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Study on improving electrochemical properties of C-conjugated PANi electrodes for supercapacitor applications

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ABSTRACT

Novel electrodes made with Polyaniline salt containing p-toluene sulfonic acid activated with carbon (PANI-PTSA-Carbon) were synthesized to study their electrochemical properties. Thermo Gravimetry (TG) study shows the weight loss property of the material. X-Ray Diffraction (XRD) patterns confirmed the formation of graphitic type of carbon with phase purity. Fourier transform-infrared (FT-IR) confirmed existence of MC in PANI-PTSA-CARBON hybrid bonds. Field emission scanning electron microscopy (FE-SEM) micrographs show the particle size under nano range. Electrochemical Impedance Spectroscopy (EIS) measurements confirm charge transfer resistance decrease with increasing carbon conjugation. Cyclic Voltammograms show high specific capacitance for PANI-PTSA-C500 indicating long cycle life after 10,000 cycles. Galvanostatic charge-discharge studies proved that SS electrodes coated with PANI-PTSA conjugated with Carbon has high specific capacitance 528 Fg^{-1} , high energy density 73 Wh. Kg^{-1} .

1 Introduction

Supercapacitors became an important part of energy storage systems. Three types of materials such as carbon, metal oxide, and conducting polymers are being used as electrode materials in supercapacitor. Recently, there has been increasing demand for electrical systems that can store the energy generated from renewable energy sources. Among all

such energy storage systems, supercapacitors have enormous potential for various applications, due to their high-power density and longer cycle life than conventional capacitors and batteries [1–5]. The most widely used electrode materials for supercapacitors are carbon materials, conducting polymers, and transition metal oxides. Due to their features of fast charge-discharge rate, high power density, and long operation life compared with batteries and

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CONSTRUCTION TECHNOLOGY AND MANAGEMENT

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Effect of Alccofine on High Strength Concrete

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ABSTRACT

There have been enormous researches going on for the use and utilization of industrial, agricultural and the waste of plant residues in the production of concrete. Production of high-strength concrete (HSC) plays an important role with different pozzolanic materials like fly ash, condensed silica fume, blast furnace slag, etc. In the last few years, there has been a steady increase in the consumption of mineral admixture by cement and concrete industries. This rate is expected to increase further due to the presence of mineral admixture in concrete is known to impart significant improvement to the quality of concrete structures. This research study involves the use of mineral admixture "ultrafine slag" as a cementitious material. The maximum limit of replacement of cement. Main aim of this work is to evaluate the compressive strength, flexural strength and split tensile strength of High strength concrete by partial replacement of cement (0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5, 9.0, 9.5, 10.0) of M60 grade of concrete. OPC of 50 grade from single source is used in this series of study. Impact resistance study is also carried out. The combination of ordinary Portland cement (OPC) with ultrafine slag is found to increase the compressive strength of concrete on all ages when compared to concrete made with ordinary Portland cement alone and has showed excellent durability characteristics.

KEYWORDS: High strength concrete, alccofine, supplementary cementitious materials.

1. INTRODUCTION

Concrete is a hard material that has cementitious medium with in which aggregates are embedded. With the development of concrete technology, the use of concrete in the construction industries have gained pace. Cement is one of the major constituents of concrete. Materials other than cement used in the manufacture of concrete are coarse and fine aggregates, admixtures and water. Cement is an extremely important constituent to bind concrete and binds together other materials. The raw materials used for the manufacture of cement consist

mainly of lime, silica, alumina and iron oxides. These oxides interact with each other in the kiln at high temperature to form four major compound compounds. Concrete is strong and tough material. Reinforced concrete, masonry systems, orthogonally blast and fire much better than timber and steel if designed properly. The quality of concrete is determined by the method of properties as well as its ability to resist environmental. Hardened concrete can be considered as being three distinct phases: the hardened cement paste (HCP) or matrix, the aggregate and the interfacial transition

Journal of Engineering Sciences
EXPERIMENTAL STUDY ON STRENGTH AND DURABILITY OF M40 GRADE
CONCRETE USING MUNICIPAL SOLID WASTE AND QUARTZ STONE

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Abstract Durability of concrete is controlled by its capacity to oppose enduring activity, chemical attack, warped spot, or some other cycle of crumbling, and will hold its unique structure, quality, and serviceability when presented to its current circumstance. Solid concrete is a consequence of appropriate plan, proportioning, placement, completing the process of testing, curing, and relieving. India is second biggest shopper of cement after china. Huge quantity of granite and quartz, some production leads to the collection of enormous quantity of slurry and quartz. Random disposal of this generated waste degrades the environment in numerous ways. Utilization of this waste may solve the problem of waste generation and also the problem of scarcity of natural resources. It has been a dominant issue for the industries to dispose and treatment of hazardous industrial waste and slurry. To utilize the municipal solid waste is one of the possibilities is to use municipal solid waste (MSW) ash in concrete production. The partial use of MSW ash shows a great contribution to waste minimization as well as resources conservation.

In this present investigation is used in study and evaluate the effect of replacement of cement by municipal solid waste (MSW) and quartz stone (QS) as the replacement for coarse aggregates by various percentage of 0%, 5%, 10%, 15% and 20% MSW and 0%, 10%, 20%, 30% and 40% QS for M40 Grade concrete. Concrete cubes were casted and cured for 7 days, 14 days and 28 days and tested for compressive strength. Cylinders were casted for 7 days, 14 days and 28 days and tested for checking split tensile strength. Prism specimens were casted for 7 days, 14 days and 28 days for flexural strength. Durability of concrete is measured at 90 days of curing in acid and sulphate for cube specimens.

1 INTRODUCTION

Concrete has been available since time immemorial indefinitely since a while, the Indian urban civilization around 2000 BC is the primary reported utilization of it material in form of concrete. Around 300 BC, during the beginning of the Roman Empire, the Romans found that joining a sticky volcanic slip with lime mortar created a hard water boundary material that we currently know as concrete. The most generally involved mortar used in ancient cement or Portland concrete contained some of local (temporal) mixed concrete, whereas the Portland concrete we may contain numerous materials like debris, slag, silica smoke and some possible high early quality cement, which in the name suggests gain quality a lot quicker than Portland or blended securities and low weight concrete which are utilized when the bottom of equilibrium of the substance is restricted. Portland concrete is fabricated by consolidating-cement material which might be found in limestone or shell with silica, alumina, and iron oxide, when they're found in the ground in shale. Concreting under the name of the stones involved in two ways are produced and participated in a dry or wet condition.

Municipal solid waste (MSW) is the waste or by-product is defined at the national level, is waste consisting of everyday items such as product packaging, glass, clippings, furniture, clothing, metal and wire, food scraps, newspapers, appliances, furniture, electronics, and batteries. These waste come from houses, institutions such as schools and hospitals, and



A Study on the use of Different Bracings in RC Buildings and Functioning of A – Chevron Bracing using ETABS Software

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ABSTRACT

Bracing Plays important role in design of Earthquake Resistant Structures, which reduces the response of the structure when they are subjected to lateral loads. There are many different types of bracers in use. In the present study various bracing are used to evaluate the responses of reinforced concrete buildings. The main task of a structure is to bear the lateral loads and transfer them to the foundation. Since the lateral loads imposed on a structure are dynamic in nature, they cause vibrations in the structure. In order to have earthquake resistant structures, bracing have been used. Buildings having square and rectangular plans with square and rectangular column cross-sections are analyzed, with and without bracing. In the present study the software ETABS 2015 have been used. Using Time history analysis the response of the Reinforced concrete building considered in the present study is compared and compared with and without Bracing. It has been observed that buildings with global bracing are performing well in terms of response of the structure when compared to other bracing system irrespective of the floor plan. In Time History analysis, up to 93% decrease in max. time Period is obtained when global bracing are used. It reduced the Base Shear of the structure by 70%. Hence global bracing can be used in RC multi-storey buildings to reduce the response effectively.

INTRODUCTION

GENERAL

The Bracing are the more applied tools for controlling responses of the structures. These tools are applied based on different construction technologies in order to decrease the structural



An Experimental Study to Investigate Strength Parameters of Silica Fumed Concrete by Using Sea Water as an Alternative of Potable Water

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ABSTRACT

In this research work, the concrete specimens are casted and cured using sea water and compared with potable water. Therefore, this research work seeks to investigate the effect of sea water during curing on compressive, tensile and flexural strength of concrete. An experimental study is made on the nature of Silica fume and its influences on the properties of fresh and hardened concrete. In the present study, an attempt has been made to investigate the strength parameters of concrete made with partial replacement of cement by Silica fume. Moreover, no such attempt has been made in substituting silica fume with cement for low/medium grade concretes (viz. M20, M30). The effects of curing of concrete with seawater on compressive, tensile and flexural strength are investigated when 15% replacement of cement by silica fume in weight. The specimens are cured for 7 days, 28 days and are tested for compressive, tensile and flexural strength. The obtained results are compared with the conventional concrete mix i.e. cured using potable water.

Keywords: experimental study, compressive, tensile and flexural strength

1. INTRODUCTION

Concrete is the prime material used in any RCC structure. In this generation, we can observe the rapid urbanization and industrialization which was leading to the increase in the construction of the projects. So, in the construction of any structure concrete is main material to be used in completion of any RCC structure. Concrete is a composite material composed of water, aggregate, and cement. Concrete is used in large quantities almost

everywhere around the world. Concrete is a very tough to find an option for concrete in construction, which is durable and economic. Concrete is a mixture of cement, aggregate and the main ingredient is cement which binds the together all remaining ingredients. But, the cost of cement is high but the importance in construction. In order to fulfill the requirements, the cement can be replaced with supplementary materials or other filler. The other important factor is sea water which helps a lot in making of all components of concrete. When water is added to the mix it actively participates in chemical reaction with cement and that process is called hydration. The strength of concrete also depends on the quality of water used in making of concrete. Due to rapid growth of population the world is facing a number of problems. Many of the experts and researchers say that there will be scarcity of fresh water and difficult to get the water in the future. If we select the alternative for fresh water other than for drinking purpose there will be scarce in getting water for drinking purpose. So, there is a need to explore alternative for potable water in construction industry as billions of water is used for making and curing of concrete. As we know that our planet earth is filled with 70% of water but we cannot use that. So, that the sea water can be used as an alternative for potable water. In the present study, an attempt has been made to investigate the strength parameters of concrete cast with partial replacement of cement by Silica fume. The effect of curing of concrete with seawater on compressive, tensile and flexural strength are investigated when 15% replacement of cement by silica fume in weight. M20 design of M20 and M30



AN EXPERIMENTAL STUDY TO INVESTIGATE WORKABILITY AND STRENGTH PROPERTIES OF CONCRETE BY PARTIALLY REPLACING CEMENT WITH PUMICE POWDER

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ABSTRACT

The construction industry is flourishing day by day; as a result, cement consumption in construction work is high. Production causes carbon footprint, partial replacement using waste products from various industries is out of the question. Pumice powder, generated by the stone processing industry, is an ideal by-product produced in various quantities with characteristics. Utilization of pumice powder in concrete can reduce the risk of water retention and the water retention reduces the waste disposal problem. Mechanical strength characteristics were evaluated by preparing concrete with pumice powder added mix after 7 and 28 days of curing. The primary objective of this investigation is to study the strength characteristics of pumice powdered concrete of M20 grade concrete & M30 grade concrete by conducting compressive, split, and flexural strength test. In the present study, an attempt has been made to investigate the strength parameters of concrete when cement is replaced with pumice powder by adding it in various percentages (0, 10%, 15%, 20%, 25%, and 30%). Moreover, no such attempt has been made by replacing with the waste material as pumice powder at highest percentages to prepare M20 and M30 grade of concrete. The strength characteristics are calculated at 7, 28 days and compared the test results with the normal mix of concrete. The motivation of this study is to promote the usage of by-product waste as a replacement for cement thereby reducing CO₂ emissions and thus resulting in the development of environmentally friendly concrete.

INTRODUCTION

Concrete is used extensively in various types of construction works as a construction material. Many great engineers around the world for decades. The most commonly used construction material in the world is concrete. To obtain arriving at proper mix through a suitable combination of cement, aggregate, water and admixtures is referred to mix proportioning. The mix proportions should satisfy all the requirements. In case of concrete, possible cement content is the maximum, economy is achieved. The purpose of concrete mix proportioning is to increase the usability and durability.

AN EXPERIMENT TO REPLACE PART OF THE CEMENT IN CONCRETE WITH RECYCLED GLASS POWDER AND USING NATURAL FIBERS

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ABSTRACT

In this paper, the main aim of our project is to compare the strength properties of conventional concrete and non-conventional concrete of M35 grade of concrete. This study investigates the combined effects of replacing glass powder and natural fibers on mechanical properties of hardened concrete for the grade of M35. In our present investigation, no. of tests were conducted to research the effect of 5%, 10%, 15% replacement of natural fibers are 0.2%, 0.4%, 0.6%. A notable improvement is being noticed in the strength properties of concrete when the glass powder is used as partial replacement of cement and on the other hand the addition of natural fibers to the concrete results in the reduction of permeability and the improvement in crack resistance, eventually, to maintain sustainability and to gain durability and strength. This paper describes about the use of glass powder and natural fibers which results in a good strength properties and with a minimal decrease in cement content.

Keywords: Concrete, Glass Powder, Natural Fibers, Compressive Strength, Permeability, Sustainability

1. INTRODUCTION

Concrete is made up of cement, aggregates, water and sometimes additionally admixtures are added to concrete to increase the properties of concrete. Concrete is mostly widely used material in the world but there are several environmental issues associated with its use which are taken into consideration and must be ignored. Cement is made up of argillaceous (clay) and calcareous (lime) materials. The main aim of our project is to partially replace the cement with waste glass powder which is 100% recyclable material with 100 ton capacity which contains more amount of silica and it takes a long time to decompose in soil. There are several environmental issues are generated with the waste glass powder to reduce these issues we call them the waste glass can be recycled. Million tons of glass waste is generated around the world but glass cement can be recycled easily. The ingredients included in glass powder are sand, lime, silica, soda ash and other admixtures. In our project we are partially replacing the cement with waste glass powder with varying percentages of 5%, 10%, 15%. In M35 grade of concrete. Generally the waste glass is obtained from glass containers, car storage, window glass, wind screens of vehicles etc.

In India much amount of glass wastage is produced. Once the glass becomes waste it is difficult to recycle which is unsustainable and this does not decompose in the environment. Many researches have been carried out to reduce and reuse the glass wastage. Glass is a brittle material. It contains silica (60-70%) compared to other compositions in glass material. The silica content makes high strength concrete and also impact the other mechanical properties of concrete and hence the strength of concrete is increasing day by day. India is the most largest producer of banana in the world. Natural fibers like banana and coconut fibers may be used to increase the strength of concrete. These natural fibers have good physical and mechanical properties and can be utilized more effectively. They are economical and also the chemicals present in these fibers. Numerous engineering parameters of the concrete were foundly improved by adding banana fibers regarding the strength parameters of the concrete. Among all the natural fibers, banana has the greatest toughness which can be used in concrete. These fibers are classified as geotextile. In our project, Ordinary Portland cement of 53 grade and M35 grade concrete were used. The addition of banana fibers and coconut fibers significantly improved many engineering properties of concrete. In addition, the strength mainly, Banana fibers having a length of 40 mm and coconut fibers having a length of 100mm - 75 mm were used.



RESIDUAL COMPRESSIVE STRENGTH OF TERNARY BLENDED MIX CONCRETE CONTAINING FLY ASH AND SILICA FUME AT ELEVATED TEMPERATURES

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ABSTRACT

The danger of concrete being subjected to extremely high temperatures is increased by the widespread use of concrete as a building element for tall structures, tunnels, jet airways, nuclear reactors, oil and gas pipelines, oil and crude oil storage tanks, and coal gasification and liquefaction vessels used in petrochemical refineries. Due to its extremely high specific gravity and limited thermal conductivity, concrete is best suited to withstand high temperatures. When concrete is exposed to high temperatures, it loses a great deal of its mechanical properties, including strength and modulus of elasticity. This could lead to unfavorable structural malfunctions that, with the characteristics of concrete that survive a fire, remain significant. To ascertain the ability to repair badly used or restore structures damaged by fire. Numerous studies on different compounds and admixtures in admixtures that can enhance concrete's durability when exposed to high temperatures have been conducted. Some admixtures that thermally expand at the designated objective temperature, the purpose of the research is to examine the impact of increased temperature on the mechanical properties of OPC and ternary mixed concrete. Numerous experiments have demonstrated that adding admixtures of minerals improves the way concrete performs at higher temperatures. Ternary blends have been shown to enhance concrete's ability to perform in adverse conditions. In this research, ternary blends were used in an effort to enhance concrete's resilience at higher temperatures. The goal of this study was to use ternary blends to try and enhance the resilience of concrete at high temperatures. A blend ratio of 0.42 is employed. A collection of initial information was developed by testing three different samples of every variety of concrete at ambient temperature. After that, an oven was used for warming the different pieces of ternary blended concrete to a desired temperature at an average pace of 20°C/min. Target temperatures were 100°C, 200°C, 300°C, 400°C, 500°C, 600°C, 700°C and 800°C. In order for the samples to derive a maximum value, the

AN EXPERIMENTAL STUDY UTILIZING FLY ASH, ACTIVATED CLAY, AND BAMBOO FIBERS ON M45 GRADE CONCRETE

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ABSTRACT

With a focus on reducing the usage of cement in concrete, cement manufacturing and its associated high amount of carbon dioxide (CO₂) due to production of cement. Increasing the carbon dioxide leads to global warming. My team focus on the reduction of cement uses by replacing with alternative clay being abundantly available, it is used as an alternate material to cement because of its pozzolanic nature. To enhance the properties of clay it was chemically activated before used in the mix. On the other hand, the efficiency of fiber reinforced concrete (FRC) is far superior to the plain concrete. To improve the mechanical properties of concrete by using bamboo fibers are used in the mix. Bamboo fibers are naturally available and has tensile strength. In my project the bamboo fibers with 0.2% replace with percentage of 20% replace with and activated clay is used as partially replacement of cement with percentage of 20%.

Keywords: Concrete, Activated Clay, Fly Ash, Bamboo Fibers.

1. INTRODUCTION

The manufacturing of cement is rapidly increasing now a days. India is the second largest manufacturing of cement in the world. The manufacturing of cement requires use huge energy and the installation of cement manufacturing plant requires high cost at the same time increasing the use of cement leads to the production of green house gases. Further, the availability of raw material is also a major concern factor. Increasing the amount of alternative materials. Clay has a major advantages as its availability and its pozzolanic nature. In concrete as a partially replacement with cement. Cement consumption is less when clay is added. Consumption of cement is less depending upon the varieties of mixed proportions. In our project we have investigated the strength along with the density in concrete. A strength parameters are carried out and the results are analyzed to determine the behavior of concrete in M45 grade. This need to activate clay elements for an industrial scale manufacturing mixes, also because of its very high pozzolanic reactions under high temperature. In addition, the cement producer has the control over production, quality and quality. The primary aim is to clarify the difference of terms like calcinated clay and activated clay. To use term which used and frequently used in publications, also includes the calcinated clays of the cement and its pozzolanic activity. The second term, activated clay, which is also with pozzolanic activity. Therefore it will be use term word instead of calcinated clay term now. In addition, fly ash as a supplementary cementitious material adds sustainability to concrete by offsetting the CO₂ emitted in cement production. The positive effects of fly ash as a partial replacement of cement on the durability of concrete are recognized through numerous researches, however, the extent of its pozzolanic activity is dependent on fly ash. The fibers are improving the mechanical properties of the concrete. There are two types of fibers are available there are natural fibers and artificial fibers. In our project to studying the usage of bamboo fibers (Natural fibers) are used in the concrete. The bamboo fibers can reduce the shrinkage and increase the load carrying capacity. Synthetic fibers are better than natural fibers. Plants fibers have a advantages than the synthetic fibers in terms of environmental impact. The primary advantage of natural fibers is low cost than the synthetic fibers.

II. OBJECTIVES OF THE STUDY

- To study the effects of adding activated clay as a partially replacement of cement.
- To study and compare the conventional and non conventional concrete.
- To minimize the risk of environmental pollution.
- To enhance the properties of concrete.
- To reduce the crack width and deflection of concrete.

Efficiency Enhancement of Permanent Magnet Synchronous Generator Wind Turbine Through Maximum Power Point Tracking using SIMULINK/MATLAB

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Abstract - The Renewable energy sources (RESs) more utilized because of its abundant availability everywhere. The Wind Energy is gaining interest because of technology enhancement and significant power cost reduction. In order to enhance the efficiency of a wind energy conversion system (WECS), the maximum power point tracking (MPPT) algorithm is usually employed. This paper presents to extract the maximum available power under a sudden wind speed change condition, which is applied in a permanent magnet synchronous generator (PMSG)-based WECS and in order to eliminate the dependence on the characteristic curve of wind turbine, a conventional perturbation and observation (P&O) method has been proposed. This method perturbs a control variable in a certain step size, and then observes the changes of output power until the MPP can be obtained. Since the P&O method does not require the wind speed sensor as well as the prior information on wind turbine, it is known to be a reliable and flexible method. Beside theoretical analyses, the simulation results are provided to prove the effectiveness of the proposed MPPT algorithm.

Key Words: Maximum Power Point Tracking (MPPT), Permanent Magnet Synchronous Generator (PMSG), Torque Observer, Wind Energy Conversion System (WECS), Hill Climb Search (HCS), Perturbation and Observation (P&O).

1. INTRODUCTION

In recent years, renewable energy resources are attracting great attention due to the scarcity of fossil energy and the requirement of restricting carbon dioxide emission worldwide. Among renewable energy resources, wind energy is considered as one of the most potential and promising resources. In a wind energy conversion system

(WECS), the kinetic energy of wind is transformed into the mechanical energy via a wind turbine, and then, this energy is converted into the electrical energy by using a generator.

Even abundance of wind power, the output power is unstable in wind turbine due to the variation of wind speed. To overcome this challenge, the maximum power point tracking (MPPT) algorithm is mainly employed to enhance the efficiency of WECS. By this algorithm to maintain the output power of wind turbine at the maximum power point (MPP) irrespective of the wind speed variation.

Until now, various MPPT algorithms have been proposed for the purpose of tracking the MPP in a WECS. To achieve the maximum power of wind turbine at a given wind speed, according to characteristic curve the torque of a permanent magnet synchronous generator (PMSG) is controlled. The main drawback is the difficulty in determining the optimal power-speed curve of wind turbine which significantly varies by each wind turbine. Moreover, the optimal curve would be varied as the operating environment is changed.

A perturbation and observation (P&O) method has been proposed due to independent of wind turbine design and information. This method perturbs a control variable in a certain step size, and then observes the changes of output power until the MPP can be obtained. Since the P&O method does not require the wind speed sensor as well as the prior information on wind turbine, it is known to be a reliable and flexible method. However, the main limitation of this algorithm is its poor MPP tracking performance under the rapid variation of wind speed.

This paper proposes an MPPT algorithm for a WECS only to eliminate the need of wind speed sensor and wind turbine

ENHANCING ELECTRIC VEHICLE RANGE AND COST THROUGH MODELING AND SIMULATION

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ABSTRACT: *As the technology is growing immensely in recent years, several extemporizations have been made for safer and greener planet electric vehicles have emerged as transformative force in the automotive industry, driven by environmental concerns innovations. By creating mathematical model, comprehensive an electric vehicle encompassing it's of various components such as the battery electric motor, power electronics and vehicle body and various controllers. Cost optimization is achieved through the examination of different aspects of EV production which is a major contributor to overall cost. The project identifies strategies to reduce and production costs. Electric Vehicle revolution by utilizing advanced modelling and simulation methods. By optimizing both cost and range consideration through a multidimension analysis. The electrical vehicle contributing to a sustainable and a eco-friendly transportation to future.*

1. INTRODUCTION:-

Electric vehicles (EVs) represent a groundbreaking innovation in the automotive industry, offering a sustainable and eco-friendly alternative to traditional gasoline and diesel-powered vehicles. These vehicles are designed as the world shifts towards a more sustainable and environmentally responsible future, electric vehicles are playing a pivotal role in shaping the way we move and interact with transportation. This introduction only scratches the surface of the exciting and rapidly evolving world of electric vehicles, which are poised to drive us into a cleaner, more efficient, and innovative era of mobility to run on electricity stored in rechargeable batteries, making them a significant departure from the conventional internal combustion engine vehicles that rely on fossil fuels.

EVs come in various forms, from fully electric cars like the Tesla Model 3 to plug-in hybrid electric vehicles (PHEVs) like the Toyota Prius, which combine both electric and gasoline power. The advent of electric vehicles has been driven by the urgent need to reduce greenhouse gas emissions, combat air pollution, and decrease our dependence on finite fossil fuels. This transition toward electrification has transformed the automotive landscape, spurring technological advancements in battery technology, electric drive trains, and charging infrastructure.

Key benefits of electric vehicles include reduced emissions, lower operating costs, quieter and smooth rides, and the potential for energy independence. Governments and organizations worldwide are promoting the adoption of EVs through incentives, infrastructure development, and research into next-generation EV technologies.

Environmentally responsible future, electric vehicles are playing a pivotal role in shaping the way we move and interact with transportation. This introduction only scratches the surface of the exciting and rapidly evolving world of electric vehicles, which are poised to drive us into a cleaner, more efficient, and innovative era of mobility

1.2 working of EV's:-

The working principle of electric vehicle in which the e-motor gets energy from a controller which collects the power from a battery. The e-vehicle works on an electric principle. Battery pack provides the power to the electric motor. Therefore, e-motor uses the energy received from the rechargeable battery to rotate the transmission system, thereby, wheels rotate. controller how much power is to be delivered to the electric motor.

