

FABRICATION OF FOLDABLE ELECTRIC MOTORCYCLE FOR LAST MILE CONECTIVITY

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ABSTRACT: The population of world is increasing and the area is decreasing. We are in the stage of compact world, where all things are going to compact, the time is to think about the vehicle which can be folded easily and can be taken everywhere. The basic aim behind our project is to make a portable vehicle which would be easy to handle by both genders and it should emit 0% emission, also keeping in mind the parking problems, we have decided to make a portable suitcase vehicle which can be folded easily. So after the use, one can fold a suitcase and can carry it along with him or her as a luggage and keep it in home or wherever there is place for the size of suitcase. We have applied our engineering knowledge as well as some references from Mazda's Suitcase car for the development of this product. It is an environment friendly, small & cheap project which can be hold by any household member and used within certain limits on public roads. While designing, we have concentrated on power, economy, ease and comfort of riding and low maintenance cost. Also we have concentrated on ergonomics factor to gives the user a comfortable ride.

Keywords - Foldable motorcycle, Electric motorcycle, health, transport, conventional bicycles, comfort and economy

I. INTRODUCTION

As the population is increasing there is increase in demand of automobiles. Due to increase in automobiles, people will require space for driving and also for parking. As we know there is limited space available and due to increase in the number of cars on roads they are causing traffic congestion and with that they require a place for parking. In addition to these pollution is also a priority nowadays. The pollution is reaching new limits day by day. So the idea of a foldable and portable vehicle comes into concept. Portable vehicle can be assembled and disassembled whenever required as well as we can carry it within the suitcase anywhere. If required we can assemble it in just less than ten minutes and drive it. In this portable vehicle we used two wheels, out of that the power is given to rear wheels and steering of the vehicle is done by front wheel. Power is produced in vehicle using a DC electric motor.

From experience, we know that at current oil prices, fossil fuelled vehicles are more attractive than bicycles for most users, but that bicycles are significantly cheaper. Thus barriers must exist to the use of bicycles for many potential riders. The paper shows how a low power can be utilize to drive such a motor and also manage other useful functions on an electric foldable bicycle.

It also eliminates the need to look for parking, which not only means an inestimable time saving but above all significant money savings in the urban economy. It is possible to convert a routine displacement carried out under pressure into an opportunity to do exercise, since we work on our cardiovascular system during the ride. In addition to avoiding traffic jams, we are taking care of our body, so the known excuse of not having time to exercise can be resolved in the most practical and comfortable way possible. In short, it is compatible to take care of yourself while going to work [3].

This paper we helps to design an e-bike which may be the solution to our problems which we are experience now a days like traffic congestion, parking difficulties and pollution from fossil fuelled vehicles [1].

II. OBJECTIVE

The main purpose of this project is to review the current situation and effectiveness of electric foldable bicycle. In order to approach this purpose, following objectives are specified.

- To maximize the speed and efficiency.
- To optimize the cost.
- To reduce the overall weight of the vehicle
- To make the vehicle more compact as possible

III. METHODOLOGY

- The part designing of frame in CATIA v5 software
- Designing the structure of the vehicle on the basis of design calculations for each part of vehicle.
- Initial Frame construction is done by using PVC pipes, to check the dimensional analysis.

Fruit Recognition using Image Processing

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Abstract: The ability to identify the fruits based on the quality in food industry is very important nowadays where every person has become health conscious. There are different types of fruits available in the market. However, to identify best quality fruits is cumbersome task. Therefore, we come up with the system where fruit is detected under natural lighting conditions. The method used is texture detection method, color detection method and shape detection. For this methodology, we use image segmentation to detect particular fruit. Fruit Detection project is implemented in MATLAB image processing toolbox. The project is implemented for both Real time and Non-Real time. The proposed method has four stages: First is Pre-Processing and second is Feature Extraction and third is Segmentation and fourth Recognition. In case of Non-Real time, the first stage is used to browse the image, second stage is extraction of the features from images using Grey Level Co-occurrence Matrix (GLCM), RGB and Color Histogram. System will convert the image from RGB to grayscale image for further processing. The color histogram represents the distribution of colors in an image. Since image is captured under different illumination condition. In the third stage, the three extracted image is obtained in the form of red, green and blue. In the fourth stage, the extracted features are used as input to Support Vector Machine (SVM) classifier. Then name of the fruit is output is obtained.

I. INTRODUCTION

Recognizing different kinds of vegetables and fruits is a difficult task in supermarkets, since the cashier must point out the categories of a particular fruit to determine its price. The use of barcodes has mostly ended this problem for packaged products but given that most consumers want to pick their products, they cannot be pre-packaged, and thus must be weighed. A solution is issuing codes for every fruit, but the memorization is problematic leading to pricing errors. Another solution is to issue the cashier an inventory with pictures and codes, however, flipping over the booklet is time consuming. Automatic classification of fruits via computer vision is still a complicated task due to the various properties of many types of fruits. The fruit quality detection technique which was based on external properties of fruits such as shape, size and color.

The proposed method is based on the use of Support Vector Machine (SVM) with the desirable goal of accurate and fast classification of fruits. Support Vector Machines (SVMs) is a classification method based on machine learning theory. SVMs have significant advantages because of their high accuracy, elegant mathematical tractability, and direct geometric interpretation. Besides, they do not need a large number of training samples to avoid overfitting. The task here is to automatically detect and classify the fruits image acquired from database. Assuming that the different images are present and some are overlapped on one another. The proposed work mainly gives a review that what steps are performed throughout the entire process to detect particular fruit. Since image is captured under different natural condition. The framework mainly consists of two phases. In the first phase textural features are extracted from fruit and in the second phase fruit is classified as detected fruit. The measurements obtained from the study of textural feature are given as input to the SVM classifier for training in order to classify it. Finally, system will detect objects and will display as an output. The objective of Fruit Recognition using image processing is to design a incremental model to recognize the fruits based on size, shape and colour of the fruit ignoring external features like environment, noise and background. This just focus the image of particular fruit and identify the fruit. An approach of classification using Support Vector Machine Classifier that has very good working efficiency produces the accurate results. The system helps to improve the performance. Maintaining the project is easy and manageable.

II. RELATED WORK

In [1], they have recognized nine different classes of fruits. Fruit image dataset are obtained from web as well as certain images are acquired by using mobile phone camera. These images are pre-processed to subtract the background and extract the blob representing fruit. For representing fruits and capturing their visual characteristics, combination of color, shape and texture features are used. These feature datasets is further passed to two different classifiers multiclass SVM and KNN. The color image is firstly

Automatic Waste Management

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Abstract—Ordinarily, in our city we see that the waste canisters or dustbins set at open spots are over-burden. It makes unhygienic conditions for individuals just as offensiveness to that place leaving awful stench. To maintain a strategic distance from such circumstances the proposed task will be executed for effective waste administration utilizing IOT. These dustbins are interfaced with arduino based framework having ultrasonic remote frameworks alongside focal framework demonstrating current status of trash, on portable web application with Android application by Bluetooth. Henceforth the status will be refreshed on to the Application. The fundamental point of this task is to lessen HR and endeavors alongside the upgrade of a shrewd city vision.

Keywords—*Arduino, ultrasonic sensor, Bluetooth transceiver.*

I. INTRODUCTION

Internet and its applications have turned into an indispensable piece of the present human way of life. It has turned into a basic apparatus in each viewpoint. Because of the enormous interest and need, scientists went past associating only PCs into the web. These examines prompted the introduction of a sensational gizmo, Internet of Things (IOT). Communication over the web has developed from client - client collaboration to gadget - gadget connections nowadays. The IOT ideas were proposed a very long time back, yet at the same time it's in the underlying phase of business arrangement.

Home mechanization industry and transportation ventures are seeing quick development with IOT. However very few articles have been distributed in this field of study. This record points in organizing a best in class survey on IOT. The innovation, history and applications have been talked about quickly alongside different measurements. Since a large portion of the procedure is done through the web we should have a functioning rapid web association. The innovation can be basically clarified as an association between human PCs things. All the hardwares we use in our everyday life can be controlled and checked utilizing the IOT. A greater part of procedure is finished with the assistance of sensors in IOT. Sensors are sent all over the place and these sensors convert crude physical information into computerized flags and transmits them to its control focus. By along these lines we can screen condition changes remotely from any piece of the world by means of web. This current framework's design would be founded on setting of activities and procedures continuously situations. smart garbage container works in the comparative way with the ultrasonic sensor that shows its profundity of waste in the receptacle. The ultrasonic sensor will demonstrate to us the

different level of waste in the dustbins and to send its yield ahead when its edge level is crossed. These subtleties are additionally given to the arduino and the controller gives the subtleties to the transmitter module (Bluetooth module). At the beneficiary area a mobile handset is should have been associated with the bluetooth module so the details of the garbage bin are shown onto the Android Application of our versatile handset

II. LITERATURE SURVEY

This isn't a unique thought, for the execution of smart waste container; the thought has existed for a long time, After the IOT field discovering its grasp in our lives. This is, anyway a unique arrangement for structuring a smart bin in with ultrasonic sensor and bluetooth module for transmission of information.

The workers of Municipal Corporation regularly demonstrates inconsistency in investigation of dustbins of various zones as it made them to complete a great deal of manual exertion. Henceforth to decrease their manual exertion innovation of IOT based inserted gadgets is utilized to present the shrewd trash accumulation frameworks is that significantly have two units one is ace unit to attempt allotment of work to accessible truck drivers for individual territory and slave unit that keep record of all the rubbish gathering in various zones. Anyway the errand of portion of work and keeping records is finished with the assistance of a gadget furnished with these dustbins. These gadgets by and large comprise of sensors like weight sensor for getting dimension of dustbin, Arduino UNO board for controlling gadget working, and Wi-Fi module with the goal that status of dustbin can be refreshed on government's web server. Further progression is done in the framework where the GSM module is utilized furthermore, to above proposed framework to acquaint a component concurring with which the gadget will send the message to the individual truck drivers when dustbin is full for gathering waste from particular zone just as ultrasonic sensor utilized instead of weight sensor for level recognition [2].

IoT-Based automatic garbage system for productive sustenance squander the executives by Insung Hong, Sunghoi Park, Beomseok Lee, Jaekeun Lee, Daebeom Jeong, Sehyun Park. This paper gave the overview working of the IOT based brilliant trash canister and the sustenance the board. It incorporates the data pretty much all the approaches to deal with the gathering of the trash [3].

Demonstration of Collective and Cyclic Pitch Control of Helicopter Swash Plate

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Abstract: As in case of Aircrafts the control surfaces helps the aircrafts in maneuvering. Where as in Helicopters swash plates does the work of control surfaces. Helicopters are the one of the most complex machines present in the world. With advancement in technology it becomes a need to reduce complexity and weight of this machine. The purpose of the swash plate is to convert stationary control inputs from the pilot into rotating inputs which can be connected to the rotor blades or control surfaces. The conventional Swash plates are bulky and becomes a major problem for aerodynamics of helicopters. In this paper a design of swash plate is discussed. In major it consists of two main parts: stationary plate and a rotating plate. The whole assembly is placed inside the main rotor mast (which is hollow from inside) and connected to the cyclic and collective controls by a series of push rods. The whole assembly is not connected to the rotor mast at any point and can tilt in all directions and move vertically. The rotating swash plate is mounted to the stationary swash plate by means of a thrust bearing. It is connected to the rotor blades by drive links and must rotate in constant relationship with the rotor blades. Both swash plates tilt and slide up and down as one unit. A tap is introduced to keep both the plates and bearing intact.

Keywords: Rotor Mast, Push Rods, Thrust Bearing

1. Introduction

Blade feathering, or pitch change, could be achieved in various ways. The use of aerodynamic servo tabs, auxiliary rotors, fluidically controlled jet flaps, or pitch links from a control gyro as possible methods. The widely adopted method, however, is through a swash plate system.

The stationary swash plate is mounted inside the main rotor mast and connected to the cyclic and collective controls by a series of pushrods. It is restrained from rotating by an ant drive link but can tilt in all directions and move vertically. The rotating swashplate is mounted to the stationary swashplate by means of a uniball sleeve. It is connected to the mast by drive links and must rotate in constant relationship with the main rotor mast. Both swashplates tilt and slide up and down as one unit. The rotating swashplate is connected to the pitch horns by the pitch links.

2. Literature Review

A Swash plate assembly according to the present invention includes a rotationally stationary Swash plate and rotational swashplate which rotates relative to the rotationally stationary Swashplate through a bearing system. The bearing system includes a duplex bearing which need not increase to accommodate bolt or expandable pin removal as typical of conventional systems. Such a bearing system provides for an uncomplicated and lightweight arrangement. Each servo control rod is attached to the Swashplate assembly to communicate control inputs thereto through a respective servo lug. Each servo lug defines a servo pivot point off an in-line plane inboard of the bearing system. As the servo lugs extend below the rotationally stationary Swashplate, a relatively uncomplicated attachment arrangement is facilitated as compared to a more conventional trunnion attachment. Attachment is provided by a servo lug fastener Such as bolted connection. Such attachment facilitates

for redundant locking features at a highly inspectable location which simplifies maintenance and increases safety.

Each pitch control rod is attached to the rotational swashplate assembly to communicate pitch commands to a respective rotor blade assembly through a respective pitch lug which defines a rotor pitch control point. The rotor pitch control point as defined by the rotational Swashplate is located on the in-line plane which passes through the central pivot point.

By locating the servo pivot point just inboard of the bearing system, an exceeding compact load path is defined thereby. The load path is defined from the servo control rod, to the servo lug, through the rotationally stationary Swash plate, bearing system, the rotational Swash plate, the rotor pitch control point and into the pitch control rod. The present invention therefore provides an uncomplicated, short load path Swash plate assembly which provides the desired compactness.[1]

Accordingly, it is an object of this invention to provide a swash plate control system that provides a better control over rotor blade positioning under different operating conditions than obtainable with prior art swash plate control systems. It is another object of the invention to provide such a swashplate control system that decouples lateral and longitudinal cyclic inputs to the swashplate without requiring the use of a mixer box. It is a further object of the invention to provide such a swashplate control system which provides direct, linear read-out of lateral cyclic, longitudinal cyclic and collective swashplate positions. It is still another object of the invention to provide such a swashplate control system that returns the swashplate to a zero collective position rapidly when desired. The attainment of these and related objects may be achieved through use of the novel swashplate control system herein disclosed.

A swashplate control system in accordance with this invention has a first gimbal ring pivotally mounted along a longitudinal axis. A second gimbal ring is pivotally attached to

Design of Double-tail Dynamic Latch Comparator for Low Power Application

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Abstract— The Analog to Digital Converter (ADC) is an important part of any signal processing system. It is used to convert the analog signal to digital signal. Power consumption and compactness are the main issues in an ADC. Among the different components of ADC comparator is the one which consumes more power. Dynamic latch comparators are the most suitable comparators for low power applications. A modified Double-tail latch comparator with reduced glitches for low frequency applications is presented in this paper. The total power consumed by the circuit is 296.171 pW at 1.8 V power supply. The simulation is carried out in Cadence Virtuoso environment using 180 nm CMOS technology.

Keywords— ADC; Comparator; Dynamic latch

I. INTRODUCTION

Analog electronics is a field of electronics which deals with the continuous variable signals. These signals are the real time signals which vary continuously with respect to time. As the world is moving towards digitization of data streams, there should be an aid to convert analog signal to digital signal. The advantages of digital signals are immunity to noise, accurate and easily storable. ADC is a device that converts analog information into digital form. The processing of data in terms of digits is easy and yields better quality of signal. ADCs are used in many applications such as signal processing systems, data acquisition systems, data processing systems, communication systems and biomedical applications. Biomedical devices such as ECG, EEG, pacemakers and bio implantable devices need to be highly accurate, compact and must consume low power.

Among different types of ADCs Flash ADC is used in communication systems which requires extremely high speed operation. Successive Approximation Register (SAR) ADC is mainly used in biomedical devices because of its low power dissipation. Sigma-Delta ADCs are used in high resolution systems [2]. Ramp ADCs are used in On-chip signal generators.

