



Experimental Study of Single Bed Prototype adsorption Refrigeration Unit Using Waste Heat Energy

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Abstract

Adsorption refrigeration has more potential to become an attractive technology due to use of low-grade thermal energy and environmentally friendly refrigerants. Ammonia-activated charcoal pair based prototype of single bed adsorption cooling system was presented and tested. The most extreme measure of adsorption capacity of ammonia was found to be 0.22 kg/kg of activated charcoal, in shell and tube type adsorption bed respectively. This experimentation indicates that the cooling limit ranges from of 46.38 to 50.67 watt, and thus the results show that it achieves a COP of 0.0971 during a 62-minute total working cycle time under the condition of the temperature of hot fluid 120°C, cooling fluid provided at the temperature of 30°C, adsorption bed temperature of 40°C and working pressure range up to 16 bar. The results have been represented by graphical relations. This unit of adsorption cooling is environment-friendly and has zero ozone depletion potential. The result indicated that the adsorption refrigeration system works effectively and is a better alternative to replacement for traditional refrigeration systems and the concept of a waste heat driven adsorption cooling system can be applied in the small cold storages.

Keywords: Adsorption refrigeration, Activated charcoal-ammonia working pair, Adsorption bed, Low-grade heat source. COP.

1. Introduction

Due to extreme development in home growth and mechanical turn of events and the requirement for a happy with expectation for everyday comforts, refrigeration request is broadly expanding day by day. The vapour refrigeration systems are a transcendent route use for domestic and industrial applications. it requires high-grade electrical energy utilization, because of their high coefficient of performance execution. This refrigeration system works normally with CFCs, HCFCs, or HFCS refrigerants. These refrigerant leakages or delivery into the atmosphere air, they have contributed to environmental effects such as ozone layer depletion and global warming potential [1]. Hence, these systems have a more significant possibility of minimizing energy consumption, environmental protection, and focused search alternative solutions for traditional cooling methods. Now, the technology of adsorption refrigeration began to develop to solve the problems of energy shortage and protection of environment related to climate change cause by ODP [2]. Adsorption technology has been the subject of research to make it more practical with a vapour compression refrigeration system and vapour absorption cooling system.

Adsorption refrigeration is a form of thermal refrigeration that uses waste heat energy as a source of power. It has a huge potential because of the use of natural and environmentally friendly refrigerants like ammonia, water for reduce ODP. It has more scope in a smaller capacity of cold storage units, mainly in rural areas, to reduce the rate of spoilage products of farmer [3]. Low-grade energy exists abundantly in the environment and its usage effectively minimises fossil fuel combustion in the refrigeration sector and eliminates pollutants. The adsorption refrigeration system should be a better option because of waste heat energy utilization; they have totally less moving parts, low support cost, clean cycle, and are free of poisonous, and it is found exceptionally competitive [4].

The different research groups and researchers have researched adsorption cooling areas and reported their journals results. The related review of these research papers is as follows:

Performance Evaluation of Diesel Engine Using Enriched Biogas: Review

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Abstract: Biogas produced from organic wastes is a potential alternative to the partial substitution of petroleum derived fuels because it is from renewable resources that are widely available. Biofuels derived from biomass are considered as good alternative to petroleum fuels. Biogas, a biomass derived fuel can be used in internal combustion (IC) engines. The main three objectives of this research was extraction of biomethane from biogas by using high pressure water scrubbing, conversion of diesel engine into biomethane engine. Injector nozzles were replaced by spark plugs and spark-ignition system with high-voltage was installed to ignite mixture. Biogas mixer system (venturi type) with electronically control was applied to replace diesel fuel system in order to supply gaseous fuel to the engine. In addition, engine management system with electronically controlled was used to control air-to-fuel ratio, ignition timing according to engine speed and load and The effect on performance of engine using biogas and diesel dual fuel operation is presented in this paper. In this paper, the important parameters of performance characteristics (such as: power output, thermal efficiency, fuel consumption and exhaust emission) of biogas-fueled C.I engine are studied and estimated with change of engine speed and load. The obtained results when operating with biogas are used to compare with that of diesel fuel under the same operating conditions.

Keywords - Organic waste, Biomass, Alternative Fuel, Biomethane Engine

I. INTRODUCTION

Today our society relies on gasoline as the primary fuel source for the automotive industry. Carbon dioxide emissions, produced in combustion, are believed to have damaging effects on the environment. Climate change may persist and available resources may run out if no actions are taken to decrease the use of fossil fuels. Gasoline prices are at record highs and will continue to rise as the demand for fuel and energy increases. Many experts believe that the solution to our problems is the renewable alternative energy source, biomethane [1]. Biomethane is a biofuel made from organic waste, created through anaerobic digestion. Using biomethane as a fuel source produces only water vapor and small amounts of carbon dioxide as products. This small amount of carbon dioxide will greatly decrease our current transportation pollution by reducing emissions. Several cars on the road today that use biomethane as fuel, show promise that these vehicles can be integrated into today's society[1]. Biogas upgrading and the production of biomethane nowadays is a state-of-the-art-process of gas separation. A number of different technologies to fulfil the task of producing a biomethane stream of sufficient quality to act as a vehicle fuel or to be injected into the natural gas grid are already commercially available and have proven to be technically and economically feasible. Nevertheless, intensive research is still in progress to optimize and further develop these technologies as well as to apply novel technologies to the field of biogas upgrading. All technologies have their own specific advantages and disadvantages and this review shows, that no technology is the optimal solution to each and every biogas upgrading situation. The right choice of the economically optimal technology is strongly depending on the quality and quantity of the raw biogas to be upgraded, the desired biomethane quality and the final utilization of this gas, the operation of the anaerobic digestion plant and the types and continuity of the used substrates as well as the local circumstances at the plant site. This choice is to be made by the planner and future operator and this report is worked out to act as a supporting guideline during the planning phase of a new biomethane production site[2]. Raw biogas can not be used directly in e.g. engines or heaters because of corrosion problems; the biogas needs to be cleaned. This cleaning incorporates H₂S removal and removal of dust, water, halogenated hydrocarbons and siloxanes etc. This cleaned biogas can be used in engines for co-generation or in heaters. However, for use in vehicles it is generally accepted to upgrade the biogas, to natural gas like composition, also called biomethane, by means of CO₂ removal (among others). In this way the upgraded biogas (biomethane) can be used for grid injection or can be used in standard light-duty or heavy-duty natural gas vehicles [3].

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Design and Development of Biogas Venturi mixture for Stationary Diesel Engine using Analytical and CFD approach

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ABSTRACT: *The major problem to use biogas as an alternative fuel in diesel engines is the modification needed for converting the current diesel engine into an enriched biogas engine. The fuel intake system is one of the major modifications required for the diesel engine. To overcome this problem, a new biogas venturi mixture has been designed by using an analytical and Computational Fluid Dynamics (CFD) approach. With the new fuel intake system, the engine runs effectively and properly using enriched biogas as an alternative fuel. It has been observed that simple modifications are required in the fuel intake system such that convergent divergent angle, throat diameter, etc. for uniform mixing of enriched biogas and air for complete combustion of fuel for improving engine performance and efficiency. This paper focuses on the design and development of a biogas venturi mixture with different convergent angles (20° , 24° & 28° , etc.) and different throat diameters (22 mm, 21mm, 20mm, 18mm & 16 mm etc.) used in a 3.5 kW, 661CC, 4-stroke stationary diesel engines using an analytical and CFD approach. This paper concludes that 16 mm throat diameter and 24° convergent angle, the maximum pressure drop and maximum velocity observed in a uniform and homogenous mixture. Better mixing can affect combustion, which leads to improved volumetric efficiency, brake thermal efficiency with reduced emission.*

Keywords: Alternative fuel, Enriched biogas, Combustion, Analytical method, CFD method.

