Special Issue

on

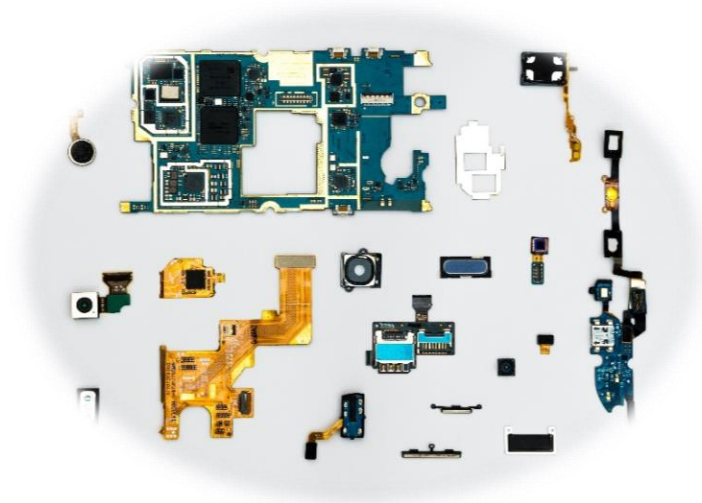## 8th One Day

National Conference

on

CHALLENGES AND OPPORTUNITIES FOR MECHANICAL ENGINEERS

(COME'23)

Organised

by

Department of Mechanical Engineering

Kongunadu College of Engineering and Technology

(Autonomous)

THE MANAGEMENT
PRINCIPAL, STAFF and STUDENTS of

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INSTITUTION'S
INNOVATION
COUNCIL
(Ministry of Education Initiative)

Department of Mechanical Engineering
Cordially invite you to the Inaugural function of
8th One Day National Level Conference on
"Challenges and Opportunities for Mechanical
Engineers (COME'23)"

on 21st April, 2023 @ 9.15 AM
through google meet
Meeting ID: https://meet.google.com/rzs-jmup-tho

Dr.S.SUJITH KUMAR,
Material Characterization-Scientist,
Transistion Optical,Tuam,
Ireland.
has kindly consented to deliver the inaugural and keynote address

Dr. PSK. R. PERIASWAMY,
Chairman, Kongunadu Educational Institutions.
Dr. R. ASOKAN,
Principal, Kongunadu College of Engineering and Technology,

Will preside over the function

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About the Institution

Kongunadu College of Engineering and Technology (KNCET) is an Autonomous, self-financing Engineering College established in the year 2007, Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai, Accredited by NBA (CSE, ECE, EEE & Mech), NAAC, Recognized by UGC with 2(f) & 12(B) and Certified by ISO 9001:2015. The College has 9 UG courses (AD, AE, BME, Civil, CSE, ECE, EEE, IT, and Mechanical Engineering) and 2 PG courses such as Applied Electronics and CSE. ECE and Mechanical departments have been recognized as approved research centers by Anna University. A Separate department Campus to Corporate is to train the students in the area of communication, soft skills and aptitude etc., through which obtaining top notch placements with the facilitation of diverse options in IT industries, core industries, ITES and startup firms respectively. The Kongunadu International Cell assists students explore opportunities to work and study in foreign countries. The college has obtained many awards & recognition from various government/private authorities and received research grants from funding agencies for doing projects, establishing MODROBS labs, organizing FDPs, STTPs, National and International Conferences, Seminars and Workshops. MSME Incubation Center and Unna Bharat Abhiyan (UBA) schemes are approved by the Government of India. The College has signed MOUs with Industries, academics, hospitals and R&D Institutions. Various Professional societies, clubs and cells are supporting students to become industry ready graduates, to do higher studies and to become successful entrepreneurs. The sports teams have won many prizes in various events at National level including Zonal, Inter Zonal and University level Sports Championship. The College attracts outstanding students by virtue of its discipline, modern infrastructure, library and faculty members.

About the Department

The Department of Mechanical Engineering was commenced in the year 2007 with an intake of 60, and then the intake was 120 in the year 2011-2012, 180 in the year 2013-2014, 240 in the year 2014-2015, 210 in the year 2019-2020 and 180 in the academic year 2020-2021. The permanent affiliation has been received for B.E (Mechanical Engineering) from Anna University, Chennai from 2017-2018 onwards. The department has been accredited by NBA during the year 2022.

To enhance the industry readiness and employability, Centre of Excellence - TVS Harita and Centre for Energy Studies have been established to undergo the research activities

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and projects. TryCAE Incubation Centre has been established to enrich the students with industrial exposure. The Laboratories in Mechanical Engineering are equipped with state of art facilities which provides the hands on experience related to industries. The lab acts as a research ground for the young technocrats of our college by providing them with the latest hardware, software and machineries.

Mechanical Engineering department has produced 12 UG rank holders. Students have been placed in various Companies such as HCL, Infosys, Byju's, Sanmina, TVS Harita Techserv Limited, Jaro Education, TVS Sundram Fasteners, Texmo – Taro Pumps, AQUA SUB Pump, Gestamp Automotive Pvt. Ltd., CRI Pumps, Sakthi Auto Components, Aquaflow Engineering Pvt. Ltd., etc.

The students are active members in Professional Societies such as SAE, ISTE through which they get awareness of technical education and its scope in the future. Students have also enrolled in IIT Spoken Tutorial, Smart India Hackathon, Swayam – NPTEL, International Certifications (SOLIDWORKS). The department is having students' association called METAS (Mechanical Engineering Technical Association for Students) with an aim to improve technical skills, domain knowledge and to prepare the students for industrial readiness.

The department has filed ten patents. The department has signed eight MoUs with Industries and academic institutions like TVS Harita Techserv Ltd. - Chennai, TryCAE Industrial Engineering - Trichy, National Research Centre for Banana - Trichy, DMW CNC Centre - Erode and IAAA (Institute of Aeronautics and Astronautics and Aviation) - Chennai with an objective of strengthening Industry and academic partnering and also to provide better career opportunities to the students. The Department has completed eight consultancies successfully.

The department has received funds from various agencies like CSIR, DST-SERB, DBT, TNSCST for organizing various seminars, workshops and projects. Students won overall First Prize in Tamil Nadu and received a sum of Rs.1,00,000 for their Best Entrepreneurship Ideas from Tamil Nadu Government conducted by Anna University, BIT Campus and established an enterprise named Crafty Agro Tech Solutions. Students also received Rs.25000 from IIT Madras – IDEA Spark for the project titled Engine Care Equipment.