SAR ADC is preferred over other ADCs because of its relatively short conversion time and small size. The block diagram of SAR ADC shown in Figure 1. It consists of sample and hold circuit block, comparator, SAR logic and Digital to Analog Converter (DAC). The

input signal (V_{in}) is sampled by the Sample and Hold circuit. The comparator compares sampled signal ($V_{S/H}$) and the reference signal (V_{DAC}). The output of comparator is given to SAR logic and most significant bit is set. DAC converts the digital signal to analog signal and this signal is fed-back to comparator [1]. This process is repeated until all the bits are set.

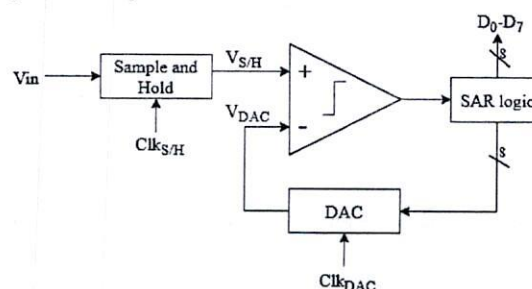


Figure 1. Block diagram of SAR ADC

In SAR ADC, comparator plays an important role. It takes sampled analog signal from Sample and Hold circuit and compares it with reference signal fed by DAC. The output of comparator is given to SAR logic. If the amplitude of analog input signal is greater than the reference signal, comparator gives logic HIGH output. If the amplitude of analog input signal is lesser than the reference signal, it gives out logic LOW. In order to achieve low power dissipation and high speed in SAR ADC, the comparator must be designed such that it has low power dissipation and delay.

II. RELATED WORK

Jomar Carandang et al., [2], proposed an ADC using 90 nm CMOS technology using a supply voltage of 1.2 V. It includes comparison of different types of comparators. Mainly open loop comparator, pre-amplifier preceding a latch comparator, and dynamic comparators. The dynamic comparator is used in biomedical devices.

Vijay Pratap Singh et al., [3], proposed a SAR using Double-tail dynamic latch comparator with reduction of power dissipation and increase the device speed.

Heung Jun Jeon et al., [4], a new dynamic latch comparator design with offset voltage compensation is presented. This comparator drives a large capacitive load

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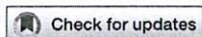
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Microwave assisted green synthesis and characterization of silver nanoparticles from *Hibiscus* leaf extract and investigation of their antimicrobial activities

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The recent research in nanoparticles synthesis field utilizes biological synthesis rather than chemical and physical methods in order to get uniform size and non-toxic of nanoparticles, further in biological synthesis the microbial synthesis is time consuming and requires sterilized conditions wherein green synthesis can overcome these drawbacks. The green synthesis of silver nanoparticles from many plant extracts finding quit attraction to many research scholars though very minute work has been done by using *Hibiscus* leaf extract. In this research work comparative experimental investigation is done on green synthesis of silver nanoparticles from three extracts *Hibiscus* leaf extract, followed by characterization was done by UV-Spectrophotometer, XRD, FTIR, AFM and SEM analysis. The silver nanoparticles of size 25-50 nm were synthesized by *Hibiscus* leaf extract. The silver nanoparticles were later treated with 4 different antibiotics wherein erythromycin showed three-fold increments in its efficiency.

Topics

Nanoparticle, Spectrophotometer, Chemical engineering, Antimicrobials, Antibiotics

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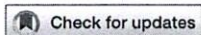
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Experimental investigation on synthesis, characterization and antibacterial properties of silver nanoparticles from *Cinnamon zeylanicum* extract

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The nanoparticles can be synthesized by biological, physical and chemical routes, among these three routes the biological synthesis is more effective, convenient, cost effective, eco-friendly and result uniform size nanoparticles though many researches have been conducted on this area there is very less work reported on silver nanoparticles synthesis from Cinnamon zeylanicum as a green approach. In this research work experimental investigation is done on synthesis of silver nanoparticles (AgNPs) from Cinnamon zeylanicum plant extract as a green approach, followed by characterization was done by UV-Spectrophotometer, XRD, FTIR, AFM and SEM analysis. The silver nanoparticles synthesis was monitored with double beam UV spectrophotometer with the scan range 200 – 800 nm, the highest absorbance at 460 nm indicated the presence of AgNPs. Further synthesized silver nanoparticles were found to be of size 20-40 nm by SEM and AFM analysis. The silver nanoparticles were later treated with 4 different antibiotics wherein *Penicillin* showed three-fold increments in its efficiency.

Topics

Nanoparticle, Spectrophotometer, Antibiotics

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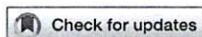
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Synthesis and Characterization of Silver Nanoparticles from *Fuzarium Oxysporum* and Investigation of Their Antibacterial Activity

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Abstract

Nanotechnology is the fastest growing field of 21st century due to this reason that the nanomaterials synthesis finds more importance in field of research. The nanomaterials can be synthesized by physical, chemical and biological methods. The biological methods are more advantageous than the other two methods because of manipulation of the size and morphology of nanostructures by microbes and plants. The *Penicillium* sps. *Fuzarium Oxysporum* was used to synthesize silver nanoparticles and the synthesis was extracellular. The nanoparticles were characterized for various studies using UV spectrophotometer, XRD, Zetasizer Nano S90, SEM, EDAX and AFM. The synthesized silver nanoparticles were found to have size in range 30-45 nm confirmed by SEM and AFM analysis. The XRD pattern confirms FCC structure of silver nanoparticles. Further, the antibacterial activity of the silver nanoparticles was tested against several antibiotics by conjugating them with antibiotics, with the help of zone of inhibition. Among several antibiotics used the efficiency of erythromycin increased by 3 fold

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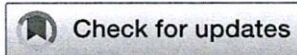
K.J.P. Anthony *et al.*

Synthesis of silver nanoparticles using pine mushroom extract: A potential antimicrobial agent against *E. coli* and *B. subtilis*

Ind. Eng. Chem. Res. (2014)

First pass yield improvement in fuel injection pump delivery valve assembly

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+ Author & Article Information

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This work was carried out in an automotive sector, for single cylinder fuel injection pump (pf-33) delivery valve assembly line. Our work aims to focus on internal quality improvement to reduce rejection in a delivery Valve assembly line, which was having around 10.5% scrap. A substantial improvement of around 60% we estimated after the completion of work. The present work also signifies the data regarding the two significant rejections were taken for study as per Pareto Analysis from three months of rejection data. Observed that a significant problem with Delivery Valve (DV) through flow measurement is because the machine to test the through flow did not attain standard specification limits, and the method of assembly of parts needs to be improved as it caused misalignment. Some via simple techniques like the “seven basic quality control (QC) tools” and also why-Why analysis provided a valuable and cost-effective way to solve the problem. Of these various techniques, some tools and techniques like Cause & Effect Diagram, Pareto Analysis and Bar charts were mainly used. Brainstorming sessions were set and executed to identify the leading root causes of rejections in the assembly line. Several benefits have been observed from this work is that increase in productivity, reduction in Work In Progress (WIP) and improved production techniques.

Topics

Quality assurance, Combustion engine, Educational assessment

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Demonstration of Collective and Cyclic Pitch Control of Helicopter Swash Plate

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Abstract: As in case of Aircrafts the control surfaces helps the aircrafts in maneuvering. Where as in Helicopters swash plates does the work of control surfaces. Helicopters are the one of the most complex machines present in the world. With advancement in technology it becomes a need to reduce complexity and weight of this machine. The purpose of the swash plate is to convert stationary control inputs from the pilot into rotating inputs which can be connected to the rotor blades or control surfaces. The conventional Swash plates are bulky and becomes a major problem for aerodynamics of helicopters. In this paper a design of swash plate is discussed. In major it consists of two main parts: stationary plate and a rotating plate. The whole assembly is placed inside the main rotor mast (which is hollow from inside) and connected to the cyclic and collective controls by a series of push rods. The whole assembly is not connected to the rotor mast at any point and can tilt in all directions and move vertically. The rotating swash plate is mounted to the stationary swash plate by means of a thrust bearing. It is connected to the rotor blades by drive links and must rotate in constant relationship with the rotor blades. Both swash plates tilt and slide up and down as one unit. A tap is introduced to keep both the plates and bearing intact.

Keywords: Rotor Mast, Push Rods, Thrust Bearing

1. Introduction

Blade feathering, or pitch change, could be achieved in various ways. The use of aerodynamic servo tabs, auxiliary rotors, fluidically controlled jet flaps, or pitch links from a control gyro as possible methods. The widely adopted method, however, is through a swash plate system.

The stationary swash plate is mounted inside the main rotor mast and connected to the cyclic and collective controls by a series of pushrods. It is restrained from rotating by an ant drive link but can tilt in all directions and move vertically. The rotating swashplate is mounted to the stationary swashplate by means of a uniball sleeve. It is connected to the mast by drive links and must rotate in constant relationship with the main rotor mast. Both swashplates tilt and slide up and down as one unit. The rotating swashplate is connected to the pitch horns by the pitch links.

2. Literature Review

A Swash plate assembly according to the present invention includes a rotationally stationary Swash plate and rotational swashplate which rotates relative to the rotationally stationary Swashplate through a bearing system. The bearing system includes a duplex bearing which need not increase to accommodate bolt or expandable pin removal as typical of conventional systems. Such a bearing system provides for an uncomplicated and lightweight arrangement. Each servo control rod is attached to the Swashplate assembly to communicate control inputs thereto through a respective servo lug. Each servo lug defines a servo pivot point off an in-line plane inboard of the bearing system. As the servo lugs extend below the rotationally stationary Swashplate, a relatively uncomplicated attachment arrangement is facilitated as compared to a more conventional trunnion attachment. Attachment is provided by a servo lug fastener Such as bolted connection. Such attachment facilitates

for redundant locking features at a highly inspectable location which simplifies maintenance and increases safety.

Each pitch control rod is attached to the rotational swashplate assembly to communicate pitch commands to a respective rotor blade assembly through a respective pitch lug which defines a rotor pitch control point. The rotor pitch control point as defined by the rotational Swashplate is located on the in-line plane which passes through the central pivot point.

By locating the servo pivot point just inboard of the bearing system, an exceeding compact load path is defined thereby. The load path is defined from the servo control rod, to the servo lug, through the rotationally stationary Swash plate, bearing system, the rotational Swash plate, the rotor pitch control point and into the pitch control rod. The present invention therefore provides an uncomplicated, short load path Swash plate assembly which provides the desired compactness.[1]

Accordingly, it is an object of this invention to provide a swash plate control system that provides a better control over rotor blade positioning under different operating conditions than obtainable with prior art swash plate control systems. It is another object of the invention to provide such a swashplate control system that decouples lateral and longitudinal cyclic inputs to the swashplate without requiring the use of a mixer box. It is a further object of the invention to provide such a swashplate control system which provides direct, linear read-out of lateral cyclic, longitudinal cyclic and collective swashplate positions. It is still another object of the invention to provide such a swashplate control system that returns the swashplate to a zero collective position rapidly when desired. The attainment of these and related objects may be achieved through use of the novel swashplate control system herein disclosed.

A swashplate control system in accordance with this invention has a first gimbal ring pivotally mounted along a longitudinal axis. A second gimbal ring is pivotally attached to

A review paper on design and fabrication of monowheel vehicle

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ABSTRACT

Mono wheel as the name indicates consists of only one wheel. Driver of the wheel sits inside the wheel and the main principle involved is application of GYROSCOPE. The main aim of Monowheel is that it reduces the space occupied when a single occupied vehicle is necessary. The main discipline of engineering that is applied is mechanical engineering where we find applications of topics like stress calculation, trusses, gyroscopic couple, and concepts of a circle etc. It can be both human powered or motor driven type

Keywords: Place Gyroscope, Monowheel, Trusses, Analysis.

1. Introduction

A Monowheel is a one-wheeled single-track vehicle similar to a unicycle. However, instead of sitting above the wheel, the rider sits either within it or next to it. The wheel is a ring, usually driven by smaller wheels pressing against its inner rim. Most are single-passenger vehicles, though multi-passenger models have been built. Hand-cranked and pedal powered mono wheels were patented and built in 19th century. Some modern builders refer to these vehicles as monocycles, though that term is also sometimes used to describe motorized unicycles. Today, mono wheels are generally built and used for fun and entertainment purposes, though from the 1860s through to the 1930s, they were proposed for use as serious transportation. In view of the efficiency of bicycles, it is natural to ask if a one-wheeled vehicle provides any advantages. A one-wheeled vehicle is potentially more efficient than a two-wheeled vehicle since frictional losses at the wheels and in the drive train is reduced. However, just as a bicycle is dynamically more challenging to ride than a tricycle, a vehicle with a single wheel poses yet more challenges to stability and control there are two main types of single-wheeled vehicles. In a unicycle, the rider sits above the wheel. These vehicles are recognizable by most people. Less well known is the monocycle, where the rider sits inside the wheel. Like the bicycle, the unicycle and monocycle are statically unstable. Since the center of gravity (cg) is lower for the monocycle, this vehicle is potentially easier to ride than the unicycle. Nevertheless, piloting a monocycle is a challenging task. In this article, we discuss the history of the monocycle. Although many potential problems were inherent in their design, monocycles were adapted to accept motors. Garavaglia is credited with motorizing the first monocycle in 1904. Inventors and entrepreneurs soon began to promote the anticipated benefits of one-wheeled conveyances in contemporary publications and promotional materials

2. Principle

It works on the principle of gyroscopic effect and laws of motion. It consists of a big wheel called as ring inside which driver is being seated. The ring wheel is driven by a small rubber wheel which is in contact with the inner rim. Chain and sprocket is used for power transmission. Rubber driver wheel is used.

2.1 Working

It works on a principle of Gyroscopic effect. A gyroscope is a device that can be used to maintain orientation based on the principles of angular momentum. It is a mechanism by means of which a Rotor is free to spin Around an Axis. If a spinning gyroscope is placed such that its axis is horizontal and loosely supported from one end, the gyroscope does not fall. It rather maintains its horizontal axis and the unsupported end starts moving in a circular manner about the horizontal axis. The resultant rotation is perpendicular to the gravitational torque and the axis of rotation. The speed of precession of a gyroscope inversely varies with its angular momentum. The power from the engine drives the powertrain system designed which runs the outer wheel and the inner wheel keeps tumbling against the outer wheel.

3. Project requirement

- Metal tubes
- Nylon roller bearing
- Machining
- 4 stroke engine
- Rubber driver roller
- Chain and sprocket kit
- Tyres
- Brake assembly

DESIGN AND FABRICATION OF POWER WINDOWS FOR BUSES

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ABSTRACT: *If Bus disasters on fire, accident etc, to avoid casualties and human lives here we are proposing power window mechanism. On sensing any danger in the form of fire and smoke the window automatically will slide down making way for passenger way out from the vehicle. Power window consists of conduction sensor circuit control unit, wiper motor, glass frame. The sensor is used to detect fire or smoke. If there is any fire or smoke in bus cabin sensor sense the fire or smoke and giving the control signal to the wiper motor.*

Key Words:

1. Introduction

The problem of vehicle accident is part of an endless list of disasters that could occur anywhere anytime. According to the Association for Safe International Road Travel, about 1.24 million die and 50 million are injured on the roads of the world every year. To overcome such problems, many vehicle manufacturers and automobile device companies have attempted to develop passenger and vehicle safe. We have pleasure in introducing our new project "**Design and fabrication of power windows for buses**", which is fully equipped by sensors circuit and wiper motor. This is an era of automation where it is broadly defined as replacement of manual effort by mechanical power in all degrees of automation. The operation remains an essential part of the system although with changing demands on physical input as the degree of mechanization is increased.

Degrees of automation are of two types, viz.

- ✚ Full automation.
- ✚ Semi automation.

In semi automation a combination of manual effort and mechanical power is required whereas in full automation human participation is very negligible.


2. Working Principle

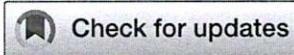
Fire and smoke sensors will fitted at the interior part of the vehicle to sense the smoke and the fire, which is connected by the micro controller, where the micro controller is programmed by embedded c is done in such a manner when the sensors sense the fire or smoke, the dc motor operates to open the windows automatically. The movement of the windows is arranged with dc motors, the whole system needs battery power to operate.