NOMENCLATURE

A_1, A_2	Inlet & throat section areas.
D_1, D_2	Inlet & throat section diameters.
P_1, P_2	Inlet & throat section pressure.
V_1, V_2	Inlet & throat section velocity.
ρ_a, ρ_g	Air & biogas density.
$P_{1g} & P_{2g}$	Inlet & throat section gas pressure
V_{1g}, V_{2g}	Inlet & throat section gas velocity
C_d	Co-efficient of discharge
Z_1, Z_2	Datums at inlet & throat section
Z_{1g}, Z_{2g}	Datums of gas at inlet & throat section.
A_g	Gas passage Area.
n	No. of holes for gas entrance.
d_2	Diameter of holes for gas entrance.
C_v	Calorific value of gas (kJ/kg).
mg	mass of gas.
ma	Mass of air.

1. INTRODUCTION

In a recent developing country like India, more than 65 percent people live in rural areas and dependent on agriculture. The electricity supply is the biggest problem faced by villages. This problem can be overcome by installing community power plants working with enriched biogas. In rural areas, cow dung and agricultural waste are available in abundant quantities. This power plant is used to generate electricity will help to grow the rural economy and the living of farmers. Arali, et al. [1] enriched biogas as a gaseous fuel required for the fuel intake system of the engine for better mixing of A/F mixture, which improves the combustion characteristics of the engine. Shaikh et al. [2] worked on the major

The Study and Analysis of different Biogas Enrichment Technologies

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Abstract

In a recent developing countries like India due to increasing number of populations, industrialization, modern agricultural machineries and way of life, the demand of energy at faster rate. To fulfill all the energy needs, large amount of fossil fuels are used with adverse impact on the environment. To overcome this problem the biogas Production is more effective way for converting agricultural waste, sewage waste or municipal waste into renewable energy.

To increase calorific value of raw biogas, the upgrading process is very important and crucial. The enriched biogas is used in stationary diesel engine to generate high efficient electricity generation. This paper focused on to study and analyzes different biogas enrichment technologies such as Physical Absorption (water Scrubbing), Pressurised Swing Absorption (PSA), chemical Absorption, cryogenic separation and membrane separation etc. and finds most economical and simplest method. From various biogas upgrading technologies the water scrubbing technology performed well in low investment cost and maintenance cost with simple operation and reliability. In this paper raw biogas is produced and tested in water scrubbing technology and get results 94.69 % methane.

Keyword:- Biogas upgrading, Physical Absorption, Pressurized Swing Absorption (PSA), chemical Absorption, cryogenic separation and membrane separation etc.

1. INTRODUCTION

Production of biogas is anaerobic digestion of organic matter such as municipal waste, industry waste, manure, sewage residue, and agricultural scrap. The main constitution of produced raw biogas consists of methane (CH_4), Carbon dioxide (CO_2), hydrogen sulphide (H_2S) etc. The methane used as a fuel to generate heat and electricity, as a natural gas used in vehicle fuel (A Petersson, 2009). The produced raw biogas from digester is divided into two gas streams the first enriched biogas and second off gas stream. The fig.1 shows that schematic diagram of raw biogas production and upgrading processes.

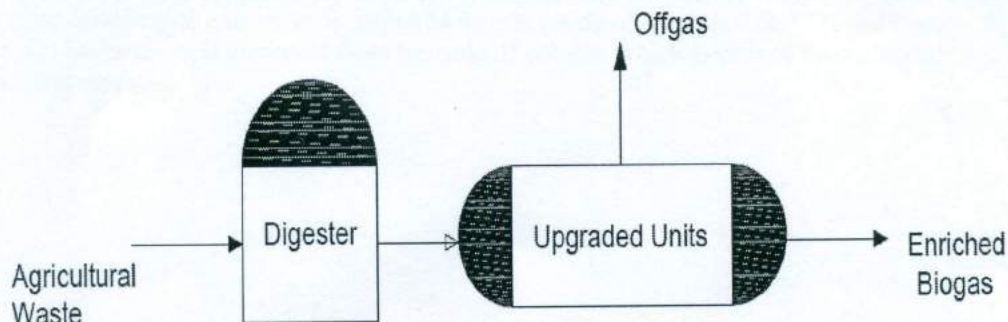


Fig. 1 Schematic diagram of Biogas Production and its Enrichment process

DESIGN AND ANALYSIS OF AN INNOVATIVE UMBRELLA FOR CAR

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ABSTRACT

Car parking umbrella can be one of the effective solution for traditional car covers and the covered parking space which are only available in some of the big residential buildings, corporate offices and malls in big cities. Car umbrella can be carried at any location which can provide shelter to car and protect it from sunlight & rain. In the vehicle cabin, the Inside temperature is very important to feel the comfortable condition to the car passengers. The inside Temperature of the car cabin is increase, when the car is left or parked directly under the sunlight. Various components of car umbrella are design using ISO standards. Selection of car umbrella assembly material is carried out by studying properties of Al6061 and Structural steel material. The selection of covering material is carried out by studying the properties like heat reflection and environment friendly, the polypropylene based non-woven fabric is suitable for this research. 3D modelling is creating in Solidworks software. Structural analysis of various components is carried out in ANSYS software.

Keywords: ANSYS, Car Umbrella, Design, ISO Standards, Solidwork.

I. INTRODUCTION

Vehicles have become a primary factor in our lifestyle. It is one the best means of transportation on a daily basis. Due to the advancement in technology, people tend to use more automatic systems these days. Thus, engineers try to change manual systems into automatic systems in order to make people's lives easier.

The car parking in an unshaded area rise the greenhouse problem. This is the problem of conversion of solar radiation entering through the windows of a car into long wave thermal radiation and trapped inside car cabin causes temperature increase of cabin components. Thereby, use of cardboard car shades to reduce the interior temperatures inside parked automobile has become popular in Baghdad and other hot regions in Iraq. Temperature inside the vehicle cabin is very important to provide comfortless to the car passenger. The temperature can be controlled by using air conditioning system that can be operated when the car engine is in operation. And, when the car is left or parked directly under the straight sunlight, the temperature inside the car cabin will be increased. The sealed automobiles commonly encounter interior temperature conditions that are tremendously uncomfortable and may be harmful also to the car passengers.

The car users are faced a hot interior after a certain hours of parking in open space or unshaded parking area. The heat under such parking conditions causes the car cabin and interior temperature to reach up to 80°C average. The thermal energy get accumulated inside the car cabin with undesired temperature rise would cause the interior parts to be get degrade because they normally are subjected to wear and tear. Degradation and may shorten the life span of the various components inside the car cabin, especially electronic devices, rubber and plastic parts. The car passengers are also being affected with the temperature condition inside the vehicle itself. The car users is forced to wait for a period of time around 2 – 5 minutes before getting into car to let the interior condition cool down either by rolling the window or running the air conditioner system (A/C) at high speed that really affect the fuel consumption.

Research work is to find out the most technically feasible passive solution to reducing the car interior temperature. This can be achieved by constructing an automatic device on a vehicle to prevent the heat penetration in the vehicle interior caused by the sunlight.

II. LITERATURE REVIEW

Several parameters like geographical area, parking condition, area to be covered of car, as well as several design consideration from researchers are studied in below literature review.

Saad Bin Abul Kashem, Aws Dhafir Yasin & Elammaran Jayamani et. al. (2017) Constructed automatic device on vehicle to prevent heat penetration inside the car body. Their device is fully autonomous to cover the car when parked in outside parking. Their system will prevent any vehicle from getting affected by heat produced by the solar energy. Solidworks design and simulation has been done to analyze the required power by the system. Finally, a prototype has been built and the feasibility has been checked.