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About the Conference

The vision of the National Conference on Challenges and Opportunities for Mechanical Engineers (COME'23) is to bring together participants to discuss the challenges and advancements in Design, Manufacturing, Thermal, Materials, and Metallurgy streams. The conference strives to fill the knowledge gap between academia and industry by forging connections between academicians, UG/PG researchers, and industrialists. This linkage will increase the potential for fresh ideas in the Mechanical stream's focus areas. The participants will be equipped for learning about global technology trends in the mechanical engineering field through keynote talks by professionals from renowned organisations.

Call For Papers

Authors are invited to contribute to the conference by submitting a novel unpublished article in the following areas but not restricted to:

- ❖ Advance Manufacturing Engineering
- ❖ Composite Materials
- ❖ Metal Joining Process
- ❖ Additive Manufacturing
- ❖ High Entropy Alloy
- ❖ Powder Processing
- ❖ Biomaterials and Engineering
- ❖ Hybrid/E-Vehicles
- ❖ CAD/CAM/CAE
- ❖ MEMS & NEMS
- ❖ Nano Fluids
- ❖ Alternate Fuels
- ❖ Energy Harvesting

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Chief Patron Message

Kongunadu College of Engineering and Technology is committed to building and sustaining itself as an institution where quality is the hallmark of each and every activity. I am immensely happy that the Department of Mechanical Engineering of our college is organizing the 8th One Day National Conference on "CHALLENGES AND OPPORTUNITIES FOR MECHANICAL ENGINEERS (COME'23)" on 21st April 2023.

On this occasion, I would like to congratulate the organizing team of COME'23 and the participants in this conference. I hope that this conference will certainly induce innovative ideas among the participants, paving the way for new inventions and new technologies in the field of Design, Manufacturing, Thermal, Materials, and Metallurgical Engineering.

I am sure that Mechanical Engineering will continue to contribute more effectively in order to achieve the ultimate goal for which the conference was established. I am confident that this conference will be a milestone in ensuring the highest standards in this profession.

I look forward to an exciting week of insightful presentations, discussions, and sharing of technical ideas with colleagues from colleges around the country.

Dr.PSK.R.Periaswamy

Chief Patron,

Chairman, Kongunadu Institutions,

Trichy, Tamilnadu, India

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General Chair Message

It is my great pleasure to welcome all of you to the 8th One Day National Conference on "CHALLENGES AND OPPORTUNITIES FOR MECHANICAL ENGINEERS (COME'23)," which will take place at Kongunadu College of Engineering and Technology in Trichy on April 21, 2023. It has been an honour and privilege to serve as the Coordinator of this conference. COME'23 provides a cross-disciplinary platform for researchers and practitioners to address advancements in Design, Manufacturing, Thermal, Materials, and Metallurgical Engineering. The program spans one day for conference paper presentations, featuring a keynote presentation and separate panels for presentations, offering ample opportunities for discussions, debates, and the exchange of ideas and information among conference participants.

The conference would not have been possible without the enthusiasm and hard work of numerous colleagues. I express our appreciation to the Conference Chair, Co-Chair, and Secretaries for their valuable contributions in organizing a high-quality conference program.

A conference of this magnitude relies on the contributions of many volunteers, and I would like to acknowledge the efforts of our technical review committee members and referees for their valuable help in the review process.

I am also grateful to all the authors who entrusted the conference with their work. Special thanks to the Keynote speakers for sharing their views on current research topics.

I eagerly anticipate an exciting week filled with insightful presentations, discussions, and the sharing of technical ideas with colleagues from both national and international levels.

Dr.R.Asokan

General Chair,

Principal, KNCET,

Trichy, Tamilnadu, India

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Conference Chair Messages

The COME'23 conference has established itself as a worldwide reference for the dissemination of high-quality research in all aspects of Design, Manufacturing, Thermal, Materials, and Metallurgical Engineering, fostering interaction and the exchange of ideas.

COME'23 was fortunate to attract high interest within the community, resulting in 40 submissions from various streams of Design, Manufacturing, Thermal, Materials, and Metallurgical Engineering. The significant number of submissions provided an excellent opportunity for a high-quality program but also required a demanding and laborious paper evaluation process. The members of the Technical Program Committee worked efficiently and responsibly under tight time constraints to produce quality reviews for each paper, forming the basis for the final paper selection. To provide conference participants with additional valuable and stimulating research outcomes, 18 papers were accepted for presentation alongside the main conference.

The program is further enriched by a keynote presentation from Dr. S. Sujith Kumar, Material Characterization Scientist at Transitions Optical, Tuam, Ireland. I extend my thanks to our Keynote speaker for addressing recent technologies and providing guidance in organizing this conference. We are grateful to all the authors who entrusted us with their work; without them, there would be no conference. The final result would not have been possible without the dedication and hard work of many colleagues.

I express my gratitude to our beloved Chairman, Dr. PSK. R. Periaswamy, Chief Patron of COME'23, who consistently motivates us to undertake innovative activities for the benefit of students. I also thank our dynamic Principal, Dr. R. Asokan, General Chair of COME'23, for his vision and leadership. I would like to sincerely thank all session chairs for providing valuable comments to participants.

Special thanks go to the track chairs, members of the Technical Program Committees, and all external referees for the quality and depth of their reviews, as well as their sense of responsibility under various circumstances.

Dr.J.Yogapriya,
Conference Chair,
Dean (R&D), KNCET,
Trichy, Tamilnadu, India

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Conference Co-Chair Message

It is my immense pleasure to announce that our Mechanical Engineering Department is organizing the 8th One Day National Conference on "CHALLENGES AND OPPORTUNITIES FOR MECHANICAL ENGINEERS (COME'23)" on 21/04/2023. COME'23 aims to focus on emerging trends in Design, Manufacturing, Thermal, Materials, and Metallurgical Engineering.

The conference will feature selected papers from researchers, academicians, and students on various topics, with separate divisions based on Design, Manufacturing, Thermal, Materials, and Metallurgical Engineering.

We are honoured to have Dr. S. Sujith Kumar, a Material Characterization Scientist at Transitions Optical, Tuam, Ireland, as our keynote speaker. I express my gratitude to the keynote speaker for accepting our invitation.