3. Project requirement

- Glass frame
- Wiper motor
- Sensor circuit
- Battery
- Relay
- Frame
- Connecting wire
- Bolt and Nut

Effect of E-waste rubber on mechanical behavior of glass a fiber reinforced with epoxy composites

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Polymer composites play a vital role in structural applications enhancing the commercial aspects of less weight and high strength, sufficient ductility, hardness, brittleness and toughness. The desirable properties of these lightweight structures' form a favourable group while selecting materials recommending for applications. Adding to this the polymer matrix composites reinforced with fibers enhance excellent mechanical properties by adding filler particles into the matrix, unlike unfilled fiber reinforced plastic structures, filler composites exhibit superior bending and tensile strength. The process of developing filler composites is done by adding a minor amount of filler particulates in different percentage with respect to the volume of the matrix by employing the suitable technique. The present work highlights the importance of E-waste rubber which is directly obtained from waste tires which are powdered and sewed. The particle size is limited to 150 μ m which is then mixed to the matrix and cured the samples followed by adding filler with a smaller percentage which is increased gradually say 5%, 10%, 15% by weight of the matrix considered. The samples were prepared by hand lay-up technique; the prepared samples were cut and tested as according to the ASTM standard. Tests have been carried out to assess the mechanical behaviour of prepared samples using digital UTM. It is concluded that samples containing 5% filler withstand maximum tensile strength. There is a 25% increase in tensile strength is observed for these samples as compared to unfilled composites. It is also noticed that the samples loaded with 5% filler shows approximately 18.75% increase in bearing bending load when compared to unfilled composite samples. This is due to the strong opposition by particulate filler to matrix de-bonding from fiber against applied bending load resulting from the uniform dispersion

Competitive Price, No Limited

Real Time Drowsiness Detection To Reduce Major Road Accidents

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Abstract: The car population is growing exponentially in the country. The drowsiness of the driver, alcoholism and neglect are the main reasons in an accident scenario. In India, no measuring device is used to measure the drowsiness of the driver. Detecting drowsiness of the driver is a safety technology for vehicles that saves the driver's life by preventing accidents when the driver starts to sleep. The main objective is first to develop a system for detecting the fatigue of the driver by constantly monitoring the retina of the eye. The system works despite wearing glasses and in different lighting conditions. Make the driver aware of the drowsiness detected by a buzzer or alarm. A message is sent to the owner if the detected drowsiness exceeds the set limit.

Keywords- Accidents, Alarm, Driver Drowsiness Message sent.

I. INTRODUCTION

Detecting drowsiness of the driver is a safety technology for vehicles that prevents accidents when the driver starts to sleep. Various studies suggest that about 20% of all traffic accidents are due to fatigue, up to 50% on some roads. The fatigue of the driver is an important factor in a large number of traffic accidents. According to recent statistics, 1,200 deaths and 76,000 injuries a year are attributable to fatigue accidents [1].

The development of technologies for detecting or preventing drowsiness at the wheel is a major challenge in the field of accident avoidance systems [3]. Because of the hazard that drowsiness presents on the road, methods need to be developed for counteracting its affects. Driver inattention might be the result of a lack of alertness when driving due to driver drowsiness and distraction [2].

Driver distraction occurs when an object or event draws a person's attention away from the driving task [4]. Unlike driver distraction, driver drowsiness involves no triggering event but, instead, is characterized by a progressive withdrawal of attention from the road and traffic demands. Both driver drowsiness and distraction, however, might have the same effects, i.e., decreased driving performance, longer reaction time, and an increased risk of crash involvement [5].

Based on Acquisition of video from the camera that is in front of driver perform real-time processing of an incoming video stream in order to infer the driver's level of fatigue if the drowsiness is Estimated then the output is send to the alarm system and alarm is activated [6][7][8]. In this system, we have introduced message sending module to the owner when drowsiness detected.

II. SYSTEM DESIGN

The design of a system is perhaps the most critical factor affecting the quality of the software, and has a major impact on the later phases, particularly testing and maintenance. The design activity is often divided into two separate phases. They are system design and detailed design.

EFFICIENT LOCALIZATION OF REGION OF INTEREST FOR DROWSINESS DETECTION

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Abstract: The vehicle population is growing exponentially in the country. The increase in the number of road accidents is the main problem associated with increased traffic. The drowsiness, alcoholism and negligence of drivers are the main actors in the accident scenario. Road accidents are a big problem today and their percentage is increasing every year. Drowsiness is one of the factors of collision. In India, no monitor is used to measure drowsiness of the driver. Therefore, extraction or region of interest (ROI) is important to detect driver drowsiness. The proposed algorithm estimates landmark positions and extracts the eye region using eye aspect ratio (EAR). An SVM classifier algorithm is used to identify eye regions.

Keywords- ROI, SVM, EAR

1. INTRODUCTION

Detection of driver drowsiness is a vehicle safety technology that controls accidents when the driver becomes sleepy. Driver fatigue is a major factor in many road accidents. Road accidents are a big problem today and their percentage is increasing every year. The development of technologies to detect or prevent driver fatigue is a major challenge for accident prevention systems. Because of the risk of drowsiness on the road, methods must be developed to counteract their effects. Driver inattention may be due to a lack of attention while driving due to sleepiness and driver distraction. Driver distraction occurs when an object or event distracts the person from the driving task. Unlike driver distraction, driver drowsiness causes no triggering events, but a gradual withdrawal of attention from the road and traffic demands. However, drowsiness and driver distraction can have the same effect, reduced driving performance, longer exposure time and increased risk of accident participation. In this proposal, a real-time algorithm for detecting blinking in a video sequence from a standard camera is proposed. More recent landmark detectors formed on wild-type data sets have greater robustness with respect to head alignment with respect to a camera, different illumination, and facial expressions. Here, the landmarks are recognized so that they can estimate the height of the eye opening. The proposed algorithm estimates landmark positions and extracts the quantity-eye aspect ratio (EAR). An SVM (Support Vector Machines) classifier identifies blink with EAR values. The Viola Jones detector is a typical method of detection of the face and eyes. In this movement, the eye area estimated by sparse tracking. Finally, it is decided whether the eyes are closed or not. The main disadvantage of this approach, is that the implicitly configure is too high requirements setup. For example, relative position of the camera for the face or alignment of the head, resolution of the image, etc. An image of the human face, including the corners of the eyes and eyelids, is available. Figure 1 shows the landmarks of the eye. There are 6 landmarks (p1, ..., p6). These marker detectors are trained on the wild datasets and are therefore resistant to different lights and facial expressions. An average error of localization is below five percent. The new methods work very well in real time.

Mechanical Responses of Polypropylene and Calcium Carbonate Nanoparticles

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Abstract - This paper is to study the mechanical behaviour and properties like tensile, impact and flexural on the composite mixture of polypropylene and calcium carbonate nanoparticles. Four compositions of Polypropylene and CaCO_3 nanocomposites were prepared in Injection molding machine with varying calcium carbonate percentage. The results are plotted and it shows the increase in polypropylene elastic modulus and a little increase in yield stress, the impact resistance increased with the addition of nanoparticles. Tensile property and flexural depends on the calcium carbonate dispersion in polypropylene.

I. INTRODUCTION

A composite material is a material made from two or more constituent materials with significantly different physical or chemical properties that, when combined, produce a material with characteristics different from the individual components. The individual components remain separate and distinct within the finished structure, differentiating composites from mixtures and solid solutions, typical engineered composite materials include,

Reinforced concrete and masonry, Composite wood such as plywood, Reinforced plastics, such as fibre-reinforced polymer or fiberglass, Ceramic matrix composites Metal matrix composites and other Advanced composite materials. Polypropylene is a semi crystalline polymer that exhibits very attractive mechanical properties, like ductility and strength at room temperature or under moderate rates of deformation. However, under severe conditions it becomes brittle [1]. This behavior makes it interesting for commercial and scientific field to study methods for toughening these materials, also known as polypropylene. The thermoplastic polymer used in a wide variety of applications. An addition polymère made from the monomer propylene, it can be produced in a variety of structures giving rise to applications including packaging and labeling, textiles, plastic parts and reusable containers of various types, laboratory equipment, automotive components, and medical devices. It is a white, mechanically rugged material, and is resistant to many chemical solvents, bases and acids. Polypropylene is in

many aspects similar to polyethylene, especially in solution behavior and electrical properties [2]. The methyl group improves mechanical properties and thermal resistance, although the chemical resistance decreases. The properties of polypropylene depend on the molecular weight and molecular weight distribution, crystal, type and proportion of comonomer (if used) and the isotacticity. In isotactic polypropylene, for example, the methyl groups are oriented on one side of the carbon backbone [3]. This arrangement creates a greater degree of crystalline and results in a stiffer material that is more resistant to creep than both atactic polypropylene and polyethylene. The density of PP is between 0.895 and 0.92 g/cm^3 . Therefore, PP is the commodity plastic with the lowest density. With lower density, moulding parts with lower weight and more parts of a certain mass of plastic can be produced. Unlike polyethylene, crystalline and amorphous regions differ only slightly in their density. However, the density of polyethylene can significantly change with fillers. The Young's modulus of PP is between 1300 and 1800 N/mm^2 . Polypropylene is normally tough and flexible especially when copolymerized with ethylene. This allows polypropylene to be used as an engineering plastic, competing with materials such as acrylonitrile butadiene styrene (ABS). Polypropylene is reasonably economical [3]. Polypropylene has good resistance to fatigue.

As polypropylene is resistant to fatigue, most plastic living hinges, such as those on flip-top bottles, are made from this material. However, it is important to ensure that chain molecules are oriented across the hinge to maximise strength. Polypropylene is used in the manufacturing piping systems; both ones concerned with high-purity and ones designed for strength and rigidity (e.g. those intended for use in potable plumbing, hedonic heating and cooling, and reclaimed water). This material is often chosen for its resistance to corrosion and chemical leaching, its resilience against most forms of physical damage, including impact and freezing, its environmental benefits, and its ability to be joined by heat fusion rather than gluing. Many plastic items for medical or laboratory use can be made from polypropylene because it can

Fabrication of Automatic Leakage Detection System for Fluids

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Abstract: The leakage of water in pipe lines and distribution of water without any leakage are the major problems in the world. Pipe burst, fault in pipe connection or natural disasters maybe turned out into leakage of fluids (water, petroleum fluids) from the pipe line. This project proposes an automatic leakage detection device which continuously monitors the water flow in the pipe line and cut off flow when leakage is detected. This project reduces man power involvement and also the time used to process the collected information. This project mainly consist of control panel, arduino board, flow meter sensors and a server to control the flow by using android mobile application. The flow meter readings were fed to arduino board to process the data which monitor and control the flow of fluid in pipe by regulating the pump. Whenever leakage occurred, the flow meter sensor shows difference in reading and arduino board sends signal to pump to cut off the flow, hence the leakage can be prevented. The project has manual and automatic pump control mode which can be monitored by wireless sensor network through android mobile application.

Key Words: Leakage, Flow meter sensor, relay, Arduino board, Wi-Fi Module

1. INTRODUCTION

Managing of water consumption is important for life preservation as water is an essential element for every organism. Thus need for providing a good water distribution is a must in order to save and economize the water. Sometimes, the condition in certain location does not allow the engineers to create a good distribution system on the ground due to restricted space and safety from inflammable liquids. Also development in constructions causes the current water distribution system to residential, offices, and industry premises through pipes under the ground.

Usually water distribution is done by the means of underground pipes, which are very difficult to monitor if any leakage takes place. Water leakages in pipes mainly occur due to pipe's age, improper installation, natural disasters etc. One of the major problems faced by most of the countries is the leakage in distribution systems located underground. The US Environment protection agency (USEPA) has said that one of their biggest needs is replacement or rehabilitation of the water distribution and transmission system. In late 20th century many new technologies came in to existence. In that primary methods include acoustic, infrared thermography, chemical tracer and mechanical methods. New technologies of acoustic methods include ground penetrating radar (GPR), combined acoustic logger and leak noise correlators, digital correlators, and radio-frequency interferometers. Acoustic methods are those who

recognize leaks based on the characteristic patterns of sound that leaks create. It has been one of the most successful methods used in metallic pipes for the past decade or so. But low frequency produced by the non-metallic pipes such as plastic and concrete pipes makes it challenging to find the leaks. Although the above mentioned method were expensive and cannot afford by few countries. Hence this project aims to overcome these problems as it can be used in any type of pipe irrespective of the fluid which is flowing through it. This project can also monitor the flow rate of the fluid and cut off the flow (when there is leakage) using an android application.

2. LITERATURE REVIEW

Frank Massa et al., [1] have explained in their report that, ultrasonic flow meter measurement probes are located at spaced intervals along the length of a pipeline carrying a fluid and each probe measures the rate of flow of the fluid at each location along the line.

Lawrence Kates et al., [2] have developed a system and method for detecting and locating a spontaneous leak or break between spaced detecting stations in a pipeline carrying liquid, making use of negative pressure waves propagated through the liquid in the line at the speed of sound when a break occurs.

Sidney Allan Ottenstein et al., [3] have developed a system and method for detecting water and/or gas leaks by monitoring usage patterns.

Dalius Misiunas et al., [4] have focused on failure management and pipe condition assessment in water supply systems. The aim of the work was to explore the feasibility of using the available low cost measurements and information to improve the operation, reliability, safety and availability of the urban water system.

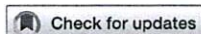
Andrew F Colombo et al., [5] have done review of transient-based leak detection methods with the goal of offering a summary of current and past work, describing the state-of-the-art in the area, providing a degree of historic perspective and categorizing the major themes in this line of research.

Wencui Ling et al., [6] have developed an integrated system for the detection, early warning, and control of pipeline leakage to manage the pipeline networks in selected areas of Beijing. A method based on the geographic information system has been proposed to quickly and automatically optimize the layout of the instruments which detect leaks.

Rui Li et al., [7] have represented both an environmental and an economical issue, how to reduce water loss through bursts and leakages. The methods for bursts (or leaks) detection and

Microwave assisted green synthesis and characterization of silver nanoparticles from *Hibiscus* leaf extract and investigation of their antimicrobial activities

Shareefraza J. Ukkund; Darshanram; Zubeen Khan; Sanjay; Ravika Patil; Apoorva Udupa; Abhinaya Nellerichale; Prasad Puthiyillam



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The recent research in nanoparticles synthesis field utilizes biological synthesis rather than chemical and physical methods in order to get uniform size and non-toxic of nanoparticles, further in biological synthesis the microbial synthesis is time consuming and requires sterilized conditions wherein green synthesis can overcome these drawbacks. The green synthesis of silver nanoparticles from many plant extracts finding quite attraction to many research scholars though very minute work has been done by using *Hibiscus* leaf extract. In this research work comparative experimental investigation is done on green synthesis of silver nanoparticles from three extracts *Hibiscus* leaf extract, followed by characterization was done by UV-Spectrophotometer, XRD, FTIR, AFM and SEM analysis. The silver nanoparticles of size 25-50 nm were synthesized by *Hibiscus* leaf extract. The silver nanoparticles were later treated with 4 different antibiotics wherein erythromycin showed three-fold increments in its efficiency.

Topics

Nanoparticle, Spectrophotometer, Chemical engineering, Antimicrobials, Antibiotics

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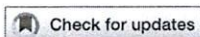
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Experimental investigation on synthesis, characterization and antibacterial properties of silver nanoparticles from *Cinnamomum zeylanicum* extract

Shareefraza J. Ukkund; Arshid Husain Bhat; Juned Khan; Naseer Ahmed Hakeem; Prasad Puthiyillam; Momin Ashraf; Apoorva Udupa



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The nanoparticles can be synthesized by biological, physical and chemical routes, among these three routes the biological synthesis is more effective, convenient, cost effective, eco-friendly and result uniform size nanoparticles though many researches have been conducted on this area there is very less work reported on silver nanoparticles synthesis from *Cinnamomum zeylanicum* as a green approach. In this research work experimental investigation is done on synthesis of silver nanoparticles (AgNPs) from *Cinnamomum zeylanicum* plant extract as a green approach, followed by characterization was done by UV-Spectrophotometer, XRD, FTIR, AFM and SEM analysis. The silver nanoparticles synthesis was monitored with double beam UV spectrophotometer with the scan range 200 – 800 nm, the highest absorbance at 460 nm indicated the presence of AgNPs. Further synthesized silver nanoparticles were found to be of size 20-40 nm by SEM and AFM analysis. The silver nanoparticles were later treated with 4 different antibiotics wherein *Penicillin* showed three-fold increments in its efficiency.

