

JOURNAL OF ENGINEERING AND TECHNOLOGY

Volume 1, No. 1, May 2016



ISSN: 2518-6493

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From the Editor's Desk

I have the privilege to introduce the third issue of the Amity Journal of Engineering and Technology (**AJET**), a peer-reviewed multidisciplinary scientific journal that focuses on emerging trends in various domains of engineering and technology. AJET aims to provide a platform to researchers to share their ideas and emerging trends, across varied themes related to the disciplines of engineering, technology, and allied areas.

The current issue of the journal is a compilation of six papers, wherein authors have discussed ideas ranging from contemporary technologies like hybrid PV-thermal systems for energy efficiency in Nigeria to discussion on pollution reduction using nanotechnology. This particular issue also includes a study that focuses on sustainable roofing systems for cost effective housing which could be very useful for developing nations. There are two papers on network security using hybrid protocols.

We would like to extend our sincere gratitude to the authors of the papers, from different countries, without whose dedication to research, this journal would not have been possible. We would also like to thank the reviewers for their valuable comments to the authors and the editorial committee, for extending support in bringing out this journal in its present form. The first three issues of AJET bear testimony to the zeal and commitment of the founding editors of the journal in providing a common forum to researchers to share their ideas and build upon them, adding to the process of knowledge creation.

We hope that academics, researchers, and industry experts will find AJET useful, as they set out to explore the fascinating world of advanced engineering, emerging technologies, and inspiring architectures.

Prof. Dr. Piyush Maheshwari
Editor in Chief

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Modeling and Simulation of Hybrid PV-Thermal (PVT) Systems for Energy Efficiency in Nigeria

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Abstract- Solar panels are more effective at low temperatures but this contradicts the desired high solar irradiation level in the hot arid region such as Nigeria, which often result in waste heat energy and low power output of solar panels. To harvest this waste heat energy into useful energy, a hybrid photovoltaic thermal (PVT) system, with a water cooling system was modeled and simulated. According to energy balance equation, a set of differential equations coupled with Backward-Euler method for pipe sectioning were established and the simulation model was developed with the aid of SIMULINK and MATLAB scripts to investigate the PVT performances. The influence of the solar radiation intensity and tap water inflow on boiler tap water, pump power, electric power, solar thermal collectors, and solar panel temperature over time are evaluated and analysed. The result revealed that at inflow rate of $10^{-4}m^{-3}s^{-1}$, the temperature of the solar panels and that of solar thermal collector significantly decrease despite increase in solar irradiation intensity. Hence, lowering of the solar panels working temperature result in considerably increase in electric power output. As a result of continuously cooling of the solar panels temperatures, the outlet water temperature dropped while the photovoltaic efficiency increased substantially.

Keywords: Hybrid photovoltaic thermal, water cooling, modeling, electric power, solar irradiation, working temperatures, Photovoltaic efficiency.

Nomenclature	
C_P	Specific heat capacity water
P	Density water
A_{STC}	Active area Solar Thermal Collector
l_{HE}	Length Heat Exchanger Tube
l_p	Distance between Solar Thermal Collectors and Boiler Tank
l_{STC}	Length Solar Thermal Collector tube
r_{HE}	Radius Heat Exchange tube
r_p	Radius pipe between Solar Thermal Collector and Boiler Tank
r_{STC}	Radius Solar Thermal Collector Tube
V_{BT}	Volume Boiler Tank
α_{HE}	Total heat transferrate Heat Exchanger
β	Temperature Coefficient
γ	Flow-power ratio Pump
T_{STCi}	Temperature of Solar Thermal Collector per panel
I_{SP}	Current through the solar panels
G	Solar Irradiation
P_{Sp}	Electric power
H	Electric Efficiency Solar Panels

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Investigation on Structural Analysis of Composite Springs – A Review

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Abstract: Helical or coiled springs are elastic bodies used in suspension systems of automobiles to absorb shocks caused due to irregularities on the road surface and to provide a comfortable ride to passengers. This paper studies the importance of helical springs in automobile applications, the common materials that are used in these springs and how composite springs can improve the performance by adding to weight reduction and improvements in corrosion resistance, durability and life of the suspension springs. The papers considered for this study state that there is noticeable improvement in the performance of the springs when replaced to composite materials like Carbon Fiber, Glass Fiber, and Carbon/Glass Fiber, which are high strength and weigh lesser than conventional materials like steels.