I would like to extend my thanks to our esteemed Chairman, Dr. PSK. R. Periaswamy, the Chief Patron of COME'23, for his unwavering support in all our activities. I also express my gratitude to our Principal, Dr. R. Asokan, for his valuable guidance in ensuring the successful completion of this conference. Additionally, I thank our Dean of Research and Development, Dr. J. Yogapriya, for her continuous motivation in organizing this National conference.

I would like to express my appreciation to all session chairs and review committee members for providing valuable comments to the participants. Finally, I extend my thanks to all the faculty members and students for their efforts in organizing this conference and making it a resounding success.

Dr.D.Jagadeesh,

Conference Co-Chair,

HoD (Mech), KNCET,

Trichy,Tamilnadu, India.

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Editorial

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Design and Fabrication of 5th Wheel to Help Car Parking

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Abstract

The rapid growth and economic advancement of Indian society have led to a significant rise in the number of cars on the roads. Consequently, one of the primary challenges faced in many parts of the country is the scarcity of adequate space for car parking. This study focuses on addressing this issue by developing a system that effectively reduces the turning radius of cars. The developed system incorporates the utilization of Ackerman steering and several mechanisms with the arrangement of various kinematic links. The process begins by bringing the vehicle to a halt, after which the wheels are turned in the desired direction with the assistance of the steering system. As a result of this innovative system, the turning radius is significantly reduced, to the point where it becomes almost negligible in comparison to the length of the car itself.

Keywords: Pneumatic Cylinder, Rack and pinion, Motor, DC Control Valve, Double acting cylinder, Battery, Wheel.

Introduction

This project is mainly built to make a parking of a vehicle by using the 5th wheel it helps the vehicle for parking and made easier of parking the car the main aim to avoid the difficulties while parking the vehicle by using this we made easier of vehicle parking.

Methodology

- ➢ Problem definition
- ➢ Conceptual study
- ➢ Planning / proposed system
- ➢ Material Selection
- ➢ Fabrication process
- ➢ Conclusion / Documentation

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Component used

- Pneumatic Cylinder
- Rack and pinion
- Motor
- DC Control Valve
- Double acting cylinder
- Steel frame
- Bolt and washer

Motor

An electric motor is a type of electrical device that transforms electrical energy into mechanical energy. The functioning principle of most electric motors involves the interplay between the magnetic field generated by the motor and the electric current flowing through a wire winding, which results in the generation of torque or rotational force on the motor's shaft.

Figure1: Motor

Pnuematic Cylinder

A pneumatic cylinder is a mechanical apparatus designed to convert the energy of compressed air into a linear motion that moves back and forth.

In the case of a double-acting cylinder, compressed air is utilized to drive the piston both inward and outward, enabling bidirectional movement. On the other hand, a single-acting cylinder employs compressed air for movement in one direction and relies on a return spring to facilitate movement in the opposite direction.

Figure 2: Pnuematic Cylinder

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Rack and Pinion

Rack and pinion steering is a steering mechanism where the rotational movement of the pinion gear results in linear motion of the rack gear. This linear motion of the rack then enables the turning of the vehicle's wheels either to the left or right.

Rack and pinion systems are widely used in various applications, including railways, where they serve as a common component. In a rack and pinion steering system, the gear arrangement consists of a pinion, which is a circular gear, and a rack, which is a linear gear.

Figure 3: Rack and Pinion

Steel Frame

Steel frame are used to construct the structure of any skeleton by arranging in horizontal and vertical manner as per the dimensions and structure is build according to the database.
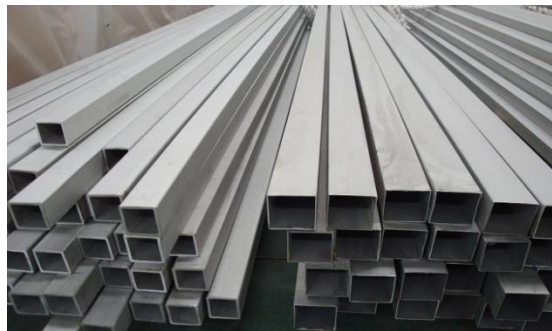
Figure 4: Steel

Bolts Nuts and Washers

Bolts and nuts are commonly utilized to connect two links, with the nut typically being a metallic block. These components come in various standard structures such as square or hexagonal shapes, and the holes in them are threaded to enable connection with bolts. Washers play a crucial role in preventing slippage and providing added tightness to the joints. Washers are available in different types, including flat rings, leather, metal, and rubber materials.

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Figure 5: Bolts, nuts and washers

Working

Our project consists of pneumatic cylinder, DC motor, four wheeler frame structure, etc. The DC motor is connecting with the wheel to drive the vehicle. The steering function of vehicle is done with rack and pinion mechanism. The pneumatic cylinder is placed rear side of vehicle frame and it has connecting with one more additional wheel. When we want to rotate car, then actuate the pneumatic cylinder by compressed air. The pneumatic cylinder lifts the rear side of vehicle. Now we can easily rotate the vehicle with normal steering system. By this process the parking system in four wheelers is very efficiently.

Future Scope

This project was mainly done to make parking of a car easier by implementing a 5th wheel in a car by this project parking of an car was done easier and avoid time delay for parking

Conclusion

A prototype was created to implement a new approach that involved introducing 360° steering to the wheels. This prototype demonstrated exceptional maneuverability in tight spaces. After implementing the 360-degree wheel rotation feature, the vehicle required significantly less space to navigate from one direction to another, resulting in reduced turning time. This type of vehicle has proven to be beneficial in various areas, including small industries and railway platforms.

In conclusion, the introduced 360-degree rotating car prototype allows for guidance in all directions, including parallel movement. Recent advancements in automobiles have prompted modifications to improve efficiency and address various challenges. The modified model offers quick response times and requires minimal space. Based on these findings, it is recommended to incorporate the developed model into future car designs.