Topics

Nanoparticle, Spectrophotometer, Antibiotics

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
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Synthesis and Characterization of Silver Nanoparticles from *Fuzarium Oxysporum* and Investigation of Their Antibacterial Activity

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Abstract

Nanotechnology is the fastest growing field of 21st century due to this reason that the nanomaterials synthesis finds more importance in field of research. The nanomaterials can be synthesized by physical, chemical and biological methods. The biological methods are more advantageous than the other two methods because of manipulation of the size and morphology of nanostructures by microbes and plants. The *Penicillium sps. Fuzarium Oxysporum* was used to synthesize silver nanoparticles and the synthesis was extracellular. The nanoparticles were characterized for various studies using UV spectrophotometer, XRD, Zetasizer Nano S90, SEM, EDAX and AFM. The synthesized silver nanoparticles were found to have size in range 30–45 nm confirmed by SEM and AFM analysis. The XRD pattern confirms FCC structure of silver nanoparticles. Further, the antibacterial activity of the silver nanoparticles was tested against several antibiotics by conjugating them with antibiotics, with the help of zone of inhibition. Among several antibiotics used the efficiency of erythromycin increased by 3 fold

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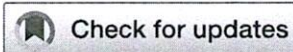
K.J.P. Anthony *et al.*

Synthesis of silver nanoparticles using pine mushroom extract: A potential antimicrobial agent against *E. coli* and *B. subtilis*

Ind. Eng. Chem. Res. (2014)

First pass yield improvement in fuel injection pump delivery valve assembly

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This work was carried out in an automotive sector, for single cylinder fuel injection pump (pf-33) delivery valve assembly line. Our work aims to focus on internal quality improvement to reduce rejection in a delivery Valve assembly line, which was having around 10.5% scrap. A substantial improvement of around 60% we estimated after the completion of work. The present work also signifies the data regarding the two significant rejections were taken for study as per Pareto Analysis from three months of rejection data. Observed that a significant problem with Delivery Valve (DV) through flow measurement is because the machine to test the through flow did not attain standard specification limits, and the method of assembly of parts needs to be improved as it caused misalignment. Some via simple techniques like the “seven basic quality control (QC) tools” and also why-Why analysis provided a valuable and cost-effective way to solve the problem. Of these various techniques, some tools and techniques like Cause & Effect Diagram, Pareto Analysis and Bar charts were mainly used. Brainstorming sessions were set and executed to identify the leading root causes of rejections in the assembly line. Several benefits have been observed from this work is that increase in productivity, reduction in Work In Progress (WIP) and improved production techniques.

Topics

Quality assurance, Combustion engine, Educational assessment

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Paper 20

PRODUCTION CULTURE IN MICRO AND SMALL INDUSTRIES AND THE USE OF COMPUTER-ASSISTED KNOWLEDGE MANAGEMENT IN MANUFACTURING PROCESSES

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Abstract:

This article outlined the culture of manufacturing in micro and small sectors. Knowing the answers from the manufacturing culture gathered from 20 manufacturing sectors through study with 87 questionnaires. With the assistance of Agile manufacturing enablers, all the questionnaires prepared. The sample companies are customer-based manufacturers of identical products with distinct shapes and sizes. It has been observed from the study that micro-and small-scale sectors do not work with a single production methodology and no strategic method has been adopted. Most sectors face skilled labor shortages and market requirements shift. The main reason for this issue is bad data storage and reuse and bad adoption / non-adoption of the method of knowledge management in micro and small sectors.

Keywords: Agile Manufacturing, Data storage, Knowledge management

1. INTRODUCTION

The type of production and knowledge management back bone for its achievement in any of the sectors. When industrialization began, the manufacturing process began with craft manufacturing and when the industry became a big manufacturing process was moved to mass production scheme for craft manufacturing. However, mass production method provides a solution to satisfy big amounts but not quality. There, mass production system moved to lean manufacturing system for Japanese people to satisfy both the quality and low price by changing mass production system. However, this Lean production system is not good enough to satisfy the present vibrant market. Now the market for a day is completely dynamic in nature and this requires more and more item of variety as per client requirement. Lean or mass manufacturing is hard to meet the vibrant market requirements. There is a need to create one of the kind agile production systems[1] to react with quality product as soon as possible.

The manufacturing sectors are classified into three kinds based on employee numbers and

ANALYSIS OF ADHESIVELY BONDED JOINTS IN AIRCRAFT STRUCTURE

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Abstract :

This thesis focuses on experience with adhesively bonded joints in aircraft structures. Adhesively bonded joints are used in the assembling of structural parts, especially of those which are made from dissimilar materials. These joints consist of adhesive layer and adherends with different mechanical and thermal properties. Some imperfections like holes, thermal residue stresses occurring in the bolted, welded, riveted and soldering joints don't take place in these joints. So the main advantages of bonded joints are lightness, sealing, corrosion resistance, heat and sound isolation, damping and quickly mounting facility which is proved. This thesis introduces an attempt to study the debond analysis of adhesively bonded joints. Single lap joints having failure at the interface of adherent and adhesive are modeled in MSC Nastran software. The coordination of the experimental and numerical techniques makes it possible to find an efficient tool for studying the debond performance of adhesively bonded joints.

I. INTRODUCTION

1.1 Adhesive bonded joints

Adhesive bonding technology has expanded greatly in recent years as more and more advanced composite materials are being utilized. Adhesive bonding is material joining process in which the adhesive, placed between the adherend surfaces solidifies to produce adhesive bond. Adhesive bonding is good choice for joining similar or dissimilar materials. The use of adhesive bonding as a joining method in aircraft construction is the accepted method of attaining high structure efficiency and improved fatigue life. The adhesive bonding gives the light, stiff and economical structure free of blemishes caused by conventional assembly methods. It is observed from the various experiments and analysis that adhesive joints prove to be more efficient for lightly loaded structure, whereas mechanically fastened joints are more efficient for heavily loaded structure. Bonded joints have the major advantages of having less source of stress concentration, efficient load transfer in large area of bonding, superior fatigue resistance and high strength to weight ratio compared to discrete joints.

Adhesive being viscous, flow over the surface of solid and because of their intimate contact, interact with its molecular forces. Then, as a result of adhesive curing process, they become strong solid which while retaining intimate contact with the surfaces hold them together. These adhesives are not strong as metal adherends, and hence, the adhesive interlayer will always tend to be the weakest link in bonded structures. Care is therefore to be taken to ensure that service stresses are well within its capabilities. This is normally achieved by providing a relatively large area in bonding. The failure in adhesively bonded joints can occur due to any of the following reasons: cohesive failure within adhesive, adhesive failure which occurs at interface of adhesive and adherend and failure of adherend which also includes delamination in composite structure or due to their combinations. The other type of failure is cyclic debonding in which progressive separations of adherends occur by failure under cyclic loading.

1.2 Failure modes

In adhesively bonded joints under in-plane loading, there exists typically three failure modes. They are,

- Adherent or substrate failure: a substrate failure occurs when the adherent fails before the adhesive. In metals, this occurs when the adherent yields.
- Cohesive failure: a cohesive failure is characterized by failure of the adhesive itself.
- Adhesive failure: an adhesive failure is characterized by failure of the joints at the adhesive or adherent interface. This is typically caused by inadequate surface preparation either chemically and/or mechanically.

1.3 Advantages of adhesive bonded joints

- Uniform stress distribution
- Possibility to join large surfaces
- Possibility to join very large thin adherents
- Gas-proof and liquid-tight
- No contact corrosion
- Good damping properties
- High dynamic strength
- Dissimilar materials, such as metals, plastics, wood, and ceramics can join.

II. METHODOLOGY

2.1. Modelling of adhesively bonded joints

AIRCRAFT FIRE PROTECTION SYSTEM FOR CLASS “A” FIRE

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Abstract :Fire protection system plays an important role in maintaining and monitoring the safety of all kind of environments and situations in an aircraft. But as we know, the usability of most existing fire protection system is limited by the fact that it is not cost effective. Subsequently, it is not affordable for us to build an exact replica so we had to take a different approach. The system has three main functions, 1) detection 2) monitoring and 3) suppression. The detection system operates as the fire detector. It includes fire and smoke sensors. The present work focus on the design and implementation of a fire alarm system using the microcontroller which operates the entire system. The detectors are placed in parallel in different levels and any signal from each detector at any level is monitored using monitoring system. The appliance system has components like buzzer for alarming and motorized sprinkler to extinguish the fire. The entire system is controlled by microcontroller which is programmed in the desired way by using C-Programming. When the sensors from each level detects the presence of both smoke and fire individually, the main buzzer operates causing it to show the current readings in the control panel LCD display. Then it triggers the sprinkler motor to sprinkle water through a tubing to extinguish the fire. Results shows that the proposed prototype is effective in both detection and suppression of fire based on the feedback of sensor node and the sprinkler system.

IndexTerms - Keil u Vision, LM35 temperature sensor, MQ5 smoke detector, 8051 micro controller

I.INTRODUCTION

Confirmed Fire on board an aircraft, especially when it is in flight, represents one of the most feared hazards in aviation. Fire in the air can ultimately lead to loss of control, either as a result of structural or control system failure, or again as a result of crew incapacitation; Fire on the ground can take hold rapidly and lead to significant casualties if evacuation and emergency response is not swift enough. Smoke or Fumes, whether they are associated with Fire or not, can lead to passenger and crew incapacitation and will certainly raise concern and invite a response. Finally, a Post-Crash Fire, following an aircraft accident, accounted for approximately half of all fatalities in the period 1999 - 2007 (UK CAP 776). Fire protection systems are installed on aircraft to detect and protect against an outbreak of fire. You will find these systems near the engines and in the fuselage. These systems monitor the conditions which could lead to a fire and are comprised of smoke detectors, heat sensors near engines or hydraulic systems and visible and audible warnings in the cockpit. The chance of a fire in small general aviation or experimental type aircraft are very remote but at least the engine compartment should have some form of detection as this is the area where heat, air and a combustible fluid are together in close proximity.

II.METHODOLOGY

System Overview

The system consists of three major sections i.e. the detection system, the monitoring system and finally the suppression system. We present a prototype for automatic detection and suppression of fire present in the aircraft. The Prototype includes sensor node and controller node. In the sensor node, temperature and smoke sensors are integrated with an ARM cortex microcontroller which acts as the heart of the whole system while an LCD display, a buzzer along with indication lights and a motor is integrated in the controller node. The sensor node is used to sense the presence of fire/smoke and the sensed data is sent

VOICE ASSISTED DASHBOARD SYSTEM

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ABSTRACT Due to the speedy advances of knowledge associated automobile technology, speech recognition in automobile is an acquainted and accessible conception in today's world. Voice recognition based mostly home automation has long been explored in varied which offers a lot of product and solutions for those that have an interest in an exceptionally easier or manageable lifestyle. The automation focuses on recognition of voice commands and uses EasyVR voice recognition modules together with a microcontroller. Voice recognized dashboard system is a very useful application for the drivers, who are not able to do various activities efficiently when they are travelling in a difficult road condition. This paper presents a most useful voice recognition system for the automobile drivers who are unable to do the basic task of operating electronic components like windshield wipers, indicators, headlight etc. All of these systems can be controlled using one concept, i.e. by using the Arduino based voice module which will control the dashboard system using the voice of the driver. It will reduce the effort of the driver which will let them concentrate on the traffic and let them drive freely.

Keywords – Arduino Mega, Voice Recognition, EasyVR shield 3.0, Arduino IDE, Automobile Dashboard, Future Technology.

I. INTRODUCTION

Voice recognition-based vehicle dashboard system is one of the key emergent industries that can amend the way people live. The goal of the reported voice recognized vehicle dashboard system is to provide those with special needs with a system that can respond to voice commands and control the on/off status of electrical components, such as headlamps, wiper speed, indicators etc. in the automobile. The number of a road accident also increasing in parallel with the rapid increment of elderly people in India. It is very important to ensure the caring and support of these people by providing automated vehicle dashboard system. The main aim of voice assisted dashboard system for the drivers is to provide voice recognition automobile dashboard to control the on/off status of electrical components, such as wiper, headlight, indicator etc.

Since the early 1980s, smart home technology has been explored when the "intelligent building" model was cast-off. The model anticipated an intelligent implementation of consumer electronic devices, electrical equipment, and security devices. It aimed for the automation of domestic tasks, easy communication, and human-friendly control, as well as safety [1].

Humanoid Robot is a robot shaped in the form of a human. A Humanoid robot is used in many different fields such as education for young children, on field marketing for companies, research and development tool, entertainment and for tasks that are unsafe to be done with real people so humanoid robots are a tool for human luxury and safety.

This paper describes a simple and easy hardware for implementation of Face, Object and speech detection and recognition. And for the purpose of Voice identification we use and EasyVR module attached to Arduino Mega. The system is programmed using Python programming language for object and face recognition and for controlling the mechanism of the robot we write the program in Arduino. All these data are given to the Robot such that when an person or object is identified the robot speaks the name of the person or the object and then it can be controlled by using voice commands. This Robot can be used in real time in automated systems [2].

Voice controlled robot (VSR) is mobile robot whose motion can be controlled by the users by giving specific voice commands. The speech is received by a microphone and processed by the voice module using voice command. Proposed design supports voice activation system for physically handicapped person incorporating manual operation [3].

Voice controlled wireless smart home system has been presented for elderly and disabled people. The concept of controlling home appliances using human voice is interesting. The proposed system has two main components, they are (a) voice recognition system, and (b) wireless system. This system to control home appliances uses a voice controlled android application. By the increasing use of PC (personal computers), internet, mobile phone and wireless technology, it makes it easy for a user to remotely access and control the appliances. Generally, home automation research targeted many needs like applications that provide the luxury and smart requirements. The aim of the report

LIMITED SLIP DIFFERENTIAL WITH ELECTROMAGNETIC CLUTCH

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ABSTRACT

This paper deals with the research of a new trend in the automobile industry that is limited slip differential with electromagnetic clutch. Mainly there are three types of differential, open differential, locking differential & limited slip differential. For the present scenario limited slip differential is the most effective and mostly used one, But then also there are many disadvantages for limited slip differential. In this research we are trying to modify the open differential with addition of an electromagnetic clutch to a limited slip differential which would be more efficient. By the addition of an electromagnetic clutch we can remove many of the mechanical parts. It would provide very fast and smooth operation with a reduced response time.

Keyword: Electromagnetic clutch, open differential, limited slip differential, differential speed limiting.

