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3.2.1 Number of papers published per teacher in the Journals notified on UGC website during the year.

Sr. No	Title of paper	Name of the author/s	Department of the teacher	Name of journal	Year of publication	Page No
1	Investigation on causes of landslide and mitigation measures using SPSS	Mr. Shrivallabh S. Chavan	**Civil Engineering**	**Nano technology perceptions**	**2024**	**1**
2	Innovative foundation design for enhansed stability for high rise buildings in civil engineering.	Mr. Amit C. Thoke	**Civil Engineering**	Official journal of the patent office	2025	2-3
3	**Modified Chaotic Map Approach for Medical Record Security**	Dr.M. N. Chavan	ComputerScience and Engineering	2nd International Conference on Networking,Embedded and Wireless systems(ICNEWS)2024	2024-25	4-5
4	**Project based learning in higher education:A Comprehensive review of aFrameworks, Approaches and Effectiveness**	Mr.S. J. Vibhute	ComputerScience and Engineering	AN International Multideciplinary,Multilingual Online Confrerence on"From Treadition (IKS) to Tommorrow(NEP)2020: Confrerence for a Viksit Bharat@2047	2024-25	6-7

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5	**Fractional Political Flower Pollination With DMN for Age -Related Macular Degeneration Detection using OCT images**	MR.R. S. Nejkar	ComputerScience and Engineering	IEEE international conference on Intelligent SignalProcessing and Effective Communication Technologies(INSPECT)2024	2024-25	8
6	DESIGN AND DEVELOPMENT OF A BLDC MOTOR BASED REGENERATIVE BRAKING SYSTEM FOR ENERGY-EFFICIENT ELECTRIC VEHICLES	Prof. Vishal T Metkari	Electrical Engineering	Industrial Engineering Journal	Jun-25	9
7	Design and Implementation of a Solar System Using DC Lighting for Energy Efficiency	Prof. Y. R. Naik	Electrical Engineering	International Journal for Research Trends and Innovation	Jun-25	10
8	EXPERIMENTAL ANALYSIS OF SINGLE-PHASE HALF CONTROLLED CONVERTER	Prof. Yogesh R. Naik	Electrical Engineering	International Research Journal of Engineering and Technology (IRJET)	Jun-25	11
9	GENERATING DC HIGH VOLTAGE USING MARX GENERATOR	Prof. A.M Bhandare	Electrical Engineering	International Research Journal of Modernization in Engineering Technology and Science	May-25	12
10	SOLAR BASED ELECTRIC VEHICLE CHARGING STATION	Prof. Yogesh R. Naik	Electrical Engineering	International Research Journal of Modernization in Engineering Technology and Science	Jun-25	13

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12	PORTABLE AIR CONDITIONER AND HEATER	Prof. B.S. Hebbale	Electrical Engineering	International Research Journal of Modernization in Engineering Technology and Science	Jun-25	15
13	DESIGN AND DEVELOPMENT OF A MULTIPURPOSE AGRICULTURAL QUADCOPTER FOR PESTICIDE SPRAYING AND WILDLIFE MONITORING	Prof.N.S.Jadhav	Electrical Engineering	International Research Journal of Modernization in Engineering Technology and Science	Jun-25	16
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15	ANALYSIS OF VARIABLE FREQUENCY DRIVE (VFD)	Prof. B.S. Hebbale	Electrical Engineering	International Research Journal of Modernization in Engineering Technology and Science	Jun-25	18
16	PROJECT ANALYSIS PAPER OF BUCK BOOST CONVERTER	Prof. B.S. Hebbale	Electrical Engineering	International Research Journal of Modernization in Engineering Technology and Science	Jun-25	19
17	IOT Based Controlled Smart Distribution Box	Prof. A.M Bhandare	Electrical Engineering	International Journal for Research in Applied Science & Engineering Technology (IJRASET)	Jun-25	20

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18	Energizing the Future: Assessing India's Electric Vehicle Ecosystem, Policies, and Market Dynamics	Dr.A.A.Katkar	Mechanical Engineering	International Journal of Environmental Sciences	2024	21
19	Development of Smart Materials with Tunable Mechanical Properties for Wearable Devices	Dr.A.A.Katkar	Mechanical Engineering	Eksplorium	2025	22
20	Hydrogen as a Clean Fuel: Storage Technologies and Associated Thermal Challenges	Dr. R.U.Urunkar	Mechanical Engineering	International Journal of Automotive And Mechanical Engineering	2025	23

Investigation on Causes of Landslides and Mitigation Measures using SPSS

P. M. Dhureen Karthik[1], Shrivallabh Chavan[2], Amit Thoke[2], Baskar Singh Ganesan[3], Ravichandra Honnalli[4], P. M. Sharan Karthik[5]

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[2]*Assistant Professor, Department of Civil Engineering Sanjeevan Group of Institutions, India*
[3]*Assistant Professor, Department of Civil Engineering, P.S.R. Engineering College, Sivakasi, India*
[4]*Assistant Professor, Department of Civil Engineering, Ballari Institute of Technology and Management, India*
[5]*Assistant Professor, Department of Civil Engineering, SSM Institute of Engineering and Technology, India*
Email: dhureen@gmail.com

This study investigates the causes and mitigation techniques for landslides, with an emphasis on the geological, environmental, and human-induced elements that contribute to slope instability. Severe rainfall, seismic activity, deforestation, and uncontrolled land use often trigger landslides, displacing soil, rocks, and debris and posing serious threats to life and infrastructure. The research looks at a variety of mitigation strategies, including technical measures like slope stabilization, retaining walls, and drainage systems, as well as vegetative options like growing ground cover and trees to improve slope stability. Furthermore, the report emphasizes the critical role of monitoring and early warning systems in identifying potential risks. Finally, the report emphasizes the need for land use planning, strict construction rules, and proactive management in mitigating landslide hazards. A multifaceted strategy that integrates these methods is crucial for reducing the effect of landslides while maintaining human and environmental health.

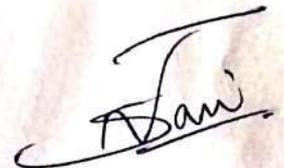**Keywords:** Landslide, Slope, Stability, Mitigation.