Keywords: *Helical Springs, Composite Springs, Composite Materials, Stiffness, Stress, Deflection.*

1.0 Introduction

A spring is an elastic body, whose purpose is to distort when loaded and to recover its shape when the load is removed (Sagar NK et al, 2016). Springs are vital suspension elements on automobiles that are necessary to lessen the vertical vibrations, impacts and bumps due to road irregularities and provide a comfortable ride (A.M. Wahl, 1963). Therefore, spring optimization plays important role in improvement of car dynamics.

The most commonly used material for manufacturing springs are High-carbon spring steels. Small sized springs are easily coiled from pre-heated stock, whereas larger ones are made of annealed steel and hardened after fabrication. These spring materials are least expensive, easily available, simple manufacturing technique and most popular. But these steels are not suitable for very high or low temperatures and for shock or impact loading (Harshal R et al, 2016).

High-carbon spring steels are the universally used spring materials due to their low cost, easy availability, simpler manufacturing methods and most popular. General-purpose spring steels is to be used only when life expectancy and deflection are not too important as these materials are not acceptable for high or low temperatures or for shock or impact loading.

Vanadium-Chrome steels are more popular alloy material for enhanced stress, fatigue, long endurance life conditions as equated to high carbon steel materials. Both chromium and vanadium escalate the hardenability of steel. Important synergistic effects can also occur when combinations are used instead of single elements (Harshal R et al, 2016). Coil springs are used for automobile suspension and industrial applications. Composite ones to reduce weight and improve corrosion resistance can replace metal coil springs. Composite coil springs reduce weight by 25% to 45%, and also exhibits higher natural frequency, and corrosion free behavior (D.A.Budan et al, 2011).

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Reduction of Pollution Using Nanotechnology

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Abstract: This review provides with the recent developments in the field of nanotechnology to control air, water and industrial pollution. Nanoparticles possess the ability to absorb large amount of pollutants or catalyze reactions at a much faster rate because of their larger surface area and high surface energy. The extremely small feature size of the nano particles make it possible for them to reach the otherwise inaccessible areas and hence promote in-situ remediation rather than ex-situ remediation. Nanotechnology gives a new face to the treatment approaches that prove to be more effective in reduction of contaminants levels and are also more cost effective than currently available techniques. Nanotechnology can protect the environment with applications such as reducing use of raw and manufactured materials (dematerialization), reducing toxics and minimizing or eliminating the generation of affluent and wastes.

Keywords: *Environmental Pollution, Heavy Metals, Nanotechnology, Nano-air filters, Toxicity.*

1.0 Introduction

The issue of environmental pollution has become hot topic in modern day world. Pollutants mainly toxic chemicals cause environmental pollution. The pollution not only degrades the quality of soil, air and water but also destroys the human health and biodiversity. Major contributors to rising pollution are vehicular emissions, construction of buildings and other infrastructure, untreated disposal of waste from factories and industries into the air, water and soil. In today's time of modernized industries releasing pollutants like heavy metals (zinc, mercury, cadmium, lead, chromium and arsenic), chloro fluoro carbons (CFCs), carbon monoxide (CO), nitrogen oxides, organic compounds (volatile organic compounds and dioxins), sulphur dioxide and particulates. Use of fossil fuels such as gas, coal and oil significantly contribute to the rise in air pollution [1].