I. INTRODUCTION:

New researches are now made on the differential of an automobile and nowadays different new types of differential are available. By eliminating the disadvantages and by improving the efficiency, varieties of differential were introduced earlier. Those were commonly used in automobile at that time, but it had many disadvantages. By the invention of locking differential many of the disadvantages were overcome by the combination of open differential and locking mechanism. Limited slip differential had ruled the new differential world in automobile and now we are introducing a new differential i.e., Limited slip differential with electromagnetic clutch. The main objective of our project is to reduce the manufacturing cost of limited slip differential as well as decreases the response time and also decreases the slipping of wheels in slippery conditions. By the addition of an electromagnetic clutch we can eliminate a number of mechanical parts or linkages, so for the engagement there is no need of a mechanical linkage, electronically it will engage and torque will be transmitted mechanically. It will help in the better actuation and can decrease the response time, so that the maintenance will also decrease.

a) ELECTROMAGNETIC CLUTCH

Electromagnetic clutch operates electrically but transmit torque mechanically. So they are also referred as electromechanical clutches. It does the exact function of normal mechanical clutch. When the supply is given at input connection the coil gets magnetised pulling the armature towards it. This creates a frictional force in between which engage the clutch.

b) OPEN DIFFERENTIAL

The open differential is one which allows different wheel speeds when vehicle encounters a turn. The speed difference is achieved by the force applied on the wheel by road surface. The force at inner wheel is higher and at the outer is lower. By this the inner wheel will rotate less than that of outer wheel. In other words the outer wheel travels more than the inner wheel. But when one wheel is in slippery surface the other wheel in traction, the wheel in slippery surface will rotate in excessive speed. The other wheel in traction will not be rotating. The speed limiting is vital in this case in order to rotate the wheel in traction and to overcome the obstacle. Most of the time differential is occupied with a clutch which locks all the time or which limits the speed when speed difference is sensed. Such differentials are called locking differential and limited slip differential respectively.

c) DC MOTOR

The electric D.C motor can be used as a power generator, when rotational mechanical power is given at its rotor. Here the D.C motor is used to generate power of 24v at 400rpm to supply for the clutch input. 400 rpm is obtained by mounting the motor on planetary casing and meshing the rotor to a reduction gear arrangement on axle. By doing this the speed difference can be obtained between the planetary casing and axle, thus speed difference can be found out. As the speed difference will be very less at the limiting condition of the differential, so the reduction gear arrangement is used. The number of D.C motors are increased in case of more power requirement

II. WORKING PRINCIPLE:

Clutch based limited-slip differential contains a few basic elements. First, all have a gear train that, like an open differential, allows the output shafts to spin at different speeds while holding the sum of their speeds proportional to that of the input shaft. Second, it has a clutch mechanism that applies a torque that resists the relative motion of the output shafts. In simple terms, this means the electromagnetic clutch mechanism which resists a speed difference between the outputs, by creating a resisting torque between

NUMERICAL INVESTIGATION ON HEAT TRANSFER AUGMENTATION USING ALUMINA NANO FLUID AND METALLIC INSERTS IN DOUBLE PIPE HEAT EXCHANGER

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Abstract : The heat exchangers are used to enhance heat transfer by providing high heat fluxes or heat transfer coefficient. Techniques have been investigated on enhancement of heat transfer rate and decrease in the size and cost of the involving equipment, especially heat exchangers. This project mainly focuses on the numerical analysis of metallic inserts viz., propeller turbulator insert along with nano fluid in a double pipe heat exchanger. The metallic inserts help in increasing the Reynolds number to an optimum value by converting the flow from laminar to partially turbulent nature. The nano fluid due to their particle size can help in absorbing or emitting the heat more effectively than the fluids of size in microns. There are various types of metallic inserts, but the main focus is on a combination of propeller type turbulators and Alumina oxide nano fluid for the purpose of analysis. The numerical outcomes are validated with experimental values. The deviation was found to be within permissible limits, and hence establishing the authenticity of the investigation.

The present work aims to investigate heat transfer augmentation using a combination of propeller type metallic turbulators (with 6 number turbulator) and volume concentrations 0.05% of Alumina Oxide nanofluid, for Reynolds number ranging from 500 to 5000. Numerical investigation reveals significant rise in heat transfer to the extent of 34.514% using propeller turbulators fitted with six propellers in 0.05% by volume of Nanofluid.

I. INTRODUCTION

1.1 HEAT TRANSFER AUGMENTATION

The heat exchangers have an important role in the energy storage and recovery. A great deal of research effort has been devoted to developing apparatus and performing experiments to define the conditions under which an enhancement technique will improve heat transfer. In general, heat transfer enhancement in heat exchangers can be divided into two methods, active and passive technique. These methods are commonly used in areas such as process industries, heating and cooling in evaporators, thermal power plants, air-conditioning equipment, refrigerators, radiators for space vehicles, automobiles, etc.

The rate of heat transfer can be increased passively by increasing the surface area, roughness, and by changing the boundary conditions. The active method involves addition of Nano sized, high thermal conductivity, and metallic powder to the base fluid, to increase the heat transfer rate. Passive techniques, where inserts are used in the flow passage to enhance the heat transfer rate, are best suited compared to active techniques. Because the insert manufacturing process is simple and these techniques can be easily applied in an existing application.

1.1 Different techniques for heat transfer

There are three types of heat transfer methods.

1.1.1.1 Active method

This method involves some external power input for the enhancement of heat transfer. It finds limited application because of the need of external power in many practical applications. In comparison to the passive techniques, these techniques have not shown much potential as it is difficult to provide external power input in many cases.

1.1.1.2 PASSIVE METHOD

This method generally uses a surface or geometrical modifications to the flow channel by incorporating inserts or additional devices.

1.1.1.3 COMPOUND METHOD

When any two or more techniques, i.e. passive and active may be employed simultaneously to enhance the heat transfer of any device, which is greater than that of produced by any of those techniques separately, the term known as compound enhancement technique.

1.2 NANO FLUIDS

It is well known that solid materials tend to have much higher thermal conductivities than fluids, as can be observed in the following. With this in mind, it is rational to assume that the thermal conductivity of fluids can be achieved by solid addition. Due to these limitations, heat transfer fluid enhancement via solid particle addition could not fully develop. Such factors are significant

IMPLEMENTATION OF TURBOCHARGER AND INTERCOOLER TO THE TWO WHEELER ENGINE

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Abstract : The turbo charging of petrol engine is no longer primarily seen from the performance perspective, but is rather viewed as a means of reducing fuel consumption and consequently environmental pollution on account of lower carbon dioxide emissions. A turbocharger, often called a turbo, it is a small radial fan pump driven by the energy of the exhaust flow of an engine. Turbo charging simply is a method of increasing the output of the engine without increasing its size. A naturally aspirated automobile engine uses only the downward stroke of a piston to create an area of low pressure in order to draw air in to the cylinder through the intake valves. Because the pressure in the atmosphere is no more than 1 bar, there ultimately will be limit to the pressure difference across intake valves and thus the amount of air flow entering the combustion chamber. This ability to fill the cylinder with air is its volumetric efficiency. Because the turbocharger increases the pressure at the point where air is entering the cylinder, a greater mass of air (oxygen) will be forced in as the inlet manifold pressure increases. It means the turbocharger increases the volumetric efficiency of the engine.

Keywords – Turbo intercooler, Forced charged, Turbo, Forced induction, Future Technology.

a) INTRODUCTION

In the present scenario, the vehicle fuel prices are going higher and the rate of fuel consumption by the vehicle is also higher. At the present days many automobile companies are trying to reduce the fuel consumption rate. There is a need to develop an engine which will reduce the fuel consumption without compromising with the performance. More efficient engine can be fitted only for the new vehicles manufactured by the company. In order to reduce the fuel consumption of the existing vehicles, a new method to improve the fuel consumption has to be implemented. One of the methods to fulfill this criterion is to turbocharger & intercool the engine. So we are fitting the turbocharger and intercooler to the HORO HONDA HUNK PETROL ENGINE. The power output of an engine depends upon the amount of air inducted per unit time, the degree of utilization of this air and the thermal efficiency of the engine. The amount of air inducted per unit time can be increased by increasing the engine speed or by increasing the density of the air at intake.

Description of component Turbocharger

A turbocharger is main component of our project.

A turbocharger or turbo is an air compressor used for forced-induction of an internal combustion engine. A turbo charger is basically an exhaust gas driven air compressor and can be best understood if it is divided into its two basic parts, the exhaust gas driven turbine and its housing, and the air compressor and its housing. The exhaust gas driven turbine is coupled with a common shaft to the compressor.

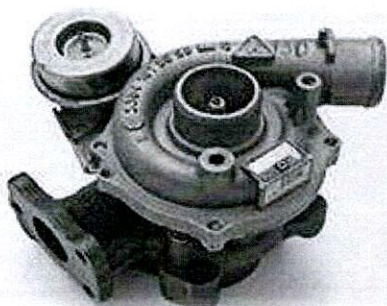


Fig.1: Turbocharger

Tilting Trike Bike

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Abstract : Generally a tilting three wheeler is a vehicle whose body and wheels tilt in the direction of the turn. The tilting trike bike is designed to tackle rough terrain and also boasts of high safety features for the rider. It uses a A-arm to support the tilting mechanism. The main advantage of this mechanism is that it can tilt while turning. By this leaning the centre of gravity balances the centrifugal force which is acting on the vehicle and makes it more stable during turning. It gives more traction when roads are slippery. The third wheel offers better braking as well as increases stability. It gives comfortable ride. It also ensures a lot of safety for the rider.

Key Words: A-arm, Dependent arm, Tilting mechanism, Mono-shock, drive mechanism

a) INTRODUCTION

Today, the use of more efficient vehicles is being discussed to improve the energy performance and better utilize the space of existing roads in the cities. As we know that safety of the vehicle is the first and the foremost thing to be considered. In 2-wheelers the safety of the vehicle from accident was understated on two major factors, Directional stability and the Aerodynamic force both of which are correlated to each other. The tilting mechanism would dramatically increase the maximum speed in curves. The use of tilting mechanism in automobile would decrease the rate of accidents due to slippage. It will give better dynamic stability as well as directional stability to the vehicle, better road grip, better comfort to the passengers, and the most important load carrying capacity of vehicle increases. By this leaning, the centre of gravity balances the centrifugal force which is acting on the vehicle and makes it more stable during turning.

As engineers we have developed a revolutionary design to tackle varying terrain conditions and improve safety. We call it 'The Tilting Trike Bike'. A tilting bike has the advantages of both the types of vehicles that is cars and bikes. When the vehicle leans into a corner it virtually acts like a single track vehicle, and even though having three wheels it can be driven like a motorcycle. The third extra wheel gives the extra traction required to tackle the corner.

Generally a tilting three wheeler is a vehicle whose body and wheels tilt in the direction of the turn. We achieve this by adding an extra wheel to a two wheeler chassis. Generally there are two types of configurations for a three wheeled vehicle. They are tadpole and delta. For our trike bike we are employing a tadpole configuration. This ensures that power is transmitted to only one wheel thus reducing transmission losses. Our vehicle can corner without roll over because the tipping movement caused by acceleration is balanced by the opposing centripetal acceleration. Safety is one of the major considerations in design. This has been keenly dealt with. Off-roading is also a trump card for this vehicle.



III. Methodology & Objectives

The design of the required model is created. Then we find a suitable location to work, after which we try to determine the exact time required for the whole process. All required materials (raw material) are arranged as required. Materials are checked for stress and strain under load. The best suitable material is chosen. All required tools are arranged. Individual elements are prepared separately such as A-arms etc. These elements are then taken to the machine shop. Welding is done according to the former proposed model. All the joints are checked and the structure is tested. The suspension system is attached, after which the wheels are installed. A road test is done and troubleshooting is performed. The final product is presented.

A REVIEW PAPER ON BIODIESEL FROM CASHEW NUT SHELL OIL

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Abstract: CNSL mainly consists of Anacardic acid, cardol, cardanol and small amount of other phenols and less polar substances. The composition percentage varies with many parameters like, nature of origin, climatic condition, method of extraction, etc. In this article, method of processing of CNS, yielding percentage of CNSL, variation in their composition with respect to type of processing, use of different constituents and their separation are listed. In addition to that, methods for separation of cardanol (a major constituent of technical CNSL) from oil, and feasibility of its use in diesel engine as a biofuel were discussed along with the physiochemical properties[8]. An extended experimental study was conducted on a double cylinder CI engine, to evaluate the performance and emission characteristics. The cardanol biofuel volumetric blends between 0-25% and base fuel (Petro diesel) were tested at various loads between zero-full load. From the results, brake thermal efficiency, increased with increase in load. The brake specific energy consumption decreased by 30 to 40% with increase in brake power. The HC emissions were nominal up to B20, and more at B25. The NOx emissions (ppm) increased with increased proportion of blends. The carbon monoxide emissions increased with higher blends and decreased slightly at higher loads. From this investigation, it is observed that up to 20% blends of cardanol biofuels may be used in CI engines without any modifications[4].

Key Words: Cashew, Nut, CNSL oil, Cardanol oil, properties of CNSL oil, Emission, Performance.

I. INTRODUCTION:

The cashew tree, belongs to the family of anacardiaceae, has a native of north east Brazil with a name of "acajou". India has the largest area harvested under the raw cashew nuts in the world. Plantation of tree, flowering, fruit and nut: Cashew tree is a fast growing, hardy and drought resistant multipurpose tree that can be cultivated in many tropical climatic conditions. Trees are also suitable for use in reforestation in barren, slash and burned farmland, degraded land and coastal sandy land. In India, cashew trees were often used as a reforestation and to fix dunes. The cashew tree gum that has been proposed as an aqueous two phase extract and substitute for fractionated dextran (Sarrubo 2000), cashew tree wood can be used as termite resistant and useful for boat building.

It was found that the mixture of 10%, 20%, 30%, 40% and 50% by volume of CPO, respectively with 90%, 80%, 70%, 60% and 50% by volume of diesel and 10% by volume of biodiesel were found stable and homogeneous for a long period of time (one week). Beyond 50%, separation was noticed and hence the quantity of CPO used was limited up to 50%. Experiments were performed on a single cylinder diesel engine using them CPO10 (10%CPO oil +10% Bio diesel+80% Diesel), CPO20 (20% CPO oil +10% Bio diesel+70% Diesel), CPO30 (30%CPO oil +10% Bio diesel+60% Diesel), CPO40 (40%CPO oil +10% Bio diesel+50% Diesel) and CPO50 (50%CPO oil +10% Bio diesel+40% Diesel) are prepared with the volume of CPO to study the performance behavior of the engine. Results were compared with conventional diesel (BD) and analyzed[1].

Bio-diesel production is a very modern and technological area for researchers due to the relevance that it is winning everyday because of the increase in the petroleum prices and the environmental advantages biodiesel offers over diesel. Accordingly, many researchers around the world have dealt with these issues and in many cases devised unique solutions. Countless legislative and regulatory efforts around the world have helped pave the way toward the widespread application of the concept[2].

Work can be focused on using different solvents and combination of solvents for extraction of CNSO from Indian cashew nut shell, both for Steam roasted shells as well raw cashew nut shells and their yields at different solute to solvent ratios. This enables optimum solute to solvent ratios for extraction of CNSO. Supercritical extraction of Cold extracted CNSO as well as CNSO obtained from Steam extracted shells can also be carried out for recovery of anacardic acid to compare the extent of anacardic acid obtained with that of chemical methods[6].

II. CASHEW NUT SHELL LIQUID:

The cashew processing industries generates huge quantity of shell, which is about 67% percentage of raw seeds. The cashew nut shell is about 1/8 inch thickness, with a soft honeycomb structure inside, containing a dark reddish brown viscous liquid known as cashew nut shell liquid oil and is pericarp fluid. CNSL is a valuable raw material obtained as a byproduct from industry. The mixture was stirred vigorously until a homogenous mixture was formed. The stirrer speed was maintained as 1500 rpm. Stable oil preparations were obtained by stirring the mixture for 1200 sec and the stability of the blend was found as stable for one week. The blending of oil was mixed with help of a mechanical stirrer, and it is found that up to 50% of CPO bio oil blend diesel fuels, without any separation for long time.[1]. It is reported

BIO-DIESEL FROM CASHEW NUT SHELL OIL

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ABSTRACT: Diesel Engine is widely used than any other engine, the performance characteristics of cashew nut shell liquid into a neat diesel in a diesel engine. As a fuel play an immortal role in modern transportation system, Due to lack of petroleum product and the diminution of fossil fuel finding the alternative fuel to the society is necessary. Country like India and Africa are having larger growth in cashew product and it is abundantly available and it is inexpensive. The experiments were conducted with blends of cardanol and diesel namely B25. Break thermal efficiency of B25 is nearer to that of diesel and also emission characteristics slightly increased. The higher viscosity and lower volatility of CNSL leads to poor mixture formation and hence lower brake thermal efficiency and higher emission levels. The higher emission level can be reduced by adding suitable additives and oxygenates with CNSL and Diesel blends.

Key words: CNSL, biodiesel, cardanol, distillation

I. INTRODUCTION:

The uses of alternative fuel resources is play an vital role in the mode of transportation .cashew oil is one of the bio-fuel resources .Cashew is an important plantation crop of India. It is presently grown in an area of 9.23 Lakh hectares. India is the second largest producer of cashew in the world. Maharashtra is the state which produces and exports large tones of cashews. Alternative fuel for compression ignition engine finds very attractive and has greater scope especially in developing and undeveloped countries due to the fast depletion, cost and environmental pollution from fossil fuel [1].