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(21) Application No.202531003127 A

(43) Publication Date : 24/01/2025

(54) Title of the invention : Innovative Foundation Design for Enhanced Stability of High-Rise Buildings in Civil Engineering

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Filing Date

(87) International Publication No

(61) Patent of Addition to Application Number
Filing Date

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Filing Date

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(57) Abstract :
The present invention discloses an innovative foundation design for high-rise buildings, enhancing stability and durability under varying soil and environmental conditions. The system comprises a reinforced concrete slab for even load distribution, deep pile foundations for secure anchorage to stable soil, and modular base units that adapt to different site conditions, including soil type and seismic risk. The design integrates seismic-resistant features and shock-absorbing materials to protect against lateral forces during earthquakes. Additionally, the system is equipped with a monitoring setup for real-time tracking of soil behavior and foundation performance, allowing for proactive maintenance. The foundation is suitable for a wide range of soil conditions, including weak and expansive soils, and is designed to mitigate soil liquefaction. The modular and flexible components reduce construction time and costs, offering a cost-effective and resilient solution for modern high-rise construction. Accompanied Drawing [Fig. 1]
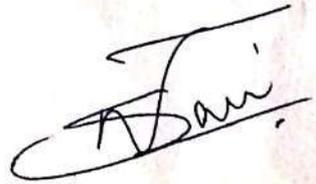
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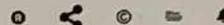# Modified Chaotic Map Approach for Medical Record Security

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Uma Hombal ; Dayananda R. B ; Ashwini Shinde ; Manjusha N. Chavan   All Authors •••

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V. CONCLUSION & FUTURE WORK

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Abstract:
Security is a major concern, particularly in the context of medical images. In this study, a Tuned Henon Chaotic encryption system is proposed. This system includes rearranging pixels in many ways, including row-wise and column-wise, in order to reach new places. The performance of the Tuned Henon Chaotic scheme is notably effective in terms of complexity and chaotic substantiality, thereby enhancing overall system security. The metrics utilised to evaluate the quality of image encryption include Pixels Mean Squared Error (PMSE), Signal to Noise Ratio (SNR), Pixels Change Rate (PCR), and Average Changing Intensity (ACI). For PCR and ACI, the values of 99.60% and 33.46%, respectively are considered optimal for effective encryption. The proposed strategy achieved near-optimum results, with UACI at 33.47% and NPCR at 99.60%. Additionally, the PSNR values should be less than 8.38, while MSE values should exceed 9,555. The Tuned Henon Chaotic algorithm meets these criteria, ensuring robust image encryption. We also conducted Histogram analysis and key sensitivity tests. The results of the Tuned Henon Chaotic algorithm were compared with the original Henon Chaotic Map (HCM) algorithm, the Blowfish algorithm, and the Fully Homomorphic Encryption (FHE) algorithm. The comparative study demonstrates that the proposed Tuned Henon Chaotic algorithm offers improved security for images of varying sizes.

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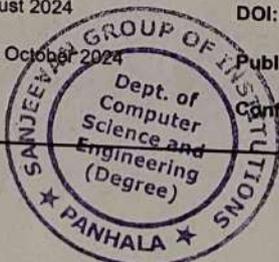
≡ **Contents**

I. Introduction

In the digital age, the security of sensitive information, particularly in the healthcare sector, is of paramount importance. Medical records, which include highly sensitive data such as medical images, require robust encryption methods to ensure their confidentiality and integrity [1]. Traditional encryption techniques often face challenges in balancing security with computational efficiency. This necessitates the development of advanced encryption algorithms that can provide high security without compromising performance [2].

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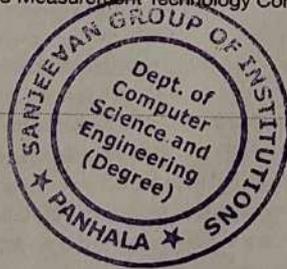
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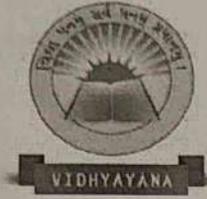
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Project-Based Learning in Higher Education: A Comprehensive Review of Frameworks, Approaches, and Effectiveness

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Abstract

Project-Based Learning (PBL) marks a transition from conventional lecture-based teaching to a more experiential, student-focused approach to education. This review examines key PBL frameworks Inquiry-Based Learning (IBL), Problem-Based Learning (PBL), and Challenge-Based Learning (CBL) and their effectiveness across disciplines. Originating from John Dewey's educational theories, PBL has evolved from its initial use in medical education to applications in fields such as engineering, business, and the social sciences. PBL focuses on

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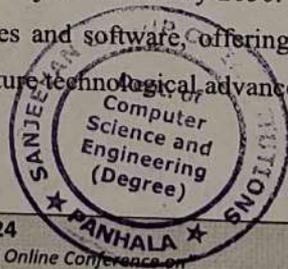
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student-led inquiries, enhancing research skills; Problem-Based Learning addresses complex problems through collaboration; and Challenge-Based Learning tackles global issues with interdisciplinary approaches. The National Education Policy 2020) emphasizes a shift towards a more holistic, experiential, and multidisciplinary approach to education, which PBL embodies. The review finds that while PBL offers significant benefits, including improved problem-solving and engagement, its effectiveness varies by discipline and implementation. It also identifies gaps, such as the need for research in emerging fields and technology integration. This review provides insights for optimizing PBL to bridge theoretical knowledge and practical application in higher education.

Keywords: Project-Based Learning (PBL), Inquiry Based Learning (IBL), Problem-Based Learning, Challenge-Based Learning (CBL), National Education Policy 2020 (NEP 2020), Higher Education, Student-Centered Learning.

INTRODUCTION

In recent years, higher education has undergone a notable transformation, shifting from traditional lecture-based teaching methods to more active, student-centered learning models. Central to this shift is Project-Based Learning (PBL), an innovative pedagogical approach that immerses students in complex, real-world projects to enhance critical thinking, collaboration, and problem-solving abilities (Larmer et al., 2015). PBL has gained recognition for its ability to connect theoretical knowledge with practical applications, making it highly relevant in today's fast-changing global economy (Blumenfeld et al., 2011).

The development of key academic knowledge, along with essential skills such as learning skills, life skills, and literacy, is crucial for preparing students for India's evolving economy. According to the India Skill Report 2022, creativity and social intelligence are expected to be vital skills for the majority of new jobs created by 2030. These skills provide humans with a distinct advantage over machines and software, offering protection against automation and making jobs more resilient to future technological advances.