R. K. Tyagi & M. K. Verma (2013) Done work on an automatic car cover is proposed which will opens itself



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Experimental Testing and FEA Analysis to Enhance the Strength of Existing Tractor Footrest

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Abstract- The plan and investigation assumes a significant job for deciding the underlying driver for the issue. When the issue and its underlying driver were very much characterized, the answer for tending to the issue would be clarified. The motor excitation recurrence and the undercarriage regular recurrence were coming nearer and it drives body to resound. The resonance builds vibration levels at the Tractor footrest which was diminishing solace level of the administrator. The vibration decreases procedures like hardening the structure, disconnecting the source from excitation and hosing systems were concentrated to diminish vibration levels at stool. Structure of existing tractor footrest in CATIA software and FEA examination is to be performed utilizing ANSYS software. In present investigation static, modal analysis and harmonic is to be performed on tractor footrest to determine stress, deformation and natural frequency and also to improve the existing design using bead pattern to obtain improved natural frequency. Experimental and FEA analysis results will be compared and conclusion will be drawn.

Keywords: ANSYS, Modal analysis, Beading pattern.

1.INTRODUCTION

A footrest is a household item or a help used to hoist the foot. There are two primary sorts of footrest, which can be approximately classified into those intended for comfort and those intended for work. This kind of stool is utilized to give solace to an individual situated, for instance, in a seat or couch. It permits the situated individual to rest their feet upon it, supporting the legs at a for the most part flat level, therefore offering ascend to the other term footrest. This sort of stool bolsters an individual's feet that don't arrive at the floor when situated. The stool is set under the feet of a sitting individual with the goal that the individual's feet may lay easily on it. A car commonly has a "fake pedal" that goes about as a stool to demoralize "riding the grasp" or "riding the brake". A foot peg is another sort of ottoman for the most part on BMX bikes, bikes, the Ford N-Series tractor, a few kayaks, the

Impossible wheel, and other transportation gadgets. Footrests have been known for a long time, and have developed since the beginning. It was put before the chimney, and long enough for the entirety of the relatives to put their feet and warm them up. Footrests where by and large compatible in regular daily existence from the seventeenth through the mid nineteenth century. In early American homes the footrest was truly important, and took valuable space in spite of the fact that the living quarters were confined. Undesirable vibration can cause exhaustion or corrupt the exhibition of the structure. Subsequently, it was attractive to take out or lessen the impacts of vibration. There were higher vibrations on the stool of the Tractor and it was diminishing solace level of the administrator. The objective was set to build characteristic recurrence of gauge tractor model to benchmark as the two tractors have same three-chamber motor which was causing reverberation with body. The acknowledgment rules were created dependent on the contributions from the client rating.

1.1 LITERATURE REVIEW

Vilas Gorakh Umbare et.al [1], In this paper, the creator exhibited the deliberate way to deal with diminish tractor stool vibrations by 20% - 25% through idea plan, virtual examination and exploratory approval. The engine excitation frequency and the undercarriage regular frequency were coming nearer and it drives frame to resound. The resonance expands vibration levels at the Tractor footrest which was decreasing solace level of the administrator. The vibration decreases systems like hardening the structure, detaching the source from excitation and hosing procedures were concentrated to lessen vibration levels at footrest. Vibration levels were brought down in the Tractor stage by 10% than current level. It had expanded solace and consumer loyalty level. The Solution of the advanced cross area grasp lodging was proposed for final usage on new tractors. The outcomes were empowering as vibration levels were brought down in the Tractor stage by 25% - 30% contrasted with the



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DESIGN OF SOLENOID OPERATING VALVE APPLYING DESIGN FOR SIX SIGMA METHODOLOGY

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Abstract— Solenoid valves are Electromechanical valve in which electric current is passed through the conducting wire and the current flowing through conductive wire wound generates EMF within the wound axis and surrounding area, and due to generated magnetic flux drives the mechanical part called as plunger. Use of Electro mechanicals all units is in different valve's, mechanical relays and electrical contactor. Solenoid coils are rated to operate from 12 V to 32 C DC and 110 V to 230 V AC systems with the power consumption ranging from 8 to 28 W. The solenoids made up of movable steel or iron slug called armature or plunger and wound of electromechanically inductive coil. The plunger movement is used to control fluid flow or the fluid flow direction. Selecting the proper valve for hydraulic system plays an important role in reducing the energy requirement and thus the operating cost. Various types of valves are used for an on/off control adjustment of the flow rate through the system, avoidance of back flow and pressure relief at safety devices. One of the most widely used valves is solenoid valve. The primary use of solenoid valve is to regulate the flow rate based on controlling electric power. Solenoid valves are also used as on/off valves in number of applications. The basic objective of this research is to achieve robustness in designing of solenoid valve for pull-in current CTQ using DFSS methodology.

Keywords— Solenoid Valve, Robust Design, Critical to Quality, Sensitivity Analysis, DFSS Methodology.

1. INTRODUCTION

The solenoid valves are mechanical structures comprising of the manifold and the sealing parts which are movable linearly or rotationally, perpendicular to the direction of fluid flow. These valves are utilized to regulate or to control flow of fluid. Solenoid valve is a made up of two important and basic functional units: 1. A solenoid with its core (electromagnet) 2. Manifold body containing one or more orifices. Besides that, the power used by solenoid valves become important as it comprises to total power consumption and in the application like aerospace the available power from system remains extremely low and solenoid needs to be designed to function in available electric power. Solenoid coils need more current only during activation, called the Pull-In current, to pull the plunger into the solenoid. However, when solenoid gets actuated, the coil of solenoid needs approximately 33% of its nominal current, termed as hold current, to maintain plunger in the hold position. Solenoid coils operating with even minor current steadily raise the temperature in the coil because of higher power dissipation. When the plunger movement gets detected, the stable condition current can be lower to hold current value to reduce power dissipation in the solenoid. The objective of this research work is to achieve robustness in designing of solenoid valve for pull in current CTQ using DFSS methodology.

improvement in this limitation, design for Six Sigma (DFSS) approach is advised as it comprises a complete range of product and service design, beginning with the voice of customer (VOC) up to the ending by product or service launch.

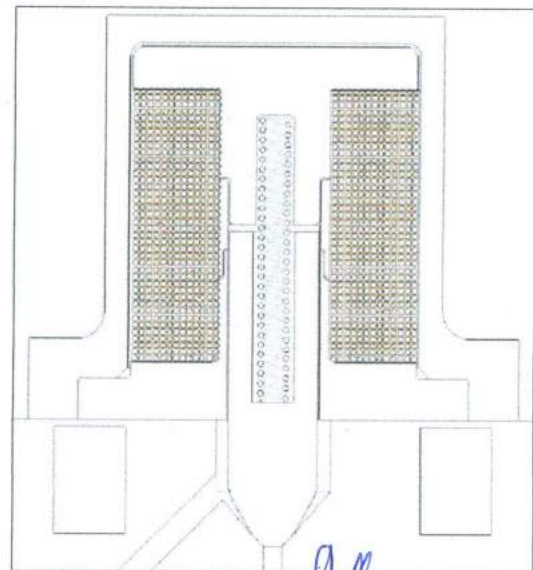


Fig.1 Solcnoid valve concept

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'Impact of Shear Wall to Reduce Torsional Effect for Unsymmetrical R.C. Frames with and without Infill Walls'

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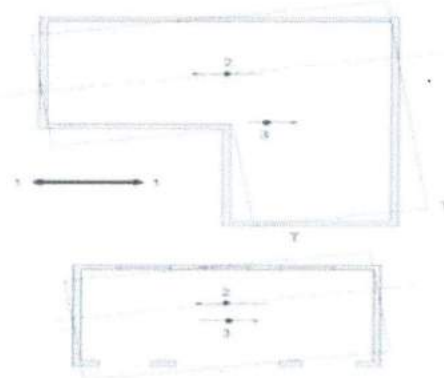
Abstract - Torsional irregularity leads to increased unequal displacements at the extremes of the building and may cause distress in the lateral load resisting elements at the edges. Torsion is nothing but twisting moment induced in structures. Torsional effects may significantly modify the seismic response of buildings and it caused severe damage or collapse of structure in several past earthquakes. These effects occur due to different reasons, such as uneven distribution of the mass, stiffness and strength etc. This is well known that torsion adversely affects the response of conventional structures, as well as base isolated structures. In buildings mass asymmetry is usually present at different floor level This mass asymmetry may be due to water tank provided at top of building, any heavy weight machine placed at any level, etc. Due to this mass asymmetry in building center of mass is shifted from center of stiffness causing eccentricity. As this eccentricity increases, torsion in building also increases. So torsion is based on the static eccentricity and floor plan dimension which is effective for irregular structures. Right from the evolution of the earth, earthquakes have been cause great disasters in the form of destruction of property, injury and loss of life to the population. The effective design and construction of earthquake resistant structures has much greater importance in India due to rapid industrial development and concentration of population in cities.