In the last two decades, extensive research was carried out in using various vegetable oils such as Jatropa oil, Karanja oil, rubber seed oil, cotton seed oil, coconut oil etc in diesel engines using different techniques such as preheating, Transesterification, blending with orange oil, blending with methanol, blending with diethyl ether, and hydrogen supplementation [3]. Presently cashew nut shell liquid (CNSL) is obtained as a byproduct of cashew industry. The cashew nut has a shell with soft honey comb structure inside it. Cashew nut shell liquid (CNSL) is acidic in nature it contains anacardic acid. There are different methods used to take derivatives of CNSL it may be pyrolysis or distillation process which we obtain cardanol further process is done and we obtain cardo.

Supercritical extraction of Cold extracted CNSO as well as CNSO obtained from Steam extracted shells can also be carried out for recovery of anacardic acid to compare the extent of anacardic acid obtained with that of chemical methods[6]. We perform various property tests like viscosity flash point, fire point, and calorific value in order to compare with the diesel and to perform in the engine test rig.

It is extensively used in the manufacture of superior type of paints, insulating varnishes in the electrical industry, special types of adhesive cement, friction and brake linings, laminating and epoxy resins, rubber compounding resins. From these studies, the cardanol have the properties much closer to the conventional diesel and which can be used as a biofuel in addition with diesel fuel.[8]

I.1 History

Cardanol-phenol resins were developed in the year 1920 by Mortimer T. Harvey. Cardanol is smooth honey like structure, the main component of cashew nut shell liquid (CNSL) is a byproduct of cashew nut processing. Cardanol finds use in the chemical industry in resins, coatings, frictional materials, and surfactants used as pigment dispersants for water-based inks. At commonly used densities of more than 100 trees per hectare, many of these trees yield 10 to 15 tons of seeds per hectare on maturing.[4]

1.2 Introduction of Cardonal

Cardonal is a byproduct of CNSL (Cashew Nut Shell Liquid), CNSL is derived from naturally occurring cashew seed, after the removal of cashew apple the remaining part is called as the cashew in which outer shell of the nut is known as kernel.it has got benzene like structure that molecular structure is obtained as anacardic acid (C₁₅H₃₁-n).

I.1.1 Blends Of Cardanol and Diesel

In previous study paper the different quantity of blends were done. The blends are B20, B30 and B40. In which neat diesel is blended with cardanol added by volume ratio as B20 without adding any additives. Further by adding additives the test results were conducted. The blending of oil was mixed with help of a mechanical stirrer, and it is found that up to 50% of CPO bio oil blend diesel fuels, without any separation for long time. CPO10, CPO 20, CPO 30, CPO 40 and CPO50 blends of pyro oil have comparable low properties compared to diesel fuel.[2]

A REVIEW PAPER ON EXTRACTION OF FUEL FROM WASTE PLASTIC BY PYROLYSIS.

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Abstract: Plastics are an integral part of our modern life and are used in almost all daily activities. Since plastics are synthesized from non-renewable sources and are generally not biodegradable, waste plastics are the cause of many of the serious environmental problems the world faces today. Due to depletion of fossil fuel reserves and increasing cost of the petroleum products are the big troubles of today's world. From past to present, tendency of oil price have increased consecutively, Especially in India has deficient amount of fossil fuel. For this reason, India has to import fossil fuel, such as petroleum for domestic demand the waste can then be converted into hydrocarbon fuel either in the collection vessel itself or in off-shore facilities, using established technology.

Keywords- Waste plastic, fuel, diesel oil, petrol oil, and pyrolysis.

I. INTRODUCTION:

The growth of the plastic consumption has been occurring rapidly in the last six decades due to their ability to be simply formed, its light weight and non-corrosive behaviour. These excellent properties have been used to replace the use of wood and metals. The world's annual plastic consumption has increased about 20 times from 5 million tons in 1950s to nearly 100 million tons [1]. This implies that more resources are being used to meet the increased demand of plastic, and on the other hand, more plastic waste is being generated. Plastics have been accepted as essential material for both in households and industrial activities due to their durability, higher load carrying capacity, less expenditure and availability. Based on their properties various types of plastic are used distinctly in specific purposes, such as packaging, material carrying, as a replacement of many mechanical components previously manufactured with metals, etc. Since plastic polymers originated from the petroleum resources, the possible technologies of converting them into fuel have been brought into attention to meet the future fuel demand to reduce the continuing fuel import demand in various countries [3].

However one has to accept that virtues and vices co-exist. Plastics are relatively cheaper and being easily available has brought about use and throwaway culture. Plastics waste management has become a problem world over because of their non-degradable property. A majority of landfills, allotted for plastic waste disposal, are approaching their full capacity. Thus recycling is becoming increasingly necessary.

Consumption of drinking water in packages increases and almost all its packaging is made from plastics. There are six plastics categories in the world: High Density Polyethylene (HDPE), Low Density Polyethylene (LDPE), Polypropylene (PP), Polyvinyl Chloride (PVC), Polystyrene (PS) and Polyethylene Terephthalate (PET). Drinking water packaging is included in Polyethylene Terephthalate (PET). Plastic is made from petroleum derivatives and considered to be difficult to parse and to be a pollutant (air, land and water). This phenomenon will become a potential problem in the future. On the other hand, the amount of fuel decreases and a solution is needed to overcome this condition. Plastic is a potential ingredient to be converted into fuel by a pyrolysis process [4].

Pyrolysis process is burning of product in absence of oxygen, In this case it is waste plastic. The waste plastic is shattered into small particles and burned in a closed container without oxygen. Different fuel density is produced in different temperatures and with suitable catalyst it could give results similar to that of Diesel or Gasoline.

II. WORKING PRINCIPLE:

There are many methods to extract fuel from waste plastic but the most commonly preferred is Pyrolysis process. It is an easy process which provides more effective results compared to other methods. The process extraction of fuel from waste plastic is divided into three stages which are as follows.

- Cleaning and Shredding.
- Pyrolysis Process.
- Distillation.

The basic plastic waste preferred for Pyrolysis is Polyethylene Terephthalate (PET) bottles or Polyethylene (PE) bags which are cleaned and shredded into small pieces. This helps to easily melt the plastic and to form hydro-carbons in the form of liquid state or gaseous state depending on the output required [2].

EXPERIMENTAL STUDY ON PREFORMANCE AND EXTRACTION OF FUEL FROM WASTE PLASTIC

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Abstract: Plastics are an integral part of our modern life and are used in almost all daily activities. Since plastics are synthesized from non-renewable sources and are generally not biodegradable, waste plastics are the cause of many of the serious environmental problems the world faces today. Due to depletion of fossil fuel reserves and increasing cost of the petroleum products are the big troubles of today's world. From past to present, tendency of oil price have increased consecutively, Especially in India has deficient amount of fossil fuel. For this reason, India has to import fossil fuel, such as petroleum for domestic demand the waste can then be converted into hydrocarbon fuel either in the collection vessel itself or in off-shore facilities, using established technology.

Keywords- Waste plastic, fuel, diesel oil, petrol oil, and pyrolysis.

I. INTRODUCTION

Due to the fossil fuel crisis in past years, mankind has to focus on creating alternate energy sources such as biomass, hydropower, geothermal energy, wind energy, solar energy, and nuclear energy. The developing of alternative-fuel technologies are investigated to deliver the replacement of fossil fuel. The focused technologies are bio-ethanol, bio-diesel lipid derived bio-fuel, waste oil recycling, Pyrolysis, gasification, di-methyl ether, and biogas. On the other hand, appropriate waste management strategy is another important aspect of sustainable development since waste problem is concerned in every city.

The waste to energy technology is investigated to process the potential materials in waste which are plastic, biomass to bio-oil. Pyrolysis process becomes an option of waste-to-energy technology to deliver bio-fuel to replace fossil fuel. Waste plastic are investigated in this research as they are the available technology. The advantage of the Pyrolysis process is its ability to handle un-sort and dirty plastic. The pre-treatment of the material is easy. Tire is needed to be shredded while plastic is needed to be sorted and dried. Pyrolysis is also no toxic or environmental harmful emission unlike incineration.

Economic growth and changing consumption and production patterns are resulting into rapid increase in generation of waste plastics in the world. For more than 50 decades the global production of plastic has continued to rise.

Some 299 million tons of plastics were produced in 2013, representing a 4 percent increase over 2012. Recovery and recycling, however, remain insufficient, and millions of tons of plastics end up in landfills and oceans each year.

Approximately 10–20 million tons of plastic end up in the oceans each year. A recent study conservatively estimated that 5.25 trillion plastic particles weighing a total of 268,940 tons are currently floating in the world's oceans.

And since plastic being a non-biodegradable material it remains into the soil, thereby polluting the environment. In India alone, the demand for the plastics is about 8 million tons per year. More than 10,000 metric tons per day plastics are produced in India and almost the same amount is imported by India from other countries. The per-capita consumption of plastics in India is about 3kg when compared to 30kg to 40kg in the developed countries. Most of these come from packaging and food industries. Most of the plastics are recycled and sometimes they are not done so due to lack of sufficient market value. Of the waste plastics not recycled about 43% is polyethylene, with most of them in containers and packaging.[1]

1.1 Types of Plastics

The types of the waste plastics are LDPE, HDPE, PP, PS, and PVC. The problems of waste plastics can't be solved by land filling or incineration, because the safety deposits are expensive and incineration stimulates the growing emission of harmful green house gases like CO_x, NO_x, SO_x and etc. These types of disposal of the waste plastics release toxic gas which has negative impact on environment. Plastic wastes can also be classified as industrial and municipal plastic wastes according to their origins, these groups have different qualities and properties and are subjected to different management strategies. Plastic wastes represent a considerable part of municipal wastes furthermore huge amounts of plastic waste arise as a by-product or faulty product in industry and agriculture. The total plastic waste, over 78% weight of this total corresponds to thermoplastics and the remaining to thermosets. Thermoplastics are composed of polyolefin such as polyethylene, polypropylene, polystyrene and polyvinyl chloride and can be recycled. On the other hand thermosets mainly include epoxy resins and polyurethanes and cannot be recycled.[1][2][5]

A STUDY ON UTILIZATION OF EXHAUST HEAT FROM IC ENGINE FOR AIR CONDITIONING IN VEHICLES

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Abstract: With the rapid changing environment and atmospheric effect, the air conditioning of the moving vehicle has become a necessity. In the same time consumers are incapable to bear the increasing operating cost of the vehicles due to continuous raise in fuel prices, component costs and maintenance costs associated with vehicles. Approximately 30 to 40% of total energy supplied in internal combustion engine (ICE) is converted to useful mechanical work. The remaining energy is expelled directly to the environment through engine cooling systems and exhaust gases resulting into entropy rise and serious environmental problems. Exhaust gas stream from ICE carries away about 30% of the heat of the combustion. An exploration has been done to research the possibility of waste heat recovery and its subsequent utilization in air conditioning system of a vehicle without increasing the component cost, weight, number of component and bring improvement in vehicle by making it luxurious.

Keywords: vapor absorption refrigeration, ammonium hydroxide, generator, exhaust, IC engine.

I. INTRODUCTION

Energy is an important entity for economic development of any country. Most of this energy consumed in power conservation devices and electricity usage. There is a significant increase in this energy consumption in heating, ventilation, and air conditioning (HVAC). Due to serious problems of energy shortage and global environment issues, utilizations of waste heat and renewable energy become one of the most interesting research fields. HVAC refrigerants in traditional cooling systems contain Chlorofluorocarbon (CFC) and hydro chlorofluorocarbon (HCFC). Such components with high ODP (Ozone depletion potential) and GWP (global warming potential) accelerate the depletion of the Earth's ozone layer. Therefore, alternative solutions to current cooling systems are required. A cooling technology known absorption cooling system powered by waste and/or renewable energy sources is an attractive solution. Absorption cooling systems powered by solar energy have attracted much attention in recent decades due to its matching between sun shine and the required cooling effect. Absorption cooling system has numerous advantages, such as using low grade heat source temperature, employing of natural refrigerants such as water, less moving mechanical parts, noiseless, Low maintenance and environment-friendly. Available energy in exit stream of many energy conversion devices goes as waste, if not recovered or utilized properly. [1]

Approximately 30 to 40% of total energy supplied in internal combustion engine (ICE) is converted to useful mechanical work. The remaining energy is expelled directly to the environment through engine cooling systems and exhaust gases resulting into entropy rise and serious environmental problems. Exhaust gas stream from ICE carries away about 30% of the heat of the combustion.

The technology of absorption refrigeration plants has been used for cooling purposes for over a hundred years now. In a vapour compression cooling machine, the refrigerant evaporates at low temperature and low pressure. The vapour is extracted from the evaporator, then transformed to a higher pressure by compressor and liquefied in the condenser. The main difference between a compression and an absorption cycle is that the former needs mechanical energy as a driving source for the compressor and the latter needs thermal energy for the Absorber and only a small amount (2% of the driving energy) of electricity for the liquid pump. A Vapour Absorption Refrigeration (VAR) System is similar to a Vapour Compression Refrigeration (VCR) System. In both systems the required refrigeration is provided by refrigerants vaporizing in the evaporator. However, in the VAR System, a physico-chemical process replaces the mechanical process of the VCR system and heat rather than a mechanical and electrical energy is used.[2]

II. AMMONIA- WATER ABSORPTION CYCLE

An Absorption Cycle can be viewed as a mechanical vapour-compression cycle, with the compressor replaced by a generator, absorber and liquid pump. Absorption cycles produce cooling and/or heating with thermal input and minimal electric input, by using heat and mass exchangers, pumps and valves. The absorption cycle is based on the principle that absorbing ammonia in water causes the vapour pressure to decrease.

The basic operation of an ammonia-water absorption cycle is as follows. Heat is applied to the generator, which contains a solution of ammonia water, rich in ammonia. The heat causes high pressure ammonia vapor to desorb the solution. Heat can either be from combustion of a fuel such as clean-burning natural gas, or waste heat from engine exhaust, other industrial processes, solar heat, or

UTILIZATION OF EXHAUST HEAT FROM IC ENGINE FOR AIR CONDITIONING IN VEHICLES.

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Abstract: With the rapid changing environment and atmospheric effect, the air conditioning of the moving vehicle has become a necessity. In the same time consumers are incapable to bear the increasing operating cost of the vehicles due to continuous raise in fuel prices, component costs and maintenance costs associated with vehicles. Approximately 30 to 40% of total energy supplied in internal combustion engine (ICE) is converted to useful mechanical work. The remaining energy is expelled directly to the environment through engine cooling systems and exhaust gases resulting into entropy rise and serious environmental problems. Exhaust gas stream from ICE carries away about 30% of the heat of the combustion. An exploration has been done to research the possibility of waste heat recovery and its subsequent utilization in air conditioning system of a vehicle without increasing the component cost, weight, number of component and bring improvement in vehicle by making it luxurious.

Keywords: vapor absorption refrigeration, ammonium hydroxide, generator, exhaust, IC engine

1. INTRODUCTION

The air conditioning consists of eliminating the heat and humidity inside an occupied space to improve the comfort of the occupants. This process is most often used to create a more comfortable indoor environment, usually reserved for humans and other animals. However, air conditioning is also used to cool parts filled with electronic devices that produce heat, such as power amplifiers for computer servers, and even to display and store certain delicate products, such as works of art. Air conditioners often use a fan to distribute the air conditioner in an occupied space, such as a building or car, to improve thermal comfort and indoor air quality. More generally, air conditioning can designate any technology that modifies air conditions (heating, dehumidification, and cooling, cleaning, ventilation or air circulation). However, in common usage, the term "air conditioning" refers to systems that cool the air. Under construction, a complete system of heating, ventilation and air conditioning is called air conditioning HVAC.