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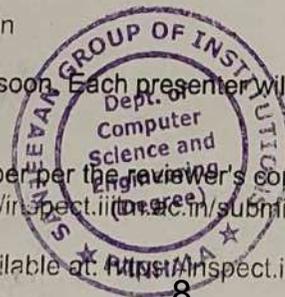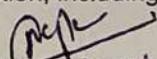
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DESIGN AND DEVELOPMENT OF A BLDC MOTOR BASED REGENERATIVE BRAKING SYSTEM FOR ENERGY-EFFICIENT ELECTRIC VEHICLES

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ABSTRACT

This paper presents the design, simulation, and experimental validation of a Brushless DC (BLDC) motor-based regenerative braking system aimed at enhancing energy efficiency in electric vehicles (EVs). With the growing demand for sustainable and low-maintenance EV technologies, regenerative braking has become a key enabler in minimizing energy loss during deceleration. The proposed system integrates a BLDC motor with a unidirectional DC-DC boost converter, enabling the recovery and reinjection of braking energy into a 12 V, 2 Ah lithium-ion battery. A detailed MATLAB/Simulink model was developed to simulate motor operation, regenerative torque generation, and battery charging dynamics. The system was then implemented in hardware using an ATmega328 microcontroller, real-time sensors, and PWM-based control logic. Test results show that the system effectively delivers up to 900 mA of regenerative current, charging the battery fully in approximately 2.22 hours. It ensures smooth torque transitions and prevents battery overvoltage through real-time voltage monitoring and adaptive control strategies. The system achieved significant reduction in mechanical brake wear, enhanced braking smoothness, and reliable energy recovery, particularly in urban stop-and-go traffic conditions. Challenges such as low-speed inefficiencies and thermal buildup were identified, and mitigation strategies were discussed. Overall, the proposed architecture offers a low-cost, scalable, and efficient solution suitable for lightweight and mid-range EVs, contributing to the development of greener and more sustainable transportation systems. This work lays the foundation for future enhancements using AI-based control, smart battery management, and real-time predictive braking algorithms.

Keywords:
BLDC motor, regenerative braking, electric vehicles, energy recovery, DC-DC boost converter, braking torque control, microcontroller-based control.

1. INTRODUCTION

The global shift towards sustainable transportation has spurred the development and adoption of electric vehicles (EVs), driven by the urgent need to address climate change, reduce fuel dependence, and urban air pollution [1,2]. However, one of the persistent challenges in EV technology is energy efficiency, particularly in extending the driving range without significantly increasing battery capacity or cost [3,4]. During regular operation, especially in urban stop-and-go traffic, a considerable amount of energy is lost as heat through traditional friction-based braking systems. This energy dissipation negatively impacts the overall efficiency and sustainability of electric mobility solutions [5,6]. To address this inefficiency, regenerative braking systems (RBS) have been introduced as a
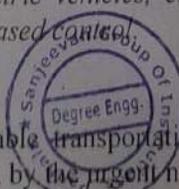
"Design and Implementation of a Solar System Using DC Lighting for Energy Efficiency"

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Guide: Prof. Y. R. Naik

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Abstract- ALL product manufacturing units need to have a faulty product detection and separation system in order to maintain product quality and maintain to good reputation so here we demonstration such a system using a solar system by using DC lightning. We Proposed design and solar faulty product is different and thus has a different mechanism A DC lightning strike in a solar photovoltaic (PV) system can induce extremely high voltages and currents, potentially damaging the system's components like PV panels, inverters, and DC cables. These damages can result from over voltage, excessive currents, or arcing due to lightning strikes.

Keywords- SC Solar cell Solar System two or more system and connect together,

DC (Direct Current), SRA solar panel ampere.

I. Introduction:

Photovoltaic (PV) solar systems generate direct current (DC) electricity from sunlight and serve as a sustainable energy source. However, their outdoor placement makes them vulnerable to lightning strikes, which can damage critical components like modules and inverters. To mitigate these risks, implementing a robust Lightning Protection System (LPS)—including lightning rods and grounding—is essential. The generated DC can be stored in batteries or converted to alternating current (AC) via inverters for powering standard appliances, making protection vital for safe and continuous operation.

EXPERIMENTAL ANALYSIS OF SINGLE-PHASE HALF CONTROLLED CONVERTER

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Abstract - *This project focuses on the experimental analysis of a single-phase half-controlled converter, a critical component in power electronics, often used in applications such as DC motor control, battery charging, and power supply systems. The study examines the operation of the converter with various load types, including resistive (R), resistive-inductive (RL), and resistive-inductive capacitive (RLC) loads. The converter circuit utilizes a combination of thyristors and diodes to achieve controlled rectification and freewheeling actions. Key observations include the analysis of output voltage and current waveforms under different firing angles, demonstrating the impact of load and firing delay on performance. Through theoretical discussion, numerical problem-solving, and practical waveform observations, the project highlights the efficiency and operational characteristics of the single-phase half-controlled converter. Safety precautions and procedural guidelines ensure accurate data collection and a safe working environment. This study aims to deepen understanding of controlled rectification techniques and their implications in practical scenarios.*

Key Words: Single-phase half-controlled converter, power electronics, DC motor control, battery charging, rectification, freewheeling, thyristors, diodes, RLC load, firing angle of time.
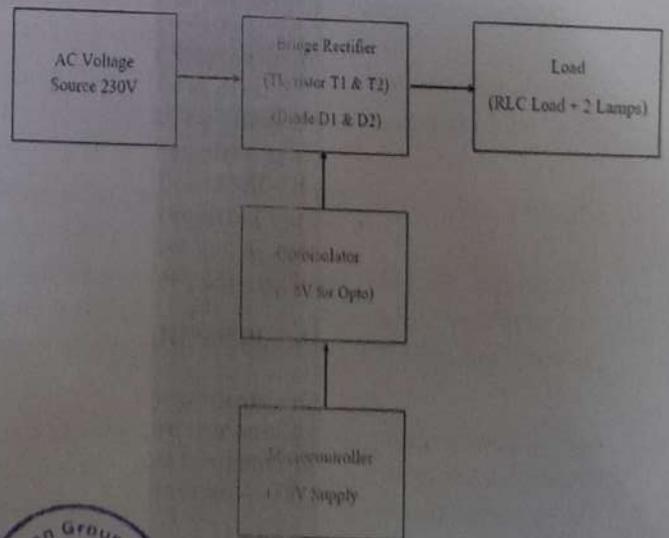
1.INTRODUCTION

A single-phase half-controlled converter is a vital component in power electronics that converts AC power into DC power. It uses a combination of thyristors and diodes to regulate the output voltage and current. The controlled nature of the converter allows it to adjust the DC output by varying the firing angle of the thyristors. This type of converter is extensively used in various industries due to its simplicity, reliability, and cost-effectiveness. Efficient AC-DC converters are essential in applications where variable voltage and current are required. With the increasing demand for energy-efficient systems, there is a need for converters that

can adapt to varying load conditions while maintaining performance and precision. This project addresses these requirements by developing a microcontroller-based solution that ensures synchronized and precise firing of thyristors efficient AC-DC converters are essential for applications requiring variable voltage and current. This project focuses on a microcontroller-based solution to enhance performance under varying loads.