Transient Stability By Using Matlab With Simulation

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ABSTRACT :

This research paper presents a comprehensive study on transient stability assessment in power systems utilizing MATLAB-based simulation techniques. Transient stability is a crucial aspect of power system operation, ensuring the system's ability to withstand disturbances and maintain synchronism following large disturbances such as faults or sudden load changes. The paper outlines the theoretical background of transient stability analysis and introduces the methodology for modeling power system components and simulating transient events using MATLAB. Various simulation scenarios are presented, including fault simulations, generator tripping, and load disturbances, to analyze system behavior under different conditions. The results obtained from the simulations demonstrate the capability of MATLAB-based tools in assessing transient stability and identifying potential instability issues in power systems.

Key Words : Transient stability, block diagram, simulation, fault analysis, applications of transient stability.

1.INTRODUCTION

Transient stability is a cornerstone of power system reliability, focusing on how the system reacts to sudden disturbances. Transient stability involves the determination of whether or not synchronism is maintained after sudden disturbance in the system. The reliable operation of power systems is essential for meeting the growing demand for electricity. Transient stability plays a crucial role in maintaining grid resilience, particularly during transient events such as faults or sudden load changes. This paper aims to investigate transient stability using MATLAB-based simulations, offering insights into system dynamics and control strategies for enhancing stability. Load change or understanding its fundamental principles is crucial for maintaining grid stability. Mathematical models and simulation tools play a pivotal role in accurately assessing transient stability, accounting for various factors such as fault types, system parameters, and control mechanisms. Faults, whether they be short-circuits or other disturbances, can significantly impact transient stability, making fault analysis a critical aspect of system reliability. System parameters like inertia, damping, and reactance also heavily

influence transient stability, necessitating their careful consideration in modeling and analysis.

Advanced control strategies are essential for enhancing transient stability in real-time grid operation. These strategies leverage sophisticated algorithms and control mechanisms to swiftly counteract disturbances and restore stability to the system. Implementing such strategies requires a comprehensive understanding of the underlying dynamics and characteristics of the power system, as well as robust real-time monitoring and control infrastructure. By designing and deploying advanced control strategies, operators can effectively mitigate the impacts of disturbances and ensure the continued reliability of the power grid, even in the face of unforeseen events.

2.LITERATURE SURVEY

- Numerous factors affect transient stability, including fault types, fault locations, system parameters, control strategies, and grid topology.
- Control strategies are essential for enhancing transient stability. Research in this area includes investigations into excitation control, governor control, and the development of advanced control devices like FACTS (Flexible AC Transmission Systems).
- The literature on transient stability encompasses a rich history of research and practical applications. Ongoing developments in modeling, simulation, control strategies, and emerging technologies are critical for maintaining the reliability and resilience of electrical power systems.

3. IDENTIFICATION OF PROBLEM

System Modeling:

Develop a dynamic model of the power system using MATLAB. Include generators, transmission lines, loads, and other relevant components. Ensure that the model captures the nonlinear dynamics and interactions between different system elements accurately.

SIMULATION OF VOLTAGE SOURCE INVERTER FED INDUCTION MOTOR DRIVES

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Abstract - This paper presented by voltage source controlled by the inverter is using by the induction motor drives controlling and using the generation of firing angles to IGBT of the inverter using modulation produces balancing pulses with Output Voltages, Current waveforms, rotor and stator are the magnitude angles speed and Torque multi wave angles are calculated and harmonic distortion lines. Voltage source inverter in degree in module operation 180 degrees to 360 degrees operation pulses width modulation voltage generating output mechanically operation of microcontroller proper switching of drives circuit consists load impedance.

Key Words: PWM Inverter, Vector Modulation, IGBT, VSI, Induction motor drives, MATLAB, Switching

1.INTRODUCTION

Project involve the using varying the voltage source of Inverter fed induction motor using drives are generating voltage supplies from the pulse generation modulated to integrated from the IGBT switches operation of GTO (Gate turn and off) thyristors insulating gate operations stepped as an integrated operation switches increasing losses operation. Voltage supplies from Asynchronous Machine varying speed operation of the rotor speed and Electromagnetic torque or stator current and finding operation of a pulse modulation techniques. Operation of a conversation of AC link converted from the DC source of operation,

Note the values of DC high-link operation of based required from the varying specific values are required and design consideration operation techniques of MATLAB (dc) charges of a capacitor voltage balancing rising values motor performance.

Conversion of a DC-AC inverter operation voltage dc energy to battery are conversion of AC pulse operated voltage have inverter performance easily AC switches to three phase conversion.

1.1 VSI INDUCTION MACHINE

Voltage source inverter controlled by induction motor drives are controlled by the varying frequency obtained from the AC to DC conversion techniques operation of switching devise are GTO Gate turn and off transistor switching of direct current from the asynchronous motor convert from the mechanically to operated harmonic waves of perfect out the varying stepped wave to PWM line voltage waveform. Sinusoidal modulation operation of single line voltage 230v,50hz large number of ripples free dc output operation 180 degrees condition magnitude wave, microwaves voltage and current waves.

Closed Loop Chopper controlled DC motor Drives

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Abstract - Closed-loop chopper-controlled DC motor drives are sufficient in range of industrial and consumer applications due to their precise speed and required control capabilities. This technology offers the advantages of DC motors with the precision of closed-loop control systems, resulting in efficient and reliable motor operation. To enhance the performance of DC motors closed loop control systems have been developed and one of the key technologies is Chopper control. The chopper circuit is responsible for regulating the voltage supplied to the DC motor, it can operate in four quadrants, meaning that it can provide positive or negative voltage and current to the motor, allowing it to run in forward or reverse direction and to brake in regenerative mode. Speed controller (PI) and current controller plays a crucial role in maintaining desired motor behavior by adjusting the chopper-pulse width modulation (PWM) signals.

Key Words: Choppers, Closed loop, Speed controller, DC motor drives, Four quadrant operation, DC power, wave forms

1. INTRODUCTION

Closed-loop chopper-controlled DC motors represent a sophisticated and faster approach to motor control, enabling precise and efficient results of motor speed and torque. Here separately excited dc motor drive is used because of its flexible control characteristics in which chopper is used to control the motor speed due to its less loss, high efficiency, lightweight, and quick response. The closed loop control of the chopper drive consists of two loops: an inner current loop and outer speed loop. The inner current loop regulates the armature current of the motor by comparing the actual current with the reference given current, which is derived from the outer speed loop. The speed loop controls the speed of the motor by comparing with the actual speed with the reference speed, which is usually set by the user or a higher-level controller. The speed loop controller can also adjust the reference current according to the load torque and the operating modes of the drive.

1.1 Choppers:

A Chopper is a high-speed semiconductor switch(S) that operates in an "on" or "off" state. Chopper circuit is a type of DC to DC converters. They change the fixed input DC voltage

to variable DC output voltage. Choppers are essential for efficient power control and signal application.

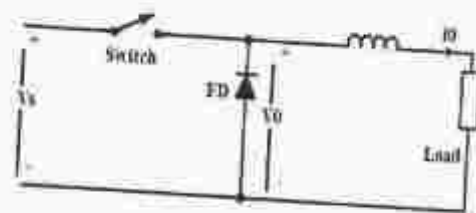


Fig.1 chopper diagram.

1.2 Classification of choppers:

1.2.1 AC LINK CHOPPER:

In this classification of the chopper, the voltage inversion takes place. The DC voltage is converted into AC voltage with the help of inverter. Now this AC voltage is passed through a step-down or step-up transformers. The output from the transformers is again converted into DC by a rectifier.

1.2.2 DC LINK CHOPPER:

DC chopper works on DC voltage. They can work as a step up and step-down transformers on DC voltage. They convert the steady constant DC voltage into a higher value or lower value based on their type. DC choppers are more efficient, speed and optimized devices.

1.3 Closed Loop Control System:

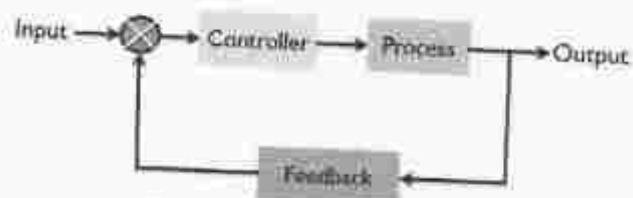


Fig.1.3 Closed Loop Control System

A closed-loop control system is also called it as feedback control system. It is automatically regulating a system to



A Machine Learning Approach to Driver Alertness Using Python

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Abstract: Nowadays, road accidents are occurring at an alarming rate. There may be many reasons behind these accidents, with drowsiness being one of the most common causes. In order to address this issue, we have developed a real-time project titled "A Machine Learning Approach to Driver Alertness Using Python" focused on driver alertness. Our main aim is to alert the driver who is falling into drowsiness. We utilize a machine learning approach, incorporating components such as OpenCV, Keras, and Pygame. As part of the project, we assign a default score, and whenever the driver's eyes remain closed for a period exceeding the default score, an alarm is triggered to alert the driver. This entire process is implemented using the Python programming language.

I. INTRODUCTION

Driver fatigue is a critical factor in endless mishaps. Late estimations measure that yearly 1200 passing's and 76,000 injuries can be credited to exhaustion related accidents. Driver sluggishness and weariness is a main consideration which brings about various vehicle mishaps. Creating and keeping up innovations which can viably recognize or forestall sluggishness in the driver's seat and alarm the driver before a disaster is a significant test in the field of mishap avoidance frameworks. Due to the threat that laziness can cause on the streets a few techniques should be produced for forestalling checking its belongings. With the coming of present day innovation and continuous filtering frameworks utilizing cameras we can forestall significant disasters out and about by cautioning vehicle drivers who are feeling lazy through a languor location framework. The mark of this endeavor is to develop a model languor recognition framework. The spotlight will be put on arranging a system that will unequivocally screen the open or shut state of the driver's eyes constantly. By observing the eyes, it's accepted that the side effects of driver weakness are frequently recognized early enough to stay away from a fender bender. Location of exhaustion includes the perception of eye developments and squint examples during a grouping of pictures of a face

II. OBJECTIVE

Nowadays the driver's safety in the car is one of the most wanted systems to avoid accidents. Our goal of the undertaking is to ensure the security framework. The venture primarily centers around these targets

1. To recommend approaches to recognize exhaustion and sleepiness while driving.
2. To examine the actual changes of weariness and laziness
3. To build up a framework that utilizes eye conclusion and yawning as an approach to distinguish exhaustion and laziness.
4. Speed of the vehicle can be decreased.
5. Traffic the executives can be kept up by decreasing the mishap.



DETECTION OF PHISHING WEBSITES USING MACHINE LEARNING

Done By

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Abstract— Criminals seeking sensitive information construct illegal clones of actual websites and e-mail accounts. The e-mail will be made up of real firm logos and slogans. When a user clicks on a link provided by these hackers, the hackers gain access to all of the user's private information, including bank account information, personal login passwords, and images. Random Forest and Decision Tree algorithms are heavily employed in present systems, and their accuracy has to be enhanced. The existing models have low latency. Existing systems do not have a specific user interface. In the current system, different algorithms are not compared. Consumers are led to a faked website that appears to be from the authentic company when the e-mails or the links provided are opened. The models are used to detect phishing Websites based on URL significance features, as well as to find and implement the optimal machine learning model. Logistic Regression, Multinomial Naïve Bayes, and XG Boost are the machine learning methods that are compared. The Logistic Regression algorithm outperforms the other two.

Keywords—Logistic Regression, Multinomial Naïve Bayes, XG Boost.

I. INTRODUCTION

Consumers have lost billions of dollars each year as a result of phishing operations. Refers to thieves' tricks for obtaining private information from a group of unwitting internet users. Fraudsters obtain personal and financial account information such as usernames and passwords using fake email and phishing software to steal sensitive information. This research examines strategies for detecting phishing Web sites using machine learning techniques to analyze various aspects of benign and phishing URLs. It investigates how linguistic cues, host features, and page significance attributes are used to identify phishing site. The fine-tuned parameters aid in the selection of the most appropriate machine learning method for distinguishing between phishing and benign sites. Criminals that seek to steal sensitive information first establish illegal duplicates of legitimate websites and e-mail accounts, frequently from financial institutions or other companies that deal with financial data. The e-mail will be made up of real firm logos and slogans. One of the reasons for the rapid growth of the internet as a means of communication is that it allows the misuse of trademarks, brand names, and other corporate identities that consumers rely on as verification processes. "Spoof" e-mails are sent to many people in order to make them involved in the criminal deception. Consumers are paid on a fraudulent website that appears to come from the real company when these emails are opened or when a link is clicked on the email.

II. LITERATURE REVIEW

According to Erzhou Zhu (2018), phishers typically put up a false website where victims were tricked into providing passwords and perceptible information[1]. As a result, it's critical to detect rogue websites before they cause any harm to their victims. This study proposes a new method based on deep reinforcement to model and detects malicious URLs, fueled by the dynamic nature of criminal websites to steal sensitive information[2]. The suggested model may learn the properties related to phishing website identification by accommodating the dynamic behavior of phreaking websites[3]. The use of various types of machine learning algorithms for the problem of classification, particularly security and virus detection, has piqued the research community's interest in recent years[4]. Deep learning algorithms have also opened a new chapter on pattern recognition and artificial intelligence with the growth of processing capacity[5]. As a result, these powerful learning algorithms may now be used to solve a wide range of categorization, decision, and automation challenges[6]. When a high number of characteristics are included in the computation, deep learning-based techniques are very effective. Because algorithms based on reinforcement learning may estimate solutions (i.e., action) based on stochastic transformations and the rewards of selecting that state action, the proposed method is robust and



AI HEALTH CARE BOT SYSTEM USING PYTHON

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Abstract: This project seeks to develop an AI health information bot using Python. The bot will provide reliable health information from a comprehensive knowledge base, guide users through a symptom assessment process (without offering diagnosis or medical advice), and promote healthy habits with personalized recommendations. It will also connect users to appropriate resources, such as local healthcare providers or credible online information. To achieve this, the bot will leverage Natural Language Processing and potentially explore Machine Learning for improved understanding and response generation. Furthermore, ethical considerations regarding disclaimers, data privacy, and bias mitigation will be paramount in the development and deployment of this AI health bot. The bot's performance will be evaluated through user testing and analysis of user satisfaction, accuracy of provided information, and effectiveness in achieving set goals. Future work will involve continuous improvement through ongoing learning and adaptation based on user feedback and advancements in the field of AI for healthcare. By combining these elements and addressing ethical considerations, this project strives to create a valuable AI health bot that empowers individuals to make informed decisions about their health and well-being, while emphasizing the importance of seeking professional medical advice from qualified healthcare providers.

1. INTRODUCTION:

This is an automated chat robot design to answer users frequently asked questions, earlier natural language processing techniques were using to design this robot but its accuracy of giving correct answer was less and now due to Deep Learning algorithms accuracy of giving correct answer increase, so here using python deep learning project we are building CHATBOT application to answer users questions. To implement this technique first we train deep learning models with the train data (all possible questions answers) and whenever users give any question then application will apply this test question on train model to predict exact answer for given question. Earlier companies were hiring humans to answer users queries but by using this application we can answer users question without using any manpower. Chabot can be described as software that can chat with people using artificial intelligence. Chabots are generally used to respond quickly to users. Chabots, a common name for automated conversational interfaces, present a new way for individuals to interact with computer systems. Traditionally, to get a question answered by a software program involves using a search engine or filling out a form. A Chabot allows a user to simply ask questions in the same manner that they would address a human. There are many well-known voice-based chatbots currently available in the market; Google Assistant, Alexa and Siri. Chabots are currently being adopted at a high rate on computer chat platforms. To implement this project, we are using python deep learning neural networks and NLTK (natural language processing API) to process train and test text data.



USE OF DIGITAL SIGNATURE WITH DIFFIE HELLMAN KEY EXCHANGE AND AES ENCRYPTION ALGORITHM TO ENHANCE DATA SECURITY IN CLOUD COMPUTING

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ABSTRACT: Cloud technology emerges as the cornerstone of the upcoming decade, offering users the ability to store vast amounts of data remotely and access it from any location, using diverse terminal devices as needed. However, challenges such as privacy, data protection, secrecy, authentication, and access control persist in cloud computing. To address these issues, researchers employ a variety of encryption techniques and mechanisms to bolster security. By integrating encryption algorithms with authentication techniques and key exchange protocols, a three-way mechanism is established, safeguarding authentication, data security, and verification simultaneously. This study proposes the utilization of the Advanced Encryption Standard (AES) encryption method in tandem with digital signatures and Diffie-Hellman key exchange to ensure the confidentiality of cloud-stored data. The integration of these methods ensures robust protection against potential threats. Should the key in transit be compromised, the Diffie-Hellman key exchange mechanism remains resilient, as the key's meaninglessness without the user's private key renders it ineffective to unauthorized parties. This three-

way approach forms a formidable barrier against hacking attempts, enhancing the security of cloud-based data.

1. INTRODUCTION

Cloud computing offers a flexible and cost-effective way for businesses to access technology resources. Imagine it as renting computing power over the internet, instead of having to buy and maintain your own servers and software. This on-demand service allows companies to scale their resources up or down as needed, so they only pay for what they use.

There are different cloud service models available, like SaaS (Software as a Service) which provides access to applications like Gmail, PaaS (Platform as a Service) that lets developers build custom applications, and IaaS (Infrastructure as a Service) that offers access to storage and computing power.

While cloud computing offers significant benefits, security is a major concern. Since data is stored and accessed remotely, there's a risk of unauthorized access. Encryption helps mitigate this risk by scrambling data into an unreadable



Signal Sensor for Emergency Vehicle Siren Recognition

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Abstract: This project focuses on addressing traffic congestion in densely populated countries like India and China by using a microcontroller (Arduino Uno) to control traffic lights and implementing an automated control system for emergency vehicles. The system uses pre-programmed MATLAB software to detect signals (sirens) from emergency vehicles and adjust traffic lights to prioritize their passage. This approach aims to improve the efficiency of traffic management and emergency response in congested urban areas.

I. INTRODUCTION

The rapid population growth in developing countries like India and China has led to significant challenges in traffic management, resulting in congestion, accidents, and delays. Traffic congestion not only causes inconvenience and economic losses but also poses serious health and environmental risks, particularly due to increased emissions. One of the critical issues exacerbated by traffic congestion is the hindrance it poses to emergency vehicles, such as ambulances and fire engines, which struggle to navigate through congested roads, impacting their response times and potentially jeopardizing lives. In urban areas, the growth in vehicular traffic has outpaced the development of infrastructure and traffic management systems, leading to a rise in accidents and delays, especially for emergency services. The inability of emergency vehicles to navigate through congested traffic quickly and safely has become a pressing concern, highlighting the need for innovative solutions to prioritize their passage.

Additionally, the lack of effective communication and coordination between traffic signals and emergency vehicles further compounds the problem, emphasizing the urgency for smarter, more efficient traffic management systems.

To address these challenges, this paper proposes a smart traffic control system that integrates a microcontroller (Arduino Uno) to manage traffic lights and a pre-programmed MATLAB software to detect and prioritize emergency vehicles. By leveraging advanced technologies, such as IoT and ad hoc vehicle networks, the system aims to improve the flow of traffic and ensure timely responses of emergency vehicles. This research contributes to the development of efficient and effective traffic management solutions, with the potential to significantly enhance urban mobility and emergency services in densely populated regions.

II. NEED OF STUDY

outlines a project that addresses the challenge of traffic congestion and emergency vehicle prioritization in densely populated countries like India and China. The need for this study arises from the critical issues of traffic congestion and delays in emergency response times, which can have serious implications for public safety and health.

By using a microcontroller and automated control system, the project aims to improve the efficiency of traffic management and emergency vehicle prioritization. This study is important because it demonstrates a practical solution to a pressing problem, showcasing the potential of technology to enhance transportation systems in densely populated areas. The findings of this study could have significant implications for urban planning, transportation policy, and emergency response strategies in densely populated countries. By improving traffic



ADVANCED SMART AND SAFE CAR USING OBJECT DETECTION, ALCOHOL DETECTION AND SAFE PARKING

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Abstract: Revolutionizing driving safety with a Raspberry Pi, IoT, and AI integration. A backup camera employs computer vision for real-time object detection, providing visual and textual feedback. Smart parking sensors calculate distances, displaying object representations for secure parking. Alcohol detection chip in the steering ensures enhanced safety by preventing drunk driving.

INTRODUCTION

In response to the escalating road accident rates, our project pioneers a comprehensive safety initiative, integrating three core elements: Alcohol Detection, Object Detection, and Safe Parking. The Alcohol Detection with Vehicle Controlling segment tackles the global issue of drunk driving by introducing an in-car Alcohol Detector equipped with a breath analyzer, designed to intervene when necessary.

The second component, Object Detection, aligns with the advancements in autonomous driving. Leveraging state-of-the-art sensors and computer vision, this feature ensures precise identification of vehicles, pedestrians, and traffic elements, creating a secure driving environment.

Addressing urbanization challenges and parking inefficiencies, the Safe Parking feature proposes an intelligent Smart Parking System. By employing a wireless sensor network and Bluetooth technology, this system optimizes parking efficiency, reducing time and fuel wastage.

Collectively, these features prioritize both driving safety and parking convenience. The integration of IoT technologies emphasizes our commitment to modernizing transportation, ultimately contributing to a safer and more efficient driving landscape. This initiative seeks to revolutionize urban travel, envisioning a future where road safety and parking ease take precedence.



An Innovative Real-time Solution for Sign Language and Gesture-based Communication.

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ABSTRACT: The "Gesture Language Translator" project is a groundbreaking solution that facilitates real-time communication between sign language users and individuals who speak different languages. Leveraging advanced machine learning and computer vision, this system recognizes and translates a variety of gestures into text or synthesized speech the chosen spoken language. It accommodates multiple sign languages, offers multilingual support, and integrates seamlessly with mobile devices and wearables. By bridging communication gaps, this project aims to empower the deaf and hard of hearing community, promoting inclusivity and cross-cultural understanding in an increasingly connected world.



EMOTION DETECTION USING VOICE RECOGNITION AND FACIAL EXPRESSIONS

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2.PROFESSOR & GUIDE

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ABSTRACT: Using Natural Language Processing(NLP) our application detects complex and nuanced human emotions with the help of voice assistant and facial expressions provided by user and we identify the emotion class that the user belongs to at that particular instance. Facial Expression Detector can be used to know whether a person is sad, happy, angry and so on only through his/her face and it uses your Web Camera and then identifies your expression in Real Time. We develop an artificial intelligence voice-controlled emotion detector which gathers input from tone of human voice and detect emotion just the way humans express. Face expression recognition and voice assistants aid in human emotion detection by providing real-time insights into emotions. Our Project is an assortment of Natural Language Processing and Recommender System so as to sustain the user's emotions using our featured content and replenish the user to a better phase.

1.1 INTRODUCTION

Emotion detection plays a significant role in human life by influencing various aspects of our well-being and interactions. It plays a key role in the field of Artificial Intelligence(AI). In real-time, the voice assistant can use the microphone to capture the user's voice. And simultaneously the device's camera can capture the user's facial expressions using computer vision. These data streams are then analysed by the

emotion detection application

In general, human emotions can be analyzed using various methods and technologies including facial expression analysis, voice analysis, body language recognition, physiological measures, behavioural observations. The interaction between human beings and computers will be more natural if computers are able to perceive and respond to human non-verbal communication such as emotions and voice assistant.

Facial emotion recognition is the technology that analyses facial expressions from both static images and videos in order to reveal information on one's emotional state and the voice analyser system can identify the emotion of human by tone of human voice.

Although several approaches have been proposed to recognize human emotions based on facial expressions or speech, relatively limited work has been done to fuse these two, and other modalities to improve the accuracy and robustness of the emotion recognition system. This project analyses the strengths and the limitations of systems based only on facial expressions or acoustic information.

It discusses two approaches used to fuse these two modalities, i.e., decision level and feature level integration. Using a database recorded from a model, four emotions were classified: sadness, anger, happiness, and neutral state. By the use of markers on face, detailed facial motions were captured with motion capture, in conjunction with simultaneous speech recordings.