This energy consumption increases considerably in the areas of heating, ventilation and air conditioning (HVAC). Due to the serious problems of energy shortages and global environmental problems, the use of waste heat and renewable energy is becoming one of the most interesting research areas. HVAC refrigerants in traditional refrigeration systems contain chlorofluorocarbon (CFC) and hydro chlorofluoro carbon (HCFC). Such components with high ozone depletion potential (ODP) and global warming potential (GWP) accelerate the depletion of the Earth's ozone layer. Therefore, alternative solutions to current refrigeration systems are needed. A known cooling technology, an absorption cooling system fed by waste and / or renewable energy sources is an attractive solution. The absorption cooling systems with solar energy have attracted a lot of attention in recent decades due to the coincidence between solar radiation and the required cooling effect. The absorption cooling system has many advantages, such as the use of a lower quality heat source temperature, the use of natural refrigerants such as water, less moving mechanical parts, no noise, no maintenance and respect for the environment. The energy available in the output stream of many energy conversion devices is considered a waste if it is not recovered or used correctly. About 30 to 40% of the total energy supplied by the internal combustion engine (ICE) becomes a useful mechanical work. The remaining energy is released directly into the environment by the engine cooling systems and exhaust gases, resulting in increased entropy and serious environmental problems. The IC engine exhaust flow takes about 30% of the heat of combustion.

The two basic types of refrigeration are

1. Natural refrigeration.
2. Artificial refrigeration.

1.1 NATURAL REFRIGERATION

In olden days, natural means achieved refrigeration with the use of ice and evaporative Cooling.

In earlier times, the ice was

- Transported from colder regions
- Harvested in winter and stored for use
- Made during the night by Radioactive cooling

Design and Fabrication of River Cleaning Machine

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Abstract-Water pollution has been a major cause of environmental concern. Most of the water bodies like rivers, lakes, streams, etc. are highly polluted. Floating wastes are a major source of pollution. Machines have been designed to remove the floating waste. Any such machine can involve the usage of some source of power which is again uneconomical. Hence it was thought by us to build a machine that would be simple and cheap and also not requiring any external power source. Taking into consideration that a flowing river or stream generally develops water heads at different locations in its course of flow, it was decided to make use of the heads available to produce hydropower that could be used to run a suitably designed machine. The river cleaning machine that we have built up makes use of hydropower developed by a turbine similar to a Pelton wheel. The rotation of the turbine runner causes the conveyor belts to move through suitable linkages like gears and chains. These linkages are designed taking into consideration the turbine speed and the power required to drive the conveyor belts which carry the floating waste away from the water body.

Key words: Water Pollution, Hydropower, Turbine, gears, sprockets, conveyors

1. INTRODUCTION

Water is the source of life. Though 70% of the earth is covered with water, about 97% of it is in the form of oceans and hence not fit for human consumption. The remaining 3% is stored in various sources like glaciers, rivers, lakes and under-ground aquifers. Rivers and lakes which are found on the earth's surface are very much essential for the mankind. River water is used for irrigation which in return gives food to the people. Rivers also maintain the ecology of the region and bring in prosperity. Unfortunately, most of the rivers and lakes are getting polluted. This is due to human actions like letting domestic and industrial wastes into such water bodies. Thus rivers like Ganges, Yamuna and Narmada have become highly polluted. Even the South Indian river Kaveri is affected by pollution. Solid waste which floats on the river surface is a cause of serious concern. Disposal of solid waste is the first step towards minimising surface water pollution. Some machines have been developed to clear the solid waste found on the surface of the water bodies.

2. LITERATURE REVIEW

Some of the journal papers working towards building machines to remove floating waste are reviewed here.

Prof. N.G. Jogi et al [1] mentioned that the Ganges in India is one of the most polluted rivers. About 29 crore litres of sewage is dumped in the Ganges along with toxins. They have suggested the usage of pedal operated boat with the conveyor attached to it for collecting garbage from the lake. With the help of this conveyor it is possible to collect the garbage like plastic bags, plastic bottles, beverage cans, food wrappers, paper bags, straws, (marine debris) etc. With this methodology no fuel is involved.

Mr. P. M. Sirsat et al [2] mentioned that in accordance with the river cleaning projects like "Namami Gange", "Narmada Bachao" and many major and medium projects in various cities like Ahmadabad, Varanasi etc. a machine is designed to clean river water surface. This machine consists of DC motors, RF transmitter and receiver, propeller, PVC pipes and chain drive with the conveyor attached to it for collecting wastage from water bodies. It also consists of a collecting plate which is coupled with conveyor belt and chain drives which rotate by the PMDC motor. The collected waste is thrown on the collecting tray. Propeller is used to drive the machine on the river & run with help of PMDC motor. The total electrical devices are controlled by RF transmitter and receiver which are used to control the machine remotely. This machine has been designed from an economical point of view and is easy to operate and helpful for water cleaning.

Sheikh Md Shahid Md Rafique and Dr. Akash Langde [3] have fabricated the remote operated river cleaning machine. The collecting plate and chain drives are rotating continuously by the motor. The collecting plate is coupled between the two chain drives for collect the waste materials from river. The collected waste is thrown on to the collecting tray with the help of conveyer. The machine has a propeller which is used to drive the machine on the river. The propeller is run with the help of two PMDC motor. The total electrical device is controlled by RF transmitter and receiver which are used to control the machine remotely.

M. Mohamed Idris et al [4] explained that the motive of the project is to automate the sewage cleaning process in drainage. A machine consisting of a chain and sprocket and driven by a motor is made use of in the cleaning process. When the motor runs, the chain starts to

Mechanical Responses of Polypropylene and Calcium Carbonate Nanoparticles

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Abstract - This paper is to study the mechanical behaviour and properties like tensile, impact and flexural on the composite mixture of polypropylene and calcium carbonate nanoparticles. Four compositions of Polypropylene and CaCO_3 nanocomposites were prepared in Injection molding machine with varying calcium carbonate percentage. The results are plotted and it shows the increase in polypropylene elastic modulus and a little increase in yield stress, the impact resistance increased with the addition of nanoparticles. Tensile property and flexural depends on the calcium carbonate dispersion in polypropylene.

I. INTRODUCTION

A composite material is a material made from two or more constituent materials with significantly different physical or chemical properties that, when combined, produce a material with characteristics different from the individual components. The individual components remain separate and distinct within the finished structure, differentiating composites from mixtures and solid solutions, typical engineered composite materials include,

Reinforced concrete and masonry, Composite wood such as plywood, Reinforced plastics, such as fibre-reinforced polymer or fiberglass, Ceramic matrix composites Metal matrix composites and other Advanced composite materials. Polypropylene is a semi crystalline polymer that exhibits very attractive mechanical properties, like ductility and strength at room temperature or under moderate rates of deformation. However, under severe conditions it becomes brittle [1]. This behavior makes it interesting for commercial and scientific field to study methods for toughening these materials, also known as polypropylene. The thermoplastic polymer used in a wide variety of applications. An addition polymère made from the monomer propylene, it can be produced in a variety of structures giving rise to applications including packaging and labeling, textiles, plastic parts and reusable containers of various types, laboratory equipment, automotive components, and medical devices. It is a white, mechanically rugged material, and is resistant to many chemical solvents, bases and acids. Polypropylene is in

many aspects similar to polyethylene, especially in solution behavior and electrical properties [2]. The methyl group improves mechanical properties and thermal resistance, although the chemical resistance decreases. The properties of polypropylene depend on the molecular weight and molecular weight distribution, crystal, type and proportion of comonomer (if used) and the isotacticity. In isotactic polypropylene, for example, the methyl groups are oriented on one side of the carbon backbone [3]. This arrangement creates a greater degree of crystalline and results in a stiffer material that is more resistant to creep than both atactic polypropylene and polyethylene. The density of PP is between 0.895 and 0.92 g/cm³. Therefore, PP is the commodity plastic with the lowest density. With lower density, moulding parts with lower weight and more parts of a certain mass of plastic can be produced. Unlike polyethylene, crystalline and amorphous regions differ only slightly in their density. However, the density of polyethylene can significantly change with fillers. The Young's modulus of PP is between 1300 and 1800 N/mm². Polypropylene is normally tough and flexible especially when copolymerized with ethylene. This allows polypropylene to be used as an engineering plastic, competing with materials such as acrylonitrile butadiene styrene (ABS). Polypropylene is reasonably economical [3]. Polypropylene has good resistance to fatigue.

As polypropylene is resistant to fatigue, most plastic living hinges, such as those on flip-top bottles, are made from this material. However, it is important to ensure that chain molecules are oriented across the hinge to maximise strength. Polypropylene is used in the manufacturing piping systems; both ones concerned with high-purity and ones designed for strength and rigidity (e.g. those intended for use in potable plumbing, hedonic heating and cooling, and reclaimed water). This material is often chosen for its resistance to corrosion and chemical leaching, its resilience against most forms of physical damage, including impact and freezing, its environmental benefits, and its ability to be joined by heat fusion rather than gluing. Many plastic items for medical or laboratory use can be made from polypropylene because it can

Optimization of turning process parameters for Titanium grade 5 using Taguchi method

Raghavendra M J, Sunil B, Pratham S Shetty, Shakeeb Husain

Abstract

In the contemporary world, the standard of the surface end is most significant demand for several turned work piece due to that maker's square measure seeking to stay competitive in the market. Taguchi parameter style is a powerful tool and efficient methodology for optimizing quality and performance output of the producing method. This paper investigates the parameters poignant the surface roughness manufacture in turning method for material Titanium Grade 5. Experiment was carried out for analysis of the influence of the turning parameters like spindle speed, feed, and depth of cut on surface roughness. The results of the machining experiments for Titanium Grade , somewhere accustomed to change characterize the main factors affecting the surface roughness by the Analysis of Variance (ANOVA) methodology. The feed rate was found to be the foremost important parameter influencing the surface roughness in turning method. Confirmation check additionally has been performed to predict and verify the adequacy of the model for deciding optimum characteristics of respondents. The result obtained by on top of the methodology is going to be helpful to different analysis works for similar kind of study for any analysis on tool vibrations, cutting forces, rake angle, etc.

Keywords

Surface Roughness; Titanium Grade 5; Taguchi method; ANOVA method

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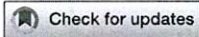
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A survey on factors affecting total productive maintenance (TPM) in service industries

Prashanth Pai Manihalla; Ramachandra C. Gopal; Srinivas T. Rao; Raghavendra M. Javaraiah



+ Author & Article Information

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In today's competitive environment, manufacturing plants need outstanding maintenance strategies to enhance the availability of machines, to decrease the cost of production and to manufacture parts with exceptional quality and dimensional accuracy. Total Productive Maintenance (TPM) is a modern maintenance strategy which aims to maximize the equipment effectiveness by targeting to accomplish zero breakdowns, zero accidents, zero wastes and zero defects. TPM involves complete involvement of all employees from the top management to shop floor. This work is limited to small and medium scale industries only and is carried out with the help of a questionnaire consisting of 15 important queries pertaining to TPM implementation. The questionnaire is given to 75 industries from service domain, out of which 45 responses have been obtained. All 45 responses are considered for the study. The respondents include chief executives, engineers, general managers and supervisors who are randomly selected. The respondent's responses are rated on a five-point Likert scale. The results are analysed with the help of simple graphs and inferences are drawn after thorough interpretation. It has been found that 38% of the service industries (17 out of 45) are using TPM and 28 industries have not yet implemented TPM. This work reveals the level of TPM usage in selected industries and identifies the factors contributing to the non-implementation of TPM.

Topics

Careers and professions, Industry

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Determination of tensile properties of sugarcane bagasse fiber reinforced with different proportions of polymer composite

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ABSTRACT

Now it had become necessary to search new materials and implementation of those materials for manufacturing industries due to huge consumer pressure and new environmental policies. Because of this, in the recent years, the use of natural fibers as reinforcement in thermoplastic and thermosetting matrices has gained much interest, due to their good qualities such as low cost, low density, huge availability, biodegradability quality, and renewability. So in this aspect sugarcane bagasse fiber is one of the best options due to its availability and also it is an end product in sugar industries. In this paper it is focused on the tensile strength of sugarcane bagasse in the mat form is reinforced with the epoxy resin matrix and how it can be achieved or replaced with existing that is sugarcane bagasse fiber in the discontinuous and random orientation fibers reinforced with the epoxy resin matrix. This study also compares the percentage of fibers reinforced with epoxy resin to increase the strength.

Keywords— Sugarcane Bagasse Fibers (SBF's), Epoxy resin, Mat form, Sodium hydroxide, Cellulose

1. INTRODUCTION

Generally, naturally available biodegradable fibers are used as raw materials in the paper industry because of its good binding strength or as combustible for energy production. Since it is a renewable resource, economic and is biodegradable. So it gained importance to improve the composite's mechanical physical and thermal properties. Natural composites are low cost raw materials while comparing with synthetic fiber, automotive and aerospace industries now focusing on interest in the sourcing of cheaper raw materials due to continuous research and the natural fiber composites have maintained a position at the top of the list [1].

Also it has been found some drawbacks, such as the incompatibility between fibers and polymer matrices, the tendency to form aggregates during processing and the poor resistance to moisture which reduces the use of natural fibers as reinforcements in polymers and to improve the strength we must remove the natural waxes present around the fibers surface and

other non-cellulosic compounds. It can be done by using various chemical treatments such as alkali treatment, bleaching, silane treatment, esterification, use of compatibilizer, plasma treatment, acetylation, etc., before compounding to remove natural waxes.

In general, there are two functions will be possessed by chemical coupling agents. The first function is a reaction with hydroxyl groups of cellulose and the second is the reaction with functional groups of the matrix. [2][3]

Hydroxyl groups present around the fibers' surface can be removed by using chemical modifications either Esterification or by using maleic anhydride modified polypropylene (MAPP) as a coupling agent. For the alkali treatment of natural fibers the chemicals used are sodium hydroxide (NaOH, 98% purity, Sigma-Aldrich France) and acetic acid (CH₃COOH, 99–100% purity, Riedel-de Haën). [4]

The polymer matrix is one of the popularly using inorganic fillers in the field of composite materials, which results in composite material with better mechanical and thermal properties. In recent years, organic fillers, such as cellulose-based fibers are slowly becoming the best suitable materials in the market to replace synthetic materials. Cellulose-based fibers (natural fibers) extracted from renewable and relatively inexpensive resources, and because of that, the addition of natural fibers, such as wood fibers, flax or sisal to polymeric matrices can result in feasible composites concerning mechanical and economic points of view. Composites based on natural fibers have environmentally superior qualities to those based on synthetic fibers, such as fiberglass. Recent studies reported that the reinforcement of composites with natural fibers uses 45% less energy, and results in lower air emissions. Another major factor is the recyclability and biodegradability properties of natural fibers composites and the major sources of natural fibers, which are renewable [5]. Poor interfacial adhesion property of natural fiber may decrease strength [6]. Natural fiber with surface modification will increase its overall strength [7, 8, 9] Removal of the lignin will increase the natural fiber strength [10]. There is a lot of provisions to develop natural fiber against hybrid fiber due to its availability

Experimental Study on Effect of Silicon Carbide and Graphite particles on Mechanical Behaviour of Aluminium-6061 Alloys

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ABSTRACT

In the past few years the global need for low cost, high performance and good quality materials has caused a shift in research from evaluation of purely metallic constituents into light weight composite structures. Considered with the matrix phase of pure aluminum or alloy of the same metal and the reinforcement material used is a non-metallic ceramic such as SiC, Al₂O₃, SiO₂ contribute greatly to the structural behavior once it is processed and tested in the standard conditions. Present work highlights the crucial effect of silicon carbide particulates and specified amount of graphite on aluminum 6061 matrix material. The fabrication of samples were done by most convenient technique called stir casting by adding reinforcing materials in the range of 3%, 6%, 9% by weight which is effectively mixed in to the matrix of aluminum 6061 alloys by maintaining the standard conditions. Rockwell hardness test is conducted and properties are evaluated experimentally to assess the influence of Silicon carbide with constant amount of graphite powder on the matrix material. It is observed from the results the addition of ceramic particles influence greatly on the hardness number which increases by increasing the silicon carbide content. Similar trend was observed while assessing the compressive strength of the composites along with considerable change incurred with shear deformation was properly recorded. This paper details only about the influence of graphite and silicon carbide mixture is added in varied proportion on aluminium-6061 composites.