2.DESIGN AND IMPLEMENTATION

For college purposes, the Adhyayan Online Platform was built with more responsible activities. It is used in academic schedules most frequently in related ways. We followed these studies and developed a kit after studying research papers.

Fig -1 Flow Diagram

GENERATING DC HIGH VOLTAGE USING MARX GENERATOR

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ABSTRACT

This project presents a method for generating high-voltage DC using the Marx Generator principle. Originally introduced by Erwin Otto Marx, the concept involves charging multiple capacitors in parallel and then discharging them in series to produce a high-voltage output. The proposed system incorporates MOSFETs, diodes, capacitors, and a 555 timer to control switching operations. During the ON period, capacitors are charged through diodes, and in the OFF period, they are connected in series using MOSFETs to deliver a multiplied output voltage. A compact version with four stages using a 12V DC input achieves an output of approximately 30–36V, while a larger setup with 60 stages can generate nearly 1000V from an 18V source. This technique is highly efficient for high-voltage DC generation and can be applied in insulation testing of electrical equipment. The system is low-cost, reliable, and suitable for laboratory testing environments or educational demonstration setups.

Keywords: Marx Generator, MOSFETs, DC generation, low-cost.

I.   INTRODUCTION

Our project focuses on generating high-voltage DC using the Marx generator principle, which involves MOSFETs and capacitor stacks. The Marx generator concept was introduced by Erwin Otto Marx in 1923. It works by charging capacitors in parallel during the ON time and then connecting them in series during the OFF time to produce a high-voltage pulse.

This technique is useful for producing voltage in the kilovolt (kV) range, commonly used for testing the insulation strength of electrical devices and components used in power systems. The system in our project includes four stages, where each stage is made up of one capacitor, one MOSFET, and two diodes.

In each stage, the diodes help charge the capacitors in parallel, and MOSFETs act as switches to connect the capacitors in series during discharge, minimizing power loss. A 555 timer IC is used to control the timing of charging and discharging cycles.

By using this method, the output voltage becomes approximately 3.2 times the input supply voltage. For instance, with a 12V DC input, our setup can generate around 30 to 36 volts.

In an extended version of the project, with 60 stages, each consisting of a capacitor, IGBT/MOSFET, and diodes, the system can achieve an output of nearly 60 times the input voltage. With an 18V DC supply, the output can reach around 1000 volts. This setup is compact, cost-effective, and suitable for high-voltage testing applications.

1.1 Motivation of the Present Work

The main motivation for using a Marx generator to produce high DC voltage is to generate high-voltage pulses needed for different purposes such as insulation testing, lightning strike simulation, and use in pulsed power systems. The Marx generator works by charging capacitors in parallel and then discharging them in series, which results in a high-voltage output.

1.2 Need for the Work

High DC voltage generation is important for experimental study of both pure and applied physics. It is also used in insulation testing of cables and capacitors. These are also pulse generators used for voltages as high as 100 to 200 kV.

SOLAR BASED ELECTRIC VEHICLE CHARGING STATION

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ABSTRACT

A solar-based electric vehicle charging station harnesses solar energy through photovoltaic panels to generate electricity, offering an eco-friendly and sustainable solution for charging electric vehicles. This system integrates solar power generation, energy storage, and charging infrastructure, reducing dependency on traditional energy sources and lowering carbon emissions. Key components include solar panels, inverters, battery storage units, and EV chargers etc. Solar energy is stored during peak sunlight hours and used for vehicle charging, ensuring reliable energy availability. These stations support the transition to green transportation by minimizing environmental impact and operating costs. Utilizing solar photovoltaic (PV) panels, the station harnesses sunlight to generate electricity, reducing & minimizing carbon emissions. Energy storage systems, such as batteries, are employed to store excess solar energy, ensuring availability during low sunlight periods or peak demand. Solar EV charging stations cater to the growing EV market while addressing environmental challenges, offering a cost-effective, green alternative to traditional charging systems

Keywords: Solar energy, Electric vehicles, Photovoltaic panels, Energy storage, Sustainable transportation.

I.   INTRODUCTION

A solar-based electric vehicle (EV) charging station is an innovative solution that combines renewable energy and sustainable transportation. These stations use solar photovoltaic (PV) panels to generate electricity from sunlight, which is then used to charge electric vehicles. The energy harnessed from the sun is clean, renewable, and free from greenhouse gas emissions, making it an eco-friendly alternative to conventional fossil-fuel-based charging. The setup typically includes solar panels mounted on rooftops, canopies, or open land. These panels convert sunlight into direct current (DC) electricity. An inverter is then used to convert the DC electricity into alternating current (AC), which is compatible with most EV chargers. In some cases, the system also includes a battery energy storage system that stores excess solar power, allowing charging to continue even during cloudy weather or at night.

There are generally three types of solar-based EV charging setups: on-grid, off-grid, and hybrid systems. On-grid stations are connected to the main electricity grid and can feed surplus energy back into it, often taking advantage of net metering policies. Off-grid systems are completely independent and rely entirely on solar generation and battery storage.

1.1. Need of Work:

In today's generation the number of petrol and diesel vehicles has increased this caused the stock of petrol and diesel is running out and whole world is turning towards electric technology. Also EV's are better than a,

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ELECTRIC BICYCLE

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ABSTRACT

In today in world travelling is very essential for human beings in order to protract in this world. In addition, to dose his travelling should be done in minimum possible way and in jiffy. This paper details about the Electric Bike, which wins on the battery thereby providing voltage to the motor. This paper compromises with device and fabric of Electric Bicycle, which makes use of Electric energy as the primary source. There are many varieties of electric bicycles. Some of these bikes have a rechargeable This makes it easy to power the bike whenever you want. E-bikes use rechargeable batteries and the lighter varieties can travel up 50 to 60 km/h. depending on the laws of the country in which they are sold, while the more high-powered can often do in excess of 40 km/h.