From the literature review it is noted that torsional effect was little addressed for multistorey unsymmetrical building. Hence in this dissertation an attempt has been made to study the nonlinear behavior of building structure subjected to seismic loading, considering torsional effect. IS: 1893 (Part 1)-2002 is used for this dynamic analysis. Time history analysis will be carried out and response quantities viz. natural time period, base shear, torsional moment, displacement will be obtained. The plan layout of the reinforced concrete ordinary moment resisting frame is consider with infill walls, without infill walls and shear wall. Seismic response of ten storey (G+9) symmetrical and unsymmetrical (L-shape) building with Plan irregularity is considered for study purpose. The plan areas of building is 15mx15m (symmetrical) and 15mx24m ((L-shape) with 3.0 m as height of each typical storey. The modal analysis will be done by using MATLAB/simulation and the results will be validated using standardized ASCE paper.

Key Words: Torsion, symmetrical, unsymmetrical, Time-history, analysis, MATLAB.

1. INTRODUCTION

Over the past century, several devastating earthquakes of the world had occurred in and around India. Few of these occurred in cities and towns and caused severe damages to human lives as well as to infrastructures with various categories. In metro city there is necessity to build a high rise structure due to high population and less land availability. Also the human ambition is force to create taller structure. Large numbers of high rise reinforced concrete structure are constructing to full fill the human requirement. Among the various categories, buildings under residential occupancy are mainly responsible for life losses. Buildings under commercial occupancy and other structures contribute to huge economic losses, in addition to the loss of precious lives.



1-Earthquake Force, 2-Centre of Stiffness or resisting force, 3-centre of gravity, T-Twisted building

Fig -1: Torsion of unsymmetrical plans

Buildings with non-uniform mass, stiffness and/or strength over their plan are often described as being torsionally irregular. Even for structures designed to be perfectly regular, the movement of live loads around the structure can cause torsional irregularity which in turn changes the member demands. There is effective an understanding of how different parameters may influence torsion. So these parameters we can see by taking with bare building structure and adding different considerations like infill wall, shear wall and base-isolation. we can obtained list which provision minimizes torsional moment for the building structure.

1.1 Objectives

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Optimization of application of 2-ethyl-hexyl-nitrate on partial substitution of ethanol in CI engine for fuel economy and emission control using MADM method

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Abstract

The present study is performed to identify the blending proportion of cetane improver for partial substitution of ethanol with diesel to achieve fuel economy and emission control. This is case of multiple attribute decision making problem which is solved using Taguchi GRA. Taguchi method is used to decide the proportion of blend in fuel sample to achieve maximum improvement with minimum number of fuel sample and grey relation analysis is done to identify the significant factor along with optimize fuel proportion. Using Taguchi method, nine different fuel samples containing mixture of ethanol, 2 ethyl hexyl-nitrates and diesel were prepared. Each sample was tested on computerized single cylinder CI engine test rig at constant speed and variable compression ratio at 16, 17 and 18 and variable load conditions. After Grey relation analysis of performance and emission results of experimentation, it is observed that D80E20EH3 by ranking method and D80E10EH3 by mean method are optimum fuel sample sequence. Confirmatory experimentation also shows that experimental GRG is close to predicted GRG of 0.8387 hence optimum sequences is acceptable. The optimum sequence shows improvement in fuel economy and lesser NO_x emission with little increases in smoke.

Keywords Ethanol · Cetane improver · MADM · Taguchi GRA · CI engine

Abbreviations

CR	Compression ration
BSFC	Brake specific fuel consumption
NO _x	Nitrogen oxide
PM	Particulate matter
CR	Compression ration
kW	Kilo watt
CO	Carbon monoxide
HC	Hydro carbon
ANNOVA	Analysis of variance
2EHN	2 Ethyl hexyl nitrate
DF	Degree of freedom

1 Introduction

Ethanol is getting widespread acknowledgement as renewable alternative fuel for diesel and as oxygenate providing potential to reduce particulate emissions [1, 2]. With ethanol blend of up to 5–10% in diesel, smoke density greatly reduces with higher percentage while NO_x show little or no reduction compared to neat diesel [3]. The better atomization and vaporization of fuel is achieved with use of 15% ethanol due to its lower density and NO emission of the engine run on the is also found to be lower than that of diesel due to the higher value of latent heat of vaporization [4]. The work on ethanol-methyl soyate blend with diesel (5:20:75) for heavy duty engine shows significant reduction in PM emission while 2–14% rise in NO_x emission without changes in CO emission as it is

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ORIGINAL ARTICLE

Parametric optimization of engine performance and emission for various n-butanol blends at different operating parameter condition

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KEYWORDS

Butanol;
C I Engine;
Taguchi;
Optimization;
Emission

Abstract In present work, study of effect of different n-butanol diesel blends (5–20% v/v) on engine performance and emission were performed for different engine operating parameter. Optimization was carried out with help of Taguchi DoE method. Single Cylinder VCR Compression Ignition Engine was fuelled with different blend of diesel and n-butanol and tested at different engine settings of CR, FIP and FIT for different load conditions (Idle, 1/3, 2/3 and full load). Normality analysis was performed to check the distribution of response data and then regression analysis was performed to derive the mathematical model for the chosen responses (BSFC, BTE, NOx and Smoke) based on n-butanol and engine parameters. During the optimization analysis, it is found that n-butanol of 15% concentration in diesel with engine settings, CR of 15, FIP of 260 bar and FIT of 25°BTDC give optimize BTE, BSFC and low smoke but resulted in higher NOx formation due to tradeoff between NOx and smoke control. The use of 15%v/v of n-butanol was found to be most suitable blend proportion with diesel as it resulted in favorable engine performance and low emission for all test load conditions. Also during this study, it was observed that Taguchi method is highly effective when individual response parameter need to be optimized for different engine responses and to identify the significant factor from multiple design factors. But for optimization of multiple design factors for most favorable responses simultaneously, use of advanced optimization methods from MADM (Multi Attribute Decision Making) approach to be implemented.

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Abbreviations. BSFC, Brake Specific Fuel consumption; BTE, Brake Thermal efficiency; CR, Compression Ratio; DoE, Design of Experiments; FIP, Fuel Injection pressure; FIT, Fuel Injection Timing; HCCI, Homogeneous Charge Combustion Ignition; NOx, Nitrogen oxides; PCCI, Premixed Charge Combustion Ignition; S/N, Signal to Noise Ratio; VCR, Variable Compression Ratio.

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Research Article

Performance of phase changing material in an artificially created cold region to promote latent heat thermal energy storage

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ABSTRACT

In the present contribution, the authors investigate the peculiarity of Phase Changing Material for accumulating heat in the region equivalent to the hilly area by creating its atmosphere, having 20°C DBT and 18°C WBT. A water cooler is used in 5*7 feet bathroom to conceive the above-intimated temperature, measured by a sling psychrometer. In particular, in this study, trials are carried out in the LHTES tank where water is charged from ambient temperature to 55°C with the aid of an Immersion water heater rod of 1000W,230V thereby liquifying PCM and then discharging to ambient temperature. Two Orientations namely, Circular and Cross are appropriated into the study, where Circular Orientation poses better results articulating the charging in an hour and discharging in 25 long hours, whereas Crossed Orientation represents charging in an hour and discharging in 23 hours. The volume of PCM and the net heat transfer surface have been kept constant in both cases, to compare them in the same operative conditions. The reason for the detour is manifested.