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Comparative Analysis of Rigid Solid Chassis with Honey Comb Chassis

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Abstract

The automotive chassis plays a vital role as a framework for supporting the body and various components of an automobile. It needs to be rigid and sturdy to endure shocks, vibrations, twists, and stresses. Besides strength, adequate bending stiffness is an important consideration in chassis design to enhance handling characteristics. Therefore, criteria such as maximum equivalent stress, equivalent strain, deformation, safety factor, etc., are significant for chassis design. Weight reduction poses a major challenge in the automotive industry. Typically, chassis are constructed using steel or aluminum, resulting in rigid and heavy structures with higher densities that lead to reduced mileage and increased mechanical losses. This project aims to reduce the weight of the chassis by replacing the solid and rigid design with an I-section honeycomb chassis. Additionally, a comparison is made with composite materials such as Kevlar, Aluminum Alloy, and A710 steel. By utilizing materials with lower densities compared to conventional ones, the weight of the chassis is reduced, thereby improving load capacity, minimizing fuel consumption, and enhancing overall vehicle performance. The modeling and analysis of the automobile chassis are conducted, comparing the original chassis with the honeycomb structure. The objective is to determine which type of chassis is lighter and to identify the most suitable material among the three options by performing static structural analysis. The chassis is modeled using SolidWorks and analyzed using ANSYS software."

Keyword: Automobile, Honeycomb Chassis, Load Withstanding Capacity.

Introduction

Automotive chassis serves as the structural framework to which several mechanical components, including the engine, tires, axle assemblies, brakes, and steering, are securely

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attached. Undoubtedly, the chassis plays a pivotal role as the primary component of a vehicle. It provides essential strength and stability, ensuring the vehicle's reliability in various conditions. Automotive frames are designed to offer both strength and flexibility, serving as the foundation for the engine and axle assemblies, supporting their integration with the overall vehicle structure.

Tie bars are essential components of automotive frames, functioning as fasteners that securely join different parts of an automobile. The automotive chassis is a fundamental structure in an automobile, typically composed of a steel frame that supports the vehicle's body and engine. It acts as a skeletal framework to which various mechanical components like the engine, tires, axle assemblies, brakes, and steering are attached. During the manufacturing process, the vehicle body is designed and molded to fit the chassis structure. Lightweight sheet metal or composite plastics are commonly used materials for constructing automobile chassis. The chassis plays a crucial role in providing strength and support to the vehicle components and any payload it carries. It contributes to the rigidity, stiffness, and overall integrity of the automobile, thereby minimizing noise, vibrations, and harshness experienced while driving.

Figure 1: Chassis of Vehicle

Working Principle

ANSYS is a widely used software package for general-purpose finite element analysis (FEA). Finite Element Analysis, also known as FEA, is a numerical technique used to break down intricate systems into small, user-defined elements. The software utilizes equations that govern the behavior of system elements and solves them to provide a comprehensive understanding of the system's overall performance. The results obtained can be presented in graphical or tabulated formats. This approach is particularly useful for analyzing and optimizing complex systems that cannot be easily evaluated manually due to factors such as geometry, scale, or governing equations ANSYS is highly regarded as the primary tool for conducting Finite Element Analysis (FEA) in the Mechanical Engineering Department of numerous educational institutions. Moreover, it finds widespread utilization in various other

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fields, including Civil and Electrical Engineering, as well as Physics and Chemistry departments.

ANSYS offers a cost-effective solution for exploring the performance of products or processes in a virtual environment. This methodology, known as virtual prototyping, enables users to iterate through different scenarios and optimize product designs well before actual manufacturing takes place. By implementing virtual prototyping techniques, the utilization of ANSYS can considerably diminish the level of risk and cost associated with ineffective designs. The flexibility offered by ANSYS enables users to analyze the influence of a design on the overall behavior of a product, encompassing various aspects such as electromagnetic, thermal, and mechanical properties.

Property	Kevlar	Aluminum Alloy	ASM A710 steel
Young's Modulus (GPa)	70.5	69	80
Poisson ratio 1/m	0.36	0.32	0.29
Yield strength (MPa)	520	220	450
Density (g/cm^3)	14.40	2.8	7.85

Table 1: Properties of Kevlar, Aluminum Alloy and ASM A710 steel

Conclusion

This project involves modeling the chassis with two different configurations: one with a honeycomb structure and the other without. The cross-section of the chassis is in the shape of an I-section. The materials utilized for this project include Kevlar, Aluminum Alloy, and A710 steel. By observing the structural analysis results, the stress and deformation, strain values are nearly equal for chassis with and without honeycomb Chassis.

By observing the directional deformation, shear stress, shear strain values are slightly more for with honeycomb structure chassis compared to without honeycomb structure chassis.

Finally, based on results it is concluded that weight reduction is the major consideration of the chassis is reduced nearly to 15% using honeycomb structure chassis compared to without honeycomb chassis. By reducing the weight, mileage of the vehicle is increased. By analyzing with different materials finally it is concluded that Kevlar with honeycomb chassis is the best composite material.

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Solar PV Cleaning Robot

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Abstract

The hired cleaners may cause discomfort which led to the introduction of vacuum cleaner robot. Compact and efficient vacuum cleaner robot was developed for potential office and home use Vacuum cleaner robot cleans the home or office even in the absence of humans. Vacuum cleaner robot cleans minute dust particles which cannot be noticed by humans The conventional vacuum cleaner system consists of large electrical and mechanical parts which are more expensive.

Keywords: solar, cleaners, robot

Introduction

Automation is a great solution of this problem. So, we make an autonomous floor cleaning robot. Ultrasonic sensor is the most important component for autonomous floor cleaning robot because ultrasonic sensor works as eyes of robot. Ultrasonic sensor useful for turning of robot by sensing the obstacle or wall. Sensing distance range set by programming. In this range robot sense the obstacle and turn back. Cleaning is Important work inexact each spot. At times this is simple and once in a while troublesome. At times we allocated individuals for reason for cleaning and pay cash and once in a while cleaning is needed in regions where presence of living being hazardous so we can't relegate living being in each spot. A few spots are so that have a huge floor territory in that place for cleaning reason we need more than one individual so we required some method to repay these issues. In headway of science a robot comes in light however it works by a faculty. To keep away from this limit of faculty we require more innovations. Computerization is an extraordinary arrangement of this issue. So, we make a self-governing floor cleaning robot that worked by web of things and Arduino programming. Families of today are getting more astute and furthermore more mechanized. Home robotization conveys accommodation and makes more opportunity for individuals. Home-grown robots are entering the homes and individuals' everyday lives, yet it is yet a moderately new and juvenile market. Be that as it may, a development is anticipated and reception of home-grown robots is advancing. Reason for this undertaking is plan and actualizes a Vacuum Robot Autonomous. Vacuum Cleaner Robot is intended to cause cleaning cycle to become simpler as

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opposed to by utilizing manual vacuum. The primary target of this undertaking is to plan and execute a vacuum robot model by utilizing Node MCU, engine driver and to accomplish the objective of this venture. Vacuum Robot will have a few measures that are easy to use.