Keywords: Electric Bicycle, Battery, Traffic Safety.

I. INTRODUTION

The term "electric vehicle" refers to a vehicle that is propelled by one or more electric motors or traction motors (EV). A self-contained electric vehicle can convert gasoline to energy using a battery, solar panels, fuel cells, or an electric generator, or it can be powered by electricity from off-vehicle sources using a collector system. E-Cycle is an electric and power-assisted bicycle that is one of the bicycle industry's fastest-growing technologies. This bicycle has an electric motor to assist you in moving forward. As a result, you can ride it like a regular bicycle while exerting less effort. An E-Cycle motor works by turning on automatically when you peddle or throttle 16 out of 30 top polluted cities in the world are in India. The air in these cities contains high levels of dangerous particulate matter, small enough to enter the human bloodstream through the lungs a problem that contributes to an estimated 7 million premature deaths each year. Irrespective of various efforts of alternative fuel and technology, emissions are not observed to be in control.

This Bicycle is designed and made in very less cost as compared to original cost. so any one can afford this Bicycle. As we know that due fuel powered vehicles, the emission of toxic gases is increasing day by day, due to this 4.3 million people.

The Regenerative method of adding a converter not only increases cost but also reduces conversion efficiency. This project proposes a DSP (digital signal processor) controlled bicycle with regenerative braking. When the system controller receives the braking signal, the motor can work as a generator, and the energy generated from braking can charge the battery. This project proposes a DSP controlled electric bicycles with regenerative braking control. The kinetic energy is converted into electric energy and stored in batteries when braking, thus improve the driving range and performance of electric bicycles.

II. BLOCK DIAGRAM
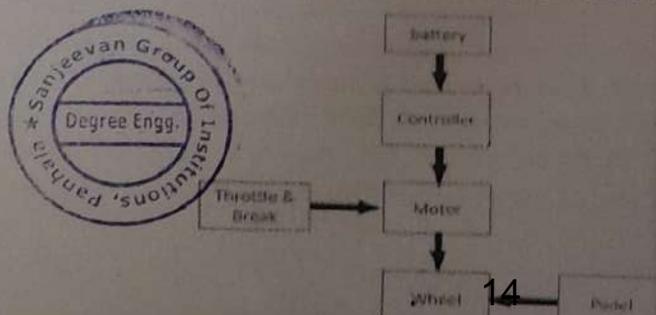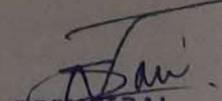
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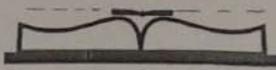
PORTABLE AIR CONDITIONER AND HEATER

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ABSTRACT

This project focuses on developing a compact and energy-efficient portable air conditioner and heater using Peltier modules. These devices function on the thermoelectric principle, utilizing the Peltier effect to create a temperature difference when electricity flows through the module. The system combines several Peltier modules, heat sinks, fans, and a microcontroller-based control circuit for effective temperature management. Its dual-function design allows it to switch between heating and cooling modes by reversing the current through the Peltier modules. Its lightweight and compact structure, powered by a rechargeable battery, makes it suitable for personal comfort in small areas, outdoor activities, or locations without traditional HVAC systems. The prototype highlights the capabilities of thermoelectric technology for portable climate control, offering an eco-friendly alternative to conventional refrigerant systems.

Keywords: Peltier Module, Heat Sink, Exhaust Fan, Solar Panel, Charge Controller, Etc.

I. INTRODUCTION

This project aims to create a versatile, energy-efficient portable air conditioner and heater that effectively manages indoor climate for both homes and businesses. The system combines modern cooling and heating technologies for year-round use in a compact, user-friendly device. Key features include portability for easy movement, adjustable temperature settings, and environmentally friendly refrigerants to promote sustainability. The project seeks to maximize energy efficiency, reduce noise levels, and improve user experience with simple controls and smart connectivity options. Given the growing demand for flexible climate solutions, this initiative aims to provide a cost-effective, reliable, and green option for various environments. Portable air conditioners and heaters serve as adaptable appliances that offer both cooling and heating in one unit. They are perfect for spaces where permanent systems are impractical or unwanted. Portable air conditioners draw warm air from the room, cool it using a refrigeration cycle, and expel heat outside through an exhaust hose. The heater function converts electrical energy into heat, which a fan distributes evenly throughout the room.

II. METHODOLOGY

Peltier Effect:

Jean Peltier discovered that applying an electric current across the junction of two different metals causes heat to move from one metal to another. This principle is fundamental to thermoelectric refrigeration. Thermoelectric modules consist of tiny metal cubes made from dissimilar exotic metals, bonded physically and connected electrically. When an electric current runs through the junctions, heat transfers from one metal to the other. Solid-state thermoelectric modules can transfer large amounts of heat when paired with a heat-absorbing device on one side and a heat-dissipating device on the other. The internal aluminum cold plate fins absorb heat from the contents, such as food and beverages, while the thermoelectric modules transfer heat to dissipation fins under the control panel. A small fan helps disperse the heat into the air. Solid-state electrically-driven refrigerators, or thermoelectric coolers (TEC), operate on the Peltier effect: DC current flowing through a circuit made of two different conductors absorbs heat from one junction and releases it at the other.
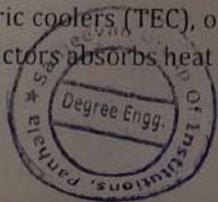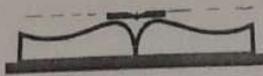
DESIGN AND DEVELOPMENT OF A MULTIPURPOSE AGRICULTURAL QUADCOPTER FOR PESTICIDE SPRAYING AND WILDLIFE MONITORING

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ABSTRACT

This project presents a multipurpose agricultural drone designed for efficient fertilizer spraying, equipped with an advanced animal detection system, night vision camera, and high-frequency noise emitter. The drone autonomously covers farmland, ensuring uniform spray distribution while minimizing labor and environmental impact. Integrated infrared night vision enables 24/7 operation and real-time monitoring, especially during low-light conditions. The animal detection system identifies intrusions, and the high-frequency sound module deters wildlife without causing harm. This smart solution enhances crop protection, prevents fertilizer wastage, and promotes sustainable farming practices through automation, surveillance, and intelligent deterrent mechanisms.

Keywords: Agricultural Drone, Quadcopter, Pesticide Spraying, Night Vision, Animal Detection, Precision Farming.