In Addition to air pollution, water resources are being polluted at a similar rate. As we know water is a resource equally important as air, factors such as leakage of fertilizers, herbicides and pesticides, oils spills, waste disposal, combustion and extraction of fossil fuels and by-products of industrial processes add majorly to water pollution [2]. Air, water and soil are the three major environmental domains that are polluted by contaminants and in order detect, monitor and if possible, clean these contaminates from these three domains we need a suitable technology. In this matter, Nano science and technology teaches various ways and methods through which the quality of the existing environment can be improved. Nano science and technology offers the ability to create and control matter at nano scale.

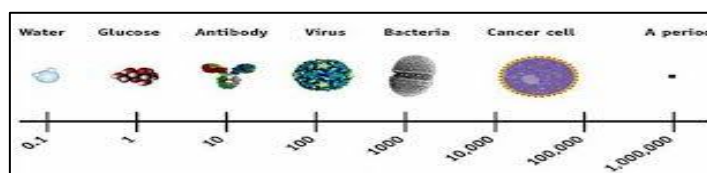


Fig.1. Feature size of nanoparticles

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Suitable Path Selection and Security Mechanism in VANETs

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Abstract: Vehicular ad-hoc networks (VANET) are self-organized network which is a subset of Mobile Ad-hoc network (MANET). It is a wireless ad-hoc network provides communication between vehicles in vehicular environment. VANET is challenging area of research because of its high mobility and frequently changed topology. VANET have its own many challenges such as security, optimal path selection, traffic congestion and securely transmit warning message or any other data from sender to receiver. This paper proposes solution designed to overcome these challenges like securely transmit data from sender to receiver by using Pretty Good Privacy (PGP) security and remove the traffic congestion or ignore the unnecessary load of network by selecting dynamic path for data transmission. In this, the hybrid protocol that is Ad-hoc on demand distance vector (AODV) and Ad-hoc on demand multipath distance vector (AOMDV) is used for to select the dynamic path in VANET. Central authority provides the certificates to each node and verifies its certification. To measure the performance of network with end to end delay, throughput and packet delivery fraction performance matrices.

Keywords: VANET, Hybrid Protocol, PGP, CA, SECURITY

1.0 Introduction

VANET is vehicular ad-hoc network type of Mobile ad-hoc network (MANET). It is a wireless ad-hoc network technology which integrates cellular technology, ad-hoc network and wireless LAN to achieve roadside to vehicle (RVC) and intelligent vehicular communication (IVC). Communication in VANET is Inter vehicular communication (V2V) and Road Side to vehicle/ vehicle to road side (R2V/V2R) communication. Now a day, vehicles are rapidly increased day by day in the whole world. In highways and metropolitan cities many number of vehicles moves so the chances of accidents are increased with number of vehicles increased. When sender sends the warning message to destination that there is accident occurred.

The main issue in VANET to securely transmit the data like warning message from sender to receiver, removing the traffic congestion and dynamically selection of optimal path for data transmission in vehicular network. Security is the main issue in VANET for delivering data between vehicles. Dedicated Short Range Communication (DSRC) as a range radio used in VANET. Vehicular nodes are communicated with each other by the help of Dedicated Short Range Communication like as Wi-Fi.

VANET have two types of mobile nodes that is ON BOARD UNIT (OBU) which is a type of mobile node and ROAD SIDE UNIT (RSU) which is stationary node. Central Authority (CA) is used for node recognition and provides certification to each node. It also discusses the security requirements of VANET.

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Sustainable Roofing Systems for Cost Effective Housing-Indian Scenario

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Abstract: A roof provides an interface with the external environment and performs a variety of basic functions including shelter from the natural elements, shade from the sun, structural support and vital insulation. Nearly 80% of the families in rural areas as well as slum dwellers in urban areas cannot afford adequate roofing. This paper reviews basic information about the most common materials that small rural communities are likely to find nearby. This paper also reviews the work done by Government and private agencies for developing some sustainable and alternate techniques for roofing. With wider audience and acknowledgement these technologies might be successfully utilized for environmental protection, employment generation and affordable housing construction.

Alternatives of any kind are sought when there are choices offered and also when a special need arises which cannot be satisfied by the available conventional means. The need of the hour is taking a holistic approach with local materials, people and techniques for a Sustainable Roof Construction.