Chapter 6


Cloud Computing and Machine Learning in the Green Power Sector: Data Management and Analysis for Sustainable Energy

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Chapter 5

Fused Deposition Modelling of Polylactic Acid (PLA)- Based Polymer Composites: A Case Study

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ABSTRACT

In this chapter, a case study on polymer composites made using the fused deposition modelling (FDM) process is exemplified. The fundamentals of the additive manufacturing process, such as stages, applications, classifications, disposal methods, material selection, general principles of FDM, and selection process parameters, have been explained. The case study focuses on creating practical four-dimensional feedstock filament prototypes out of polylactic acid (PLA), polyvinyl chloride (PVC), wood powder,

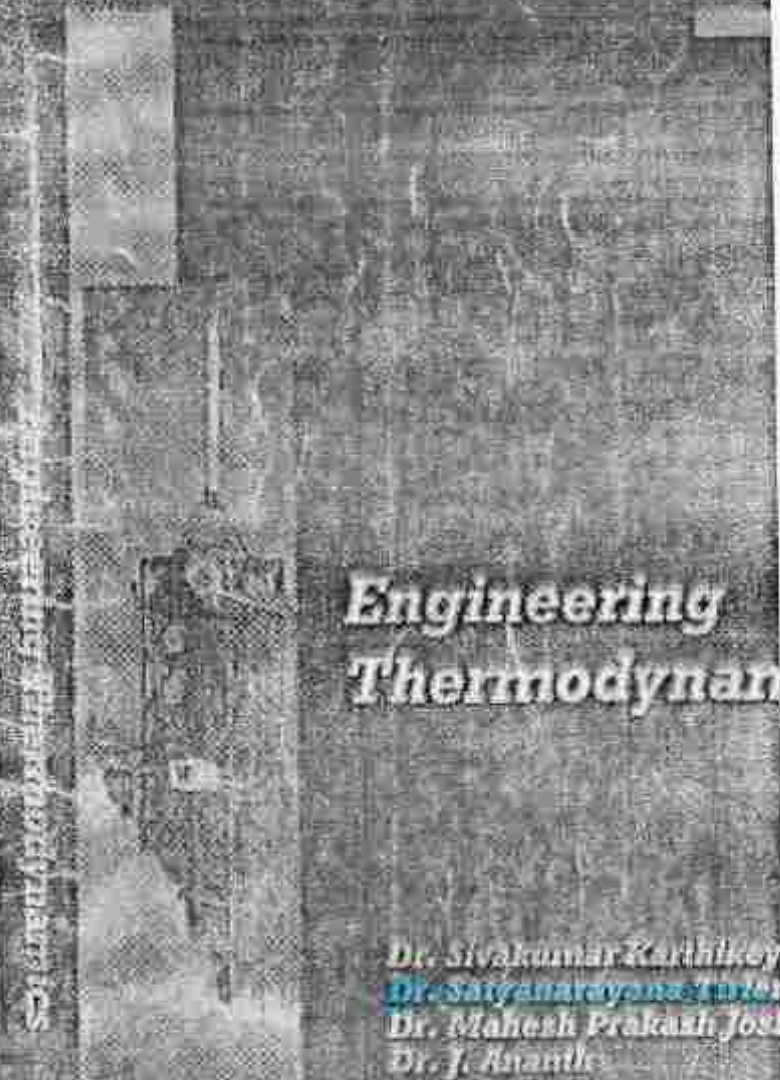
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Engineering Thermodynamics

Dr. Sivakumar Karthikeyan
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Influence on the mechanical properties of virgin recycled polypropylene composites with different types of reinforcing loads

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ABSTRACT

The fiber-particulate composites in general present superior behavior in terms of mechanical properties than the materials loaded only with mineral filler, except for the formulation that has 60% mica which reached values comparable to those of the composites reinforced also with FV. Compounds with mica/FV and talc/FV show better synergism in relation to CaCO₃. The incorporation of mineral fillers and/or FV in polypropylene increases the flexural and elastic modulus by up to 3.53 and 4.3 times, respectively. Among the composites studied, mica in high concentration proved to be a very promising alternative since it has good mechanical properties and a very low cost when compared to fiber-particulate and/or compatibilized systems. FV contributes to higher strength and modulus values. The result with only recycled polymer suggests that with the use of recycled material from industrial scraps and greater refinement in the study, quite satisfactory properties can be achieved with the use of 100% recycled resin.

1. Introduction

Polyolefins normally have low values of modulus of elasticity and flexure due to their macromolecular structure, which, on several occasions, makes them unfeasible for structural applications. But due to its characteristics of low density, low cost and ease of processing, or even other properties such as chemical resistance, the incorporation of reinforcing fillers is sought to increase its rigidity, in order to maintain some desired characteristics in the final composite. Some of the most used materials for mechanical reinforcement of thermoplastic matrices are glass fibers (FV) and reinforcing mineral fillers such as talc (magnesium hydroxide), mica (potassium, sodium and aluminum hydroxide) and calcium carbonate (calcite). The incorporation of fibers and solid particles of high modulus and strength, as low-cost mineral fillers in polymeric matrices, in general, restrict chain mobility and deformation under mechanical load. This generates the possibility of major changes in material properties if correct loads are added in appropriate concentrations, increasing mechanical properties such as flexural modulus

and elasticity. Sometimes fillers may have other specific functions such as: flame retardancy [1], heterogeneous nucleation, color, lubrication and to change thermal and electrical properties [2–4].

In general, the main advantages of using fibers and reinforcing fillers in thermoplastics can be summarized as follows: substantial increase in the modulus of elasticity/rigidity of the composite; expressive increase in the mechanical resistance (traction, flexure or compression) and sometimes in the tenacity/impact resistance properties of the composite.

Depending on the type of filler and polymeric matrix in question; substantial improvement in creep resistance, sometimes slightly altering the viscoelastic characteristics of the polymeric matrix; improvement in long-term mechanical strength (durability and resistance to fatigue); depending on the type of reinforcement and the nature of interactions at the polymer-reinforcement interface; expressive increase in the thermo-distortion temperature (HDT); increased dimensional stability; reduced thermal expansion and molded shrinkage; modification in the rheological, electrical and permeability characteristics of the composites [5].

Thermoplastics with fiber-particulate reinforcements are of special

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Static Structural Analysis and Static Fluid Pressurized on Marlin Glider Wing Torpedo's

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Abstract - The design technique for the glider wing torpedo is open to design parameter changes and gives the designer insight into the security of the final configuration. Constructing a torpedo finite element model and testing its static properties as a function of design parameters structural analysis of torpedo's were significantly used to strengthen our defence system. In this paper, three models, circular, elliptical and black marlin glider wing torpedoes, were introduced, and the results of the three models were compared at static load and pressure conditions. The parameters were taken at the deepest point of the Pacific Ocean under standard conditions. The black marlin glider wing torpedo shows better results than the other two models.

Keywords - Glider wing, Strengthen, Static load, Static pressure, Pacific Ocean standards.

1. Introduction

Combining NACA profiles creates a glider wing [1]. We used Solid Aluminum alloy because the wing needed to be strong while being as light as possible [2]. The skin of a glider wing is an essential component that helps the wing retain its hydrodynamic shape and transfers various types of loads to the structural members of the wing [3]. Traditional stretch-forming methods are used to create a skin for torpedo [4].

Loads operate perpendicular to the wing surface and have varying magnitudes throughout the wing's length [5]. The same concept of simplification and weight reduction of the Glider wing is used to prepare hearing primarily focused at work.

The design perspective determination of the acting loads on the torpedo is of paramount importance [6]. The task now is to decide which critical load combinations are most likely to occur to determine the maximum loads at each stage [7]. Hydrostatic pressure rises in proportion to the depth from the surface measured by the fluid's weight increasing and supplying downward force from above.

The size and features of the mesh are controlled via a global mesh size and tolerance parameter and designed with Aluminum alloy material. Marlin glider wing torpedo with different analyses are worked.

2. Methodology

2.1. Structural Load on Wing

On and beyond the limits of the representative manoeuvring envelope, the strength criteria must be met at each combination of fluid speed and load factor. Other loading conditions are often overlooked because the structure is likely to withstand all intermediate loads produced.

The forces that act on any structure, causing it to deflect and vibrate, resulting in stresses and strains, are referred to as circular, elliptical and black marlin glider wing torpedoes masses as 133.82, 128.02 and 122.63kg. Torpedo's must withstand a variety of static and dynamic loads. The computation is carried out in a straight forward manner by integrating loads along the torpedo components using analytical formulae obtained from the hydrodynamic model simplification.

$$W_{\text{torpedo}} = mg$$

$$D_{\text{Load factor}} = 3 * W_{\text{torpedo}}$$

$$\text{FOS} = 1.5$$

$$D_{\text{Ultimate limit}} = \text{FOS} * D_{\text{Load factor}}$$

$$L_{\text{Load on wing}} = 80\% * D_{\text{Ultimate limit}}$$

$$L_{\text{Load acting on each rib}} = 0.5 * L_{\text{Load on wing}}$$





Review article

A review on the contribution of nanotechnology for biofuel production from algal biomass: A bridge to the reduction of carbon footprint

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ARTICLE INFO

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 Nano additives
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ABSTRACT

There is a rapid exhaustion of fossil fuels, so there is a huge demand to develop alternate fuels. Though algae have an excellent productivity rate with high lipid content that favours biofuel production, the downstream production cost of biofuel from the algal source is expensive. Novel techniques are required to minimise the cost involved in biofuel processing. Nanoparticles have potential advantages and are used in various stages of biofuel production from algae, such as algal harvesting, increasing biomass concentration, and separation of algal cells. Moreover, nanoparticles act as biocatalyst carriers in the transesterification process. While iron oxide nanoparticles majorly help in the growth of microalgae, nanoparticles such as carbon nanotubes and magnesium oxide aid in increasing the production of lipids. Magnesium sulphate nanoparticles increase the production of chlorophyll significantly. Though nanoparticles possess numerous benefits in increasing biofuel production, they exhibit a certain level of toxicity towards humans and our ecosystem. The toxicity mainly relies on the nature of nanoparticles, cultivation media and the type of microalgae species used for biofuel production. This review showcases algae's important features that favour biofuel production and the various sources of algae biomass. More importantly, nanotechnology's role in biofuel production and the challenges faced while using it in processing biofuel are demonstrated. Finally, opportunities for future work employing nanotechnology for sustainable biofuel production are presented. Last but not least, constant research work is required to overcome the barriers and progress the nanotechnology for their large-scale usage in increasing the algal biofuel production.

Introduction

Fuels based on fossils, including diesel, petrol and natural gas, meet about 84% of the world's energy requirement. However, if used at this rate, there will be a massive energy crisis in the near future. Besides energy depletion, fossil fuel usage releases carbon monoxide, sulphur

oxide and other volatile compounds [49]. For instance, about 23 % of carbon dioxide emission is from the fuels based on fossils that are used in transport vehicles. This can cause irreparable damage to public health and the environment [71,91]. Hence, an alternative solution from a renewable energy source capable of meeting future energy needs and reducing the emission of greenhouse gases (GHG) is highly needed [3,4].

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INCREASE THE PERFORMANCE OF PARABOLIC COLLECTOR BY USING NANO FLUID

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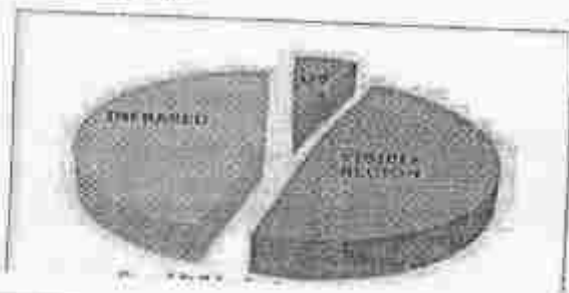
Abstract

A numerical study of the performance of a solar Parabolic Trough Collector (PTC) has been done focusing on its receiver. The receiver consisting of a glass-alkoid enclosing a Heat Collector Element (HCE) with vacuum in the annular space has been subjected to seasonal and diurnal variations of solar radiation along with the concentrated heat flux reflected from the parabolic trough mirror for conditions at Visakhapatnam, India. Different parameters of the system such as receiver tube diameter, material of the receiver tube and heat transfer fluid are chosen for the study and evaluating the performance of the system. In the present work stainless steel with mirror finish is taken as the reflecting material for the trough. Stainless steel and copper are taken as the material for the receiver tubes. Tubes modeling is done in CATIA V5 R20 and Mesidng simulation has been done using ANSYS FLUENT software. Properties of water and nano fluid has been Calculated with equations given On the basis of recorded parameters efficiency of the system was calculated. Fluid as water and nano fluid (TiO2) are taken as medium in the tube, by using these fluids the experimental work is proceeded. Overall heat loss coefficient (U_L) and Heat removal factor (F_R) and thermal efficiency also calculated. By comparison between theoretical and experimental values it was concluded that nano fluid (TiO2) performs better than water.

Introduction

The worldwide requirement of energy is persistently increasing and makes it ineluctable to make the use of unconventional resources. The sun is one of the substantial energy sources that has the potential to fulfill this rising energy need. Sun is inexhaustible and cleaner source of energy. Solar thermal technology is inevitable in growth of the community as well as the nation. Also, it is important to the nation and to the Earth. Sun is an enormous pool of clean energy and this clean power reaches earth in the form of its rays is known as Solar Energy. Solar energy is an abundant source of energy and is available in plenty. Conversion of these incoming solar radiations can be done directly or indirectly in other useful forms of energy as heat and electricity which can be utilized further as per the requirement of the mankind. The sun is providing an incredible supply of solar energy for over 4 billion years. Solar energy was used by the ancient people to warm their homes and dry clothes but their uses were mostly primitive. Drastic increase in global oil prices, extensive use of fossil fuels, threatening rise in pollution and greenhouse effect have led a large number of countries around the globe to carry out extensive research in this area.

The sun and the earth



The sun is at the centre of the solar system and contains about 99% mass of the solar system making it the largest member. The diameter of the sun is about 864,938 miles which is about 109 times to that of earth. There is a continuous conversion of helium atom into hydrogen at the center through a fusion process and its surface temperature is about 5500°c. It takes about 8 minutes 20 seconds to reach the light from the sun to earth and the energy radiated can be calculated by Stefan Boltzmann law of radiation which is $E = \sigma T^4$, where [2]

ϵ = Emissivity of the surface, σ = Stefan-Boltzmann constant

The earth is the third planet from the sun and its diameter is about 7,926 miles. The planet rotation cause it to bulge at the center due to which there is difference of 40 miles in equatorial and pole diameter. About 70% of the earth's surface is covered by water due to which it is known as the blue planet. Earth is inclined at an angle of 23.5°c on its axis.

Solar spectrum and solar radiation

Sun's radiation is in the form of electromagnetic radiation which is categorized further into infrared radiation, ultra violet radiation and white light.

Solar Spectrum:

Sun's radiation is a combination of different waves which absorb and emit radiations that differ in wavelengths. Harmful portion of these wavelengths i.e. is the Gamma and X-rays are filtered out by the atmosphere. About 48% of the sun's radiation falls in visible region, whereas about 45.6% is in the infrared region [2] and the rest is in ultraviolet spectrum. The solar spectrum is shown in the figure.1.1 [2].

Direct and Diffuse solar radiation

The solar energy that reaches the earth is further categorized in the form of direct and diffuse radiations.

Diffuse: As the white light passes through the sun's atmosphere it gets scattered, reflected and absorbed by various elements such as the clouds, pollutants, dust, air molecules etc. This radiation is known as diffuse radiation

Direct: The portion of the sunlight which does not diffused and reaches the earth is known as direct radiation or Beam radiation. On a clear, dry sunny day the atmosphere can block up to 10% of beam radiation whereas this can reach up to 100% on very thick cloudy day. The solar flux registered per sec by a surface having unit area and kept perpendicular to the sun rays is known as Solar constant (I_{sc}) which is a constant throughout the year. The Solar constant is having a value of 1367W/m² [2].

Literature review

Tyagi et al. (2009) investigated the performance of non-concentrating and nanofluid based direct absorption solar collector (DASC) theoretically by using different parameters. After that, its performance is compared with flat-plate collector where nanofluid is used as a working fluid which is the mixture of water with aluminum nanoparticles. The results showed that the efficiency of DAC is 10% higher than flat-plate collector. The various



Investigating the Influence of Process Parameters on the Mechanical Properties of Friction Stir Welded Joint Between AA5083 & AA6061

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Abstract

In recent years, the usage of aluminum in shipbuilding and oil tanker manufacturing industries has increased. Moreover, plates of greater thickness are required. Friction Stir Welding is a solid-state joining process of similar or dissimilar materials. Friction Stir Welding (FSW) has been used in the joining of aluminum alloys. In the present work, an effort is made to analyze the FSW of AA5083 & AA6061 thick plates. A cylindrical tapered pin tool is used in the study. Two process parameters, namely Tilt angle and Machine RPM, are varied in three levels. Tensile strength, Vickers Hardness, and microstructural analysis are carried out. The dissimilar joining of aluminum alloy Al6061 and Al5083 with plates of 4mm thickness was carried out by friction stir welding. The objective of the present research is to analyze mechanical properties by changing the parameters and optimizing the various process parameters such as Tilt angle, Machine RPM for higher weld strength. The influence of welding process parameters on the strength of weld joint has been evaluated by tensile test. The tool rotational speeds were taken between 700 to 1100 rpm, and the tilt angle was taken between 1 to 3 degrees. The maximum tensile strength yielded 180,857 N/mm² during the weld joint of Al6061-Al5083 at 700 rpm machine rpm and 1-degree tilt angle.

Introduction

Welding is the most important and preferred activity out of all the processes required for fabrication of a product. This is because welding provides high strength to the joint when compared to other joining techniques. Therefore, in the fields of manufacturing, aerospace, shipbuilding, oil tanker manufacturing, welding contributes a major portion of the total work.

Among various metals available, aluminum has some specific characteristics which attract its usage in the above-mentioned industries. Some of the characteristics of aluminum are less weight, good formability, resistance to corrosion, ductility, electrical and thermal conductivity. Joining aluminum by conventional arc welding results in excessive distortion. Moreover, the required thickness in these applications is also more, i.e., above 10mm. Usually, Tungsten Inert Gas welding, laser beam, and electron beam welding techniques are used in joining aluminum. As these processes result in excessive distortion and require special attention and are slow, there is a need for a new technique in joining aluminum.

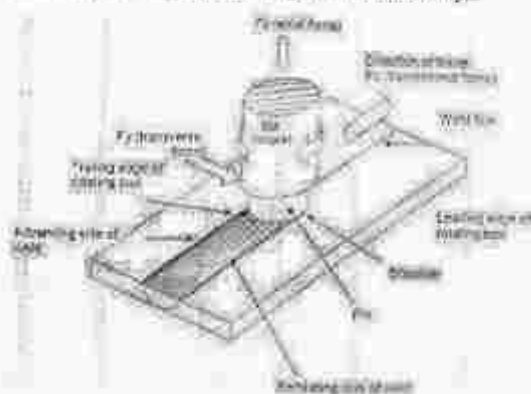
In the year 1991, The Welding Institute (TWI) developed a process named Friction Stir Welding (FSW). This is a solid-state welding technique which makes use of a specially designed tool to generate frictional heat. Initially, the tool is placed such that the shoulder face just touches the upper side of the plates to be joined; the tool is then rotated at speed. As there will be some pressing action, the base metal gets heated up and once it reaches 80% of the melting temperature, it gets softened and deforms plastically. Then the tool is

traversed along the seam to be joined, the softened material is stirred together forming a weld. Aluminum is quickly becoming a popular choice of metal in fabrication. It's lightweight, non-corrosive, and visually appealing, making it the perfect material for many projects. However, many of the very same properties that make aluminum a great option for fabrication are also reasons it can be difficult to work with.

While it may be tempting to assume that welding principles can be generalized across a range of metals, this is far from the case. Welding is about chemistry, and each metal has unique chemical properties that require specific processes. Aluminum doesn't act the way other metals do during welding, so it can be difficult to determine weld progress and quality. Simply put, aluminum is difficult to weld because it is a soft, highly sensitive metal insulated by a tougher oxidized layer. Aluminum is highly susceptible to impurities in its molten state, increasing the risk of ending up with weak, porous welds. Its low melting point and excellent thermal conductivity create a much smaller window of workability than you'd get with a metal like steel. This small window, coupled with aluminum's lack of visual indications, can make gauging your weld progress a challenge.

Working principle

Friction stir welding works on the same principle as friction welding. In this process, friction is used to generate heat at the interface surface. This heat initiates the diffusion process at the mating surfaces. A high-pressure force is applied at these mating surfaces, which accelerates the metal diffusion process and forms a metal-to-metal joint. This is the basic principle of friction welding. In friction stir welding, a rotating tool is used to apply friction and pressure force at the plates. This tool rotates at its own axis and moves longitudinally at the plates' interface, generating heat by friction between the rotating tool and workpiece. This heat deforms the interface surface and diffuses the two pieces of workpiece into one another by applying a high-pressure force. This joint is created due to the nonmechanical treatment at the interface surface. One significant advantage that makes friction stir welding a versatile process is that it can be easily automated and provides a higher metal joining rate. It is mostly used to join aluminum alloys.



SIMULATION AND EXPERIMENTAL STUDY OF SIMILAR ALUMINIUM ALLOY BY USING FRICTION STIRR WELDING

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Abstract

For Friction Stir Welding (FSW), several simplified FEM models have been developed to explain key parts of thermal-mechanical phenomena. In this study, to simulate the FSW process of the AA6061-T6 aluminum alloy, a thermo-mechanical 3-D finite element model is used. The Deform 3D software is used to simulate the stages of the FSW process using Visco plastic material data. 3D modeling of plate, cylindrical pinned tool, tapered and square pinned tools are prepared using CATIA software. The temperature generated during the plunging, and welding stages of the FSW of AA6061-T6 is 80% to 90% of the melting temperature being evaluated. Initially geometry and process parameters are considered from previous work [22] and the same is compared with the results obtained from the overall FEM simulation.

Introduction

Metal Joining

Metal joining is a method to join two or more materials by the help of some external means. There are huge requirements of metal joining because of limitation to manufacture a large or complicated work piece design by conventional manufacturing processes such as casting, forging, rolling, extrusion etc. There are many methods exist to join materials as shown in Figure.

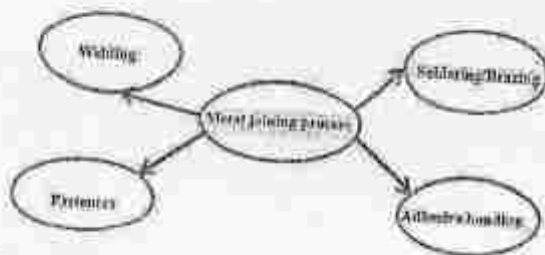


Figure : Different of methods of metal joining.

Welding :

Welding is a fabrication process that joints materials, usually metals or thermoplastics, by causing coalescence. Welding is one of the absolutely necessary and widely used manufacturing processes in any manufacturing/production industries. The main aim of welding technology is to achieve the optimal condition for defect free joint.

There exist mainly two types of welding: one is conventional fusion welding and other is solid state welding. In fusion welding a heat source is used to melt the material and after melting pressure is applied to join the materials but solid state welding is performed below the work piece's melting temperature such as friction stir welding (FSW). All types of welding processes are mentioned in Figure.

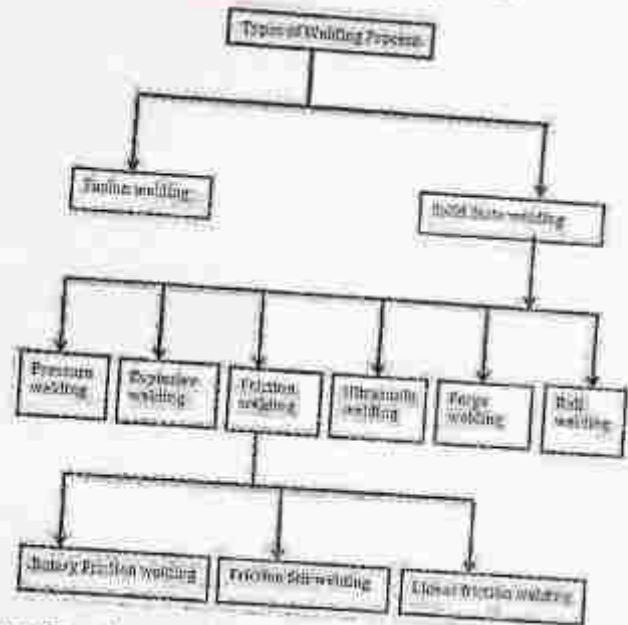


Figure : Flow chart of welding process.

Here are general problems associated with fusion welding and these are:

- Decline of mechanical properties due to melting & re-solidification.
- Presence of Hot cracking, solidification cracking and porosity.
- Inclusions of Hydrogen, Oxygen and Nitrogen from surrounding.
- Requirement of expensive consumable filler material.
- Application or use of flux and Shielding gas.
- Energy Consumption is high.
- Environmental problems because of fume gases.

Friction Stir Welding

Friction stir welding (FSW) is an emerging, energy efficient, attractive and eco-friendly solid state welding process invented in 1991 in England. FSW appears to offer a number of advantages over conventional fusion welding techniques, such as no need for expensive consumables filler materials, good mechanical and metallurgical properties of the resultant joint, absence of solidification crack, no porosity, low distortion and less energy consumption. In the beginning this emerging welding technique has been applied for aluminum, but later on it has been used for joining of magnesium, titanium, copper, and ferrous alloys also.

Principle of Operation

A non-consumable cylindrical-shoulder tool, with a threaded/unthreaded probe (pin) is rotated at a constant speed and is inserted/plunged in-between the two separate work piece sheets or plates to be joined and subsequently fed at a constant rate along the joint line shown in figure.