I.   INTRODUCTION

Agriculture plays a pivotal role in the Indian economy, significantly contributing to the nation's GDP. Despite its importance, the sector is plagued by several challenges, such as pest attacks, crop diseases, and damage caused by wildlife. These issues lead to substantial crop losses each year. To mitigate these challenges, farmers often rely on the use of pesticides and fertilizers to enhance crop productivity. However, the manual application of these chemicals poses severe health risks for farmers, including skin irritations, genetic disorders, and long-term health complications.

The proposed project aims to address these concerns by developing an advanced quadcopter drone that can serve multiple agricultural purposes. This drone is designed to not only spray pesticides but also monitor crops, enhancing overall farm management.

The improved drone features a robust frame capable of supporting heavier payloads, such as a high-resolution night vision camera. This camera enables the drone to detect animal movements on fields at night, alerting farmers in real-time to prevent crop damage. With its ability to hover and navigate across large farming areas, the drone ensures thorough coverage, improving both operational efficiency and safety.

The growing concept of precision agriculture focuses on optimizing farming practices to improve yield while addressing labor-related issues and enhancing the efficiency of farming processes. Several developing countries have started to use unmanned aerial vehicles (UAVs) for precision agriculture, a practice that first gained momentum with Yamaha's introduction of UAVs for pest control and crop monitoring. However, Yamaha discontinued production in 2007. Various studies have explored UAV applications for tasks such as crop monitoring, plant height estimation, pesticide spraying, and land analysis. Despite the advances, the widespread adoption of UAVs in agriculture is limited due to factors like UAV weight, flight range, payload capacity, configuration, and cost.

Multifunctional UAVs are essential in reducing health risks associated with manual pesticide application and improving wildlife management. These drones can enhance agricultural productivity, protect crops, and promote sustainable farming practices. In the past decades, agricultural imaging technologies such as those used by NASA for large-scale coffee plantations, have been utilized to increase crop yields. UAVs like VIPtero have proven effective for site-specific management in vineyards, capturing multispectral images within minutes. Advancements in laser technology have increased UAV flight times, and research into UAV aerodynamics has improved flight performance, enabling more precise applications.

OPTIMAL PESTICIDE AND FERTILIZER SPRAYING SOLAR VEHICLE

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DOI: https://www.doi.org/10.56726/IRJMETS79874

ABSTRACT

The growing demand for sustainable agricultural practices has led to the development of innovative technologies aimed at enhancing productivity while minimizing environmental impact. This paper presents the design and implementation of a solar-powered vehicle equipped for optimal pesticide and fertilizer application in agricultural fields. The vehicle integrates solar energy harvesting systems to power its operation, reducing reliance on conventional fuels and lowering carbon emissions. Equipped with sensors and smart technology, the vehicle optimizes the application of pesticides and fertilizers based on real-time data analysis of soil conditions, crop health, and environmental factors. This ensures precise resource utilization, reducing wastage and mitigating the harmful effects of over-application. The system employs GPS-based navigation and automated controls to enable efficient field coverage, enhancing productivity and reducing labor costs. The use of renewable solar energy ensures continuous and cost-effective operation, making the vehicle a sustainable solution for modern agriculture. This study highlights the potential of solar- powered automated systems to revolutionize farming practices by improving efficiency, reducing input costs, and promoting environmentally friendly operations.

Keywords: Fertilizer, Pesticide, Solar, Carbon Emission.

I. INTRODUCTION

In modern agriculture, the need for precision and efficiency in pesticide and fertilizer application is paramount. Overuse or improper application of these chemicals no only leads to environmental harm but also wastes valuable resources and can affect crop yields. Traditional methods of spraying often result in uneven distribution, runoff, and excessive chemical usage. This has led to a growing interest in automated, energy-efficient solutions that can optimize the spraying process while minimizing the ecological impact. This report introduces a cutting-edge solution: the Optimal Pesticide and Fertilizer Spraying Solar Vehicle. Powered by renewable solar energy, this autonomous vehicle is designed to apply pesticides and fertilizers in a highly efficient, precise, and environmentally friendly manner. The vehicle uses advanced technologies, including GPS-based navigation, sensor systems, and precision application techniques, to ensure that the right amount of chemicals is applied to the right areas at the right time. This results in significant reductions in chemical usage, increased crop health, and minimized environmental contamination. Furthermore, the solar-powered aspect of the vehicle ensures that it operates sustainably, reducing the carbon footprint associated with conventional fuel-powered agricultural machinery. By integrating renewable energy and smart spraying technology, this vehicle presents a promising solution for the future of sustainable farming. This report outlines the design, functionality, and benefits of the Optimal Pesticide and Fertilizer Spraying Solar Vehicle, with a focus on its contribution to sustainable agricultural practices, cost-effectiveness, and environmental preservation.

1.1. Need of Work

The optimal pesticide and fertilizer spraying solar vehicle project aims to develop an eco-friendly, efficient, and automated system for agricultural spraying. This project involves the integration of solar power technology with autonomous vehicle systems to reduce environmental impact, improve crop management, and lower operating costs. By using solar panels, the vehicle can recharge during the day, making it independent of conventional energy sources. The vehicle will be equipped with sensors and GPS technology to precisely apply pesticides and fertilizers, ensuring optimal use and reducing waste. Additionally, the system can be designed for minimal human intervention, improving safety and reducing labor costs. The project requires expertise in

ANALYSIS OF VARIABLE FREQUENCY DRIVE (VFD)

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ABSTRACT

The design and execution of a Variable Frequency Drive (VFD) system especially suited for accurate speed control of a three-phase induction motor are described in this paper. Essentially, the system utilizes the Emn Unidrive M300 VFD model, a sophisticated device that has the capability to adjust dynamically the voltage and frequency supplied to the motor. This dual adjustment is necessary for maximizing the efficiency with which the motor operates, which will lead to significant energy savings and longer motor operating life. The selected induction motor for use in this case features a nominal speed of 1440 revolutions per minute (RPM), a rating of 3.0 horsepower (HP), and is operated using a 415V input supply. Through rigorous testing, the project convincingly demonstrates the beneficial benefits of incorporating such a system by highlighting the VFD's ability to provide responsive and efficient motor control, provide substantial energy savings, and ensure consistently smooth operation across a wide range of varying speeds.

Keywords: Variable Frequency Drive, Voltage, Frequency, Speed Control, 3-Phase Induction Motor.