Mobile Industrial Robots

Mobile industrial robots are pieces of machinery that are able to be programmed to perform tasks in an industrial setting. Typically these have been used in stationary and workbench applications; however, mobile industrial robots introduce a new method for lean manufacturing. With advances in controls and robotics, current technology has been improved allowing for mobile tasks such as product delivery. This additional flexibility in manufacturing can save a company time and money during the manufacturing process, and therefore results in a cheaper end product.

Mobile robot technology has potential to revolutionize many sectors of industry; however, it carries with it some disadvantages. The logistics of manufacturing will be streamlined by allowing robots to autonomously navigate to different areas for their work. The labor demands for employees will be lessened as robots will be able to work alongside humans, and robots will assist with medicine and surgery more and more. However, there are drawbacks to this technology. Coordinating the movement of robots around facilities and calibrating their position at their destination is tedious and far from perfect. A robot malfunctioning in a manufacturing setting will hold up production - and this robot could malfunction anywhere in a facility. Human safety must also be considered. Robots must prioritize the safety of human operators over their programmed task - which may complicate the coordination of multiple autonomous robots. Especially in a surgical setting, there is no room for error on the robot's part. Even though some challenges are present, mobile robot technology promises to streamline aspects across much of the industry.

Overview

The simplicity of mobile industrial robots provide their main advantage in industrial settings due to the ease of use and ability to be operated via technologies well understood by most people. In addition, robots are able to operate almost continuously and will never complain about long work hours; greatly increasing efficiency in a lean manufacturing environment. The main current disadvantage lies in high costs of repair as well as the production delays that would be caused by a failure or malfunction. These factors are very

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preventative to putting major amounts of responsibility on mobile robotics; however they are being continually lessened.

Applications of mobile industrial robots

The mobile industrial robots have many applications that they have been used in already including in the healthcare industry, home and industrial security, ocean and space exploration, the food service industry, and in distribution applications.

Medicine

Mobile industrial robots have several uses within the healthcare industry in both hospitals and homes. Drug delivery, patient services, and other nursing functions could be easily adapted to robots. Due to the fact that items being carried around typically weigh less than 100 kg, robots much smaller than the MiR (see above) may be used. Specialized equipment may be mounted on robots, allowing them to assist with surgical procedures. Overall, their place in the medical industry is to provide a more reliable source of customer care while reducing human error.

Scientific experimentation and exploration

In the scientific world, there is a large number of applications for mobile robots. Their ability to perform experiments and exploration without putting human lives in danger makes them an important asset. Unlike humans, robots do not require life support systems to function. In space travel, robots are performing science on planets and asteroids because sending humans is far more taxing on resources and money. The same is true in the oceanography domain. In fact, several of the same robotic systems are designed to perform their science under both conditions - space and underwater. In nuclear power plants, robots can service electronics and mechanical systems which prevents human exposure to large amounts of radiation.[5]

Aircraft maintenance and repair

Air-Cobotis a collaborative mobile robot able to inspect aircraft. Picture of the robot in Air France Industries.

Figure 1: Inspect Aircraft

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For applications like painting and de-painting aircraft, two fixed robots are inadequate because not all parts of the aircraft can be reached. Adding more fixed robots would complete the task, but the cost is prohibitive. If mobile robots are used, one or two may be enough to service the entire aircraft because they can move to whatever area needs work. Mobile robots need to be truly autonomous to be useful in manufacturing. Erik Nieves said, "Mobility moves robots from being machines to production partners Rather than bringing work to the robot, the robot should be smart enough to go to where the work is.

Automated aircraft inspection systems have the potential to make aircraft maintenance safer and more reliable. Various solutions are currently developed: a collaborative mobile robot named Air-Cobot, and autonomous drones from Donecle or Easy jet.

Existing fire extinguishers contain different chemicals, depending upon their application. Generally, they are pressurized with Nitrogen or Carbon Dioxide (CO2), when this pressure released on fire will extinguish the fire, as we know there is many such fire fighting agents such as water, potassium bicarbonate, evaporating fluorocarbons etc. All these agents have the same property of leaving an unproductive system behind it. To deal with Fire we need to have complete information on fire and its working. The formation of fire requires three elements in a proper mixture they are fuel, oxygen and heating element. There is a chance of extinguishing the fire by sound. If we remove the heating element or move it apart from fuel fire can be extinguished.

Existing System

Researchers use the prototype approach as it targets to speak extra intently with software clients become studied via way of means of existing. The layout focuses on "concentrate to the purchaser" so, with inside the technique of modelling between improvement and clients, they speak extra (feedback) with inside the layout become studied via way of means. In essence, the developer is extra emphasised to speak extra to fulfil the desires of the machine purchaser become studied via way of means. In the primary level "Listen to Customer", which includes out the communiqué technique with an improvement that is without delay carried out with the wishes of the purchaser with the "Build / Revise Mock-Up" level, specifically making semi-completed modelling and intending to the "Customer Test Drives Mock-Up" level become studied via way of

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means. The existing is a hobby take a look at software to the purchaser what's anticipated or if there may be something which you need to add from the machine software this is designed if there may be a need this is much less then continue to the authentic level "Listen to Customer" maintains to loop till this system machine designed is enough fulfil the purchaser in phrases of machine necessities become studied via way of means.
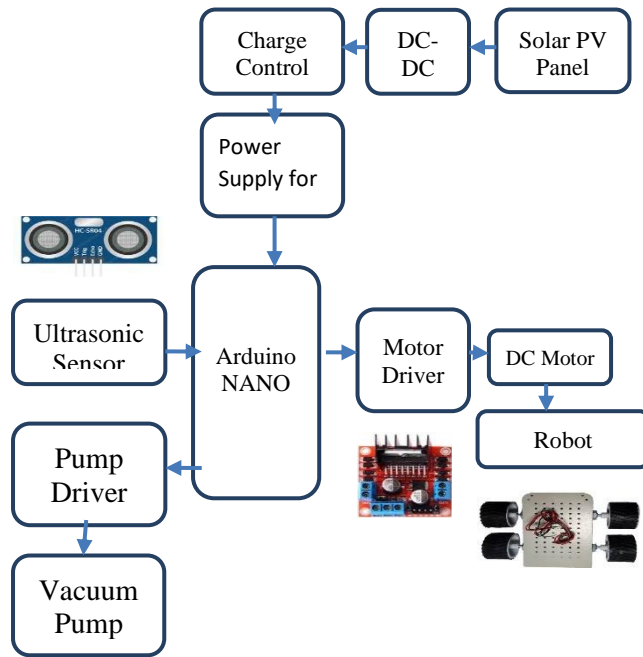
• Fire flame at night, detection of heat flux using IR thermal imaging cameras and LIDAR system
• WSN consisting of temperature sensor setup and GPS module was also used for detection of forest fire.
• Existing implements fuzzy logic based fire detection system for vehicle.
• Temperature, flame and smoke sensors are used to sense fire.
• In this system air-conditioning system is used for extinguishing fire within 20 seconds when fire occurs.