FABRICATION OF AUTOMATIC MOTORIZED BENCH VICE

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Abstract - A vice is nothing but a holder which has two holding points at each ends and this holding points help the work piece to stay in place so that the work can be done on the work piece. Now here one of the jaws on the vice is fixed and do not move and the other jaw that is placed in opposite moves so that we can adjust the vice according to the work piece design. So basically the first jaw of the vice helps to hold the work piece in the place and the second jaw can be used to tighten or loosen according to the shape of the work piece. So this is how the basic bench vice works. So the vice can be used for doing many works on it such as to shape a metal object, to make keys, also to cut the object etc.. Like this there are many ways for which we can use the bench vice. Now the paper basically relates to the vices and the scope of improving the working of Bench vice with the help of using a DC motor which helps in the movement of the jaws through the dc motor. Now the main objective of this paper is to make a bench vice which can be operated without any man power and use dc Motor to clamp the work piece so that the work can be done on it. The power to the movable jaw is supplied by the dc motor so that the work can be done on the work piece of any size and shape. We have also tested the vice with various work Pieces just to verify so that it can hold properly while the work is done

Key Words: Vice, DC Motor, Clamp, Workpiece

1. INTRODUCTION

Design wise three sorts of vices are quite common in use namely plain vice, swivel vice and gear maker's vice which is usually referred to as bench vice. Overview our project is design and fabrication of motorized machine vice. The principle a part of the attachment main body contains electric motor with machine vice, rod, motor, joystick, and frames [1]. The machine vice and therefore the electric motor is connected with a rod through coupling. It's wont to hold the work piece with none clearance in it. Versatile machine vice by increasing the hold power through achieved by wiper motor [2-5]. A two direction switch is control the wiper motor for the clockwise and anti-clockwise rotation. Portable automatic machine vice and easy to carry out one place to another place.

OBJECTIVE AND INNOVATION

Objective The objective of our project is to design and fabrication of automatic machine vice. All Rights Reserved Versatile machine vice by increasing the hold power through achieved by wiper motor [2-5]. A two direction switch is control the wiper motor for the clockwise and anticlockwise rotation. Portable automatic machine vice and easy to carry out one place to another place

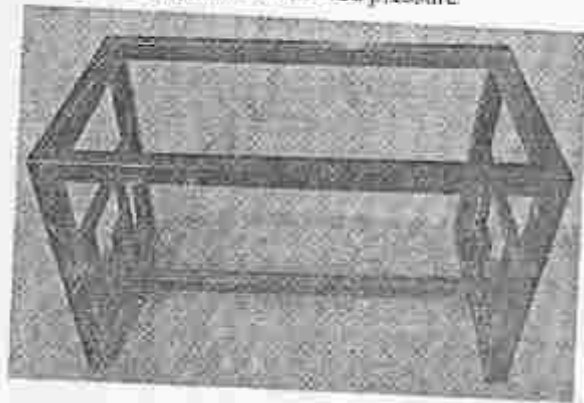
MAIN COMPONENTS

L-Bar Frame

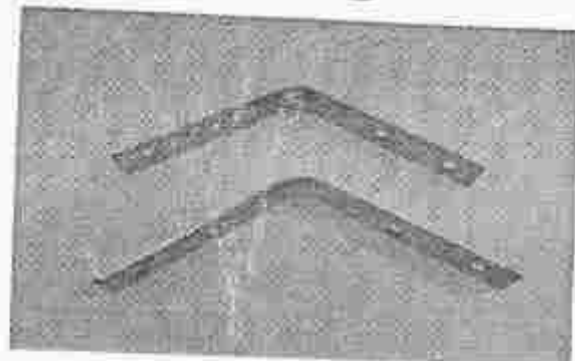
The frames are formed by L-shaped bars. low-carbon steel material frame are utilized in our project to construct base and a vertical column. lowcarbon steel is very weldability. The high steel and low-carbon steel are easily weldable. M.S. L-bars is plastically deformed by more elongation

Clamps

clamp could also be a fastening device used to hold or secure objects tightly together to prevent movement or separation. A through the appliance of inward pressure



LFRAME



CLAMP

Design and Development of Solar Powered Electric Cart for on Campus Application

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Abstract - Electric vehicles (EVs) are becoming increasingly popular due to their eco-friendliness and low operational costs. However, the use of fossil fuels to generate electricity to charge these EVs undermines their sustainability goals. Combining solar energy with EV charging can create a sustainable and clean transportation system, which can reduce our dependency on non-renewable energy sources. The overall objective of the project is to design an efficient solar powered electric cart that can be used on campus in transporting and carrying Stationery loads. This is accomplished through the design of subsystems such as the frame, drivetrain, power, suspension, Brakes and steering, and integrated into a master assembly model using soft wares namely SolidWorks, a computer aided design (CAD), and finite element method (FEM). The FEM analysis is carried out to study the stress and displacements of the cart in order to ensure the safety. The basic performance of cart is evaluated in terms of its range, acceleration and maximum achievable speed. The cart is designed for 250kg load carrying capacity, acceleration of 1.2 m/s² and maximum achievable speed of 15km/h with a power rating of about 1.5kW. Secondary support software such as Excel, and solar analyzing software were used to assist in the planning of the various subsystems as well as data collection and assortment.

Keywords : Solar / electric cart, electronic differential speed control, Lithium-ion battery, transportation, photovoltaic.

1.INTRODUCTION

The issues of climate change or global warming have been rigorously discussed by many governments since the early 21st century. A great number of relevant reports have revealed the negative impact of climate changes dominantly driven by human activities. With the globally increasing civilisation and industrialisation, a large number of fossil fuel burnings in industries have led to the acute problem of air pollution (Wee, 2010). Simultaneously, the exhaust emissions from automotive vehicles cannot be ignored. Vehicle emissions, which mainly include CO₂, CO, NO_x and particulate matters (PM10 and PM2.5), have been considered as the major contributors to the effect of greenhouse gases, also leading to the increase in different forms of cancers and other serious diseases (Fenton and Hodgkinson, 2001; Fajri and Asael, 2008).

The ever rapidly growing transportation sector consumes about 49% of oil resources. Following the current trends of oil consumption and crude oil sources, the world's oil resources are predicted to be depleted by 2038 (Ehsani et al., 2010). Therefore, replacing the non-renewable energy resources with renewable energy sources and use of suitable energy-saving technologies seems to be mandatory. Electric Vehicles (EVs) as a potential solution for alleviating the traffic-related environmental problems have been investigated and studied extensively (Clement et al., 2009; Hajimiragha et al., 2010; Stephan and Sullivan, 2008). Compared to ICEV, the attractive features of EVs mainly are the power source and drive system.

2.0 SYSTEM OF SOLAR CART VEHICLE

2.1 CHASSIS

Chassis is a major component of a vehicle system. It consists of part of the vehicle which consists of frame and running gear like motor, transmission system, suspension system etc. This type of chassis used for electric vehicle. It consists of internal framework that supports man-made object. Design and analysis of the chassis is done through a advanced CAD (fusion 360, & Analysis software). The design and analysis of the chassis is done for stress distribution criteria. This type of chassis is mostly used in light weight vehicles like electric vehicles. It provides a good beam resistance because of its continuous rail from front to rear. As a result chassis has been designed in a way to reduce vibration, increase strength and optimize the weight of the chassis

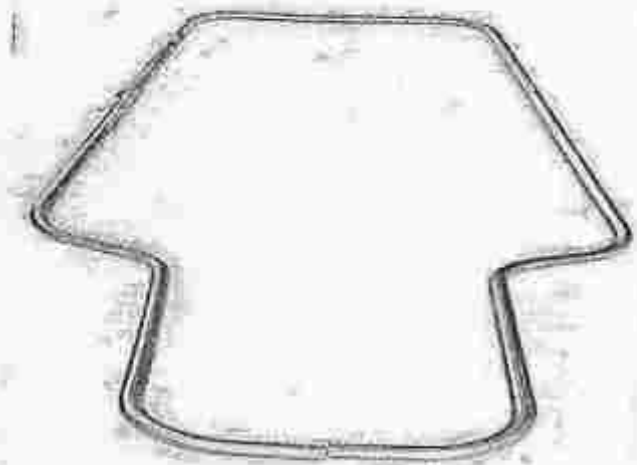


Fig2.1:Chassis

Reducing Fuel Consumption by Adding Alternative Substitute for Petrol Engine

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Abstract— Now days, pollution is major problem across the world. There are many causes which arise pollution, among which contribution through automobiles are more. In order to reduce pollution and reduce dependence on fossil fuel, hydrogen is best alternative for I.C. engine. Most economic way to produce hydrogen gas is through electrolysis process. Water is abundant and cheap. The hydrogen fuel is extracted from Brown's gas or HHO gas which in turn is produced from a common ducted electrolyses setup. Water disassociated into Brown Gas (HHO) using efficient electrolyzing techniques. Due to high combustible nature of the brown's gas, both browns gas and fuel completely burns in the IC engine, hence giving no scope for the incomplete combustion. With the introduction of browns gas a 99% decrease in the unburned hydrocarbons and Carbon monoxide has been observed. On other hand by using HHO with petrol results much cleaner exhaust and more power to the engine. The result is increased gas mileage and smoother running; this gas may take as a mileage Booster. HHO boosters help to reduce pollution and save energy and money all over the world. It is observed that when the Brown's gas is introduced into the engine's thermodynamic cycle at the right time, it mixes with gasoline to optimize the engine performance in terms of its thermal efficiency, volumetric efficiency, fuel consumption rate, emissions etc. It also brings down the operating temperature and pressure conditions of different parts of the IC engine, thereby ensuring more sustainability and durability. This project aims to calculate performance characteristics of a four-stroke IC engine that is powered by gasoline fuel in combination with hydrogen fuel, fed through the inlet manifold. Later emission analysis also to be performed. About key words petrol and HHO, brown gas, Oxy-hydrogen gas, electrolytes KOH, NaOH, Hydrogen generator

I. INTRODUCTION

At the present days, Global warming has become a very huge challenge for mankind and one of the reasons is emission of harmful gases due to incomplete combustion of the fuel from automobiles. The problem

is becoming severe day by day because of increase in the vehicular density. In the use of gasoline fuels harmful emission products like CO, NOx and HC are left over as an exhaust in to the environment. By using exhaust gas circulation and using some catalytic converter these emissions can be reduced to some extent. Due to raising prices of petrol, one can be thought of an alternative fuels for petrol engines which help reduce cost of fuel. The scientific community is addressing these problems by an attempt to replace fossil fuels with cleaner and renewable sources of energy such as solar powered vehicles, electric cars. But we have seen that this are either non-reliable, costly or lags the technical advancement and convenience which is provided by the petroleum fuel vehicles. So the idea is not to compete with petroleum fuels but to increase the life of petroleum fuels to exist longer in this ever demanding automobile industry. Every buyer has a mind set to have a vehicle with great looks, good performance and high efficiency. But unfortunately, even with the latest technology, it is difficult to achieve the perfect balance between performance and price. So in order to conserve petroleum fuels for future and to eliminate the above limitations, there is a need of alternative and innovative fuel.

Oxy-hydrogen gas is one of the best alternatives available for us. The oxy-hydrogen gas is obtained by the simple process of electrolysis of water, which has high calorific value 3 times more than petrol. In our project work, we are interested to add this HHO gas as supplement to petrol as fuel in S.I engine for better performance and lower emission values. It has the unequal advantage of being able to remove pollutants from the air during combustion, and even reduces the carbon residue within the engine (similar to the effect of higher octane fuels). Water electrolysis is simply the breaking down of water into its basic hydrogen and

EMERGENCY BRAKING SYSTEM IN FOUR-WHEELER

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Abstract – Automatic Emergency Braking (AEB) is a braking system which helps to apply brakes automatically under the condition of emergency and helps to mitigate the severity of a crash. This paper deals with the study of designing and working of automatic emergency braking system using the various fundamentals of mechanical and electronics engineering popularly known as 'Mechatronics'. In this system Ultrasonic Sensors with the combined use of Stereo Cameras will detect an obstacle in front of the vehicle and it will tell us the relative distance between the obstacle and the vehicle. The ECU will then judge if an accident is likely to happen or not and the brakes will be applied automatically under this system.

Key Words: Heat exchanger, Perforated rings, Reynolds number, Overall heat transfer coefficient.

1. INTRODUCTION

These days the number of accidents is very high and uncertain. An accident can happen anytime and anywhere and can cause serious damage, serious injury, and even death. These accidents are mainly caused by the driver's delay in hitting the brakes. This project solves the problem of manual brake delays. Using ultrasonic waves as various sensory vehicles can stop automatically. The Arduino board is used to build and dispose of the required C Program, which contains the PIC microcontroller. Therefore, by using this car, the technology can automatically stop by hearing obstacles.

1.1 BACKGROUND:

Driving is common for most people. The number of vehicles is increasing day by day. Nowadays, technology has undergone major changes leading to increased speed. Speed plays a vital role in keeping track of long distances. But this speed is also a major problem for road accidents. Normal braking is not enough to avoid accidents when the driver is not working. Further improvement should be made to the brake system to brake the car where the driver is not able to brake the brakes, which may require an automatic braking system. This automated braking system allows the vehicle to brake without the help of the driver. The main implication of the ultrasonic braking system is that the vehicles must be braked automatically when the sensors feel an obstacle.

This is an automotive technology that detects an impending collision with another vehicle or obstacle and removes the vehicle properly, which is made by the brake circuit. This system includes two ultrasonic viz sensors. Ultrasonic wave emitter viz. the ultrasonic wave emitter and the ultrasonic wave receiver extend the ideas in detail and act differently as if the automatic system of brakes could complement the techniques of increasing the presence of technology.

1.2 OBJECTIVES

The aim of this project is to build an automated brakes system to avoid accidents. Performing a car brake safety system using ultrasonic sensors and designing a car that is less sensitive to driving. This project is required to be attached to the entire vehicle, mainly used when driving cars at night. Most accidents occur at night due to long-distance distances the driver may be tired. Therefore, the driver may hit a car on the sidewalk or trees on the sidewalk. Through this project, the car is stopped by an automatic braking system. Therefore, we can avoid the danger

2. LITERATURE REVIEW

2.1 Eung Soo Kim "FABRICATION OF AUTO-BRAKING SYSTEM FOR PRE-CRASH SAFETY USING SENSOR."

The auto-braking system is developed by VHDL and is designed to maintain the distance between the two vehicles. It offers a pre-crash safety system for smart cars.

2.2 Implementation of Automatic Reverse Braking System, FPGA Divya Thakur Prof. A. P. Thakare

The Auto-Braking System uses a raised Sensor to prevent front, rear end, right turn, and left-turn traffic accidents. This module can detect the distance between the front car and the driver's "Automatic Reverse Braking system" processes sensor data and controls the vehicle to prevent accidents.



Design, Static Structural and a Steady State Thermal Analysis of Aluminum Composite Piston

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Abstract - The aim of this project is to increase the life and to analyze the various characteristics of composite piston that is strength, weight, thermal conductivity, density, thermal stress and specific heat. Piston is the basic component of the automobile engine. The modified design of the composite piston in this project is compared with existing piston to analyze the Mean Time Between Maintenance. Now-a-days the pistons are made up of aluminium silicon alloy which expands enormously due to generation of heat in the piston. This will affect clearance volume and insufficient clearance can cause the piston to seize in the cylinder. Hence an alternative composite material (Al) which will reduce the expansion. These composite piston are mainly applicable in reciprocating engines, pumps and marine ships. The temperature distribution of the piston will be analyzed with the help of ANSYS software. In this analysis, the rate of heat transfer and thermal stress are evaluated for different composition materials.

Key Words:

composite piston, aluminum silicon alloy, thermal stress, thermal distribution

1.INTRODUCTION

1.1 I.C ENGINE

The internal combustion engine is an engine in which the combustion of a fuel (normally a fossil fuel) occurs with an oxidizer (usually air) in a combustion chamber. In an internal combustion engine the expansion of the high-temperature and -pressure gases produced by combustion applies direct force to some component of the engine, such as pistons, turbine blades, or a nozzle. This force moves the component over a distance, generating useful mechanical energy. The term internal combustion engine usually refers to an engine in which combustion is intermittent, such as the more familiar four-stroke and two-stroke piston engines, along with variants, such as the Wankel rotary engine. A second class of internal combustion engines use continuous combustion: gas turbines, jet engines and most rocket engines, each of

which are internal combustion engines on the same principle as previously described.

1.2 APPLICATIONS

Internal combustion engines are most commonly used for mobile propulsion in vehicles and portable machinery. In mobile equipment, internal combustion is advantageous since it can provide high power-to-weight ratios together with excellent fuel energy density. Generally using fossil fuel (mainly petroleum), these engines have appeared in transport in almost all vehicles (automobiles, trucks, motorcycles, boats, and in a wide variety of aircraft and locomotives).

Where very high power-to-weight ratios are required, internal combustion engines appear in the form of gas turbines. These applications include jet aircraft, helicopters, large ships and electric generators.

1.3 PISTON

ROLE OF PISTON IN AN IC ENGINE

A four-stroke engine is the most common type used in automobiles. The four strokes are intake, compression, power, and exhaust. Each stroke requires approximately 180 degrees of crankshaft (or flywheel) rotation, so the complete cycle would take 720 degrees. Each stroke plays a very important role in the combustion process, and each has a different pressure surrounding it.



FLOW AND STRENGTH ANALYSIS OF CENTRIFUGAL PUMP IMPELLER WITH DIFFERENT MATERIALS

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Abstract

In this work, flow analysis on pump impellers is planned to study using a commercial computational fluid dynamics (CFD) code. The design optimization of the defined design variables is selected as vane profile, meridional plane development and flow exit. The objective functions are selected as the total head and total efficiency of the impellers. Strength analysis is performed in this work. Initially the geometry model of the impeller is taken from KUMAR PUMPS industries. With the help of this the 3D model is created in CATIA software. CFD, structural and vibration analysis is performed with ANSYS software. Impellers are made of different kinds of materials based on cost and strength analysis. Five types of materials are considered to the impeller to detect heat load carrying material. Vibration analysis is one of the conditions machining technique to identify the fracture character. The vibrations are measured in terms of frequency. The frequency is directly proportional to stiffness. So, it is required to improve the stiffness and the frequency should also be increased for impeller material. Using this, the selection of material depends.

Introduction

Water pumps can be divided into three types: displacement, impulse and other types. Positive displacement pumps can be of reciprocating and rotary type. In either case liquid is displaced from the low pressure suction side to the high pressure discharge side (the term positive refers to the direction of flow displacement related to the pressure gradient). The geometry of the pump is changed periodically and determines the flow in both supply and delivery system. In a positive displacement pump there is no direct communication between the suction and discharge circuit. As a rule, a positive displacement pump is self-priming.

A reciprocating piston pump basically consists of a piston, two valves and a suction and a delivery pipe. Sometimes airchambers are applied to smooth the flow and reduce shock forces. In the traditional piston pump the upper valve is usually situated in the piston and known as the piston valve; the lower valve is called the foot valve. If the upper valve is not integrated in the piston, the pump is usually called a plunger pump (Figure 2).

Centrifugal Pumps

Centrifugal (or rotodynamic) pumps are based on the principle of imparting kinetic energy to the water. In these pumps water enters axially and is discharged by the rotor into a discharge pipe. They have an impeller which rotates in a casing of a special shape. The impeller vanes accelerate the water, which is thrown out by the centrifugal force. The shape of the casing is designed to effectively build up a high pressure at the pump outlet. It is this pressure level that lifts the water against the pumping head. In Figure 5, a single stage of a centrifugal pump is shown. This type of pumps are typically driven by an electric motor or combustion engine and installed above ground level.

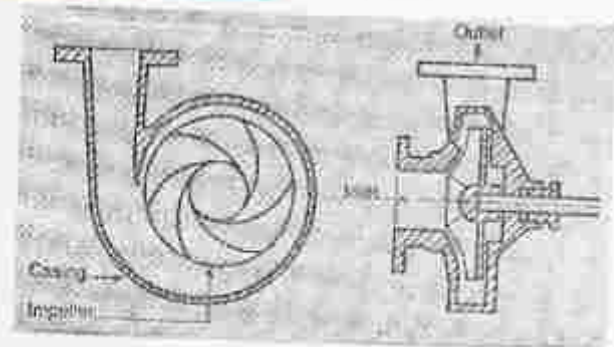


Figure 5 Impeller and casing of a centrifugal pump stage.

Each impeller together with its casing is called a stage. If more pressure is needed than can be created by a single stage, several stages can be mounted in series on a common shaft to form a multi-stage pump. As the water passes through the successive stages, pressure is built up until the required pressure head is obtained. Multi-stage centrifugal pumps with a small diameter and integrated electric motor can be lowered into a borehole for deepwell pumping. Such pumps are used in conjunction with photovoltaic and wind-electric systems.

The efficiency of centrifugal pumps varies strongly with the output rate for a given head. Centrifugal pumps are designed for optimal operation in their design point, i.e. at one determined pressure head and specific flow rate. Away from this design point, their efficiency drops rapidly. In windpumps, piston pumps are much more common than centrifugal pumps since their efficiency is less sensitive to fluctuations in head and speed.

Centrifugal pumps are mostly found for low-head applications where piston pumps perform poorly. Of the very few windpumps equipped with a centrifugal pump, the Dutch Doussin is widely used in The Netherlands for drainage purposes. Experimental designs have been developed for medium pumping heads, but have not been commercialized.

Advantages

1. High pressure is obtained at the outlet.
2. Priming process is not needed in this pump.
3. It provides high suction lift.
4. It is also used for air.

Disadvantages

1. It requires high maintenance because of more wear and tear of the parts.
2. Low flow rate i.e. it discharges low amount of water.
3. They are heavy and bulky in size.
4. High initial cost.

Application

- It is used at a place where low discharge rate is required with high pressure.
- It is mostly used to deliver water at large heights such as in deep well.
- It is used for inflation of types of bicycles.

REVIEW PAPER ON HUMAN VALUES IN THE SOCIETY

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ABSTRACT: Human Values influence daily life by directing our attention to what is most important to us as human beings. In turn, these values influence the way we live our everyday lives by helping to determine how we spend our time and energy. Human society may not significantly sustain without human values. Hence, it is necessary to talk on the subject and bring about awareness of human values into the modern society. There is no denying the fact that the present global society is facing a lot of crises. Human value crisis is a known fact of the modern society. Indeed, humans are aware of the global and national problems which they are currently facing. The impact of human activities on the earth in various ways is placing a significant amount of stress. For instance, the climate change due to global warming. There seems to be a significant link between the remedial measures and various solutions to climate change and the practice of human values. It is believed that at the end of the day, it is the human values which will save the mankind.

INTRODUCTION: If any ethics are primarily to help a person to live a just and righteous life with him/her and in relation to others, ethics too is similarly oriented towards a righteous life. The personal and social life of every individual is permeated by a great sense of righteousness. Without this possibility of constituting the world-view of the community and the possibility of the individuals striving to achieve it, a values system can only be either runtime in the "thought- museum" of cultural artifacts or a fantasy. It is perpetual preparedness to make cultural changes with a view to obtaining this balance. It is believed that various global and national problems may be solved through the practical application of human values in every society. In order to full this, goal humanity is to be considered as the highest value in the global human society. For, the test for humanity is to achieve unity among the living and non- living creatures of the world with the preservation of historical, ethnic and cultural differences as well as the distinctiveness of nation states and communities. Such human unity can be driven home only by recognizing human values such as truth, kindness, benevolence, peace, love, dignity, respect, forgiveness, etc. Of course, these values must be strictly determined and must not be treated as mere obligations. Hence, the most important task for philosophy students is to develop foundations and principles of a global human society and to formulate a global consciousness and a humanistic worldview that adequately reflects the realities of our epoch. Our action must increasingly be based on an acknowledgment of global and universally accepted values. Because, it is the human values which are to be treated as the keys to solving the global problems.

AN CASE STUDY ON ENVIRONMENTAL ISSUES IN INDIA

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ABSTRACT

The word "Environment" is most commonly used to describe "natural" environment and means the sum of all living and non-living things that surround an organism, or group of organisms. Environment includes all elements, factors, and conditions that have some impact on growth and development of certain organism.

The environmental issues in India become more serious every day and she is turning into a bit of a mess on this front but with a serious lack of education and over 1 Billion people, a huge amount of which are in dire poverty, it's hardly surprising. The recent boom in its industries, little or no environmental education, infrastructure nearly at bursting point not to mention the huge deforestation that's going on. In fact, there is no shortage at all of government legislation protecting the environment but unfortunately it is never enforced due to flagrant abuse of power, corruption and lack of resources. One of the critical ecological problems is the global warming that caused by large emissions of carbon dioxide in atmosphere by cars, airplanes, factories all over the world.

Keywords: Environment, Lack Of Education, Population, Poverty, Industries, Deforestation, Government Legislation, Corruption, Global Warming, Pollution.

I. INTRODUCTION

ENVIRONMENTAL CONCERNS AS A GLOBAL ISSUE

India is not the only country facing environmental issues. Definitely air and water pollution and climate change are more global issues that require a concerted effort by all nations to solve. A report by the Intergovernmental Panel on Climate Change (IPCC) in "Climate Change Science Compendium 2009", suggests that the world will be experiencing more of ocean acidification, ice-sheet melting, sea-level rise, and so-called tipping points in climate affects much sooner than ever thought off (Parks, 2009).

Although environmental issues are global in nature, each country is in control of its own environment with jurisdiction over its territory and, hence, should be controlling, monitoring, and enacting regulations in safeguarding its environment. This is true for India too. The Copenhagen Accord makes it clear that it is up to individual countries to devise and enforce the regulations necessary to achieve their national commitments to combat global warming by reducing greenhouse gas emissions. Because of the country specific role of controlling and monitoring the environment, it is difficult to enforce environmental standards on countries from a global perspective, each country should be willing to consider environmental issues as a probable contributor to the overall global degradation of the environment and participate in controlling it through its laws and participation by its industrial sector. In addition, each country could be part of a worldwide association/organization that uses the global network, technological know-how, and resources to be a contributing partner to this group in helping the environment (like the Kyoto Protocol of 1997 and Copenhagen Accord of 2009 on climate change). When international organizations and non-governmental organizations (NGOs) try to help individual countries on environmental issues, in some instances it creates problems. In a research paper funded and supported by the World Bank, researchers found that in India, the role of international institutions and NGO's often have difficulty matching their interest with that of the state, especially, when it comes to human rights standards (Randeria, 2003).

