 2020[6]. But the problem faced by the users is that it absorbs only an average amount of light energy that hits on its surface perpendicular. And thus the efficiency of the product was low. Thus the researchers reached on the idea of orienting panels according to the movement of sun. It has been estimated that the arrival of a tracking system, over a fixed system, can increase the power output by 30% - 60%[7]. Employing a tracking system is an ongoing research work and people throughout the world are actively doing research on this. Thus the analyzers started to introduce different principles to reorient panels.

Solar trackers can be active or passive and may be single axis or dual axis according to the requirements [8]. Solar tracking includes moving parts and control systems that lead to expensiveness, single axis tracking systems seem to be a good solution for small PV power plants. It uses a tilted PV panel mount and an electric motor to move the panel. The rotation axis may be horizontal, vertical or oblique. The one axis tracking itself is distinguished into North-South horizontal axis tracking, Polar tracking, East-West horizontal axis tracking, Azimuthal axis tracking. The two axis trackers are also in use and it extracts maximum energy, due to its total freedom of movement (north-south and east-west) in both tracking

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Ultrasonic smart glasses for blind

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Abstract: This paper presents a low cost, portable and user friendly travelling aid for the blind people which use ultrasonic sensor technology. The device is in the form of spectacles. Ultrasonic smart glass is a concept based on the simple idea that animals such as bats use ultrasonic sound for detecting obstacles. The device has five ultrasonic sensors attached to it to detect obstacles. The five sensors are well placed on the various positions of the spectacle in order to determine the obstacles in the five directions; front, back, left, right as well as below. The knee cap sensor is placed at an angle to detect holes and steps on the ground. Ultrasonic sensor produces ultrasonic waves in the direction in which the blind is moving. The ultrasonic waves reflects back when an obstacle is detected. Then the device generates appropriate instructions in the form of voice message in the ear phone connected to the blind's ear. When the device fails to guide the blind the location of the blind can be send to the caregiver using GSM and GPS. All the associated accessories of the device that is circuits can be placed inside a cap and the cap also used along with the glasses which give better appearance.

Keywords: GPS, GSM, Ultrasonic sensor.

I. INTRODUCTION

According to the famous philosopher and scientist Aristotle, among the five sense organs vision is the most important one and our knowledge about the surrounding world depends on it. The people who are suffering by the eye sight issues are the most unfortunate people in the world. Vision is the most important part of human physiology as 83 % of human information being gets from the environment via sight. In general there is a significant increase in cases of blindness in the world. According to WHO statistics of 2011[1] approximately 285 million of the people are visually impaired across the globe, among 39 million are blind and 246 million have low vision. This report also says out of 39 million blind people, 15 million are from India. Hence India is the country having the largest number of blinds across the world.

The biggest challenge for a blind person is their mobility. The blind can easily move around their house without the aid of anyone because they know the position of everything in the house. But when they want to travel out of their house they need to depend on others. We all are wish to have independence in our life. Due to the lack of vision the blind people often need to depend on others.

The blind people use various navigation aids for their

mobility. One among them is the navigation aid from other human beings. The blind always need the assistance from their caregiver like where ever they go and to meet their daily needs. The assistance from other human being is often not favorable for them because like normal ones the blind also wish to have independence in their life. To avoid the dependence from others and to get more privacy in their life instead of a humans they often use animals as their aid. The most famous one is the guiding dogs. But there are certain places like restaurant where the animals are not allowed. Hence the assistance from the guiding dogs is also not favorable in such situations. Then the blind began to use other devices for their guidance. There are many existing devices for the guidance of blind. The most common one is the walking stick or cane. The canes are used to detect the obstacles by sweeping it back and forth. But the cane also has some demerits that sometimes the blind man gets aware about the obstacle too late. Also it cannot sense obstacles beyond a range and it is difficult to carry the cane everywhere they go.

In order to tackle the problems faced by the blind innumerable number of attempts has been made. One such attempt can be seen in the project "Project Prakash" [2], an empathetic attempt towards the blind children. The project involves a systematic study of the development of object perception skills in children following recovery from congenital blindness.

The normal walking stick has been modified to a smart cane that alerts visually impaired over obstacles in front[3]. The main objective was to communicate with blind through voice alert and vibration. The cane uses ultrasonic sound technology to detect the obstacles. But the problem with the smart cane is that it alerts the blind using vibration, sometimes it cause irritations to the user while using it.

Several modifications have been done in the blind stick to alleviate the discomfort caused by such sticks. Mohammed Azher Therib[4] designed a four leg walking stick for the blind in which ultrasonic sensor has been installed with a capability of a measured angle about 40 degree to detect hole or stair in front of the blind within the range of 48 cm. The device prevents the blind from falling that may result in injuries. Moisture sensors were implemented in this device in the first out of four leg stick to measure the degree of the land soil moisture in front of the blind. When the measured degree of moisture exceeds