Proposed System

First it checks if it's on manual mode. If yes, then it checks the keypad. On keypad it checks if any key is pushed, i.e., Left, Right or Centre. If yes, then the data is displayed accordingly on the LCD screen, i.e., our mobile phone which we are using as a remote to control the robot manually. The data is transmitted to the bot. Then it checks if any hurdle is detected. If yes then the signal is displayed and the robot is informed to stop and it goes back to manual mode. If no hurdle is detected, the robot checks for the data signal received. If the data signal is received, then it starts decoding the data and is displayed on the LCD. If the data signal is not received then it goes back and checks for the data signal transmitted

• To overcome the harmful effects of chemical and water fire extinguishers.
• We design this project based on robot all component is mounting on the robot and controller by the wireless device.
• If there is fire detected, then the heat sensors send signals to the processor.
• Based on which sensor is triggered the location of the fire is found.

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Proposed Block Diagram

Figure 2: Proposed Block Diagram

This concept utilized the scientific principle of physics and the engineering aspects of electronics to successfully suppress a flame. Based on the physical aspects of acoustic waves, it is important to understand that acoustic wave patterns are referred to as longitudinal pressure waves –meaning that the waves move in a back and forth vibrating motion in which they are able to agitate air molecules away from the fuel of the flame. Secondly, we hypothesized that the physical aspect of The Ideal Gas Law has an effect on suppressing a flame. The Ideal Gas Law stathat Pressure

Times Volume is equal to the constants n, the substance of gas and R, the universal gas constant multiplied by temperature (PV= nRT). Therefore, when the pressure waves are being directed at the source of a flame, it will decrease the pressure at the source, which in turn will decrease the temperature of the flame.

In this system the ultrasonic sensors are used to sense the obstacles. Ultrasonic sensors emit sound scopes with frequency lying in ultrasonic spectrum (20KHZ), which is inaudible to human ears. The sound waves hit the obstacle and bounces back to detectors. The ultrasonic sensor is used for detecting objects/obstacles and move the direction of the robot. GSM module is used by the blind person to contact to mobile numbers stored in the microcontroller in case of any emergency. Using GSM technology robot movement will be controlled. And using ultrasonic obstacle avoidance will be done. Here an Arduino Uno is used as the microcontroller.

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Circuit consists of a GSM module, an ultrasonic Sensor, two L293D driver ICs, two motors, a cleaner and an LCD Display. The ultrasonic sensor triggers and echo pins are connected PWM of Arduino respectively. The virtual terminal represents the GSM Module. The RXD and TXD of GSM module is connected to TXD and RXD of Arduino. Motor driver IC (L293D) for driving the two motors is connected in such a way that the IN1 & IN2 for driving motor 1 and motor 2 are connected L293D is connected to motor 1 and OUT3 & OUT4 are connected to motor 2 LCD is interfaced in such a way that RS, E, D4-D7 of LCD is connected.

Hardware Description

Power Supply

A power supply (sometimes known as a power supply unit or PSU) is a device or system that supplies electrical or other types of energy to an output load or group of loads. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.

circuit is a small +5V power supply, which is useful when experimenting with digital electronics. Small inexpensive wall transformers with variable output voltage are available from any electronics This shop and supermarket. Those transformers are easily available, but usually their voltage regulation is very poor, which makes then not very usable for digital circuit experimenter unless a better regulation can be achieved in some way. The following circuit is the answer to the problem.
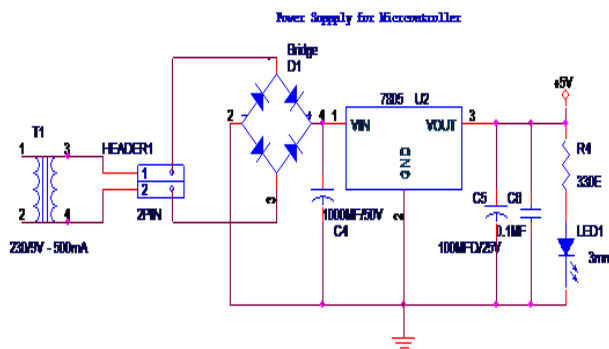
Figure 3: Power Supply

Arduino

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the

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microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments. All Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too, is open-source, and it is growing through the contributions of users worldwide.

Arduino Software (IDE)

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.
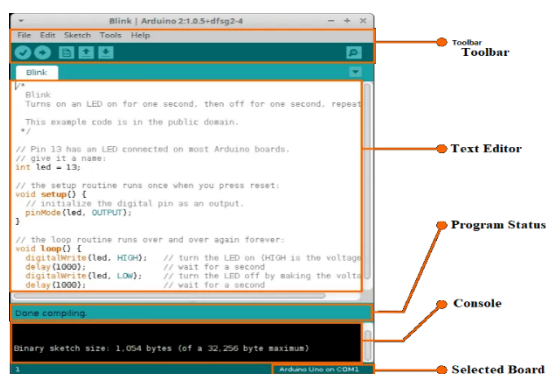
Figure 4: Arduino Software

Writing Sketches

Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for

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cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom righthand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

- ➢ **Verify** Checks your code for errors compiling it.
- ➢ **Upload** Compiles your code and uploads it to the configured board. See uploading below for details. Note: If you are using an external programmer with your board, you can hold down the "shift" key on your computer when using this icon. The text will change to "Upload using Programmer"
- ➢ **New** Creates a new sketch.
- ➢ **Open** Presents a menu of all the sketches in your sketchbook. Clicking one will open it within the current window overwriting its content.
- ➢ **Save** Saves your sketch.
- ➢ **SerialMonitor** Opens the serial monitor.