The Major Environmental Issues in India

Some of the major environmental concerns confronting India include:

- Air pollution from industrial effluents and vehicle emissions;
- Energy-related environmental problems such as, chemical & oil pollution and Greenhouse Gas (GHG) emissions (Greenstone and Hanna, 2014);
- Water pollution from raw sewage, the lack of adequate sanitation, and nonpotable water throughout the country;

Enhancing Wind Power Generation Forecasting with Advanced Deep Learning Technique using Wavelet-Enhanced Recurrent Neural Network and Gated Linear Units

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Abstract: Wind power generation forecasting is a critical facet of efficient renewable energy management. This research presents a pioneering approach, the "Wavelet-Enhanced Recurrent Neural Network with Gated Linear Units" (W-RNN-GLU), designed to elevate the precision and insight of wind power forecasting. The model integrates wavelet transformation, recurrent neural networks (RNNs), and Gated Linear Units (GLUs) to capture intricate temporal dependencies and extract relevant features from wind power data. Through multiscale insights facilitated by wavelet transformation, the W-RNN-GLU model discerns fine-grained details and overarching trends. The RNN component adeptly navigates dynamic temporal dependencies, while GLUs regulate feature extraction with precision. Empirical evaluations demonstrate the model's superiority, achieving significantly improved forecast accuracy compared to traditional techniques. The proposed model stands as a trailblazing solution, bridging the gap between traditional time series methods and advanced machine learning algorithms. As renewable energy assumes greater prominence, the W-RNN-GLU model emerges as a pivotal tool in shaping the future of wind power generation forecasting. The effectiveness of the proposed W-RNN-GLU model is substantiated through rigorous empirical evaluations. In comparison to established methods such as Lasso and LightGBM, the W-RNN-GLU model showcases remarkable performance. For instance, the Mean Absolute Error (MAE) achieved by the W-RNN-GLU model is significantly lower than that of Lasso and LightGBM, signifying its enhanced predictive accuracy. Moreover, the Root Mean Square Error (RMSE) achieved by the W-RNN-GLU model underscores its ability to capture nuanced variations within wind power data. This tangible improvement in forecast accuracy positions the W-RNN-GLU model as a transformative solution for wind power generation forecasting, paving the way for more efficient and sustainable energy management practices.



CONVERTING THE CONVOULTION VEHICLE INTO THE ELECTRIC VEHICLE WITH DUAL BATTERY SYSTEM

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Abstract

Now a days the conservation of power is the most compulsory phase of the society and in automobile is a paramount phase of society in day to day life, subsequently the conservation of power as properly as pollution due to the utilization of fossil fuels in vehicle quarter is a difficult job. So strength conservation and pollution-free conveyance grew to be most paramount factor. To resolve this trouble the thought of Electric Conveyance (EV) (electricity powered automobile) machine was once introduced, this can be utilized in all kind of automobiles such as cars, bus, bikes etc. But as soon as the battery of EV is charged it peregrinates a inhibited distance, once more we have to cost the battery of conveyance, which is a time eating process. In this paper we worked on this issue of electrical Vehicle (EV). We resolved this by doing dual battery operation with self-generation by using flywheel with help of dynamo. This will helps to improve the distance covering range of electrical vehicle (EV) and make it more efficient by using the self generating power by the vehicle. It will save the lot of time which is needed to charge the electric vehicle (EV). The advent of electric vehicles (EVs) has marked a significant transition towards sustainable transportation solutions, aiming to mitigate environmental impacts and reduce reliance on fossil fuels. Dual battery electrical vehicles (DBEVs) present a novel approach to enhancing the performance and range of EVs by integrating two distinct battery systems. This abstract explores the concept, advantages, challenges, and potential applications of DBEVs in the automotive industry. DBEVs integrate two types of batteries: a high-energy-density battery optimized for long-range travel and a high-power-density battery tailored for performance and acceleration. By leveraging the strengths of each battery type, DBEVs can achieve superior efficiency, extended range, and enhanced acceleration capabilities compared to single-battery EVs. The key advantage of DBEVs lies in their ability to address the trade-off between energy density and power density inherent in current battery technologies. By utilizing a combination of batteries optimized for different purposes, DBEVs can deliver both long-range endurance and high-performance attributes without compromising on either aspect. However, the implementation of DBEVs poses several technical challenges, including battery management system integration, thermal management, weight distribution, and cost optimization. Efficient management of two separate battery systems necessitates sophisticated control algorithms to ensure seamless operation and maximize overall vehicle performance. Despite these challenges, DBEVs hold immense potential for various applications, including passenger vehicles, commercial fleets, and specialty vehicles such as electric sports cars and off-road vehicles. The flexibility offered by dual battery configurations opens up opportunities for tailored solutions to meet the diverse needs of different vehicle segments and consumer preferences. In this Dual battery electrical vehicle are very useful to cover more distance without any recharging

where we are in emergency situation or complete discharge of the battery pack. In this system we are using the dynamometer for charging the ideal battery pack while running the vehicle of the charged battery pack it helps to cover the some more distance. In this process we are also reduce the electrical and mechanical losses of the vehicle and improve the efficiency of the vehicle. Here we use the switching mechanism for switch the batteries with stopping of the vehicle automatically.

Introduction

Electric vehicle (EV) is not a recent invention. Between the end of the XIX century and the beginning of the XX century, most of the vehicles were powered by electricity. This was due to their reliability and cleanliness compared to that of vehicles powered by internal combustion engines (ICE). However, with the development of ICEs and the reduction of their price, electric cars have been forgotten for almost a century. Nowadays, with a significant increase in the price of fossil fuels, and a growing concern for the environment developed. The interest around EVs has grown again. The ICE is the main component responsible for the motion of a conventional automobile, whereas the fuel tank is of secondary importance. On the contrary, in EVs, the main components are the batteries (or energy accumulators), the controller and the electric motor [1]. Several topologies and different architectures exist, which cover different applications of pure EVs. Because of the large number of topologies encountered during an initial literature research, only a set of components of different topologies was considered. These topologies were evaluated using widely available data of efficiency, weight, and applied power. On this basis, the best topology for the conversion of an conventional vehicle into an EV was identified, and applied to a Mercedes Benz Class A 100, also named "Eco Auto" thereafter. In today's world, we face the problem of dwindling fuel resources for vehicles. There is no doubt that the emission of carbon-dioxide from an automobile exhaust is a concern for the rise of global warming. One of the optimistic solutions for such problems is usage of the electrical vehicle. electric vehicles are widely available in commercial vehicles, and passenger cars. The global automotive industry is undergoing a transformative shift towards sustainability, driven by the urgent need to reduce greenhouse gas emissions and combat climate change. In this context, the electrification of vehicles has emerged as a promising solution to mitigate the environmental impact of transportation. While the production of new electric vehicles (EVs) is accelerating, there exists a vast fleet of conventional (internal combustion engine (ICE) vehicles already on the roads. Converting these existing vehicles into electric counterparts presents a compelling opportunity to accelerate the transition towards cleaner mobility. Electric vehicles produce zero tailpipe emissions, reducing air pollution and contributing to improved air quality in urban areas. Converting ICE vehicles to electric power helps mitigate the



DESIGN ANALYSIS & FABRICATION OF GEAR BY USING 3D PRINTING

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Abstract

Hybrid gears are composed of high-strength steel, carbon fiber reinforced plastic (CFRP), and adhesive bond to join these materials. In this study, the effect of root tip radius (TR), drive side pressure angle (DSPA), and rim thickness (RT) on the stress of hybrid gears is investigated numerically. In addition, the stress results of hybrid gears are compared with steel gears that are used for validation of the numerical results. Single tooth stiffness (STS) values are calculated based on tooth deformations obtained from numerical analyses. According to the results, increasing RT has a positive effect on stress, STS, and STE, while DSPA is effective on the dynamic factor at most. By using 3D printing modelling fabrications prototype model.

Keywords: steel-composite (hybrid) gear, CATIAV5 & Ansys 19.0, 3D printing

Introduction

Gears are the most widely used powertrains in terms of utilization rate and application area. Due to the continuous and smooth transfer of power and motion and the constant ratio, gears are utilized from huge machines to the most miniature clock mechanisms. With several advantages, involute gears are the most often used gear. With the developing technology, expectations have arisen to provide higher power and moment transmission from involute gears. For this purpose, designers have focused their work on different gear geometries. Gear geometry research has primarily concentrated on asymmetric involute gears. When comparing the symmetric gear, larger loads per unit facewidth can be carried by gear with asymmetric teeth. Another significant goal in the industrial sectors, such as automotive, aviation, and machinery, where involute gears are the key transmission elements, is to reduce the amount of fuel usage and, consequently, the CO2 emission rate. The total structural mass of a product is the most responsible factor in the amount of fuel usage. The easiest method of the lightweighting process is to replace the material with a lower density one. Most automotive and machine parts subjected to low stresses were previously made from steel but are now made from aluminum, magnesium, or composites. For gears, usage of these light materials is limited due to higher stress during the power transmission. Gear steel grades are still the most proper options. Indeed, Hertzian stresses occur on the contact zone, as well as bending stress on the tooth root zone for spur gears during operation. Except for these certain zones, the stress levels are quite low. For these reasons, a lightweight material can be used for the low stress zone. Mesh stiffness (MS) is another crucial factor for spur gears since it directly affects transmission error and dynamic behaviour. Carbon fiber reinforced polymer (CFRP) can be used for the low-stress zone with their high rigidity and good NVH properties. For decades, CFRP materials have been utilized as the material of engineering structures in aerospace, automotive, and other industries. Within NASA's Glenn Research Centre, the first significant research was started for gear production. Hartschuh and his colleagues developed and experienced a prototype hybrid gear. To connect

hybrid gear, numerical and experimental methods were utilized to get critical frequencies. Furthermore, vibration and sound levels for various driven-driving gear material combinations were measured using dynamics experiments for a variety of torque and rpm levels. There was no apparent fatigue damage for conducted spin and torque values, according to the results. The critical frequencies were found to be lower than complete steel gear. Total mass was reduced by 20%, approximately. According to these tests, stress and fatigue damage to hybrid gears is not a significant issue, provided the rim thickness value is properly adjusted. Cetera et al suggested a FE-based method for CFRP to determine the critical velocities of hybrid gear. The proposed method was verified with previous experimental data. Cetera et al. used FE research to determine stress on the root and joint region for hybrid gear subjected to large loads. Different modeling approaches were compared. The acquired values of these two techniques were quite similar, according to the results. When compared to this rimmed-thin method steel gear of the same weight, hybrid gears have reduced maximum STE values. Cetera et al. performed a comparison study to understand how rim alternative connecting procedures affected the vibration of hybrid gears. According to the findings, adhesive bonding is superior with greater damping capabilities. However, the interference fitting method ensures higher tooth stiffness. The numerical results were merged with experimental data. For the identical ring and thicknesses, Kargut et al. evaluated the stress, stiffness, and weight status of gears with aluminum and composite materials used for low stress zone. Gnaat and Carpell examined different laminas and ply sequences. The natural frequency is significantly affected by the elasticity modulus, according to the findings. Yilmaz et al. conducted comprehensive study to evaluate performance of hybrid gears with symmetric teeth. The moment transmission capacity of hybrid gears was determined based on stress values. In these aforementioned studies, fixed parameters were utilized to design hybrid gears. There is a gap in the literature about the effect of TR and DSPA for hybrid gears, especially. In this study, stress, stiffness, STE, and DF of hybrid gear with different design parameters are investigated, numerically.

Literature Review

"S. Mahendran, K. M. Esahil, L. Senthil Kumar-DESIGN AND ANALYSIS OF A SPUR GEAR". We observe the impact analysis and torque loading for cast steel and composite materials. Finally, comparing and analyzing of the stress induced, deformation and weight of the composite spur gear is less as compared to the cast steel spur gear.

"K. Mani-A new approach for polymer composite gear design". We observe the tests that the polymer (acetyl) gear wear rate will be increased dramatically when the load reaches a critical value for a specific geometry. This method has been related to test results under different operating ambient temperature and gear geometries.

"S. Kiranjanika, C. Gyanathan, R. Ganesamoorthy-Transmission efficiency of polyamide nanocomposite spur gears".The enhancement in mechanical



DESIGN OF IOT BASED TRICYCLE

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Abstract - The rapid advancement in Internet of Things (IoT) technology has opened up numerous opportunities for innovation across various industries. In the transportation sector, IoT has the potential to revolutionize conventional vehicles into smart, connected modes of transportation. This project focuses on the design of an IoT-based electric tricycle, aimed at providing a sustainable and efficient mode of personal transportation. The electric tricycle integrates IoT technology to enhance its functionality and user experience. Key features include real-time monitoring of vehicle parameters such as speed, battery status, and location, enabling remote tracking and management through a dedicated mobile application. Additionally, the tricycle incorporates smart safety features such as collision detection and automatic emergency braking, enhancing rider safety on the road. The design phase involves the selection of appropriate components and the integration of IoT modules, sensors, and actuators into the tricycle framework. The fabrication process encompasses building the chassis, integrating the electric propulsion system, and assembling the IoT components. Emphasis is placed on ensuring durability, reliability, and energy efficiency throughout the construction process. Overall, the project aims to contribute to the advancement of sustainable transportation solutions by leveraging IoT technology to create an innovative, eco-friendly electric tricycle. Through this endeavor, we envision promoting the adoption of electric vehicles and facilitating a more connected and efficient urban mobility ecosystem.

emphasis on transitioning towards sustainable transportation alternatives.

1.1.2 Emergence of Electric Vehicles (EVs):

Electric vehicles (EVs) have emerged as a promising solution to address the environmental and energy challenges associated with conventional automobiles. By replacing internal combustion engines with electric motors powered by rechargeable batteries, EVs offer significant reductions in greenhouse gas emissions and dependence on fossil fuels. Furthermore, advancements in battery technology, electric drivetrains, and charging infrastructure have accelerated the adoption of EVs, making them increasingly viable for mainstream consumers.

1.1.3 The Need for Sustainable Urban Mobility Solutions:

Urban areas, in particular, face pressing challenges related to traffic congestion, air quality, and public health. In densely populated cities, the demand for efficient, affordable, and environmentally sustainable modes of transportation is paramount. Conventional automobiles, while providing mobility and convenience, contribute to traffic congestion and pollution. Therefore, there is a critical need to explore innovative transportation solutions that prioritize sustainability, efficiency, and accessibility, especially in urban environments.

1.1.4 Role of Electric Tricycles in Urban Mobility:

Electric tricycles represent a niche segment within the broader electric vehicle market, offering a compact, maneuverable, and cost-effective mode of personal transportation. Unlike traditional bicycles, electric tricycles provide added stability, cargo capacity, and comfort, making them suitable for a wide range of users, including commuters, delivery services, and senior citizens. Electric tricycles are particularly well-suited for urban environments, where they can navigate congested streets, narrow alleyways, and pedestrian zones with ease.

1.1.5 Integration of IoT Technology for Enhanced Functionality:

The Internet of Things (IoT) presents an opportunity to enhance the functionality, connectivity, and intelligence of electric tricycles. By integrating IoT sensors, actuators, and communication modules into the vehicle's design, it is possible to enable real-time monitoring, remote control, and data-driven optimization. IoT-enabled electric tricycles can

Keywords: IoT-based electric tricycle, Sustainable transportation, Connected vehicles, Electric vehicle innovation, Real-time monitoring, Safety features, Fabrication process, Integration of IoT technology, User experience, Smart mobility solution

1. INTRODUCTION

1.1 Background and Motivation:

1.1.1 Environmental Concerns and Transportation Challenges:

The transportation sector is a significant contributor to greenhouse gas emissions, air pollution, and energy consumption worldwide. With rapid urbanization and population growth, cities are facing increasing challenges related to traffic congestion, noise pollution, and environmental degradation. Traditional gasoline-powered vehicles exacerbate these issues, leading to adverse effects on public health and the environment. Recognizing the urgency of mitigating these challenges, there is a growing global

Fabrication and Development of Solar Powered Cart

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Abstract - Electric vehicles (EVs) are becoming increasingly popular due to their eco-friendliness and low operational costs. However, the use of fossil fuels to generate electricity to charge these EVs undermines their sustainability goals. Combining solar energy with EV charging can create a sustainable and clean transportation system, which can reduce our dependency on non-renewable energy sources. The overall objective of the project is to develop and fabricate an optimized, efficient solar powered electric cart charging with bi-directional smart inverter control that can be used on campus in transporting and carrying Stationery loads. Subsystems such as the frame, drive train, power, suspension, Brakes and Steering that are modeled and analyzed through quantitative methods are purchased and fabricated. The cart is fabricated as per its design for 250kg load carrying capacity, acceleration of 1.2 m/s² and maximum achievable speed of 15km/h with a power rating of about 1.5kW. Secondary support software such as Excel, and solar analyzing software were used to assist in the planning of the various subsystems as well as data collection and assortment. The proposed model provides the IOT-based smart solar energy consumption analysis and control model by using solar photovoltaic micro grid. The proposed IOT design must meet product and process requirements.

Key Words:

Power optimization, golf cart, solar transport, Photovoltaic, Solar-powered, Emission Analysis, Environmental, Solar power.

INTRODUCTION

The issues of climate change or global warming have been rigorously discussed by many governments since the early 21st century. A great number of relevant reports have revealed the negative impact of climate changes dominantly driven by human activities. With the globally increasing civilisation and industrialization, a large number of fossil fuel burnings in industries have led to the acute problem of air pollution (Wee, 2010). Simultaneously, the exhaust emissions from automotive vehicles cannot be ignored. Vehicle emissions, which mainly include CO₂, CO, NO_x and particulate matters (PM10 and PM2.5), have been considered as the major contributors to the effect of greenhouse gases, also leading to the increase in different forms of cancers and other serious diseases (Fenton and Hodgkinson, 2001; Fajri and Asael, 2008).

The ever rapidly growing transportation sector consumes about 49% of oil resources. Following the current trends of oil consumption and crude oil sources, the world's oil resources are predicted to be depleted by 2038 (Ehsani et al., 2010). Therefore, replacing the non-renewable energy resources with renewable energy sources and use of suitable energy-saving technologies seems to be mandatory. Electric Vehicles (EVs) as a potential solution for alleviating the traffic-related environmental problems have been investigated and studied extensively (Clement et al., 2009; Hajimiragha et al., 2010; Stephan and Sullivan, 2008). Compared to ICEV, the attractive features of EVs mainly are the power source and drive system.



FATIGUE ANALYSIS OF WELDING STRUCTURES USING THE FINITE ELEMENT METHOD

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Abstract

Welding, the simple process and excellent strength makes it useful in manufacturing of steel structures like ships, ocean structures, automobiles, aircraft and bridges. The challenges associated with welding and welded joints are improved tensile strength of welding under variable environmental and working conditions. The study was carried on welding of two dissimilar materials in which SA106 and STS 304 are parent materials and M 309 is used as a filler material as well as overlap length and gap size are selected as parameters to be varied during experimentation. Design and validation of fixture is carried out for testing purpose. Specimens are prepared with greater accuracy and tests were carried out using UTM. The results obtained from experimentation are compared with result obtained from simulation. The specimen was modeled in ANSYS 15 Workbench. Structural analysis was carried out to obtain the mechanical response of the structural model, initially 1000N load applied to find out the buckling factor. Then on the same specimen, fatigue analysis is conducted by applying cyclic loading. It is recommended to keep overlap length 25 mm for 5 mm thick plate. This will give maximum tensile strength.

Introduction

Welding is a materials joining process in which two or more parts are coalesced at their contacting surfaces by a suitable application of heat and/or pressure. Many welding processes are accomplished by heat alone, with no pressure applied; others by a combination of heat and pressure; and still others by pressure alone, with no external heat supplied. In some welding processes a filler material is added to facilitate coalescence. The assemblage of parts that are joined by welding is called a weldment. Welding is most commonly associated with metal parts, but the process is also used for joining plastics. Our discussion of welding will focus on metals. Welding is a relatively new process. Its commercial and technological importance derives from the following: 1. Welding provides a permanent joint. The welded parts become a single entity. 2. The welded joint can be stronger than the parent materials if a filler metal is used that has strength properties superior to those of the parents, and if proper welding techniques are used. 3. Welding is usually the most economical way to join components in terms of material usage and fabrication costs. Alternative mechanical methods of assembly require more complex shape alterations (e.g., drilling of holes) and addition of fasteners (e.g., rivets or bolts). The resulting mechanical assembly is usually heavier than a corresponding weldment. 4. Welding is not restricted to the factory environment. It can be accomplished "in the field."

FACTORS AFFECTING TENSILE STRENGTH OF WELDED JOINT

After doing literature survey some parameters are observed which affects tensile strength of welded joint. The henceforth chapter discuss the effect of parameters on tensile strength.

Process Parameters

There are various parameters which affects on strength of the weld. In that welding current, welding voltage, electrode size, welding speed. Basically by varying welding current, deposition of welding material may vary. High welding current cause's microstructure become finer and increase in tensile strength and low current caused root of the metal plate not weld completely which weakened the joint. Also the welding voltage is important parameter in welding process. The voltage is necessary for proper arc maintenance. Bead forming is too small due to too high voltage. The size of electrode to be chosen is based on the thickness of the plate. While too big electrode may stick and be hard to start, too small electrode will spatter and even can catch fire. The Speed at which electrode moves or deposition takes place. The increase in welding speed usually decreases the penetration. Due to speed of welding, sufficient is getting for welding because of decreases penetration. At too slow welding speed, results in piling of bead. If too fast, bead will be sparse and have poor fusion. The increase in welding speed usually decreases the penetration. JOINT GEOMETRY

According to researchers study, it is found that the fatigue life is improved by varying gap size. Gap size affects on strength of the weld. Experimentally it is found that Overlap length plays major role in strength of the weld. Stress variation of lap more changed by the overlap length. The maximum stress decreased when overlap length is increased. Researcher studied that, the gap size is more effective factor to fatigue life. According to study strength of the weld depended on the lap length and gap size and eliminates the stress concentration in overlapping area.

Types of Loading

Welding joints are applicable in wide range of engineering approach such as structural and mechanical engineering. There are various loading condition according to change in application such as the failure of welded joint due to tension can be seen in flange welded to the hub transmitting torque. In structural application such as bridges the joints are subjected to static as well as fatigue loading. In both the case of structural application, the failure mode may be different due to change in loading condition (i.e. Reason for crack initiation in both the cases is different and life span of welded joint too. Automobile uses spot welding for joining various frame components. During a high speed collision, these welded joints are subjected to impact loading. Lot of research has shown that the some kind of welded joint behaves in different manner for different kind of loading condition and by keeping the joint geometry as it is. It gives different values of strength for different kinds of loading.



DESIGN AND ANALYSIS ON SUSPENSION SYSTEMS IN BIKES BY USING CATIA AND ANSYS

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Abstract

In this study, we considered mono suspension system. We compare the ride quality of mono suspension. A no of studies has been proposed for different material and parameters of two-wheeler vehicles to know how they differ from each other by performing static structural analysis under different loading conditions by designing 3D model of suspension system using software like CATIA V5 and ANSYS for performing analysis. We have also performed for the same and have depicted the convergence of the simulation with the design clearly.

Key words: Two-wheeler suspension system, Shock absorber, Design, CATIA V5, Analysis, ANSYS.

Introduction

A motorcycle's suspension serves a dual purpose- contributing to the vehicle's handling and braking and providing safety and comfort by keeping the vehicle's passengers comfortably isolated from road noise, bumps and vibrations. Shock absorber is a mechanical device designed to smooth out or damp shock impulses and dissipate kinetic energy. In this work, suspension system is designed and a 3D model is created using CATIA V5R21. Structural analysis is done on the shock absorber by varying different types of materials and loading conditions. Suspension type considered in this analysis are mono suspension system. To validate the strength of the model, the structural analysis on the design of suspension system is performed. The analysis is done by considering different loading conditions like bike weight, bike weight with single, and double rider. Finally, comparison is done for different suspension systems by varying different materials such as stainless steel, ASTM spring steel, Beryllium copper Epoxy resin material.

The primary goal of motorcycle suspension is to keep vehicle tires in contact with the ground. Without proper suspension, tires would lose traction when encountering bumps, dips or other ground imperfections. We can't forget about braking, acceleration or cornering forces either. Motorcycle suspensions use a spring and damper combination to isolate the chassis and rider from road imperfections. On-road motorcycle suspension systems work to minimize the effect of potholes, bumps, cornering and acceleration/deceleration forces. Off-road motorcycle suspension systems handle roots, rocks, jumps, ledges and more. Without suspension, any impact between a vehicle tire and a ground imperfection is at best uncomfortable, and at worst, the cause of a dangerous crash. Basic motorcycle suspension lacks adjustability. It works fairly well in a wide variety of circumstances, whereas more premium suspension is tunable to rider weight and intended riding type. Cruisers or dual sport motorcycles have vastly different needs than a dedicated sport bike. 3 Adjustability can include ride height (under load), fine tuning how quickly springs compress or rebound as

well as preloading spring tension to accommodate differing weight for different riding styles, such as riding with a passenger and/or luggage. The most common suspension systems found on motorcycles use a coil spring and hydraulic damper setup. Air springs and other types of suspension exist.

Springs allow a motorcycle wheel to move independently from the chassis, and dampers control and manage movement of the spring. A motorcycle riding only on springs would bounce continuously and dangerously after every road impact. Springs are coiled steel wire that compress or stretch when acted upon by an external force. Spring rate is the measurement of force required to compress it a certain distance, which is typically measured in pounds per inch. Spring rate varies with material thickness and number of coils. Heavier duty springs will have relatively thicker coils spaced farther apart from one another.