I. INTRODUCTION

Variable frequency drives (VFDs), also known as frequency inverters or inverter drives, are a major innovation in modern motor control technology. By cleverly varying the frequency and voltage of the electrical power supplied to alternating current (AC) motors, these high-technology electronic devices finely control their speed This crucial capability allows AC motors to work satisfactorily at a broad spectrum of speeds, beyond the fixed-speed limitation of direct-on-line operation. Due to this, VFDs are increasingly becoming a necessity in applications with a need for accurate motor control, including industrial pumps, conveyor systems, HVAC fans, and numerous other industrial equipment. Their ability to optimize motor performance is responsible for more efficient and environmentally friendly industrial operation through enhanced process control and significant benefits in the way of energy savings and extended motor life.

VFDs are a key technology in applications that demand accurate motor control due to its dynamic control mode, which allows motors to operate well across a broad range of speeds. Due to this, VFDs are widely applied in a broad variety of industrial applications, including pumps, fans, conveyors, and numerous other pieces of machinery where accurate and adjustable motor speed is critical to achieve optimum performance and energy efficiency.

II. LITERATURE REVIEW

The concept of Variable Frequency Drives (VFDs) is not something new; in fact, it began developing decades ago in the early 1900s. Factories and industries then understood that they required a new means of controlling the speed of their devices. The existing motors back then were fixed-speed, meaning they could only operate at one constant speed, which was inefficient and not flexible enough for applications requiring varied speeds

In 1960s, and a revolution occurred with the advent of electronic drives. This was revolutionary. Engineers suddenly had at their fingertips the means to manipulate electricity with precision in a way that enabled them to control the frequency and voltage fed to a motor. Imagine it as being able to adjust a radio dial rather than just having an on/off switch. This new capability to "shape" the electrical power directly resulted in the creation and mass adoption of VFDs so that motors could now run at a variety of speeds to exactly match the task at hand.

In early 1900s. There were factories and machines that used electric motors, operated primarily at a single, constant speed. This was somewhat like having a car that only (Degree speed to drive, not very) adjustable or effective, particularly when different speeds were needed for different jobs, such as a conveyor belt that would move slowly to handle sensitive objects but rapidly to handle heavy objects.

PROJECT ANALYSIS PAPER OF BUCK BOOST CONVERTER

Prof. B.S. Hebbale[*1], Sumati Powar[*2], Dipali Patil[*3], Sangram Navlav[*4], Dhiraj Patil[*5]

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ABSTRACT

A buck-boost converter is a type of DC-DC converter that can increase or decrease voltage. It combines the features of both buck (step-down) and boost (step-up) converters. This means it can give an output voltage that is either higher or lower than the input voltage, depending on how it's working. The main parts of a buck-boost converter are an inductor, a switch (like a MOSFET), a diode, and a capacitor. It works by storing energy in the inductor when the switch is on, and then releasing that energy when the switch is off. The output voltage is controlled by adjusting how long the switch stays on—this is called the duty cycle. **Buck-boost converters** are used in devices like **power amplifiers**, **power supply units**, and **renewable energy systems** (like **solar panels**) to control and adjust voltage. They are efficient and compact, but can be tricky to control and may produce voltage ripples (small fluctuations). Overall, they are a useful and flexible way to manage voltage when the input voltage changes.

Keywords: DC-DC Converter, Step-up/Step-down, Inductor, Diode, Switch, Capacitor.

I.   INTRODUCTION

In electronics, DC-DC converters are used to control voltage levels for different devices. One special type of converter is the Buck-Boost converter, which can both increase and decrease voltage. This makes it very flexible and useful. It can keep the output voltage steady even if the input voltage goes higher or lower than what's needed—a common issue in many real-life situations. The Buck-Boost converter works by using parts like inductors and capacitors to store energy, along with switches and diodes to control how that energy flows. One of its biggest advantages is that it can give a stable output voltage whether the input voltage is too high or too low. Because of this, it's perfect for things like battery-powered devices, solar energy systems, and power supplies that need to handle a wide range of input voltages. In this report, we'll look at how the Buck-Boost converter works, how its parts are chosen and designed, and what we learn from simulations and real-world testing. This will help us fully understand how it works and where it can be used.

II.   METHODOLOGY

The methodology for designing and implementing a Buck-Boost converter typically involves a series of steps that range from theoretical modeling to practical implementation, followed by testing and optimization. Below is an outline of the general methodology for designing a Buck-Boost converter:

Problem Definition & Specification

- Define Input and Output Specifications:

o Determine the input voltage range (e.g., from 5V to 15V) and desired output voltage (e.g., 12V). A Buck-Boost converter must keep the **output voltage steady**, whether the input voltage **is higher or lower** than the output.

o Define the output current or power requirements for the specific application (e.g., 5A, 10W).

- Identify Key Constraints:

o Consider the required efficiency, size, cost, and thermal limits based on the application (portable electronics, renewable energy systems).

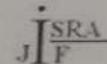### Topology Selection & Circuit Design

- Choose the Converter Topology:
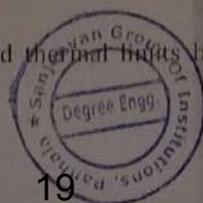
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IOT Based Controlled Smart Distribution Box

by

Mr. A. M. Bhandare

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Energizing the Future: Assessing India's Electric Vehicle Ecosystem, Policies, and Market Dynamics

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Abstract

This study explores the evolution of India's electric vehicle (EV) ecosystem, highlighting both accomplishments and persistent challenges. It delves into significant government initiatives such as the FAME II and Production Linked Incentive (PLI) programs, which promote market growth and enhance infrastructure [1]. The research assesses the present condition of India's charging infrastructure, local manufacturing capabilities, and the supply chains for essential raw materials needed for EV production [2]. It also examines market trends, including the rising popularity of luxury electric vehicles and two-wheelers, to understand consumer adoption patterns [9]. The study identifies hurdles such as high battery costs, inadequate charging facilities, and dependence on imported components [5]. Furthermore, it reviews significant investments and partnerships that are shaping the industry landscape [10]. The necessity of establishing domestic battery production and recycling systems for supply chain resilience is emphasized [4]. The paper identifies consistent policy frameworks, technological progress, and active private sector participation as crucial elements for success. Recommendations are provided to enhance the ecosystem's resilience in achieving the target of 30% electric vehicle sales by 2030. This research aims to guide policymakers, manufacturers, and investors committed to advancing sustainable transportation in India.