Figure 5: Writing Sketches

Additional commands are found within the five menus: File, Edit, Sketch, Tools, Help. The menus are context sensitive, which means only those items relevant to the work currently being carried out are available.

Conclusion

The Solar Panel Cleaning System project aimed to bring a better solution for maintaining solar efficiency. The main scope was to develop a machine that can clean a solar panel by a proper control system. This project is a developed Designing the control system required learning Raspberry Pi configurations, python coding and its interference with the electrical components. Using soldering boards to implement the designed circuit, hardware wiring, relays and machinery were new experiences. This being said, the project fulfilled the desired design with the planned control and mechanism. The DC motors were controlled by both relays and

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drivers to accomplish speed and directions control. Also, control code for the DC motors and the water pump were written then implemented in the system Overall the design and improvisation of sound wave extinguisher has been done successfully. All the actions which has to be performed by extinguishers are working properly. Sound wave extinguisher with these modifications will be a new success in terms of safety as well as fire fighting and rescue operations. Based on the experiment result obtained it can be seen that the sound wave can extinguish flames.

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Design and Fabrication of 4 Wheeler Highway Plant Maintenance with Mobile App Control

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Abstract

Highway plant cutting Machine is very much useful in highways road workers, it is very simple in construction and easy to operate. Anybody can operate this machine easily. It consists of two axial cutting blades to cut out the extra growing plants. After cutting operation the sensor will be activated to providing water to the plants. The cutting and water providing operation time is very less compared than human working time and the cost is also very less. Maintenance cost is less. In our project is a very simple drive mechanism and easy to operate any persons and children. The size of the machine is also portable, so we can transfer from one place to another place very easily.

Keywords: Motors, Transformer, Power supply, Microcontroller, RC transmitter and Receiver, Blades, mobile app

Introduction

This project is mainly built to make a maintenance in highways by cutting the plant branches in between the Highway roads which was disturbance for the travellers in the Highway and also this project is used to pour water by sensing of plants and automatically pour water to the plants this may operate through manually and then using the mobile app control.

Methodology

The automatic highway tree cutting machine is kept two type of stainless steel cutting blades. The micro controller when start push button is activated automatically. The motor is running its normal speed to ready to cut out the tree. The motor pulley is already connected to the main shaft pulley with the help of belt drive. The main shaft is rotating according to the speed of the motor and pulley dimension. Then received forward signal by the mobile app

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machine will be moving forward by using motor and wheel arrangement . The cutting blades are rotated due to the rotation of the main motor. These motor used to cut the growing trees. And after cutting process the sensor will be activating to open solenoid valve with the help of microcontroller and Bluetooth for providing water to the trees. The pushing rod is back to its original position due to the spring action. The mobile app motor bush button is off, so that cut off the main supply to the DC motor. The motor is off, so that the main shaft is off.

Component used

- Motors
- Transformer
- Microcontroller
- RC transmitter
- Main frame
- Bolt and nut

Motor

An electric motor is an electrical machine that converts electrical energy into mechanical energy. Most electric motors operate through the interaction between the motor's magnetic field and electric current in a wire winding to generate force in the form of torque applied on the motor's shaft

Figure 1: MOTOR

Transformer

A transformer is an inductive electrical device for changing the voltage of alternating current. A transformer consists of two magnetically coupled coils. Alternating current in one (called the "primary") creates a changing magnetic field which induces a current in the second coil (the "secondary").

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Figure 2: TRANSFORMER

Microcontroller

Microcontroller is a compressed micro computer manufactured to control the functions of embedded systems in office machines, robots, home appliances, motor vehicles, and a number of other gadgets. A microcontroller is comprises components like – memory, peripherals and most importantly a processor.

Figure 3: MICROCONTROLLER

Steel Frame

Steel frame are used to construct the structure of any skeleton by arranging in horizontal and vertical manner as per the dimensions and structure is build according to the database.
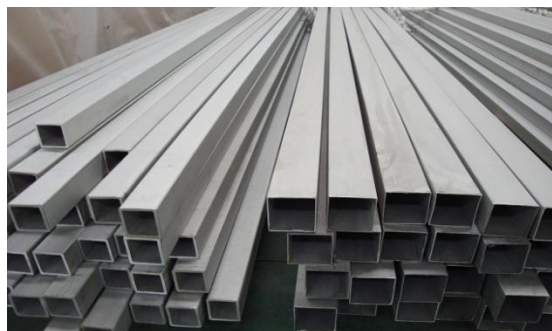

Figure 4: Steel

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Bolts Nuts and Washers

Bolts and nuts are used to joining the two links and the nut is usually of metallic block these are available in most common structures like square or hexagonal which the hole is designed by threading and this can be mated together with a bolt. And the washers are used to prevent the slippages, this can give the tightness to the joints etc. and are available in different types such as flat rings, leather, metal, rubber.

Figure 5: Bolts, nuts and washers

Working

The automatic highway tree cutting machine is kept two type of stainless steel cutting blades. The micro controller when start push button is activated automatically. The motor is running its normal speed to ready to cut out the tree. The motor pulley is already connected to the main shaft pulley with the help of belt drive. The main shaft is rotating according to the speed of the motor and pulley dimension. Then received forward signal by the mobile app machine will be moving forward by using motor and wheel arrangement . The cutting blades are rotated due to the rotation of the main motor. These motor used to cut the growing trees. And after cutting process the sensor will be activating to open solenoid valve with the help of microcontroller and Bluetooth for providing water to the trees. The pushing rod is back to its original position due to the spring action. The mobile app motor bush button is off, so that cut off the main supply to the DC motor. The motor is off, so that the main shaft is off.

Future Scope

This project was mainly done to make avoid of accident due to plants in between the roads by this project the accident may get lesser and avoid workers in between the roads for maintenance

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Conclusion

And finally the project works to cut the plants and pouring the water for the plants in the Highway. This is mainly built to make a maintenance in high way. It was eco friendly and didn't cause any pollution and mainly we newly implemented a mobile app control.

References

The first actual mower was invented in 1830 by Edwin Beard Budding. Budding was an engineer from England who first discovered the idea of a mower from a cylindrical machine used for cutting in a mill. present the design and development of a plant cutting robot that is able to cut plants up to 6 inches in diameter.