Literature review

1. Study and Design of Advance Suspension System for Two Wheeler Shubham Kashi, Karim Gaware, Tushar Kale, Harshal D. Patil, International Research Journal of Engineering and Technology (IJRET) Volume: 05 Issue: 08 | Aug 2018. Now a day's various types of suspension are available in market but for optimizing the better and efficient cushioning effect. It is a need of today to improve and advancement in suspension system. In This research literature they thoroughly studied design parameters required to design magnetic suspension system and gives information about various types of rear suspension of two-wheeler. Research literature describes techniques for the design, construction of magnetic suspension system.
2. Experimental investigation of mono suspension spring, Vidya S.Vinaya, J.R.Mahajan (IJRET) checked the convenient method of replacing metal coil spring with the composite coil spring using composite materials like carbon fiber, glass fiber and combination of Carbon fiber and glass fiber. Using composite material it will reduce the weight of the coil spring. according to experimental result the spring rate of the carbon fiber is 34% more than the glass fiber and 45% more than the glass fiber/carbon fiber spring. The cost of glass fiber springs are 25% more than steel springs and cost of the carbon fiber spring is 200% more than steel springs. The stiffness of composite spring is less than steel springs and hence its application is limited to light vehicles.
3. Design and Analysis of Two-Wheeler Shock Absorber Coil Spring Prof. Prince Jerome Christopher J, Pavendhan R. of JJ College of Engineering & Technology, Trichy, TN. The objective of this project is to design and analyze the performance of Shock absorber by varying the wire diameter of the coil spring. They collected theoretical information and working of the shock absorbers and then performed the design calculations of helical spring of shock absorber. They designed the shock absorber using PRO/ENGINEER software with calculated dimensions. They then performed analysis on the design using



MODELLING AND ANALYSIS OF CNC MILLING MACHINE BED WITH COMPOSITE MATERIALS

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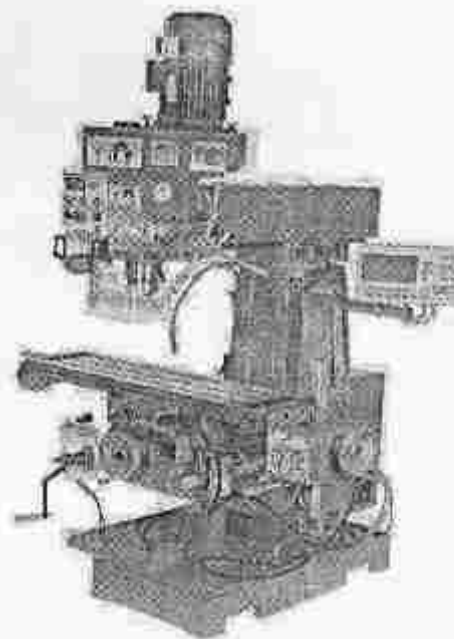
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Abstract - The materials utilized as a part of a machine device have an unequivocal part in deciding the efficiency and exactness of the part made in it. The regular basic materials utilized as a part of exactness machine apparatuses, for example, cast iron and steel at high working velocities create positional mistakes because of the vibrations moved into the structure. Quicker cutting rates can be procured just by structure which has high firmness and great damping attributes. We know that by experiences life of a machine is inversely proportional to the levels of vibration that the machine is subjected. The further procedure is completed to experience the distortion, normal recurrence and removal utilizing Static examination, Modal investigation and Harmonic individually. Since the bed in machine apparatus assumes a basic part in guaranteeing the exactness and precision in segments. Is a standout amongst the most critical apparatus structures which have a tendency to retain the vibrations coming about because of the cutting operation. To break down the bed for conceivable material changes that could build solidness, diminish weight, improve damping characteristics. In this paper constant load is applied on a bed with and without Nanocoating on the material and with composite materials. Graphene is used for coating basing on strength and thermal properties. Modelling of the bed was carried out in SolidWorks and ANSYS is used for structural analysis. By comparing the stress distribution and deformation in the bed by changing its material with the previous. Finally this thesis summarizes the suitable materials can be used as machine bed material.

1. INTRODUCTION

In contemporary manufacturing, the careful selection of materials for machine tool components, such as milling machine beds, plays a pivotal role in achieving optimal performance and durability. This project focuses on assessing and comparing the suitability of two prevalent materials, namely gray cast iron and structural steel, for application in milling machine beds using advanced ANSYS simulation techniques. The primary motivation behind this study is to address the critical need for material optimization in machining operations. By thoroughly evaluating gray cast iron and structural steel under simulated machining conditions, we aim to make informed decisions regarding material selection for milling machine bed.

2.0 MILLING MACHINE



Key words: Machine Tool, Machine Bed, Stiffness, Damping, SOLID WORKS, Ansys

DESIGN AND ANALYSIS OF THE PISTON USING COMPOSITE MATERIALS LIKE AA7275 STRUCTURAL AND THERMAL ANALYSIS DONE IN ANSYS SOFTWARE

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Abstract – This project focuses on the design and analysis of a piston utilizing composite materials, particularly AA7275, to enhance structural integrity and thermal efficiency. The study employs ANSYS software to conduct comprehensive structural and thermal analyses. The structural analysis evaluates the mechanical behavior, stress distribution, and deformation characteristics of the piston under varying operating conditions. Meanwhile, the thermal analysis investigates the heat transfer mechanisms, temperature distribution, and thermal stress accumulation within the piston. By integrating composite materials and utilizing advanced simulation techniques, this project aims to optimize the performance and reliability of the piston, contributing to advancements in engine technology.

INTRODUCTION

In every engine, piston plays an important role in working and producing results. Piston forms a guide and bearing for the small end of connecting rod and also transmits the force of explosion in the cylinder, to the crank shaft through connecting rod. The piston is the single, most active and very critical component of the automotive engine. The Piston is one of the most crucial, but very much behind-the-stage parts of the engine which does the critical work of passing on the energy derived from the combustion within the combustion chamber to the crankshaft. Simply said, it carries the force of explosion of the combustion process to the crankshaft. Apart from the critical job that it does above, there are certain other functions that a piston invariably does -- It forms a sort of a seal between the combustion chambers formed within the cylinders and the crankcase. The pistons do not let the high pressure mixture from the combustion chambers over to the crankcase.

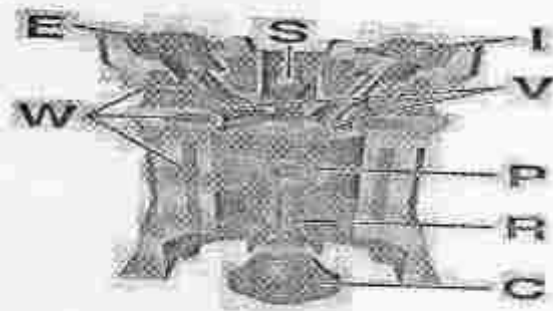


FIG 1.1 PISTON

MATERIALS FOR THE PISTON

Cast Iron, Aluminum Alloy and Cast Steel etc. are the common materials used for piston of Internal Combustion Engine. Cast Iron pistons are not suitable for high speed engines due to its more weight. These pistons have greater strength and resistance to wear. The Aluminum Alloy Piston is lighter in weight and enables much lower running temperatures due to its higher thermal conductivity. The coefficient of expansion of this type of piston is about 20% less than that of pure aluminum piston but higher than that of cast iron piston and cylinder wall. To avoid seizure because of higher expansion than cylinder wall, more piston clearance required to be provided. It results in piston slap after the engine is started but still warming up and tends to separate the crown from the skirt of the piston. Cutting a vertical slot will avoid this disadvantage. This slot helps in taking up thermal expansion and so the overall diameter of the piston is not required to be so reduced as to obstruct the safe operation between the cylinder walls and the pistons. To increase the life of grooves and to reduce the

ANSYS software facilitates Multiphysics simulations, allowing engineers to study the interactions between different physical phenomena such as structural mechanics, fluid dynamics, electromagnetics, and thermal effects. Its robust solvers and algorithms enable accurate prediction of system behavior under various operating conditions, helping engineers optimize performance, reliability, and efficiency. Moreover, ANSYS provides a range of specialized modules tailored to specific industries and applications, including automotive, aerospace, electronics, healthcare, and renewable energy. These modules incorporate domain-specific features and workflows, empowering engineers to address industry-specific challenges and design requirements effectively. Recent advancements in ANSYS software include enhanced computational capabilities, improved user interfaces, and integration with emerging technologies such as artificial intelligence and additive manufacturing. These developments enable engineers to accelerate the design iteration process, reduce time-to-market, and achieve superior product performance. Furthermore, ANSYS supports collaborative engineering workflows through its integration with product lifecycle management (PLM) and computer-aided design (CAD) software. This integration facilitates seamless data exchange between design, simulation, and manufacturing teams, ensuring consistency and accuracy throughout the product development lifecycle.

KEY WORDS : AA7275; Piston; Structural integrity and Thermal Efficiency; Structural analysis; ANSYS; CAD.

FABRICATION OF HYBRID POWER GENERATION BY USING SOLAR, WIND AND WAVE ENERGY

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Abstract -The escalating demand for electricity in India necessitates a shift towards renewable energy sources. This paper proposes a hybrid power generation system that combines solar, wind, and wave energy technologies to meet this demand efficiently. By harnessing these renewable sources, the system eliminates fuel costs and emissions associated with conventional power generation. Situated near the sea, the system maximizes solar energy utilization and taps into strong winds for wind power generation. Moreover, it leverages wave energy for additional power generation. The hybrid system offers a practical solution to address the challenge of electrifying non-grid rural areas, especially where conventional energy solutions are economically unviable or environmentally harmful. Hybrid systems emerge as a promising approach to deliver reliable and sustainable power solutions to remote communities, contributing to rural development agendas and mitigating the adverse impacts of conventional energy sources.

Key Words: Renewable energy source, hybrid, electricity, conventional energy, environment, power generation.

1. INTRODUCTION

The quest for sustainable energy solutions has intensified amidst growing concerns over global warming and the depletion of fossil fuel reserves. Among the renewable energy options, wind and photovoltaic (PV) energy stand out as promising contenders to meet our energy demands. While each possesses inherent advantages, such as the capacity of wind energy to supply substantial power and the consistent availability of solar energy throughout the day, both suffer from intermittency, rendering them unreliable as standalone sources. However, by integrating these intermittent sources and implementing maximum power point tracking (MPPT) algorithms, their efficiency and reliability can be significantly enhanced. This paper explores the potential of hybrid wind, solar, and wave energy systems in addressing the intermittency challenge and advancing towards a more sustainable energy future.

While several hybrid wind/PV/wave power systems with MPPT control have been proposed, existing literature often relies on complex configurations involving separate DC/DC boost converters for each renewable source. Alternatively, a simpler multi-input structure has been suggested, combining sources at the DC-end while still achieving MPPT for each source. This paper introduces a novel rectifier structure for hybrid wind/solar/wave energy systems, aiming to streamline the integration process and enhance overall system efficiency. By exploring innovative approaches to system design and control, we strive to overcome the challenges associated with

intermittent renewable energy sources and pave the way for more reliable and sustainable power generation.

Solar energy is abundant and readily available in most regions, offering predictable generation during daylight hours. Wind energy, on the other hand, can be harnessed day and night, but its availability is subject to meteorological conditions. Wave energy, derived from ocean waves, represents a continuous and reliable source of renewable power but is typically localized to coastal areas. By combining these three complementary sources into a hybrid system, it is possible to mitigate the limitations of individual technologies and achieve a more stable and consistent power output.

In addition to addressing intermittency challenges, the proposed hybrid system offers opportunities for improved power transfer efficiency and reliability. By leveraging the complementary nature of wind, solar, and wave energy, the system can mitigate the variability of individual sources and ensure consistent power supply. Moreover, the integration of MPPT algorithms enhances the system's ability to maximize energy extraction from each source, further optimizing overall performance. Through comprehensive analysis and experimentation, this paper aims to contribute to the advancement of hybrid renewable energy systems and facilitate their integration into mainstream energy infrastructure.

The integration of wind, solar, and wave energy sources in a hybrid system presents a promising solution to the challenges of intermittency and reliability. By combining these renewable sources and implementing advanced control strategies, we can enhance energy extraction efficiency and ensure a more sustainable future for generations to come. This paper proposes a novel rectifier structure for hybrid energy systems, offering a simplified yet effective approach to integration and control. Through ongoing research and development, we seek to unlock the full potential of renewable energy resources and accelerate the transition towards a cleaner, more resilient energy landscape.

2. Body of Paper

The primary objective of this study is to explore the feasibility and potential benefits of integrating solar, wind, and wave energy sources into a hybrid power generation system. By leveraging the strengths of each resource and optimizing their synergies, the proposed hybrid system aims to enhance energy reliability, improve grid stability, and reduce dependence on fossil fuels. Additionally, the study seeks to evaluate the economic viability, environmental impact, and scalability of such a hybrid approach, considering various geographical locations and deployment scenarios. By combining these



MECHANICAL BEHAVIOUR OF DISSIMILAR ALUMINIUM ALLOYS WITH EFFECT OF TOOL OFFSET BY USING FRICTION STIR WELDING

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Abstract: Friction stir welding (FSW) is a solid (not molten metal) joining technique in situations where the properties of the original metal must be preserved as much as possible. It involves mechanically mixing two metals together, softening them, and then forcing them together, like clay, mass, and grinding. In most cases, large parts that cannot be easily heated are joined afterwards to maintain the controlled properties of aluminum during this process.

Light metal alloys such as aluminium, magnesium and their compounds can now be joined by friction, which significantly stimulates welding. In this work, different aluminum alloy sheets AA2024 – AA7075 and AA6063-AA6069 were used for square tools. The tool parameters considered are 1600 rpm, 120 mm/min stroke and four offset values of 0 mm, 0.5 mm, 1 mm and 1.5 mm. Mechanical properties such as tensile strength, hardness and flexural strength were examined using standard testing procedures. It can be clearly seen the increase in the offset value due to the increase in tensile strength in the case of AA202-AA7075, but slight declines were observed in AA6063-AA6069. A higher hardness is observed in the compact and relatively economical HAZ, the smallest value in the base metal. The bending strength of the metal is lower, but between the 1.5mm thickness of the tape it provides better bending strength.

Index Terms: Friction-stir welding (FSW), AA2024, AA7075, AA6063, AA6069 and Mechanical Properties.

1. INTRODUCTION

Friction Stir Welding (FSW) is considered a solid state joining process because the heat generated by the process does not reach the melting temperature of the materials being joined. FSW has been around for more than 25 years, it was developed in 1991 at The Welding Institute (TWI) in the UK. FSW allows for the joining of materials that, by traditional welding technologies, are considered to be non-weldable, these are materials that traditional welding would have poor solidification microstructure, porosity in the fusion zone, and a significant loss of mechanical properties as compared to the base materials (i.e. dissimilar material, Mg alloys, some aluminum alloys, copper, titanium etc.). In the FSW process (see Fig.1.1), a non-consumable cylindrical tool with a shoulder and pin is used as a stirrer. The tool is fixed to a milling machine chuck and is rotated along the longitudinal axis (Fig.1.2 (a) shows the modified milling machine used in this study). The work pieces to be

Design and Analysis of Solar Power Cart for Inhouse Application Through ANSYS

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Abstract -The design and analysis of a solar power cart for in-house applications using ANSYS software is presented in this paper. The solar power cart is a portable, self-contained unit equipped with solar panels, batteries, and power electronics, designed to provide a renewable energy source for various in-house applications. The objective of this study is to analyze the structural integrity and thermal performance of the solar power cart using ANSYS simulation tools. The structural analysis focuses on evaluating the cart's mechanical strength and durability under various loading conditions, including static and dynamic loads. Finite element analysis (FEA) is used to simulate the structural behavior of the cart's components, such as the frame, wheels, and mounting structures, to ensure they can withstand the operational loads. The thermal analysis investigates the heat distribution and dissipation within the cart to prevent overheating of the components and optimize the overall thermal performance. ANSYS Fluent is employed to simulate the airflow and heat transfer mechanisms, enabling the design of effective cooling systems and thermal management strategies. The results of the design and analysis are used to optimize the solar power cart's performance, efficiency, and reliability for in-house applications. The proposed design demonstrates the feasibility of using ANSYS software for the design and analysis of renewable energy systems, providing valuable insights for future research and development in this field.

Key Words:

Hallow shaft, Catia software Ansys19.0

1.INTRODUCTION TO CAD

PC helped design (CAD) is using PC developments (or workstations) to important resource inside the creation, change, appraisal or improvement of a plan. PC helped configuration writing computer programs is used to construct the productivity of the style draftsman, update the most stunning viewpoint setup, improve correspondences through documentation, and to make an informational index for gathering. PC supported plan yield is oftentimes inside the kind of mechanized reports for print, machining, or other creation undertakings. The time spent CDAD (for Computer Aided Design and Drafting) is moreover used. Its usage in arranging progressed systems is suggested as electronic strategy robotization, or ERA.

2. DESIGN OF SHAFT SOLAR CART

It is a model of shaft design fig(2.1) & fig(2.2),it as consider 2.1 as shaft diameter and 2.2 shaft length



Fig2.1 diameter of hallow shaft

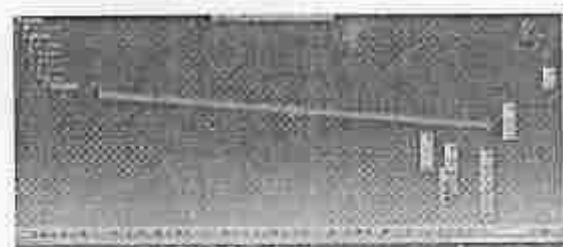


Fig2.2 length of shaft

Thermal Analysis of Different Piston Head Profiles by Using FEM

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Abstract

The objective of this research work is to optimize the stress variations at the top of the piston in real engine conditions. During this pressure analysis on the examined surface of the piston, the thermal behavior is examined. The operating gas pressure, temperature and piston material functions are used as investigation functions. The analyzes carried out showed that the upper part of the piston could be damaged or broken due to the temperature caused by the working conditions, as the replacement of damaged or non-functioning parts is very expensive and usually difficult to obtain. Concave and convex piston profile designed in Solid Work 2023, used to design the piston geometry and for FEM analysis to optimize the thermal behavior of the used ANSYS R23.0 piston. Aluminum alloy and gray cast iron material for piston construction. Stress and displacement are analyzed for the piston by applying pressure to it in the structural analysis. By observing the results of the analysis, we can decide whether the piston we are designing is safe or not under the applied load conditions. Heat flow and thermal temperature distribution are analyzed using piston surface temperatures in thermal analysis.

Keywords: Concave, convex piston, Solid, ANSYS R23.0, Aluminum Alloy, Thermal analysis, FEM.

1. Introduction

Nowadays, automotive components are in high demand due to the increasing use of automobiles. The increase in demand is due to the improved performance and lower cost of these components. R&D and test engineers must develop critical components as quickly as possible to minimize time to market for new products. This requires understanding new technologies and rapidly adopting new product developments. A piston is a component of reciprocating internal combustion engines. The piston converts the energy of the expanding gases into mechanical energy. The piston slides in the cylinder liner or sleeve. Pistons are generally made of aluminum alloys or cast iron. To prevent combustion gases from passing the piston and minimize friction, each piston is surrounded by several metal rings. These rings act as a seal between the piston and the cylinder wall and also reduce friction by minimizing the contact area between the piston and the cylinder wall. The piston design must be rigid enough to prevent mechanical and thermal deformation and must have sufficient bearing surface to prevent excessive wear. The piston was designed with resistance and temperature considerations in mind. The strength of the pin must be sufficient to resist shear fracture. During combustion, the piston undergoes deformation, and the energy stored in it is a crucial factor in the performance and failure conditions of a piston under static load. The production of Von Misses yield stress can be formulated as Von Misses stress or equivalent tensile stress; A scalar stress value can be calculated from the stress tensor.

Thermal Analysis of an Object with Large Surface Area Under Controlled Conditions Regarding Radiative Sky Cooling and with High Emissivity in the 8-13 μm Wavelength Range

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Abstract - Radiative Sky cooling is an eco-friendly method of using the deep sky as a heat sink and transferring heat into space with a specific wavelength of 8-13 μm (atmospheric window), which is ideal for penetrating the atmosphere by avoiding scattering and total internal reflection in it. Because space acts as a sink, any object emitting heat in those wavelengths acts as a source. As a result, no external energy is required to cool the material. Though the average temperature of the outer sky is 3K, the effective sky temperature is affected by atmospheric factors such as humidity, air temperature, sky clearness etc. In this case, the emitter has been precoated with a specific radiative paint that allows high emissivity of the object in target wavelengths. The effectiveness of surface geometry on this radiative heat transfer is studied in various temperatures and humidity conditions under clear sky also conductive and convective modes of heat transfer and dust in the air are neglected. The view factor is considered along with the surface roughness for comparison. The results of simulation of a corrugated sheet with high reliable high surface area is compared with published results of an experimental model. The surface emissivity is maintained same as that of the experimental model. The behaviour of the both models at different conditions are noted and correlated.

Keywords: Radiative Sky Cooling, Atmospheric Window, Specific Emissivity, Ziblod condensers, Dew harvesting, Nocturnal cooling, space cooling, Spectral emission, Total Heat Flux

1. INTRODUCTION

The increasing demand for thermal comfort is causing more and more greenhouse emissions. To overcome that scientists are discovering new possibilities for space cooling. Jiri Siman et al. (2013) established that one of these techniques is cooling based on radiation into outer space, which is basically heat loss by long wave infrared radiation emission towards the sky [1]. Bartoli et al. (1977) found that the radiative sky cooling cells are the objects which emit infrared radiation within the bandwidth of 8-13 μm which cannot be reflected by air and escapes the earth's atmosphere [2]. When this object is isolated from all other heat sources around it, it will continuously cool down below ambient temperatures and can be used effectively in the space cooling applications as a passive cooling system.

As this technology doesn't have any coolants which cause ozone depletion or have compressors which consume large amount of electricity, it can be used as a greener

alternative for space cooling units. In general, this effect is highly pronounced in dry environments like deserts. Because the humidity and dust in the air, cloudiness plays a significant role in the sky cooling. Under isolation, a flat disc is replaced with a corrugated disc of higher surface area to verify if there is any improvement in the performance with respect to surface area. The consideration of the temperature of the surface of the specimen is treated as constant for the following analysis.

2. Methodology

The primary objective is to verify the relevance of the surface area and projected area of the radiative cooling cells in different environmental conditions. This is a surrogate model related to the established "Czech Model" which is used to test the radiative cooling cell performance in Czech Republic by Ondrej Sikula et al. (2015) [3]. The system has also used the novel approach by Bilcom Bhatia et al. (2018) as they have isolated the cooling cells made from polished aluminum sheet from convective wind currents and also used a reflective shield to eliminate the radiation input from the Sun. The radiative cooling system is insulated from all sides by polystyrene except the top and it is covered with a polyethylene sheet in order to prevent incoming diffuse radiation from sky and allow the emitted radiation from the object into the sky [4].

Raman AP et al. (2014) experimentally found that the performance of spectral emission can be achieved by coating a 1D stack of hafnia and silica, consisting of seven bilayers, was shown to be sufficient to achieve cooling below ambient temperatures in experiment [5].

The main parameters used to evaluate the performance of these cooling cells are the ambient temperature and the sky temperature. Even though the sky is not a solid object, considering the atmospheric plane as a solid plane reduces many computational complexities and we can even neglect the effect of the gases in the atmosphere. The Sky temperature is highly affected by the dust particles in the air, the cloud type, the effective area they cover, the local relative humidity and dew point temperature. It is complex to exactly calculate the sky temperature, so Pramod V Mulik et al. (2019) approximated it as follows,

$$T_{sky} = T_{air} * (\epsilon_{clear sky})^{0.25} \dots\dots\dots (1)$$

$$\epsilon_{clear sky} = 0.711 + 0.56(T_{dp}/100) + 0.73(T_{dp}/100)^2 \dots\dots\dots (2)$$

Here T_{sky} = the effective temperature of the sky (K)

Design and Fabrication of Solar Refrigerator by using Peltier Module

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Abstract - In present days we are using high electricity consuming refrigerators, which are also produce CFC pollutant (Chlorofluoro carbon gas) into the atmosphere by usage of different refrigerants in refrigerators, which type of pollutant is most effect the environment and humans health by increasing global warming. So we are find the solutions to the global warming problem, by coming up with a solutions to eliminate the emission of CFC's. Our project is to design and fabrication of portable solar Refrigerator by using pelier module, which eliminates the emission of CFC's by neglecting the refrigerants, is very ecofriendly and also cheaper when compared to the present day Refrigerators. The fabrication of a portable refrigerator works on solar energy and thermoelectric effect. This portable solar powered refrigerator can be used in deserts, rural areas where electricity is not available throughout the day, and also be used in medical applications like prevention of medicines, injections. This is also arranged with a charging device which can be used for lighting and to charge electronic devices like mobile phones.