Keywords: Silicon carbide, MMC's, Al-MMC's

I. INTRODUCTION

Composite materials have been widely used in engineering applications because of their advantages compared to conventional metallic materials. For instance, composite materials have high specific strength, high specific stiffness, and high resistance to chemical attacks. Especially, in certain application areas such as the petrochemical and gas industry, harsh chemicals cause corrosion and deterioration of the structures over the time. Investigation on the Mechanical Properties of Hybrid Metal Matrix Composites" have studied about the preparation and evaluation of mechanical properties of Al6061-SiC[1-

5]. The composites were prepared using stir casting method in which amount of reinforcement is varied from 5-15% in steps of 5wt%. The prepared composites are characterized by micro structural studies and density, and mechanical properties were evaluated as per the standards. Their studies revealed fairly uniform distribution of the particles in composites with clustering at few places. The experimental densities were found to be lower than theoretical densities in all the composites. From their research it is observed that the dispersed SiC in Al6061 alloy contributed in enhancing the tensile strength of the composites. Microstructures, mechanical properties and wear characteristics of as

Preparation and Mechanical Testing of E-waste Glass Filled Polymer Composites

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ABSTRACT

It is a great challenge to prepare light weight materials using E-waste products which are difficult to recycle to contribute as a new product due to its inefficiency to recombine with its physico-chemical characteristics. This work aims to prepare and test samples prepared by the E-waste scrap glass mixed with polymer matrix material proportioned with glass fibre. Composites with different filler ratio (0%, 3%, 6%, 9%) are prepared. Tests were performed to calculate tensile properties, flexural strength of the composites. Based on the tensile and flexural test it is depicted that composite with 6% filler material exhibits enhanced properties due to the strong bonding between filler and the matrix material.

Keywords : E Waste, E Glass/Epoxy Composites, Tensile & Flexural Behaviour.

I. INTRODUCTION

A composite material is a heterogeneous solid consisting of two or more different materials that are mechanically or metallurgic-ally bonded together. The word —compositell means, —consisting of two or more distinct parts. Thus, a material having two or more distinct constituent materials or phases may be considered a composite material. Composite materials emerge as a promising alternative to correct the deficiencies caused by steel reinforcement in concrete structures [1-5]. It is only when the constituent phases have significantly different physical properties and thus the composite properties are noticeably different from the constituent properties that we have come to recognize these materials as composites. The constituents are combined at a macroscopic level and are not soluble in each other. Each of the various constituents retains its identity in the composite and maintains its characteristic structure and properties. There are recognizable interfaces between the materials. 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 and flakes. The composite material, however, generally possesses characteristic properties such as high strength-to-weight ratio, high stiffness-to-weight ratio, high temperature performance, corrosion resistance and hardness, which are not possible to obtain with the individual components.

II. FABRICATION OF SPECIMENS

The aim of this project is to study the structural and dynamic properties and strength of composite material (E-waste reinforced). These composite specimens were prepared by Hand lay-up technique, as it is relatively cheaper and convenient method of composite preparation, when compared to other fabrication method. The tensile, hardness and 3 point bending tests were carried out in a universal testing machine.

Following are the types of materials used:

Fibre- E-glass 360 GSM Bidirectional

Assessment of Axial Cramp Resistance of Graphene based Aluminum Nano Composites by Stir Casting Technique

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ABSTRACT

Determining the cramp resistance of structural member bears the potential naming for high durable metals and alloys like aluminum points the celestial asset to choose between the various elements which can perform the similar role as metal matrix composites implimnets. The Role of light weight materials in many industries and research fields is to accelerate the need of finding dynamic combinations to excel the most desirable commercial aspects owing to its light weight, high strength, higher hardness, wear resistance, durability. Graphene based materials offer better platform to innovate lighter and stiffer and tougher materials. Unlike other materials graphene weighs very lighter and stronger stimulate to use this as a major reinforcing material with most flexible matrix is aluminum. Significantly graphene is the only material available in two-dimensional structure which yields better mechanical properties like strength and hardness. To aid the easy preparation of metal matrix composites a well known technique called stir casting technique is normally employed. By keeping this objective, the present work involves the synthesis of graphene reinforced aluminum based metal matrix composites with the help of stir casting process. The aluminum powder used here is 7075 grade which is meant for aerospace structure to retain as better matrix material. Graphene is added to aluminum matrix with 0.5%, 1%, 1.5%, and 2.0% by weight of the matrix considered. Compression test has been performed for all the prepared samples with the help digital UTM. It is found that sample filled with 0.5% of graphene shows excellent resistance to compressive loading which records maximum strain of 0.60025 against applied break load of 222KN which are concluded to be better compared to the rest of the samples

Keywords: Light Weight Structures, Nano Composites, Cramp Resistance

I. INTRODUCTION

Graphene based composites now days projects as linear high end derivatives as light weight members to replace densified structures. They can withstand elevated temperature in corrosive environment than polymer composites. Only light metals are responsive, with their low density proving an advantage. Titanium, Aluminum and magnesium are the popular matrix metals currently in vogue, which are particularly useful for aircraft applications. The strength-to-weight ratios of resulting composites can

be higher than most alloys. The melting point, physical and mechanical properties of the composite at various temperatures determine the service temperature of composites. It is more significant to introduce lighter metals as a part of structural aspects aiming that loading superficial material showing least density to impart desired qualities like strength and hardness by correlating with domain matrix, the new trend has been evolved to admin the light weight composites is graphene material. The graphene and aluminum are two metals so that these both come under metal matrix composites (MMC) these are

DISPLAYING OF COCKPIT INSTRUMENTS USING PROCESSING IDE AND ARDUINO

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Abstract :

Aircraft cockpit consists of analog instruments basically during olden days cockpit was full of analog indicators. Since the era is evolving and everything is in digital there was a new idea of digitalization of analog instruments to digital. So that instead of placing basic six instruments only one LCD is fixed which shows the values of all basic six instruments accurately. Modern aircraft which have been employed to mainly reduce the pilot work load. Research to date on advanced flight instrumentation has primarily focused on mode confusion or pilot misinterpretation of system information. A few studies have also identified pilot workload with a reduction in manual flight skills as a result of regular operation in automated modes. In this study, simple avionics instrument has been designed and implemented for light aviation vehicles. At the moment there are a few commercial products that provide data and vehicle statuses such as altitude, temperature, air speed, etc. However, due to implementation of modern technology for such instruments for such complexity was not affordable. This study presents a new approach such that recent hardware and sensors are utilized to provide critical data to the user accurately. The commercial hardware used in the instrument may easily be available from the electronics market. Devices like these can be used for aviation, automobiles and also sea and land vehicles, providing the user with important data. In this study, design of the device is explained in detail, which may be constructed with basic electronic circuit using Arduino and processing IDE. The instrument that holds security may be fitted for any air vehicle by using the methods in this study.

I. INTRODUCTION

The introduction of digitalization on the modern airliners has contributed to improved range, overall performance, and safety of the aircraft. This digitalization has reduced the physical workload of the pilot and has increased the awareness of the pilot workload, which includes evolution of display system and its programming tools. The Federal Aviation Administration intends to introduce digital data communication as a means of exchanging information between aircraft, ground-based facilities and air-based facilities.

The Arduino UNO is open source software. The board consists of sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards and other circuits, that can be easily programmed to understand and interact, the best parts about Arduino is that the software where the program is free and open source.

Processing IDE is an open source programming language and provides environment to program images, animation, and interactions. It is used by students, artists, designers, researchers for learning, prototyping, and production. It is developed to understand fundamentals of computer programming within a visual context and to serve as a software sketchbook and professional production tool.

Processing was developed to make it easy to create interactive art, it makes programming accessible for the masses. Processing has a close connection to Arduino. The programming language and development environment for the Arduino platform are based on Processing, so data has to be transmitted from software to hardware.

II. METHODOLOGY

2.1 ARDUINO

Arduino is an open source programmable circuit board which can be combined to make a wide variety of different projects. This board contains a microcontroller, which can be programmed to sense and control objects in the physical world. By responding to sensors and inputs, the Arduino is able to interact with the outputs such as LEDs, motors and displays. Because of its flexibility and low cost, Arduino has become a very popular choice for makers who are looking to create interactive hardware projects. The most commonly used Arduino boards out there is the Arduino Uno. While it was not actually the first board to be released, it remains to be the most actively used for its extreme popularity and most widely documented on the market.

2.2 JUMPER WIRES:

A **jump wire** (also called as jumper wire or jumper) is an electrical wire, or group of them in a cable, with a connector or pin at each end, which is usually used to interconnect the components of a breadboard or test circuit or with other equipment or components, without soldering. Individual jump wires are fitted by connecting their "end connectors" into the slots provided in a breadboard, the header connector of a circuit board, or a piece of test equipment.



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Electrical energy harvesting in aircraft by using carbon fiber battery.

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Abstract

The concept of harvesting electrical energy onboard has aroused a renewed interest in aircraft industries. In this context a piezoelectric material harvests mechanical vibrational energy available in considerable amount due to turbulence. Embarked piezoelectric material which is an inverter when replaced in wing panels which undergoes mechanical vibrations and there by generating electricity. A static converter transforms the electrical energy into carbon fibre structural batteries placed in wing panels. We are developing structural carbon fiber composites with battery functionality. These devices can withstand structural loads while simultaneously storing electrical energy. By designing with enough structural and energy efficiency, these materials enables significant system-level weight reductions by replacing metallic components while providing storage of electrical energy for uses in an aircraft. To enable this concept, we have designed mechanical load-bearing properties directly into the battery electrodes and electrolyte such that each component is itself multifunctional. Carbon fiber fabric as anode material, lithium ion phosphate coated on to aluminum fiber weave as cathode material, and gel polymer electrolytes are each being developed to exhibit a desirable combination of mechanical strength and electrochemical performance. These components are being integrated using moldable, scalable, cost-effective composite processing techniques. A prototype of a real system is reviewed to demonstrate potential benefits.

Key Words

Piezoelectricity, carbon fiber, structural battery.

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FUSED DEPOSITION MODELLING USING POLYMER BINDED METAL

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Abstract :

Fused deposition modeling (FDM) is a type of additive manufacturing process. In FDM melted material is deposited selectively in a pre-determined path layer by layer to build a model. The challenge in this project is to use metal injection molding feedstock in FDM. It is basically a hybrid mix between Metal Injection Molding (MIM) and Additive Manufacturing (powder metallurgy). This can be used by individuals as well as industries. In this research several topics of the MIM process were studied to understand how the feedstock is prepared using metal powder mixed with polymer/wax binder. The experimental study was done on aluminium powder feedstock by varying the percentage of powder content in the mixture. The extruder design, the extrusion temperature, nozzle size and shape. It was obtained from the results that why powder loading should be higher and suitable extrusion temperature for stable flow.

I. INTRODUCTION

1.1 Metal injection molding

The metal injection molding is most useful manufacturing process to produce large amounts of small and complex parts. It takes less than a minute to produce 35 parts in one go and has been ruling manufacturing industries all around the world. The problem of metal injection molding is how to make metal flow into the mold. The problem is solved using metal powders of size less than 25 micron dissipated into a binder which can melt at lower temperatures and easily flow into the mold. This process includes feedstock preparation, injection molding, debinding and sintering.

The feedstock should prepare with good flow ability and uniform structure. The preparation of feedstock for MIM is most challenging one. Second important step is die cavity filling. The rheological properties of the feedstock plays important role in this manufacturing method. This process is based on the injection of a fluid material composed of powder of the desired material for the final part. The part is then subjected to debinding to remove the binder and then it is sintered to obtain dense part.

- **Binders:** The binder is very important for metal injection molding process. The fluidity for the feedstock mixture and adhesion of the powder to stay the molded shape throughout injection molding is obtained through binders. It also provides strength and cohesion for the molded part and must be easy to remove from the molded part.
- **Debinding:** Its mainly dependent upon the type of polymer used, where binders get eliminated from the parts leaving only the metal structure, but the problem here is quick heating or excess binder elimination will result in loss of structure.
- **Sintering:** Debinded parts are then sintered to obtain the final part, which is smaller than the actual mold size due to contraction of metal powders and loss of polymers from the parts. The green molds are then sintered gradually for hours with very slow rate of heating until it reaches the temperature below the melting temperature of the metal powder used. And finally the sintered parts are finished by filing and machining the outer surface.

1.2 Additive manufacturing

Metal additive manufacturing is also known as rapid prototyping or 3D printing, the method uses powder to form parts, wire or sheets which proceeds or prints layer by layer. This process includes critical products such as those required for use in aerospace. Some of the metal AM systems are powder-bed, selective laser sintering, wire-fed processes based on electron beam or plasma melting. Till now 29 types of metal powder materials are experimented for AM, including stainless steel, aluminium, nickel, cobalt chrome, and titanium alloys.

- **Selective laser sintering:** Selective Laser Sintering is an additive manufacturing technique that uses a laser as the power source to sinter powdered metals pointing the laser automatically at points in space defined by a 3D model, binding the material together to create a solid structure. SLS involves the use of a high power laser to fuse small particles of plastic, metal, ceramic, or glass powders into a mass that has a desired three-dimensional shape. The laser selectively fuses pulverized material by scanning cross-sections generated from a 3-D digital description of the part on the surface of a powder bed. After each cross-section is scanned, the powder bed is lowered by one layer thickness, a new layer of material is applied on top, and the process is repeated until the part is completed.
- **3D printer:** 3D printing is any of various processes in which material is joined or solidified under computer control to create a three-dimensional object, with material being added together. Rapid prototyping and additive manufacturing both use 3D printing technique. Parts can be of almost any shape or geometry and typically are produced using digital model data from a 3D model or another electronic data source such as an Additive Manufacturing File (AMF) file (usually in sequential layers). There are many different technologies, like stereolithography (SLA) or fused deposit modelling (FDM). Thus, unlike material removed from a stock in the conventional machining process, 3D printing or Additive Manufacturing builds a three-dimensional object from a computer-aided design (CAD) model or AMF file, usually by successively adding material layer by layer.

Crack Growth Analysis of Lug Joint

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Abstract: In this paper, an examination of crack growth in a lug joint is introduced. This component is widely utilized in various industries like aerospace and automotive. This study aims to examine how a lug joint reacts to varying loads and sizes of crack as it propagates. The finite element method is utilized for the analysis and the progression of the crack is assessed via the Paris law. We investigate how material properties, geometry and loading conditions impact crack growth behavior and identify the critical crack size in various loading situations. This finding offer significant understanding of how lug joints progress and develop cracks

I. INTRODUCTION

In aircraft structures, lugs are connector type elements used as structural supports for pin connections. Prior to the 1950's, lugs were overdesigned as weight and space were not design driving factors. With the tightening of weight, cost, and space requirements in the aerospace industry, a more precise method of lug analysis was required. Fatigue as a complex process, could be dangerous and even cause failure of lug and hence components which are connected by lug joint. Due to previous reason it is very important to assess, analyze and to predict the crack initiation and crack growth behavior of attachment lugs.

Landing gear is a vital structural unit of an aircraft which enables to take off and land safely on the ground. A variety of landing gear arrangements are used depending on the type and size of an aircraft. The most common type is the tri-cycle arrangement with one nose landing gear unit and two main landing gear units. Even during a normal landing operation heavy loads (equal to the weight of an aircraft) are to be absorbed by the landing gear. In turn joints are to be provided such that such heavy concentrated loads are first received by the airframe and subsequently diffused to the surrounding areas. Normally heavy concentrated loads are received through a lug joint. Therefore, design of a lug joint against failure under static and fatigue loading conditions assumes importance in the development of an aircraft structure. This project deals with the design and analysis of a typical lug joint representative of a landing gear attachment of a small transport airplane. The design will provide safety against 1) failure of the lug, 2) failure of the pin. The types of loadings to be considered are a) axial, b) transverse or drag load. Aircraft design practices will be used.

1.1 GEOMETRICAL CONFIGURATION

ATTACHMENT LUG

The attachment lug configuration in the present work is shown in figure 1. The attachment lug dimensions are length 'L', width 'W', outer to inner radius ratio R_o/R_i are shown in the figure. The pin is assumed to be rigid which nearly corresponds to a steel pin in the aluminum lug, with the ratio of pin to lug modulus being three. Pin is assumed to be push fit and the pin plate interface is assumed to be smooth.