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INTRODUCTION

Renewable sources such as solar, wind, biogas, tidal may be harnessed to store energy to a greater extent since energy saving has become a primary priority for future generations. Since renewable sources are a source of intermittent supply, enriching existing technology of storing heat in the LHTES form has become a common concern of discussion due to its advantages of storing a large amount of heat even with small temperature changes and high storage density.

More particularly, LHTES incorporated with PCM has been a popular approach for TES application but, PCMs are limited by their low thermal conductivity which is generally less than 0.5 W/mK. To enhance the heat transfer from the heat source to the PCM, many methods like using acetamide [1], tetradecane[2], heat exchanger pipes[3,4] commercial paraffin [5–8] as PCM have been developed. Many applications also use a single fin[9–13] or multiple aluminum fins

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Performance Analysis of Latent Heat Thermal Energy Storage using Phase Changing Material in a Circular Orientation.

Rupali Patil, Avinash Desai



Abstract: The enormous consumption of energy has led to the fact of saving it at large. To negate the loss of energy, the present work commences research in the field of Thermal Energy Storage in its latent form incorporating Phase Changing Material (PCM) in circular oriented copper Ball Structure. Heating of PCM (by an electric heater) inferred in these copper balls continues till 85°C (well beyond the melting point of selected PCM), and then when disconnected, PCM discharges gradually giving off the heat accumulated within. Considering 30 litres of water in Latent Heat Thermal Energy Storage Tank (LHTES), for a family of four, the research intends to investigate the prolonged duration of time required to keep the water warm. The consequence presents that the time required to charge (heat) water is 4.6 hours (270 minutes) and discharge (heat is given off) is 29 hours (1740 minutes). Thus proving significant potential in keeping water warm for better performance in a circular orientation.

Keywords: Phase Changing Material, Latent Heat Thermal Energy Storage, Charging, Discharging.

Acronyms:

- CFD- computational fluid dynamics
- HTF- heat transfer fluid
- PCM -phase change material
- TES -Thermal energy storage
- LHTES-Latent heat Thermal Energy storage
- UR-Upper Ring
- LR-Lower Ring
- PW-Paraffin Wax
- ECBC-Energy Conservation Building Code
- H-Enthalpy/kg K
- k -thermal conductivity, W m⁻¹ K⁻¹
- S- Source term
- t- Time, seconds
- T-Temperature °C
- S - Source Term
- ρ -density, kg m³

I. INTRODUCTION

In the current Era, the exhaustive nature of energy has embarked on its presence abundantly. In the said Channel, there exists an urge to modify energy sources into cleaner sources from mother nature. This reminds of solar energy, but it comes with the detriment of its infrequent nature. LHTES, on the other hand, serves to be a popular storage system due to its advantageous history of high storage density [1].

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Also, there occurs to be huge merchandise for PCM in the minds of researchers due to the need for investing in energy [1,2].

Studies deduce that TES charging with the help of air conditioning and discharging by electric heater benefits greater performance [3,4]. Also, the spherical shape of capsules offers maximum thermal conductivity with the largest energy density [5].

Solidification rates are depicted to give more amount of periodic time when compared with charging [6]. Though this scenario prevails, PCM poses a threat of low thermal conductivity. Not to compromise with thermal conductivity, the PCM can be incorporated into structures having higher thermal conductivity [7,8-10] like copper material, heat pipes, etc. some materials are posing better results than PCM like myristic acid [11], but cost limitation demands to choose PCM over any other. Various research regarding storing thermal energy in PCM is initiated mostly in the domestic domain of temperature between 0-60°C [5], hence present study too, concentrates on the domestic application.

From the above characterization, current research work attains a spotlight on storing thermal energy in PCM for domestic application of trapping heat for long hours in other household purposes until it prevails to be warm, hoping to get the water warm for an entire day. for the said purpose, according to the survey, spherical capsules serve a better solution for incorporating PCM to negate the loss of low thermal conductivity.

1.1 Novelty in Research

Acquiring the observations from the current survey, though spherical capsules prove out best to incorporate PCM, the study is deprived of the way the spherical capsules of PCM are to be placed in the LHTES tank. The placing/orientation of PCM inside the LHTES tank has not been quantified. Circular orientation has been selected for investigating the performance of PCM in the LHTES tank.

II. METHODOLOGY

According to a study by K.nithyanandam et.al [16], two resistances, surface convective and internal conduction resistance needs to be propagated in LHTES.

1. The Setup created for the experimental work consists of two hot water tanks which are insulated with Glasswool of 30mm thickness. The tank can store 30 litres of water.

2. The Experiment is carried out in two stages-charging (melting) and discharging (solidification). Two tanks viz. hot water tank and LHTES tank are taken into consideration. The circular orientation in LHTES tank is shown in Fig.no.1(b)

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'Impact of Shear Wall to Reduce Torsional Effect for Unsymmetrical R.C. Frames with and without Infill Walls'

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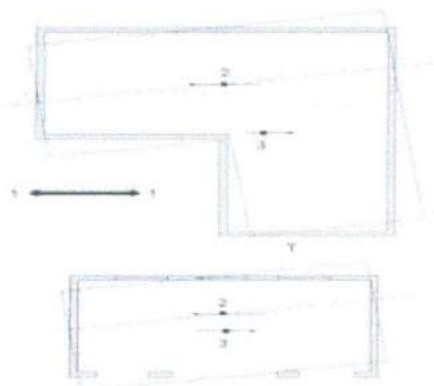
Abstract - Torsional irregularity leads to increased unequal displacements at the extremes of the building and may cause distress in the lateral load resisting elements at the edges. Torsion is nothing but twisting moment induced in structures. Torsional effects may significantly modify the seismic response of buildings and it caused severe damage or collapse of structure in several past earthquakes. These effects occur due to different reasons, such as uneven distribution of the mass, stiffness and strength etc. This is well known that torsion adversely affects the response of conventional structures, as well as base isolated structures. In buildings mass asymmetry is usually present at different floor level This mass asymmetry may be due to water tank provided at top of building, any heavy weight machine placed at any level, etc. Due to this mass asymmetry in building center of mass is shifted from center of stiffness causing eccentricity. As this eccentricity increases, torsion in building also increases. So torsion is based on the static eccentricity and floor plan dimension which is effective for irregular structures. Right from the evolution of the earth, earthquakes have been cause great disasters in the form of destruction of property, injury and loss of life to the population. The effective design and construction of earthquake resistant structures has much greater importance in India due to rapid industrial development and concentration of population in cities.

From the literature review it is noted that torsional effect was little addressed for multistorey unsymmetrical building. Hence in this dissertation an attempt has been made to study the nonlinear behavior of building structure subjected to seismic loading, considering torsional effect. IS: 1893 (Part 1)-2002 is used for this dynamic analysis. Time history analysis will be carried out and response quantities viz. natural time period, base shear, torsional moment, displacement will be obtained. The plan layout of the reinforced concrete ordinary moment resisting frame is consider with infill walls, without infill walls and shear wall. Seismic response of ten storey (G+9) symmetrical and unsymmetrical (L-shape) building with Plan irregularity is considered for study purpose. The plan areas of building is 15mx15m (symmetrical) and 15mx24m ((L-shape) with 3.0 m as height of each typical storey. The modal analysis will be done by using MATLAB/simulation and the results will be validated using standardized ASCE paper.

Key Words: Torsion, symmetrical, unsymmetrical, Time-history, analysis, MATLAB.