1. INTRODUCTION

Refrigeration is a process of removing heat from a low temperature reservoir and transferring it to a high-temperature reservoir. The work of heat transfer is traditionally driven by mechanical means, but can also be driven by heat, magnetism, electricity, laser, or conditioning. Refrigeration has had a large impact on industry, lifestyle, agriculture, and settlement patterns. The idea of preserving food dates back to at least the ancient Roman & Chinese empires. This has resulted in new food sources available to entire populations, which has had a large impact on the nutrition of society. Electricity generation is the leading cause of industrial air pollution in the country. Most of our electricity comes from coal, nuclear, and other non renewable power plants. Producing energy from these resources takes as every to all on our environment. Polluting our air, land. Renewable energy sources can be used to produce electricity with fewer environmental impacts. It is possible to make electricity from renewable energy sources without producing CO₂. This refrigerator will be suitable for cooling purposes meant for small objects and will have a relatively small chilling time as compared to the normal to the refrigeration systems, also for the backup. This refrigerator will be attached to a dynamo based charging system which will maintain the smooth operation of refrigerator in case of non availability of solar power. In most of the rural areas of our country, the

electric supply is either sporadically available or not available at all. The most severe effect of this problem is on the Primary Health Care Centres. Due to no electricity, most of the PHC's do not maintain adequate supply of medicines and equipment which need to be kept in a cold environment. So in case of any emergency, the patient is to be referred either to the town or city hospital which results in loss of precious time and may prove fatal for the patient. Due to the difficulty in disposal of Chlorofluoro carbon (CFCs) and Hydro Chlorofluoro carbons (HCFCs), conventional sources are being used so as to decrease the environmental degradation. The temperature difference is developed between the two junctions of the thermocouple due to which one side of the peltier becomes cold and other hot. In refrigerator space, cool side of the thermocouple model is used whereas hot side is used for the rejection of heat to atmosphere with the help of heat sink. The size of the peltier varies from very small to very large size according to the requirement and application.

2. Body of Paper

The circuit of the refrigerator is made quite simple and convenient so that in case of any fault, it can be easily dissembled and can be repaired without any major changes to the design. The peltier unit are connected to the 12 volt DC supply. The cooling fans mounted on the heat sink are connected with the power supply of 12 DC volts.

A switch is placed in the incoming positive dc supply and an LED along with a 1 K Ω -ohm resistance is placed after the switch in parallel with the supply. The circuit diagram of the circuitry of the refrigerator is as shown in the following figure.



OPTIMIZATION OF FSW FOR 7050 AL ALLOY WITH TAGUCHI METHOD

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Abstract: Friction stir welding was invented by the Welding Institute, UK in 1991. It is a solid state joining process. The base metals are not melted and there is no requirement of filler metal. The plates are heated by frictional force and brought to plastic condition at the interface. The plasticized metal is then interspersed in the welding region from both sides of the base plate.

The purpose of the present work is to optimize process parameters of friction stir welding of aluminium alloy 7050 using Taguchi's approach. It is known that aluminium is found abundantly on earth and it has many applications. Aluminium and its alloys are used in many aspects of life, for example, duralumin is used in making aircrafts and kitchen appliances, Nickel alloy is used in aerospace manufacturing. The main parameters taken into consideration in this work are Tool Rotational Speed, Welding Traverse Speed and Tool Tilt Angle. Brinell hardness and Tensile strength of the joints are taken as response variables. The range of tool rotational speed, welding traverse speed and tilt angle are 1000 rpm to 2000 rpm, 16 mm/min to 33 mm/min and 0° to 2° respectively. The optimum values of tool rotational speed, welding traverse speed and tool tilt angle for tensile test are 1400 rpm, 25 mm/min and 2° respectively and for hardness test same are given as 2000 rpm, 25 mm/min and 1° respectively. The significance of process parameters has been decided by the ANOVA (Analysis of Variance). After analysis it has been observed that tool rotational speed is the most significant parameter for tensile strength and tool tilt angle for hardness.

Keywords: Friction stir welding, AA 7050, Taguchi Method, Tensile test and Hardness test.

1. INTRODUCTION

Friction stir welding was invented by the Welding Institute, UK in 1991. It is a solid state joining process. The base metals are not melted and there is no requirement of filler metal. The plates are heated by frictional force and brought to plastic condition at the interface. The plasticized metal is then interspersed in the welding region from both sides of the base plate.

The tool is made of hardened steel. It consists of a 'pin', a 'shoulder' and shank. The tool is held in a collet and placed in a spindle which rotates the tool at a high speed, as required. The tool is plunged into the base plate interface or the welding line. The pin is completely pushed into the metal such that the shoulder is a little bit sunk into the plate. The shoulder rubs against the plates causing frictional force which heats up the plate. The plate metal is then plasticized and the rotational action of the tool 'stirs' the metal pushing the metals one side from the other. The tool is then traversed along the weld line as shown in figure 1.1. The metal cools and solidifies as the tool moves ahead.



DESIGN AND ANALYSIS OF SINGLE STAGE AND DOUBLE STAGE SAVINOUS VERTICAL AXIS WIND TURBINE

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Abstract

The development of wind energy utilization in urban areas has garnered increasing attention from both industry stakeholders and local governments seeking alternatives to conventional, non-renewable electricity generation methods. Wind turbines, devices that convert wind kinetic energy into mechanical power, offer promise in this regard. Specifically, the Savonius vertical axis wind turbine represents one such innovation, featuring a rotor shaft positioned vertically to capture wind from all directions. This work aims to model and design such turbines for small-scale energy applications, exploring their performance across various wind speeds. Through the construction and examination of single-stage and double-stage turbines, factors such as wind velocity, pressure, temperature, and air viscosity will be analyzed. The experimental setup comprises DEPRON-made turbinaes mounted on a frame, facilitating tests within a controlled environment to assess turbine performance and coefficient of performance under artificial wind conditions.

Introduction

Harnessing wind energy dates back millennia, with early civilizations utilizing it for various tasks. From propelling boats along the Nile River in 5000 B.C. to grinding grain in Persia, the Middle East, and India by 200 B.C., wind power showcased its versatility. The concept of windmills spread across continents, with windmills becoming integral to food production in the Middle East by the 11th century and later making significant strides in Europe, particularly in the Netherlands, where windmills were adapted for draining lakes and marshes. Wind energy's journey continued as settlers brought the technology to the New World, where windmills were used for tasks like pumping water for farms and ranches and, eventually, generating electricity for homes and industries.

The modern era of wind energy saw significant advancements and challenges. While wind turbines provided electricity as early as World War II in Vermont, the technology faced setbacks in the 1950s due to cheap oil. Renewed interest emerged in the 1970s amid oil shortages, leading to collaborations between the U.S. government and the industry to advance wind turbine technology. Experimental turbines, supported by NASA and later the U.S. Department of Energy, laid the groundwork for today's multi-megawatt turbine technologies. Despite economic challenges in the 1980s, California's wind energy sector thrived due to tax incentives, marking a pivotal period for utility-scale wind power.

While global wind energy growth slowed after the 1980s, Europe continued to embrace it, driven by environmental concerns. Today, wind power spans a broad spectrum, from small-scale turbines serving isolated residences to massive offshore wind farms contributing gigawatts of electricity to national grids. The journey of wind energy reflects humanity's enduring quest for

sustainable and renewable energy sources, with ongoing advancements poised to shape its future role in the global energy landscape.

Literature review

India, with its vast expanse and population exceeding 1.2 billion, encompasses 29 states and 7 union territories, ranking as the seventh-largest nation globally, covering a land area of 3,287,263 square kilometers. Despite its significant economic growth, averaging 7% over the past decade, India faces the daunting task of providing ample and affordable energy to its populace. Contributing 2.4% to global energy production and ranking eleventh worldwide in energy production, the nation encounters a range of energy-related challenges and opportunities.

A. A. Kadam and colleagues [5] conducted a study on Savonius wind rotors, focusing on enhancing efficiency through computational fluid dynamics (CFD) analysis using Fluent 6.3.26 software. Their research explored various overlap conditions, revealing maximum power extraction at a 16.2% overlap condition. Mohammed Hadi Al [6] performed experimental comparisons between two and three-bladed Savonius wind turbines, showcasing the superiority of two-bladed rotors, particularly at a tip-speed ratio (TSR) of 1, under low wind-speed conditions. Similarly, K.K. Sharma and colleagues [7] analyzed the performance of a three-bladed Savonius rotor through CFD analysis, examining different overlap ratios' effects on rotor performance.

Sukanta Roy and collaborators [8] investigated the impact of overlap ratios on a two-bladed vertical axis wind turbine (VAWT) using CFD with Fluent 6.3, identifying optimal conditions for consistent torque variation and higher mean static torque coefficient.

B. Wahyudi and colleagues [9] explored the efficiency of Savonius hydrokinetic turbines, particularly Tandem Blade Savonius (TBS) rotors, revealing the superior performance of convergence TBS.

Lastly, Sampun Chaitap and team [10] studied the effects of operating conditions, specifically tip speed ratio, on Curved Blades Vertical Axis Wind Turbines (CB-VAWT) performance through wind tunnel experiments with laboratory-scale models.

N.H. Mahmoud and colleagues [11] conducted experimental analysis in a wind tunnel setup, comparing the efficiency of two-bladed Savonius rotors with three and four-bladed configurations. Their study concluded that two-bladed rotors, particularly when equipped with end plates and optimal overlap ratios, exhibited superior efficiency.

Bhaskar Jyoti Choudhury and collaborators [12] delved into the flow characteristics of a two-bladed Savonius rotor through 2-dimensional and 3-dimensional analyses using CFD ANSYS Fluent software. Their investigation focused on variations in drag and torque coefficients for different rotor blade angles, along with analyzing static pressure, velocity, vorticity, and turbulent kinetic energy using 2-dimensional analysis.



DESIGN AND CONSTRUCTION OF A PORTABLE SOLAR WATER HEATER

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Abstract – Solar thermal water heaters are an old technology used a century ago in California. They are now used extensively, in updated form, in many countries. According to government and industry estimates, well-functioning solar water heaters can theoretically displace 50 to 80 percent of the output of a natural gas-fueled household water heater, depending how hot water

Key Words: Solar thermal water heating, renewable energy, domestic hot water, residential natural gas use, sociotechnical energy analysis, energy futures

1. INTRODUCTION

The world relies heavily on fossil fuels for most of its

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usage aligns with production and storage capacities. In so doing, they offer tremendous potential for reducing greenhouse gas emissions, fuel consumption, and energy bills. Such performance holds promise for California given its climate change and energy efficiency policy goals, since 40 percent of the natural gas used in California households is used to produce hot water. However, absent programs, only a specialty market for solar water heaters has developed. To encourage wider deployment, the California Solar Initiative—Thermal program offers financial incentives for systems qualifying under a carefully crafted set of specifications. The program has had some limited success since its inception in 2010.

Within that context, this research assessed the performance and potential future use of natural gas-displacing solar water heaters in single-family homes in California, attending to a wide range of sociotechnical considerations. This project documented high diversity in user satisfaction and perceived system performance, and a qualified decrease in project costs to below \$5,000 per installation. Solar water heating is a technology in progress, not universally suitable but instead appealing to varied niches shaped by household sensibilities, abilities, and hot water use levels. Thus, recent evolution provides a counterpoint to the pessimism, even as serious difficulties remain. The suitability of solar water heating for California households is not purely a matter of cost effectiveness within a typical energy efficiency framework, but also of evolving performance, perceptions, and values in light of ongoing and aspirational energy and social transitions ahead.

energy demands, and this has caused a lot of harm to the Earth. The increase of green-house gas levels in the atmosphere is largely due to the combustion of fossil fuels as a source of energy. This has caused global warming which has led to climate change, floods, forest fires, rising sea levels and the melting of glaciers. These are just some consequences of the over-reliance on fossil fuels for our energy demands. Solar energy provides an alternative and environmentally friendly energy source to the fossil fuels used for our energy needs. Over the last few decades, solar energy systems have gained more recognition because they can provide energy at a low long-term cost and minimal environmental damage. Researchers have developed several techniques for harnessing solar energy, these techniques include applications for space heating, water heating, electricity generation and many others. Solar energy is generated by the fusion reaction of hydrogen atoms in the sun. This fusion reaction results in the release of high-energy particles called gamma rays. Gamma rays are transmitted as electromagnetic radiation to the Earth, which is at about 150 million kilometres from the sun. Electromagnetic radiation comes in three forms: infrared rays, visible light, and ultraviolet rays. Solar energy reaching the Earth's surface can be harnessed directly by using photovoltaics (solar cells) and solar concentrators. Photovoltaics are used for electricity generation, while solar concentrators are used as a source of thermal energy. The utilization of solar energy collectors (concentrators) to transform radiation into heat energy is the basis of the solar water heating technology. A simple solar water heater consists of a collector, a tank, and the flow channel through which the working fluid is transported. Records show the solar water heater (SWH) was first invented in the Roman empire around 200 B.C.E (Geeg & Sumathy, 2016). The Romans had a simple system, they used the solar heating concept to heat their



DESIGN AND DEVELOPMENT OF ARDUINO-BASED CONTROL OF A PORTABLE SOLAR WATER PUMP AT 50 LITRES

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Abstract

Solar power pumps are currently very popular because they do not require large land and land, the use of solar power as a driving force for DC (Direct Current) water pumps is designed using several tools including: photovoltaic 10 Wp type poly crystalline, solar charge controller, 12V 5Ah battery, Arduino UNO, DHT16 temperature sensor and 12V DC water pump. In this study, the author will make a solar pump motor drive (Solar Panel) and regulate the circulation of air volume and temperature in the hydroponic plant.

Keywords: Solar Panels, DC Water Pumps, system design, water storage tank, water distribution network, environmental impact.

Introduction

The project "automatic water level control with an automatic pump control system" is design to monitor the level of liquid in the tank. The system has an automatic pumping system attached to it so as to refill the tank once the liquid gets to the lower threshold, while offing the pump once the liquid gets to the higher threshold. Sustainability of available water resource in many regions of the world is now a dominant issue. This problem is quickly related to poor water allocation, inefficient use, and lack of adequate and integrated water management. Water is commonly used for agriculture, industry, and domestic consumption. Therefore, efficient use and water monitoring is potential candidate for home or office water management system. Moreover, the common method of level control for home appliance is simply to start the food pump at a low level and allow it to run until a higher water level is reached in the water tank. This water level control, controls monitor and maintain the water level in the overhead tank and ensures the continuous flow of water round the clock without the stress of going to switch the pump ON or OFF thereby saving time, energy, water, and prevent the pump from overworking. Besides this, liquid level control systems are widely used for monitoring of liquid levels in reservoirs, sites. Proper monitoring is needed to ensure water sustainability is actually being reached with disturbance linked to sensing and automation, such programmatic approach entails microcontroller based automated water level sensing and controlling or using 555 timer IC.

AIMS AND OBJECTIVES The goal or objectives of which the designed device is expected to accomplish is to build an automatic water level control with automatic control system. In this project sensors are place at different level of the tank and with the aid of this sensors, the micro-controller monitors the level of the liquid at any particular point in time, areas of the objectives are to design an automatic water monitoring system to an interactive incorporate medium between the end user and the machine to prevent over labor of the pumping machine and prevent it from getting had to avoid wastage of water.

Automatic water level monitor came into existence because of human error and inconsistency that is associated with manually operated water pumping machine. This is because it takes time for individual who is manually operating the water pump to turn off the pumping machine and this may cause water spillage and at times the individual might not know that the water level has drop so low until the tank is completely empty. This was the problem that leads to the development of the idea of an automatic water level control and automatic pump shut down.

This project was design to automatically control the pump which ensures constant reserve of water in the reservoir. The scope of the design was kept concise and simple to in other not to introduce unnecessary complexities and reader is generally uncomfortable. The system does not have attached complex peripheral device which though impossible for the detail printable information has been excluded for reasons of affordability material of low range and less accurate performances as opposed to a well-built automatic water pump was used to achieve this aim, the automatic water level controller detects and control the water in the tank.

Literature Review

An automatic water level control detects the water level in the tank and also ensures continuous water flow round the clock because of its automatic, this automatic water control is made up of microcontroller written in C programming language this program is burn into an IC called AT89C52 with 40 pins. The level measurement consists of determining the distance from the upper surface of a liquid in a reservoir or vessel or any arbitrarily chosen mark located above or below this surface by itself the level is not an independent physical quantity describing the state of a substance through direct and indirect level, some examples of direct level measurement are dipstick, the bubbler, immersion electrode, capacitor type, liquid level radiation type liquid level measurement.

For instance, the dipstick, it is very simple, the stick being dipped periodically through a hole and the hole and the immersion mark is being read off with the aid of the calibration on the stick. Then, the direct level measurement are sight glass, depending on the manometer principle, the manometric tube is place in a convenient and its being connected to the lower part of tank and guarded for safety reasons, the top the bright glass is vented into the tank and the sight has isolation valve top and bottom while the micro base, water level controller has the ability to switch on the pumping machine when the water in the tank has gone below gauge level automatically switches the OFF the pumping machine when the water in the tank has reach its maximum level. Electronics circuit has undergone tremendous changes since the invention of a triode by L.E. DE FOREST in 1907. In those days, the active component, like resistors, inductors and capacitors etc. of the circuit were separated and distinct units connected by soldered lead with the invention of a transistor in 1954 by W. H. Brattain and

Fabrication of Manually Operated Electro Magnetic Abrasive Finishing

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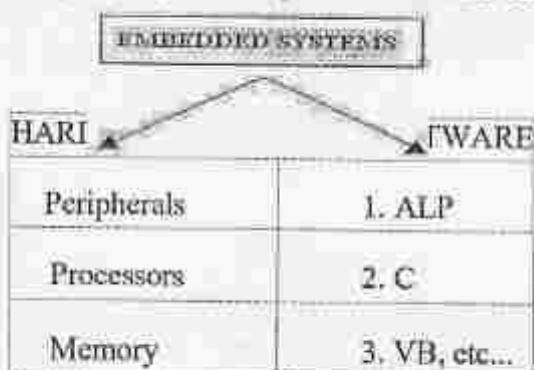
Abstract – The aim of our project is to obtain precision finishing of rough surfaces which are required to the work by addition of joystick to adjust the magnetic field on to the required surface. The magnetic field can be relocated at any point by the use of joystick by the use of arduino uno board. Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs.

The results demonstrate the viability of the manually operated (EMAF) setup in achieving desired surface finishes across a range of materials, including metals and composites. It is designed to offer flexibility and ease of use, allowing operators to adjust parameters such as magnetic field intensity, abrasive particle size, and feed rate. Through a series of experiments and analysis, the efficiency of the fabricated system is evaluated in terms of surface roughness, material removal rate, and surface integrity.

Key Words: Precision finishing, Magnetic force, Surface quality, Polishing, Manual operation.

1. INTRODUCTION

Embedded is a combination of computer hardware and software, and perhaps additional mechanical or other parts, designed to perform a dedicated function. Most of the controlling systems, today, are embedded systems. The complexity of the systems may differ from to the other,



Using a specialised machining technique called electro magnetic abrasive finishing (EMAF), metallic workpieces can have high-quality surface finishes. EMAF removes material from the workpiece surface using abrasive particles and an electromagnetic field, producing a smoother and more uniform finish.

For items in a variety of applications, including aerospace equipment, medical devices, semiconductors, vehicles, tools, and dies, among others, a high-quality surface with a low value of surface roughness and high dimensional accuracy is needed. The production of components with complicated shapes for various applications requires the use of sophisticated materials, such as alloys of hard materials, glass, ceramics, and composite materials. These materials are challenging to finish because of their extreme hardness and toughness, as well as the goods' intricate shapes. The finishing process is the last step in the manufacture of components, and it accounts for around 15% of the overall production expense. Abrasive finishing is a method for precision surface finishing that shows promise. In order to complete the intricate shapes shows promise.

2. SYSTEM DESIGN:

A workpiece holder, an abrasive suspension tank, and an electromagnetic field generator make up the EMAF machine. The holder, which is then immersed in the abrasive suspension, is filled with the workpiece. The workpiece's surface is traversed by the abrasive particles in a controlled manner as a result of the generator's powerful magnetic field, which removes material and provides the appropriate surface finish. Depending on the particular application, the abrasive particles employed in EMAF can either be free or bound to a carrier material. The intensity of the abrasion can be changed by varying the magnetic field, giving the surface finish gained precise control.

Operating mode for Robot is through Bluetooth commands by using android software. We store few feedback commands in the controller which can be used for controlling the robot whenever input is provided from the android software. In this joystick mode, buttons will be present for the movement of the robot in all four directions. It helps in easy operation for those who can operate the same using hand.

Experimental Investigation and Analysis of Mechanical Properties of Chopped Strand Mat-E Glass Fiber Polyester Resin & Graphite Powder Composites

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5.K.Naresh, 6.A.Narendra Kumar Kumar.

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Abstract - Composite materials play a vital role in many industrial applications. Researchers are working on fabrication of new composite materials worldwide to enhance the applicability of these materials. In view of this the mechanical performance of the composite material is essential. The objective of the present work is to analyze the effect of graphite powders content on the mechanical behavior of woven E-glass 350gm-Glass fiber reinforced. Five different types of composites are fabricated using 0%,2%,4%,6%,8%wt of graphite powders with woven-E glass fiber and polyester resin. The polyester resin, catalyst and accelerator are mixed in 50:1:1 weight ratio in polyester matrix graphite. The aim of the project is to investigate the effect of graphite powders with woven e-glass 350gm for making the composite material stronger and tougher. The investigation is carried out by mixing different weight percentages of the graphite powders with the polyester resin and preparing individual samples. After woven-glass preparation, the materials were properly mixed using the hand-lay techniques and different specimens were prepared with different compositions of the graphite powders. After all the samples were prepared, mechanical tests were carried out on the samples to ascertain the changes observed due to the composition of graphite powders. The obtained results of various samples specimens were compared and graphically charted to characterize the new composites material.

Keywords: MattE-Glass 350gm; Polyester resin; Graphite powders; Hand- Lay technique ; Catalyst & Accelerator.

1.INTRODUCTION

A composite is a structural material that consists of two or more combined constituents that are combined at a macroscopic level and are not soluble in each other. One constituent is called the reinforcing phase and the one in which it is embedded is called the matrix. The reinforcing phase material may be in the form of fibers, particles, or flakes. The matrix phase materials are generally continuous. Examples of composite systems include concrete reinforced with steel and epoxy reinforced with graphite fibers, etc.

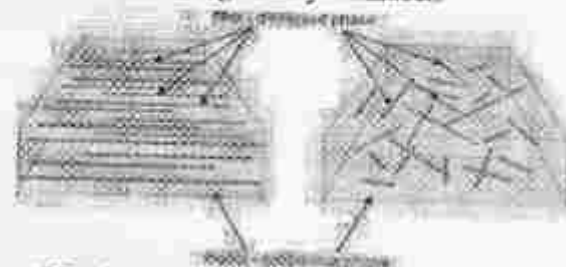
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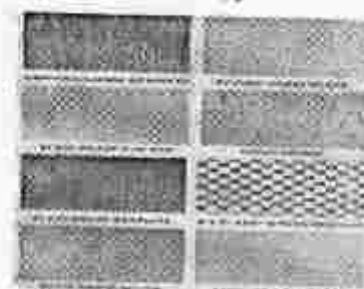
Classification of composite materials based on geometry and based on matrix.

1.1. Constituents in composites:

One constituent in composite is called the reinforcing phase and the one in which it is embedded is called the matrix. The reinforcing phase material may be in the form of fibers, particles, or flakes. The matrix phase materials are generally continuous.



Matrix phase: The primary phase, having a continuous character, is called matrix. Matrix is usually more ductile and less hard phase. It holds the dispersed phase and shares a load with it. **Dispersed (reinforcing) phase:** The second phase (or phases) is embedded in the matrix in a discontinuous form. This secondary phase is called dispersed phase. Dispersed phase is usually stronger than the matrix, therefore it is sometimes called reinforcing phase.



Different Types of Mats

Fabrication of Electric Tricycle

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Abstract - The goal of the Electric Tricycle Project is to bring increased mobility to disabled persons in Burkina Faso, West Africa. Presently, hand-powered tricycles are used by many of the disabled in this community, but some current users of the hand-powered tricycles do not have the physical strength or coordination to propel themselves on the tricycle with their arms and hands. The aim of this project is to add an electric power train and control system to the current hand-powered tricycle to provide tricycle users with improved levels of mobility, facilitating freedom in travel and contribution to the community. The design objectives required a simple and affordable design for the power train and controls, a design that needed to be reliable, sustainable, and functional. In response to the request from an SIM missionary at the Handicap Center in Mahadaga, Burkina Faso, Dokimoi Ergatai (DE) committed to designing and supplying a kit to add electric motor power to the current tricycle design, and we, David Sandberg, Tolulope Ogundipe, and Daniel Dourte partnered with DE in their commitment. Our project was advised by Dr. Donald Pratt and Mr. John Meyer.

Key Words: Burkina Faso, Electric Tricycle, Handicap Center, Mahadaga, David Sandberg, Tolulope Ogundipe.