Keywords: Electric Vehicles (EVs), Smart Grid Integration, EV Charging Infrastructure, Renewable Energy, Policy Frameworks, EV Market Trends, Battery Technology, Vehicle-to-Grid (V2G), India EV Policy

1. INTRODUCTION

India's transition towards electric mobility is motivated by environmental concerns and economic opportunities. The escalating urban air pollution, increasing greenhouse gas emissions, and significant reliance on imported fossil fuels necessitate a shift to electric vehicles (EVs) for sustainable development [4]. Additionally, enhancing manufacturing self-sufficiency is part of the country's 'Make in India' and 'Atmanirbhar Bharat' initiatives, with EV production being a vital aspect [7]. The Indian government has set an ambitious target for electric vehicles to account for 30% of all new vehicle sales by 2030 to achieve these interconnected goals [2]. Recent market analyses show a substantial rise in luxury EV sales, which increased by 66% year-on-year, indicating a favorable shift in consumer preferences in the premium segment [9]. Concurrently, government initiatives like the FAME II scheme, the PLI scheme, and various state-level incentives have played a crucial role in shaping the EV landscape [1], [6]. However, the path to widespread EV adoption is not without its challenges. Issues such as limited charging infrastructure, high vehicle costs, and a fragile domestic battery supply chain pose significant barriers to large-scale implementation [3], [5]. Moreover, India's dependence on imported lithium and other critical materials raises questions about the long-term sustainability of its EV sector [4]. To alleviate market concerns, especially in the two-wheeler and commercial vehicle segments, targeted awareness initiatives and financial incentives will be essential [10]. Engaging the private sector, attracting foreign direct investment, and fostering technology partnerships are critical steps to bridge existing capability gaps. This paper conducts a comprehensive analysis of these factors and offers actionable strategies to ensure the success of India's EV goals within the established timeline.

2. Government Policy & Incentives

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Development of Smart Materials with Tunable Mechanical Properties for Wearable Devices

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Abstract: Smart materials that can be tailored help improve wearable devices by making them flexible, more comfortable and able to handle different functions. The main focus of this research is to combine reversible polymer networks with low melting alloys and examine the resulting properties for dynamic adjustment of the stiffness. Based on testing, it was found that the materials could be made flexible from 1.2 MPa in the soft state to 350 MPa in the rigid state, with a stiffness change of about 290 times driven by heat. The shape memory feature of the polymer allowed one to cycle the parts while still being able to nearly totally recover the original shape. Laser-assisted techniques made it possible to craft more precise patterns, helping flexible electronics be integrated well while keeping their strength. Fatigue testing proved that the materials could still work effectively as shown by more than 85% of their initial stiffness after a total of 1000 loading cycles. Using biological ideas, the device got better at conforming to the body, making wearing easier for users. According to these results, the developed smart materials have the capability to be used in future wearable devices that require quick and reversible shape canges. Sustainability is one focus of the research with a look at recyclable materials and circular design ideas. All in all, this work gives a basis for designing wearable devices that are flexible, strong and eco-friendly, while still offering control over mechanical features.

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REVIEW ARTICLE

Hydrogen as a Clean Fuel: Storage Technologies and Associated Thermal Challenges

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ABSTRACT – Hydrogen has emerged as a clean, renewable, and non-toxic alternative energy carrier with the potential to support a sustainable energy future. Despite its advantages, one of the major obstacles to widespread adoption is the challenge of efficient and safe storage. This review critically examines hydrogen storage technologies—including gaseous, liquid, and solid-state methods—focusing on the thermal management issues associated with each. The study methodology involved a comprehensive review of current scientific literature, government reports, and technical papers, particularly focusing on studies addressing heat transfer limitations and enhancement techniques in hydrogen storage systems. The analysis reveals that gaseous hydrogen storage suffers from high compression heat and limited density; liquid hydrogen faces challenges related to boil-off and cryogenic insulation, while solid-state storage—though safer and denser—encounters difficulties due to low thermal conductivity and slow kinetics. Among the examined techniques, solid-state storage appears to be the most promising for practical use, especially when integrated with thermal enhancement strategies such as fins, metal foams, and expanded graphite. The review highlights the need for hybrid approaches that combine multiple heat transfer augmentation methods and identifies nanoparticle-enhanced fluids as a promising direction for future research. Overall, this work provides an integrated perspective on the thermal barriers in hydrogen storage technologies and outlines potential pathways for performance improvement, supporting ongoing research and development in this field.

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1. INTRODUCTION

Energy storage and transfer are essential and fascinating aspects of our daily lives. Since 1950, the global population and the desire for an improved standard of living have resulted in an exponential rise in energy demand. This demand is projected to peak around 2035, based on historical and forecasted global primary energy consumption trends reported in World Energy 2014–2050 [1]. It highlights the historical dominance of fossil fuels and the projected rise of renewable energy sources such as wind, solar, and biofuels. The shift toward cleaner energy emphasises the growing need for efficient storage solutions, like hydrogen, aligning with global decarbonisation goals. The primary challenge to address is the imbalance between energy demand and supply. Additionally, the finite nature of non-renewable energy sources like oil, coal, and natural gas has raised concerns about energy security in many countries. Although the world has ample natural gas and coal reserves, they will eventually be depleted. With the current consumption rate, natural gas and coal resources are projected to last for around 70 and 200 years, respectively, while oil reserves will be depleted even sooner [2,3].

During the last few decades, the extensive use of fossil fuels for energy production, which emit greenhouse gases, has led to a change in climate conditions and a negative impact on human health [4,5]. As a result, alternative energy sources are required to meet future energy needs, especially in the transportation sector, which accounts for nearly 60% of the world's energy consumption [6]. One of the most significant challenges today is developing energy systems that can meet energy needs using renewable and sustainable sources. These systems must be feasible, cost-effective, reliable, and environmentally friendly, causing minimal or no harm to the ecosystem. Various potential alternatives, including solar, nuclear, wind, hydro, tidal, geothermal energy and biofuels, have been proposed. However, hydrogen appears to be the most suitable candidate due to its highest energy density per unit mass (120 MJ/kg), negligible environmental impact, and abundant presence in the universe [7–9]. In recent years, there has been growing interest in hydrogen fuel-based technologies. Key aspects of a hydrogen-driven economy include its production, purification, transportation, storage, and utilisation. Among these, hydrogen storage has been a central research focus for many years [10]. Presently, extensive research is underway to assess the requirements, impacts, opportunities, and challenges associated with implementing a hydrogen-based economy. One of the most significant obstacles in using hydrogen as a fuel is enhancing the methods for its practical storage.

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