1. INTRODUCTION

Over the past century, several devastating earthquakes of the world had occurred in and around India. Few of these occurred in cities and towns and caused severe damages to human lives as well as to infrastructures with various categories. In metro city there is necessity to build a high rise structure due to high population and less land availability. Also the human ambition is force to create taller structure. Large numbers of high rise reinforced concrete structure are constructing to full fill the human requirement. Among the various categories, buildings under residential occupancy are mainly responsible for life losses. Buildings under commercial occupancy and other structures contribute to huge economic losses, in addition to the loss of precious lives.



1-Earthquake Force, 2-Centre of Stiffness or resisting force, 3-centre of gravity, T-Twisted building

Fig -1: Torsion of unsymmetrical plans

Buildings with non-uniform mass, stiffness and/or strength over their plan are often described as being torsionally irregular. Even for structures designed to be perfectly regular, the movement of live loads around the structure can cause torsional irregularity which in turn changes the member demands. There is effective an understanding of how different parameters may influence torsion. So these parameters we can see by taking with bare building structure and adding different considerations like infill wall, shear wall and base-isolation. we can obtained list which provision minimizes torsional moment for the building structure.

1.1 Objectives

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'Impact of Shear Wall to Reduce Torsional Effect for Unsymmetrical R.C. Frames with and without Infill Walls'

Prof. R.B. Ghodke¹, Prof. S.D.Kangiri², Prof. V.N.Bande³, Prof. R.S.Dahatre⁴

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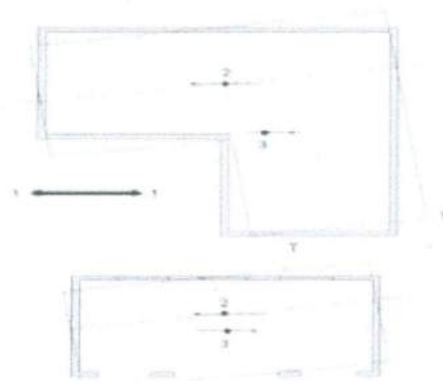
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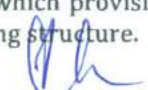
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1.1 Objectives





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Numerical Simulation of Fins Mounted On Inner Tube of Single Tube Fire Water Heater

Mr. Dandge A.G. Mr. Pingale Rohit

Abstract

The rate of heat transfer to water around a pipe can be greatly enhanced by the use of extended fins. The main objective in improving the performance of thermal system is to enhance heat transfer. To increase thermal performance of water heating boiler, it is necessary & effective to employ extended surface, referred to as fins, on the central pipe, to compensate for the low heat transfer coefficient. The prototype finned tube consists of equi spaced fins mounted on the outer surface of tube, in order to locally augment heat transfer between the fin base area & the surrounding fluid. Because heat conducted through fins is very efficient for metals, it results in high fin surface temperature and an increase of total active area.

Index Terms—CFD, enhancement of fin, effectiveness, heat transfer rate

I. INTRODUCTION

The rate of heat transfer to water around a pipe can be greatly enhanced by the use of extended fins. The main objective in improving the performance of thermal system is to enhance heat transfer. To increase thermal performance of water heating boiler, it is necessary & effective to employ extended surface, referred to as fins, on the central pipe, to compensate for the low heat transfer coefficient. The prototype finned tube consists of equi spaced fins mounted on the outer surface of tube, in order to locally augment heat transfer between the fin base area & the surrounding fluid. Because heat conducted through fins is very efficient for metals, it results in high fin surface temperature and an increase of total active area.

Objectives of project study:

1. To determine optimum design specification for water heater.
2. Analysis of water heater with and without fins.
3. To analyzing the shape, size, orientation and spacing of fins for optimum design specifications of water heater.

II. LITERATURE SURVEY

V. N. Kapatkar discovered that the experimental analysis of the results obtained over a range of fin heights and heat dissipation rate. Attempts are made to establish a comparison between the experimental results and results obtained by using CFD software.

Piotr Wais (Poland) discovered that the in order to intensify the heat transfer from the heat exchanger surface to fluid, it is possible to increase convection coefficient (by growing the fluid velocity), widen temperature difference between surface and fluid or increase the surface area across which convection occurs. Extended surfaces, in the form of longitudinal or radial fins are common in applications where the need to enhance the heat transfer between a surface and an adjacent fluid exists.

M. Siddique 'Recent Advances in Heat Transfer Enhancements: a says that the way to improve heat transfer performance is referred to as heat transfer enhancement (or augmentation or intensification). Nowadays, a significant number of thermal engineering researchers are seeking for new enhancing heat transfer methods between surfaces and the surrounding fluid. Due to this fact classified the mechanisms of enhancing heat transfer as active or passive methods. Those which require external power to maintain the enhancement mechanism are named active methods. Examples of active enhancement methods are well stirring the fluid or vibrating the surface. On the other hand, the passive enhancement methods are those which do not require external power to sustain the enhancements' characteristics. Examples of passive enhancing methods are: (a) treated surfaces, (b) rough surfaces, (c) extended surfaces, d) displaced enhancement devices, (e) swirl flow devices, (f) Coiled tubes, (g) surface tension devices, (h) additives for fluids, and many others.

Jan Taler discovered that the fin and tube geometry affects the flow direction and has the effect on the temperature changes. Numerical analyses are carried out to examine finned tube heat exchanger. Three dimensional models are performed to find heat transfer characteristics between a finned tube.



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Recent Development in Humanoid Robot

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Abstract— Research was conducted in the project which develops social humanoid robot named Sara – a mobile anthropomorphic platform for researching the social behaviour of robots. There are different two basic ways for the realization of humanoid wrist. The first one is based on biologically inspired structures that have variable stiffness, and the second one on low backlash mechanisms that have high stiffness. To avoid backlash a solution is provided with low backlash differential mechanism which requires small actuators. Depending upon the kinematic dynamic requirements, a dynamic prototype of the robot wrist is fabricated. The driving torques of the wrist mechanism were determined by dynamic simulation for several hand positions. The realized wrist has 2 DOFs and enables movements in the direction of flexion/extension 115°, ulnar/radial deviation $\pm 45^\circ$ and the combination of these two movements. It consists of a differential mechanism with spur bevel gears, out of which are driving and identical, while the one is the driven gear to which the robot hand is attached.

I. INTRODUCTION

Leonardo de Vinci who is considered as the first man, have drawn a humanoid mechanism in 1495. It was designed to sit up, wave arms, move head while opening and closing its jaw. The 18th century can be considered as the fertile period in the development of many autonomous which were able to reproduce some human movements. In 1773, Pierre and Henry Louis invented the first automation which was able to write. The mechanical trumpeter was created by Fridrich Kaufmann in 1810. The trumpeter contained a notched drum which was used to activate some valves that helped to pass air through twelve tongues. Construction and development period of humanoid begins in the 19th century when John Brainerd invented the Steam Man in 1865 [8]. It was moved by steam-engine and used to pull carts. This robot is having appearance similar to humans planned for interaction with humans. Due to its human-like body appearance the robot can perform significant behavior for humans. Size is important for an interactive robot. A robot can be a powerful instrument for service purpose. The presence of robot is novel as it can attract people attention and redirect their interest to the provided information. This paper mainly focuses on real-time working pattern generated by the humanoid robot. An important factor for humanoid robots is that it should be capable of walking in stable manner so that it can satisfy human demands.

However, the task of controlling the humanoid robot is not easy due to the presence of many degrees of freedom and the danger of tipping over. In the area of gesture recognition several approaches are established using different input devices and learning algorithms.