1. INTRODUCTION

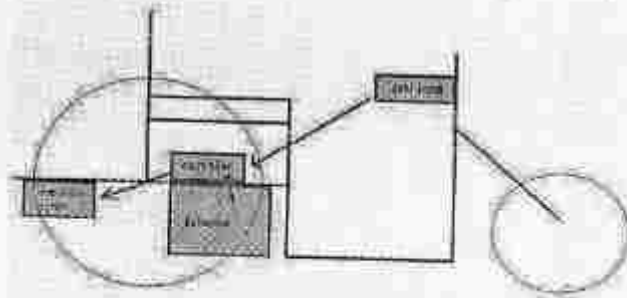
Hand-powered tricycles are presently being used to provide mobility for disabled persons in a rural community in Mahadaga, Burkina Faso. Below is a photograph of a boy in Mahadaga on his hand-powered tricycle. The map on the right shows the location of Burkina Faso (in green). With this project we designed and manufactured a system to convert the hand-powered tricycle to an electric motor powered version. We essentially created an affordable, rugged electric wheelchair for use in a developing country. We have worked to make our design appropriate to the culture where it will be used. This meant designing for the use of locally available parts and manufacturing capabilities. The result is a system that can be almost entirely replicated, with the exception of the motor and motor controller, with familiar parts, tools, and processes. Using the hand-powered tricycle as the basis for our design made the Electric Tricycle more of an appropriate technology because it uses a familiar, locally available platform as a starting point. In Mahadaga there are currently four potential users of the Electric Tricycle. Disease or old age has left these members of the community dependent on others for their mobility. Though they own hand-powered tricycles, they are being used like conventional wheelchairs with the motive force coming from a person pushing from behind. Our first user is

named Yempabou. He is a 12 year old boy from Burkina Faso who has cerebral palsy. Yempabou is pictured below



2. Body of Paper

The design of the Electric Tricycle is adaptable to the current hand-powered tricycles with little modification. The design consists of an electric motor, a drive system, motor and steering controls, and a power supply. See picture below for schematic design as shown in the form of figure and pointed



An electric motor was chosen because high fuel costs prohibited the use of a combustion engine and because of the availability of electricity in Mahadaga. A solar array that provides electricity for the Handicap Center provides the ideal source of electricity for battery recharging. The first aspect of our design that was addressed was the drive system or means of power transmission. Power must be transmitted from the electric motor to a rear wheel of the tricycle. Second, a method of motor control was decided on. The controls for motor speed and braking were incorporated into a simple mechanical joystick to facilitate operation by users with limited dexterity. The hand-power system was replaced with a steering system that disables

SIMULATION ANALYSIS OF SHELL AND TUBE HEAT EXCHANGER USING DIFFERENT FLUIDS

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Abstract - There are many models to characterize the behavior of the heat exchangers encountered in many industries. There are several correlations available, so that the heat transferred and the thermal stresses can be evaluated. Shell and Tube heat exchangers are having special importance in boilers, oil coolers, condensers, and pre-heaters. They are also widely used in process applications as well as the refrigeration and air conditioning industry. The robustness and medium weighted shape of Shell and Tube heat exchangers make them well suited for high pressure operations.

The present work deals with the design and analysis of water-cooled shell and tube condenser and we have shown how to done the thermal analysis by using theoretical formula, for this we have chosen an industrial problem of 8 ton capacity of counter flow shell and tube heat exchanger of water type. The condenser is designed using theoretical procedures. The condenser is modeled by using the dimensions obtained from the design procedures. Then thermal analysis is carried out in SOLIDWORK flow simulation. The results obtained through the analysis are discussed in detail and compared with analytic values.

Key Words: Heat exchanger, Perforated rings, Reynolds number, Overall heat transfer coefficient.

1. INTRODUCTION

Heat Transfer Mechanisms:

Water-cooled shell & tube condenser is an important component of the refrigeration and air-conditioning systems. The condenser removes the heat from refrigerant carried from evaporator and added by compressor and convert the vapor into liquid refrigerant. It is a heat exchanger in which heat transfer takes place from high temperature vapor refrigerant to low temperature water, which is used as cooling medium. These condensers are always preferred where adequate supply of clean and inexpensive means of water disposal are available.

Shell & tube condensers are those in which heat transfer occurs between two fluid streams, which do not mix or physically contact each other. The fluids so involved are separated from one another by a tube as well as wall, which may be involved in the heat transfer path. Heat transfer will thus occur by convection from the hot fluid surface, by conduction through the solid and again by convection from the solid surface to the cooler fluid.

Conduction:

Conduction is the transfer of energy from the more energetic particles of a substance to the adjacent less energetic ones as a result of interactions between the particles. Conduction can take place in solids, liquids, or gases. In gases and liquids, conduction is due to the collisions and diffusion of the molecules during their random motion. In solids, it is due to the combination of vibrations of the molecules in a lattice and the energy transport by free electrons. A cold canned drink in a warm room, for example, eventually warms up to the room temperature as a result of heat transfer from the room to the drink through the aluminum can by conduction.

CALORIMETER DESCRIPTION

The secondary system calorimeter has the useful compressor capacity measurement range of 1750 Watt (6000 Btuh) to 7320 Watts (25000 Btuh). The calorimeter is capable of conducting various tests for the air-conditioning and heat pump compressors.

General arrangement of the equipment is as follows:

a) The insulated Compressor Chamber and the Insulated Secondary Pot Chamber are mounted side by side. Each chamber has the Heating-Cooling Arrangement mounted at the bottom. The arrangement consists of a Centrifugal Blower, a Cooling Coil and Heaters.

b) The Insulated Secondary Evaporator Pot is located inside the pot chamber.

c) The Insulated Return Gas Control pot is located on the backside of the.

Heat transfer coefficient:

The heat transfer coefficient or film coefficient, or film coeffectiveness in thermodynamics and in mechanics is the proportionality constant between the heat flux and the thermodynamic driving force for the flow of heat (i.e., the temperature difference, T):

The overall heat transfer rate for combined modes is usually expressed in terms of an overall conductance or heat transfer coefficient, U . In that case, the heat transfer rate is:

DESIGN AND DEVELOPMENT OF HYBRID POWER GENERATION BY SOLAR AND WIND ENERGY

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Abstract - This in our study, we delved into designing an optimal model for a hybrid solar-wind energy plant, meticulously considering various design parameters such as the number of photovoltaic modules, wind turbine height, number of turbines, and rotor diameter. Our aim was to minimize costs while ensuring consistent energy production. Our findings unequivocally revealed a distinct complementary relationship: during summer months, solar arrays predominantly met energy demands due to abundant solar radiation and minimal wind energy, whereas in winter, with higher wind speeds and reduced solar radiation, wind turbines became the primary energy suppliers. This study highlights the significant potential of leveraging synergies between solar and wind energy in an optimized hybrid system, ensuring reliable energy production year-round. Moreover, our project focused on exploring the feasibility of installing roof-mounted vertical wind turbines of various types, including those with shrouded blades, to enhance turbine efficiency. One notable advantage of vertical axis wind turbines is their ground-level installation, facilitating easy maintenance. Additionally, their omni-directional nature eliminates the need for precise alignment with the wind direction to generate power. Our main objective revolves around designing a self-starting vertical axis wind turbine using CATIA V5, aiming to contribute to the advancement of sustainable energy solutions.

Key Words: Renewable energy source, vertical axis wind mill, power generation, catia v5

1. INTRODUCTION

This document shows the suggested format and appearance of a manuscript. The difficulty and expense of getting fuel to remote areas of the country to use as a source of energy and the threat of expanding pollution of air have forced many countries to switch to alternative energy sources, to meet their needs. It is only now after twenty years of cheap fuel that the true cost of energy is really being felt. By far our biggest source of primary energy has been fossil fuels burned in homes, factories and in power stations to produce heat and electricity. Not only have hydrocarbons provided us with power, they have also given us liquid fuel for transport and have been used to produce the many types of plastics we use in our daily life. Energy has been and will still be the main stay of any economy. There are many different types of energy. Potential energy is the energy available because of the position between particles, for example, water stored in a dam, the energy in a coiled spring, and energy stored in molecules (gasoline). Kinetic energy is energy available in the

motion of particles wind energy is one example of this. There are many examples of energy: mechanical, electrical, thermal, chemical, magnetic, nuclear, biological, tidal, geothermal, and so on. A renewable energy revolution is our hope for a sustainable future. Clearly, the future belongs to clean energy sources and to those who prepare for it now. Solar and wind energy often provide least-cost options for economic and community development in rural regions around the globe, while supplying electricity, creating local jobs, and promoting economic development with clean energy resources. The future will be a mix of energy technologies, with renewable sources such as solar, wind, and biomass playing an increasingly important role in the new global energy economy.

Aerodynamically, they are drag-type devices, consisting of two or three scoops. The differential drag causes the Savonius turbine to spin. Some designs have long helical scoops, to give smooth torque. Much of the swept area of a Savonius rotor is near the ground, making the overall energy extraction less effective due to lower wind speed at lower heights. The most ubiquitous application of the Savonius wind turbine is the ventilator which is commonly seen on the roofs of vans and buses and is used as a cooling device. Ipt prepared for SPIE journals. Accepted papers will be professionally typeset. This template is intended to be a tool to improve manuscript clarity for the reviewers. The final layout of the typeset paper will not match this template layout.

2. Body of Paper

The main objective of the project is to design and fabricate a small scale vertical axis wind turbine.

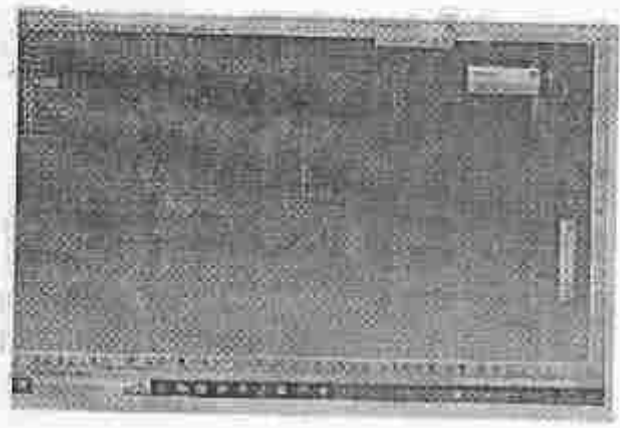


Fig -1

The above figure represents the design of the vertical axis wind mill by using the catia v5.

Experimental Investigation and Analysis of Mechanical Properties of Chopped Strand Mat-E Glass Fiber Polyester Resin & Silica Powder Composites

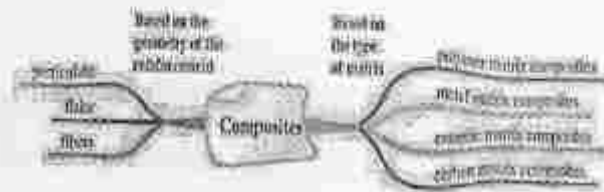
K. Jaswanth¹, K. Dhanunjaya², M. Jai Shiva Narayana³, B. Venkata Narsimha Karthik⁴,
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Classification:

Abstract - Composite materials play a vital role in many industrial applications. Researchers are working on fabrication of new composite materials worldwide to enhance the applicability of these materials. In view of this the mechanical performance of the composite material is essential. The objective of the present work is to analyze the effect of Silica powders content on the mechanical behavior of woolen E-glass 350gm-Glass fiber reinforced. Five different types of composites are fabricated using 0%,2%,4%,6%,8%wt of Silica powders with woolen-E glass fiber and polyester resin. The polyester resin, catalyst and accelerator are mixed in 50:1:1 weight ratio in polyester matrix Silica. The aim of the project is to investigate the effect of Silica powders with woolen e-glass 350gm for making the composite material stronger and tougher. The investigation is carried out by mixing different weight percentages of the Silica powders with the polyester resin and preparing individual samples. After woolen- e-glass preparation, the materials were properly mixed using the hand-lay techniques and different specimens were prepared with different compositions of the Silica powders. After all the samples were prepared, mechanical tests were carried out on the samples to ascertain the changes observed due to the composition of Silica powders. The obtained results of various samples specimens were compared and graphically charted to characterize the new composites material.

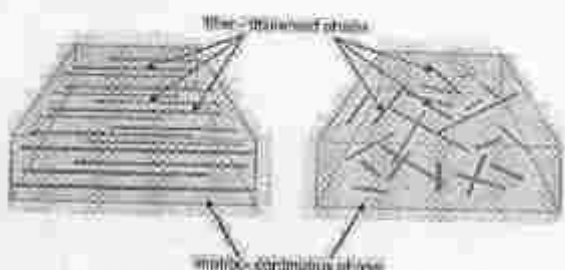
Keywords: Chopped Strand Mat (CSM) 450 G M-Glass Fiber; Silica Powder; Polyester Resin; Hand-Lay; Catalyst; Accelerator.



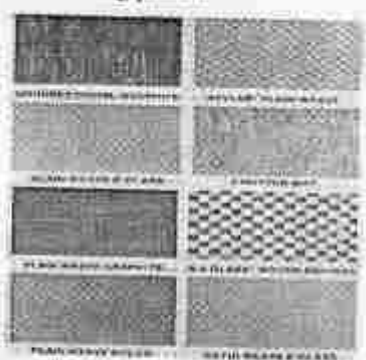
Classification of composite materials based on geometry and based on matrix.

1.1. Constituents in composites:

One constituent in composite is called the reinforcing phase and the one in which it is embedded is called the matrix. The reinforcing phase material may be in the form of fibers, particles, or flakes. The matrix phase materials are generally continuous.



Matrix phase: The primary phase, having a continuous character, is called matrix. Matrix is usually more ductile and less hard phase. It holds the dispersed phase and shares a load with it.
Dispersed (reinforcing) phase: The second phase (or phases) is embedded in the matrix in a discontinuous form. This secondary phase is called dispersed phase. Dispersed phase is usually stronger than the matrix, therefore it is sometimes called reinforcing phase.



Different Types of Mats

1. INTRODUCTION

A composite is a structural material that consists of two or more combined constituents that are combined at a macroscopic level and are not soluble in each other. One constituent is called the reinforcing phase and the one in which it is embedded is called the matrix. The reinforcing phase material may be in the form of fibers, particles, or flakes. The matrix phase materials are generally continuous. Examples of composite systems include concrete reinforced with steel and epoxy reinforced with silica fibers, etc.

Numerical Investigation of Turbulent Airflow in Heat Exchanger Tube Equipped with Perforated Conical Rings (NOZZLES)

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Abstract - Numerical investigation of turbulent air flow in heat exchanger tube equipped with perforated conical rings (nozzles). The main aim of this project to conduct thermal analysis on heat exchanger tubes to find the Reynolds number and rate of heat transfer and overall heat transfer coefficient by equipping it with perforated conical rings (nozzles). Nozzles, conical rings are popular heat transfer enhancement tools due to their simple installation, low cost and efficient performance. They can simply improve the thermal efficiency of the system and also used to investigate thermal characteristics of heat exchanger tube. This can be achieved by sending the air with turbulence into the heat exchanger tube equipped with nozzles and 3d simulation is conducted to analyses and compare with the standard values.

Key Words: Heat exchanger, Perforated rings, Reynolds number, Overall heat transfer coefficient.

1.INTRODUCTION

1.1 Heat Transfer Mechanisms:

We defined heat as the form of energy that can be transferred from one system to another as a result of temperature difference. A thermodynamic analysis is concerned with the amount of heat transfer as a system undergoes a process from one equilibrium state to another. The science that deals with the determination of the rates of such energy transfers is the heat transfer. The transfer of energy as heat is always from the higher-temperature medium to the lower-temperature one, and heat transfer stops when the two mediums reach the same temperature.

Heat can be transferred in three different modes: conduction, convection, and radiation. All modes of heat transfer require the existence of a temperature difference, and all modes are from the high-temperature medium to a lower-temperature one. Below we give a brief description of each mode.

1.1.1 Conduction:

Conduction is the transfer of energy from the more energetic particles of a substance to the adjacent less energetic ones as a result of interactions between the particles. Conduction can take place in solids, liquids, or gases. In gases and liquids,

conduction is due to the collisions and diffusion of the molecules during their random motion. In solids, it is due to the combination of vibrations of the molecules in a lattice and the energy transport by free electrons. A cold canned drink in a warm room, for example, eventually warms up to the room temperature as a result of heat transfer from the room to the drink through the aluminium can by conduction.

1.1.2 Convection :

The convection heat transfer mode comprises of energy transfer due to specific molecular motion (diffusion), energy is transferred by bulk, or macroscopic, motion of the fluid. This motion is associated with the fact that, at any instant, large numbers of molecules are moving collectively or as aggregates. Such motion, in the presence of a temperature gradient, contributes to heat transfer. Because the molecules in aggregate retain their random motion, the total heat transfer is then due to the superposition of energy transport by random motion of the molecules and by the bulk motion of the fluid.

1.2 Types Of Convection:

Free or Natural convection:

When fluid motion is caused by buoyancy forces that result from the density variations due to variations of thermal temperature in the fluid. In the absence of an internal source, when the fluid is in contact with a hot surface, its molecules separate and scatter, causing the fluid to be less dense. As a consequence, the fluid is displaced while the cooler fluid gets denser and the fluid sinks. Thus, the hotter volume transfers heat towards the cooler volume of that fluid. Familiar examples are the upward flow of air due to a fire or hot object and the circulation of water in a pot that is heated from below.

Forced convection :

When a fluid is forced to flow over the surface by an internal source such as fans, by stirring, and pumps, creating an artificially induced convection current.



INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

FRICITION STIR WELDING OF ALUMINIUM FOAM SANDWICH PANELS

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Abstract: The friction stir multi-lap welded joint has been created between the sheets of two aluminium Al5052-H32 alloys and the pure copper foil. The values of the shear strengths in the multi-lap weld of dissimilar materials, has been evaluated consisting of a sandwich structure. The sheets used are very thin in terms of thicknesses. The tool material is M2 HSS (High Speed Steel). The design of experiments has been done by following Taguchi method's L9 approach. The ultimate shear strength is determined for all the samples. Microstructure has been evaluated with the scanning electron microscope (SEM) and the optical microscope for the AlA-Cu-AlA sample found to have the highest ultimate shear strength. Also, micro-hardness has been found out for the same. The AlA-Cu-AlA weld having the highest ultimate shear strength was made with the friction stir weld parameters: 800 RPM of tool rotation speed, 5 mm/min of traverse speed & 0.2 mm of the plunge depth. It was also found that the AlA-AlA weld had higher strength than the AlACu-AlA weld for the same set of varying parameters. While dealing with the thin sheets, clamping plays a significant role. The discussed process could be utilised to create the copper cladding over the tubes of aluminium alloys which would make them light weight and excellent heat sinks.

Index Terms: FSW, Al5052-H32, Copper Foil, Taguchi Method's and SEM.

1. INTRODUCTION

Before the advent of friction stir welding, when arc fusion welding was in fashion, the defects to welding ratio was considerably higher. The culprit behind that unfavourable event was the low energy-density fusion welding process which causes the formation of a large pool molten metal and a large heat affected zone. This led to the formation of defects that were developed during the weld pool solidification. In return, these defects led to the distortion of work piece and the welded joint while reducing the strength of the joint as well. Up until 1990s, fusion arc welding and gas welding had been the prevalent players in the welding industry.[1] Not long before the invention of FSW, certain other non-fusion welding processes such as friction welding, had already been developed. However, the former non-fusion welding processes could only find a very limited use in the industrial applications. In the case of friction welding, the two work pieces are made to come in contact with each other and with the help of linear motion or rotations, relative motion is achieved between them. Along with the relative motion, there is also simultaneous application of the compressive force along the two work-pieces. The reason why the geometry of the parts joined by the friction welding is restricted is due to the availability of only two movements: linear and rotational, which can be utilized to create the relative motion between the work-pieces. The principle governing the joining process in friction welding is that due to the relative motion between the two parts that are to be joined, frictional heat is generated. This frictional heat in turn, causes the softening of the metal at ends of parts in contact. At this semi-plastic softened state, when pressure is also applied, the two parts make up a strong joint at the surface of contact. Friction welding is very



INVESTIGATION OF DISSIMILAR AL-BASE ALLOYS BY USING DIFFERENT PIN PROFILES

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Abstract: Aluminum alloys have different applications (e.g. Al 5083 and Al 6082: marine, automotive and aeronautical components). Regarding the application, it is necessary to check the poor weldability of the conventional connection in which two aluminum alloys are connected in the liquid state due to the different chemical, mechanical and thermal properties of the connected material and the formation of hard intermetallic growths. Great brittleness occurs, which leads to a reduction in the mechanical strength of the connection.

Feasibility of friction stir welding (FSW) of Al 5083 and Al 6082 sheets with different pin profiles: straight cylindrical (Cy), threaded cylindrical (Th), triangular (Tr) and square (Sq) are studied, as cylindrical and threaded cylindrical generate regular stirring action whereas, triangular and square pin profiles produce pulsating stirring action in the flowing material due to their flat faces. Further investigations are underway to determine the effects of these tools pin on the microstructure, hardness, crystallographic structure, and tensile strength of the bonded specimens. All samples showed the lowest hardness value in the heat-affected zone on the side of AA 6082, and this zone also fractured during the tensile tests. Since all samples have comparable microstructures and hardnesses, only the threaded cylindrical sample has the lowest tensile strength because the heat-affected zone has the largest structural component in the tensile direction.

Index Terms: Al 5083, Al 6082, friction stir welding, material testing and pin profile.

I. INTRODUCTION

FSW (Friction Stir Welding) is a solid-state welding technology that is used to join materials that are similar or dissimilar. FSW is particularly well appropriate for joining aluminium alloys [1]. FSW is also considered for joining steel, titanium, Inconel, and magnesium alloys. These materials have a diverse set of uses in shipbuilding and marine industries, aerospace, automotive, rail and construction industries, oil and gas industries, and robotics. Aluminium alloys are precipitation hard-enabled alloys, joining aluminium alloys using fusion welding is challenging, there is a chance of dissolution of precipitate during the fusion welding, which leads to the loss of strength. The friction stir welding process (FSW), was devised and patented by The Welding Institute, in England, in 1991. It's a ground-breaking joining technique based on solid-state plastic deformation of materials [2].

The basic working principle of FSW is shown in Fig 1. Two plates are brought together, positioned on a holding plate, and tightly secured. The parts are inserted with a specially developed non-consumable tool that is made up of a shoulder of a large diameter and a smaller pin. The movement of the tool shoulder (which is in close interaction with the workpiece's top surfaces) and during welding the pin generates a lot of agitation and frictional heat, which causes the plate material to become plasticized. Plasticized plate material is agitated and forged behind the trailing face of the tool pin as the tool moves along the weld line, this will form a joint behind.

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Evaluation of YSZ Ceramic Composite Coating on IS 2062 Steel using Tig Cladding Process for Enhancing Structural Material Performance

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Abstract: This study explores YSZ ceramic coatings on IS 2062 steel via the TIG cladding process at currents from 120A to 200A. Higher currents increase composite layer depth due to enhanced heat transfer. Microstructural analysis shows variations in grain size and dendritic formations with current changes. Coating powder distribution impacts morphology and microstructure. Hardness testing reveals improved hardness in coated substrates, peaking at 120A. Wear rate analysis indicates enhanced wear resistance across currents, with 120A showing the highest resistance, suggesting an optimal processing parameter for durability.

Index Terms - YSZ ceramic coatings, TIG cladding process, steel substrates, microstructural analysis, grain size, hardness testing, wear resistance

TIG cladding process. Firstly, the steel plates are cut

and their surfaces are abraded to ensure good adhesion. The YSZ ceramic powder is mixed with a solution to form a paste, which is then applied onto the substrate. Heat is applied using a TIG torch to melt the coating onto the steel surface. Various TIG currents are used to deposit tracks of the coating onto the substrate. After deposition, the samples are prepared for testing by cutting them into smaller pieces. Testing involves analysing the microstructure and phase constitution using microscopy, measuring the hardness using a Rockwell tester, and assessing the wear rate using a pin-on-disc wear tester. Precautions are taken throughout the process to ensure safety and accurate results, including wearing protective gear, maintaining cleanliness and documentation



EXPERIMENTAL INVESTIGATION AND ANALYSIS OF MECHANICAL PROPERTIES OF CHOPPED STRAND MAT-E GLASS FIBER POLYESTER RESIN & GRAPHITE POWDER COMPOSITES

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Abstract: Composite materials play a vital role in many industrial applications. Researchers are working on fabrication of new composite materials worldwide to enhance the applicability of these materials. In view of this the mechanical performance of the composite material is essential. The objective of the present work is to analyze the effect of silica & graphite powders content on the mechanical behavior of woven E-glass 350gm-Glass fiber reinforced. Five different types of composites are fabricated using 0, 4, 8, 12 & 16%wt of silica & graphite powders with woven-E glass fiber and polyester isoresin. The polyester isoresin, catalyst and accelerator are mixed in 1:2 weight ratio in polyester matrix with silica & graphite.

The aim of the project is to investigate the effect of silica & graphite powders with woven e-glass 350gm for making the composite material stronger and tougher. The investigation is carried out by mixing different weight percentages of the silica & graphite powders with the polyester isoresin and preparing individual samples. After woven-e glass preparation, the materials were properly mixed using the hand-lay techniques and different specimens were prepared with different compositions of the silica & graphite powders. After all the samples were prepared, mechanical tests were carried out on the samples to ascertain the changes observed due to the composition of silica & graphite powders. The obtained results of various samples specimens were compared and graphically charted to characterize the new composites material.

Keywords: Woven E-Glass 350gm; Polyester Isoresin; silica & graphite powders; Hand- Lay technique; Catalyst & Accelerator

1. INTRODUCTION

A composite is a structural material that consists of two or more combined constituents that are combined at a microscopic level and are not soluble in each other. One constituent is called the reinforcing phase and the one in which it is embedded is called the matrix. The reinforcing phase material may be in the form of fibers, particles, or flakes. The matrix phase materials are generally continuous. Examples of composite systems include concrete reinforced with steel and epoxy reinforced with graphite fibers, etc.

Historical examples of composites are abundant in the literature. Significant examples include the use of reinforcing mud walls in houses with bamboo shoots, glued laminated wood by Egyptians (1500 B.C.), and laminated metals in forging swords (A.D. 1800).



Fig 1.1: Earliest composite Mud & Clay