Key words-sustainable, cost effective, materials, technologies, low cost research.

1.0 Introduction

Indian population is growing at an alarming rate. The rise from 2001 to 2010 as per the census is to 1.2 billion. With this growing rate of population every year, the problem of housing has become all the more complex. Although in some of the big cities in India we see a large number of good houses yet there are millions of people who either don't have a permanent roof over their head or live in dirty and unhygienic slums.

The surveys by NGOs regarding the conditions of rural houses and slum dwellings in several states of India have concluded that they lacked in adequate roofing systems and materials available are inefficient to provide a proper shelter. (UNCHRI, 2013) [1]

Increase in construction costs directly affects the economy. Roofs constitute about 25% of the construction cost. This is due to the high cost of operations, which can be reduced at several levels by use of efficient planning, cost effective technologies, materials and use of alternate techniques. It becomes necessary to adopt the use of alternative building materials and construction to reduce the costs and valuable resources.

1.1 Intents and Objectives

This paper takes review on basic information about the most common materials that small rural communities are likely to find nearby. This paper also reviews the work done by Government and private agencies for developing some sustainable and alternate techniques for roofing. With wider audience and acknowledgement these technologies can be successfully utilized for environmental protection, employment generation and affordable housing construction in urban and rural settlements in Developing Countries

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Secure Data transfer in MANET by using Hybrid Protocols

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Abstract: Wireless networks are gaining popularity day by day, as users want wireless connectivity irrespective of their geographic position. MANETs consist of mobile nodes that are free in moving in and out in the network. Mobile Ad hoc Network (MANET) is a collection of mobile nodes in which the wireless links are frequently broken down due to mobility and dynamic infrastructure. Routing is a significant issue and challenge in ad hoc networks. Many routing protocols have been proposed like IAODV and IDSR so far to improve the routing performance and reliability. In this paper we have presented Efficient and Secure Data transfer with hybrid of DSDV and MDSR protocol based on the performance metrics like packet delivery fraction, end-to-end delay, and throughput. Simulation is done in NS2 (Network Simulator version2).

Keywords: MANET, Gray Hole, Protocol, DSDV, MDSR.

1.0 Introduction

Mobile Ad-Hoc Networks are autonomous and decentralized wireless systems. MANETs consist of mobile nodes that are free in moving in and out in the network. Nodes are the systems or devices i.e. mobile phone, laptop that are participating in the network and are mobile. These nodes can act as host/router or both at the same time. They can form arbitrary topologies depending on their connectivity with each other in the network. These nodes have the ability to configure themselves and because of their self-configuration ability, they can be deployed urgently without the need of any challenging and interesting research areas.

1.1 MANETs Routing Protocols

Mobile Ad-Hoc Network is the rapid growing technology from the past 20 years. The gain in their popularity is because of the ease of deployment, infrastructure less and their dynamic nature. MANETs created a new set of demands to be implemented and to provide efficient better end-to-end communication. MANETs works on TCP/IP structure to provide the means of communication between communicating work stations. Routing protocols in MANETs are a challenging and attractive tasks, researchers are giving tremendous amount of attention to this key area.

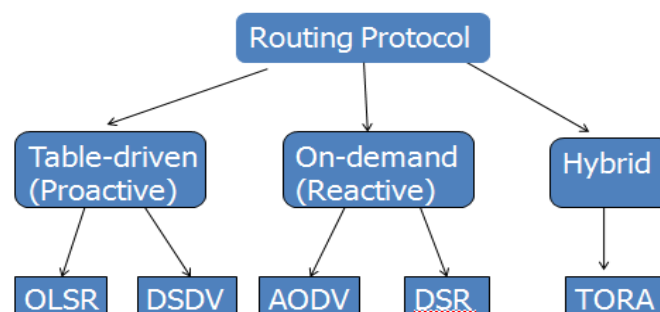


Fig.1. MANETs Routing Protocols

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