This developed humanoid robot that communicates with humans can also be made to participate in human society as a partner. Body like human will provide an abundance of nonverbal information and enable us to smoothly communicate with robot. To accomplish this, we developed a humanoid robot that autonomously interacts with humans when gesture is given by user. The results reveal the importance of well-coordinated behavior, performance of the developed robot and suggest a new analytical approach to human-robot interaction humanoid robots will be working in direct contact with humans, in an environment that is dynamic and unstructured, and will be performing numerous and complex tasks. One of expectations of modern society is the use of humanoids as an acceptable aid for people with special needs, regardless of whether they have a disability or have impaired mobility and motoric functions due to their old age. This kind of robots must be safe both for humans and for objects in their environment. Apart from this, humanoid joints mechanisms of which are formed, must fulfil numerous requirements that exist during dynamic activity of the robot. Those are high carrying capacity and reliability, high efficiency, low noise, low vibration, low backlash which is essential for motion control, self-locking that provide the robot posture without actuator power supply, compact design etc. Therefore, special attention should be given to the design and realization of the wrist Working Humanoid Robot

1.1 Human wrist and its mobility

The wrist is a complex structure that connects the hand to the forearm. It allows the hand and fingers to function, it provides and controls the extension and contraction of the long flexors and extensors of fingers and it enables fine hand motoric. It consists of the radiocarpal joint that enables extension of the wrist, the mediocarpal joint for flexion movements of the wrist, the intercarpal joint consisting of a number of smaller joints and the radioulnar joint that enables forearm rotation. Large number of muscles and ligaments is involved in wrist movements.

Finite Element Analysis of Coir Fiber Based Natural Composite

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Abstract—Natural fiber composite are knows as bio composites. Utilization of natural fibers as reinforcement in polymeric composites are increasing due to the improvements in properties of fibers can provide to the product. Composites are prepared by hand layup process. 2% NaOH fiber treatment was carried to improve the interfacial bonds between fiber and matrix leading for better mechanical properties. 5% by volume of coir fiber loadingsand epoxy resin composites are prepared. Fiber length was taken as 5mm, 10mm & 15mm and the ratio of epoxy resin: hardener was taken as 10:0.8. Three plates of dimension as 300 mm x 300 mm x 4 mm were manufactured and specimens are tested as ASTM standard for ultimate tensile strength. It was observed that the tensile strength of epoxy resin/ coir fiber composites was maximum at 15mm fiber length and is 15.27 N/mm². The Experimental results for tensile testing were validated using a numerical method technique in FEA software. The results by experimentation and Finite Element Analysis are close other. We can use composite material replacement to conventional materials in industrial applications.

Keywords: ASTM, Coir Fiber, FEA, Mechanical Properties.

I. INTRODUCTION

The composite materials can provide number of benefit as compared to conventional material. The composite materials are combination of two or more constituents with physically separable phases. The composite phase materials have different physical properties and is recognized as being a composite material. The reinforcement materials are platelets, fibers of particles and are added to improve mechanical properties such as stiffness, strength and toughness of the matrix material. Long fibers which oriented in the direction of loading gives the most efficient load transfer. This is because the stress transfer zone extends only over a small part of the fiber-matrix interface and perturbation effects at fiber ends can be neglected. The ineffective fiber length is small. Many popular fibers are available as continuous filaments for use in high performance composites which are glass fiber, carbon fiber and aramid fibers. The advantage of modern composite materials is that they are light and strong. Choosing a correct matrix combination and reinforcement material, new material can be manufactured that will exactly meets the requirements of a particular application.

A composite also gives design flexibility because they can be manufactured into complex and required shapes. The resulting composite product is more efficient, the raw materials are often expensive. A researcher found out a Morphological investigations on coir fibers and reveals that the external sheath of lignin obstructs the cellulose to make interfacial bond with the polymers. To remove this peripheral layer of lignin and to brings about more stable and superior interfacial bond. For achieving this, there are number of treatments that are established such as alkali treatment, bleaching etc. by which the surface properties of natural fibers are improved. The coir production industry in India, Sri Lanka and Brazil is much developed. The coir fiber composites has many applications in structural systems in manufacturing, housing, electrical panels, ducting etc. The coir fibers has low electrical and thermal conductivity. Coir composites can be used as low temperature insulating materials in household applications and electronic packaging applications.

II. MATERIAL & METHODOLOGY

Manufacturing of Laminates by Compression molding Technique:

The coconut fiber which has which is used as reinforcement in manufacturing of composite material is collected from local sources. The alkaline treatment using 2 % NaOH is carried out to coir. This treatment was to remove oils, wax, lignin and other fiber constituents which reduce adhesion between the matrix and fibers thereby making a weak boundary layer. The mould for manufacturing of plates have been prepared with dimensions of 300×300×4 mm. The lengths of coconut fiber are chosen as 5mm, 10mm and 15mm and has been mixed with epoxy resins of their respective weights by simple mechanical stirring and mixture of this are poured in the mould, keeping the view of testing condition and characterization standards while manufacturing. Three set of different composite compositions have been prepared by hand lay up method. A releasing agent (wax) has been use on mould to give easy removal of composites from the mould after curing period. The air trapped in the composite is removed by sliding roller and mould has been closed at temperature of 30° C for 24 hour and at a constant load of 50 kg.

Finite Element Analysis of Coir Fiber Based Natural Composite

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Abstract—Natural fiber composite are knows as bio composites. Utilization of natural fibers as reinforcement in polymeric composites are increasing due to the improvements in properties of fibers can provide to the product. Composites are prepared by hand layup process. 2% NaOH fiber treatment was carried to improve the interfacial bonds between fiber and matrix leading for better mechanical properties. 5% by volume of coir fiber loadingsand epoxy resin composites are prepared. Fiber length was taken as 5mm, 10mm & 15mm and the ratio of epoxy resin: hardener was taken as 10:0.8. Three plates of dimension as 300 mm x 300 mm x 4 mm were manufactured and specimens are tested as ASTM standard for ultimate tensile strength. It was observed that the tensile strength of epoxy resin/ coir fiber composites was maximum at 15mm fiber length and is 15.27 N/mm². The Experimental results for tensile testing were validated using a numerical method technique in FEA software. The results by experimentation and Finite Element Analysis are close other. We can use composite material replacement to conventional materials in industrial applications.

Keywords: ASTM, Coir Fiber, FEA, Mechanical Properties.

I. INTRODUCTION

The composite materials can provide number of benefit as compared to conventional material. The composite materials are combination of two or more constituents with physically separable phases. The composite phase materials have different physical properties and is recognized as being a composite material. The reinforcement materials are platelets, fibers of particles and are added to improve mechanical properties such as stiffness, strength and toughness of the matrix material. Long fibers which oriented in the direction of loading gives the most efficient load transfer. This is because the stress transfer zone extends only over a small part of the fiber-matrix interface and perturbation effects at fiber ends can be neglected. The ineffective fiber length is small. Many popular fibers are available as continuous filaments for use in high performance composites which are glass fiber, carbon fiber and aramid fibers. The advantage of modern composite materials is that they are light and strong. Choosing a correct matrix combination and reinforcement material, new material can be manufactured that will exactly meets the requirements of a particular application.

A composite also gives design flexibility because they can be manufactured into complex and required shapes. The resulting composite product is more efficient, the raw materials are often expensive. A researcher found out a Morphological investigations on coir fibers and reveals that the external sheath of lignin obstructs the cellulose to make interfacial bond with the polymers. To remove this peripheral layer of lignin and to brings about more stable and superior interfacial bond. For achieving this, there are number of treatments that are established such as alkali treatment, bleaching etc. by which the surface properties of natural fibers are improved. The coir production industry in India, Sri Lanka and Brazil is much developed. The coir fiber composites has many applications in structural systems in manufacturing, housing, electrical panels, ducting etc. The coir fibers has low electrical and thermal conductivity. Coir composites can be used as low temperature insulating materials in household applications and electronic packaging applications.

II. MATERIAL & METHODOLOGY

Manufacturing of Laminates by Compression molding Technique:

The coconut fiber which has which is used as reinforcement in manufacturing of composite material is collected from local sources. The alkaline treatment using 2 % NaOH is carried out to coir. This treatment was to remove oils, wax, lignin and other fiber constituents which reduce adhesion between the matrix and fibers thereby making a weak boundary layer. The mould for manufacturing of plates have been prepared with dimensions of 300×300×4 mm. The lengths of coconut fiber are chosen as 5mm, 10mm and 15mm and has been mixed with epoxy resins of their respective weights by simple mechanical stirring and mixture of this are poured in the mould, keeping the view of testing condition and characterization standards while manufacturing. Three set of different composite compositions have been prepared by hand lay up method. A releasing agent (wax) has been use on mouldto give easy removal of composites from the mould after curing period. The air trapped in the composite is removed by sliding roller and mould has been closed at temperature of 30° C for 24 hour and at a constant load of 50 kg.



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Design and Analysis of Hybrid Composite Chain Link

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Abstract—Every consumer industry have a part of Material Handling. There is no matter what product is produced, at some time in its production way it is likely to be transported or stored by material handlers. Chain is the most important element of the industrial processes required for transmitting power and conveying of materials. Roller conveyor chain performs efficient and economical in wide range of applications in manufacturing industries. Chain drives are most important systems used in industry to carry the products and to transmit the power.

In this paper we perform, theoretical analysis of the stresses in chain link, pin and estimation of required strength as per given capacity of roller conveyor chain, finite element analysis of stresses in chain link for traditional material and hybrid composite material using ANSYS. Then Experimental analysis of chain link suggested alternative composite material is to be carried out and comparison of theoretical, FEA and experimental results for Chain Link Plate made of Hybrid composite will lead to the conclusion of the study and final results.

Keywords- Chain Link, Hybrid Composite Material , FEA, mechanical experiments

I. INTRODUCTION

A) Composite Material :

A composite material is a material system which consists of a mixture or a combination of two distinctly differing materials which are insoluble in each other and differ in form or chemical composition. Composite materials include of layers of at least two completely different materials that are bonded together. Thus, a stuff is labeled as any material consisting of two or more phases. Many combinations of material may, therefore, be termed as composite materials, such as concrete, mortar, reinforced rubbers, conventional multiphase alloys, fiber reinforced plastics, and fiber reinforced metals and similar fiber impregnated materials. Two-phase composite materials are broadly classified into two categories: particulate composites and fiber reinforced composites. Particulate composites are those in which particles having various sizes and shapes are dispersed with in a matrix in a random fashion. As the distribution of the particles are random and are of various shapes and sizes, these composites are treated as quasi-homogeneous and quasi-isotropic.

Examples of particulate composites are mica flakes reinforced with glass (non-metallic particles in a non-metallic matrix), aluminium particles in polyurethane rubber (metallic particles in a non-metallic matrix), lead particles in alloys (metallic particles in a metallic matrix) and silicon carbon particles in aluminium (non-metallic particles in a metallic matrix).

Some of the properties that can be improved by forming by composite material are:

- Strength
- Stiffness
- Corrosion resistance
- Wear resistance
- Weight
- Fatigue life
- Temperature dependent behavior
- Thermal insulation
- Thermal conductivity

B) Chain background :

A chain is a reliable machine component, which transmits power by means of tensile forces, and is used primarily for power transmission and conveyance systems. The function and uses of chain are similar to a belt.

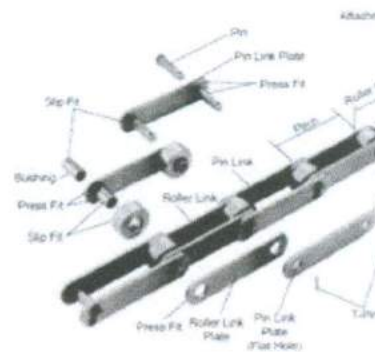


Fig. 1 - Chain components

Fig. 1 shows the basic structure of chain. In chain structure having parts called pin, roller, bushing, links, locking plate.

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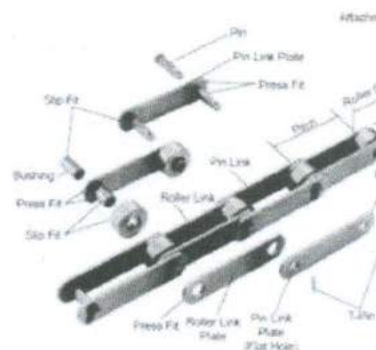


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DESIGN AND ANALYSIS OF AN INNOVATIVE UMBRELLA FOR CAR

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ABSTRACT

Car parking umbrella can be one of the effective solution for traditional car covers and the covered parking space which are only available in some of the big residential buildings, corporate offices and malls in big cities. Car umbrella can be carried at any location which can provide shelter to car and protect it from sunlight & rain. In the vehicle cabin, the Inside temperature is very important to feel the comfortable condition to the car passengers. The inside Temperature of the car cabin is increase, when the car is left or parked directly under the sunlight. Various components of car umbrella are design using ISO standards. Selection of car umbrella assembly material is carried out by studying properties of Al6061 and Structural steel material. The selection of covering material is carried out by studying the properties like heat reflection and environment friendly, the polypropylene based non-woven fabric is suitable for this résearch. 3D modelling is creating in Solidworks software. Structural analysis of various components is carried out in ANSYS software.

Keywords: ANSYS, Car Umbrella, Design, ISO Standards, Solidwork.

I. INTRODUCTION

Vehicles have become a primary factor in our lifestyle. It is one the best means of transportation on a daily basis. Due to the advancement in technology, people tend to use more automatic systems these days. Thus, engineers try to change manual systems into automatic systems in order to make people's lives easier.

The car parking in an unshaded area rise the greenhouse problem. This is the problem of conversion of solar radiation entering through the windows of a car into long wave thermal radiation and trapped inside car cabin causes temperature increase of cabin components. Thereby, use of cardboard car shades to reduce the interior temperatures inside parked automobile has become popular in Baghdad and other hot regions in Iraq. Temperature inside the vehicle cabin is very important to provide comfortless to the car passenger. The temperature can be controlled by using air conditioning system that can be operated when the car engine is in operation. And, when the car is left or parked directly under the straight sunlight, the temperature inside the car cabin will be increased. The sealed automobiles commonly encounter interior temperature conditions that are tremendously uncomfortable and may be harmful also to the car passengers.

The car users are faced a hot interior after a certain hours of parking in open space or unshaded parking area. The heat under such parking conditions causes the car cabin and interior temperature to reach up to 80°C average. The thermal energy get accumulated inside the car cabin with undesired temperature rise would cause the interior parts to be get degrade because they normally are subjected to wear and tear. Degradation and may shorten the life span of the various components inside the car cabin, especially electronic devices, rubber and plastic parts. The car passengers are also being affected with the temperature condition inside the vehicle itself. The car users is forced to wait for a period of time around 2 – 5 minutes before getting into car to let the interior condition cool down either by rolling the window or running the air conditioner system (A/C) at high speed that really affect the fuel consumption.

Research work is to find out the most technically feasible passive solution to reducing the car interior temperature. This can be achieved by constructing an automatic device on a vehicle to prevent the heat penetration in the vehicle interior caused by the sunlight.

II. LITERATURE REVIEW

Several parameters like geographical area, parking condition, area to be covered of car, as well as several design consideration from researchers are studied in below literature review.

Saad Bin Abul Kashem, Aws Dhafir Yasin & Elammaran Jayamani et. al. (2017) Constructed automatic device on vehicle to prevent heat penetration inside the car body. Their device is fully autonomous to cover the car when parked in outside parking. Their system will prevent any vehicle from getting affected by heat produced by the solar energy. Solidworks design and simulation has been done to analyze the required power by the system. Finally, a prototype has been built and the feasibility has been checked.

R. K. Tyagi & M. K. Verma (2013) done work on an automatic car cover is proposed which will opens itself



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