In 18th century the concept of plant cutter was just a mechanical machine which was manually operated. With the invention of engines, petrol engines were used to power cutters Now a days there are many types of leaf cutters with various feature's like solar powered, Petrol engine RC operated but they do not provide the ease to its user.

Design and Development of a tree Cutting Robot for Roadside Vegetation
Management" by Jie Li and colleagues (2019).
The authors present the design and development of a plant cutting robot that is able to cut plants up to 6 inches in diameter.

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Design and Analysis of Heat Reduction in Two Wheeler Silencer Using Fins

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Abstract

In this project, we will explore the differences between two types of bike silencers: those with fins and those without. Bike silencers are essential components of the exhaust system that reduce the noise generated by the engine and control the emissions released into the atmosphere. A bike silencer with fins uses a series of thin, metallic fins to increase the surface area available for heat dissipation. The fins help dissipate the heat generated by the exhaust gases, reducing the likelihood of damage to the silencer due to excessive heat. To investigate the thermal performance of bike silencers with and without fins, an experiment was carried out by designing and constructing two types of silencers, one with fins and one without, using different materials such as stainless steel and al 6061-T6. The results of the experiment showed that the silencer with fins provided better thermal performance compared to the one without fins. These findings suggest that the use of fins and al 6061-T6 in the construction of bike silencers can significantly increase the heat transfer and heat flux caused by motorcycles. And finally, these silencers are designed in solid modeling software Solidworks 2020 and analysis is done using finite element method by using ANSYS software17.2

Keywords: Design*, Silencer, Fins.

Introduction

The bike silencer, as a component of the motorcycle exhaust system, plays an important role in transferring heat away from the engine. The combustion of fuel in the engine generates a significant amount of heat, which is carried away by the exhaust gases as they flow through the exhaust system. The silencer helps to dissipate this heat by providing a larger surface area for the

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exhaust gases to come into contact with, as well as by using materials that conduct heat away from the gases and into the surrounding environment.

In some high-performance motorcycles, the silencer may be designed to maximize heat transfer in order to improve engine performance. For example, a performance-oriented silencer may be constructed with materials such as titanium or carbon fiber, which have high thermal conductivity, in order to more effectively transfer heat away from the exhaust gases. On the other hand, a silencer designed for noise reduction may prioritize sound-dampening features over heat transfer efficiency. Overall, the design and construction of the bike silencer plays an important role in managing heat generated by the engine and maintaining optimal performance.

Working Principle

Fins are used in a large number of applications to increase the heat transfer from surfaces. Typically, the fin material has a high thermal conductivity. The fin is exposed to a flowing fluid, which cools or heats it, with the high thermal conductivity allowing increased heat being conducted from the wall through the fin. The design of cooling fins is encountered in many situations and we thus examine heat transfer in a fin as a way of defining some criteria for design

Figure 1: Fins

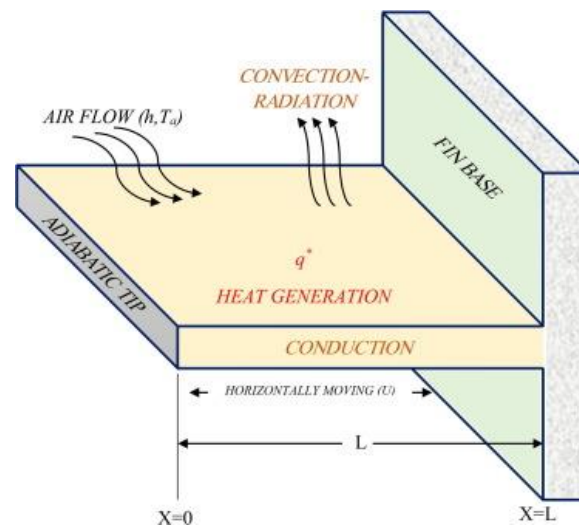The primary objective of a bike silencer with fins is to improve its thermal performance. The additional fins on the silencer increase its surface area, which enhances its ability to dissipate

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heat. This can be particularly important in high-performance bikes where the engine generates a significant amount of heat that needs to be efficiently dissipated. Improving the thermal performance of the silencer can have several benefits, including increasing its efficiency in reducing the noise generated by the engine and improving its durability. By reducing the temperature of the silencer, it can also help to improve rider comfort and safety, as a hot silencer can potentially cause burns or discomfort to the rider.

In summary, the main objective of a bike silencer with fins is to improve its thermal performance, which can have a positive impact on its noise reduction capabilities, durability, rider comfort, and weight reduction.

This article discusses the use of computational fluid dynamics (CFD) to analyze the thermal performance of a bike silencer. The authors simulated the flow of exhaust gases and heat transfer within the silencer, and compared the results to experimental measurements. The study found that CFD was an effective tool for predicting the thermal performance of bike silencers

Conclusions

In conclusion, the comparison of heat transfer between no fin silencer, fin silencer made of aluminum material, and fin silencer made of stainless-steel material has shown that the addition of a fin silencer can significantly improve heat transfer performance. The use of a fin silencer made of aluminum or stainless-steel material can provide a better cooling effect than a system with no fin silencer.

Furthermore, the study suggests that the material used in the fin silencer can have a significant impact on the heat transfer performance. The use of a aluminum fin silencer can provide better heat transfer performance than an stainless-steel fin silencer due to its higher thermal conductivity. Overall, the choice of fin silencer material and design can play a crucial role in optimizing heat transfer in various automobile applications.

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Fabrication of Mobile Operated Drilling Machine

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Abstract

This paper focuses on detailing the design of a computer numeric control (CNC) drilling machine. The objective of this machine's design is to ensure cost-effectiveness, making it suitable for application in small or medium-scale industries and for low position service workers. In addition to the mechanical aspects, the electronic and software components of the machine have also been designed. Furthermore, the machine has been fabricated and successfully tested, validating its functionality.

Keywords: Computer, drilling machine, MSME

Introduction

A drilling machine is a device used for creating holes in components. Manual drilling machines often suffer from issues such as low accuracy, lengthy setup time, and low productivity. Although CNC machines offer solutions to these challenges, they are often hindered by their high upfront expenses and the need for skilled labor to operate them. Therefore, there exists a necessity for an affordable CNC machine that can deliver precise hole drilling, reduced machining time, and a lower initial investment. To address the requirement for skilled operators, a software with a user-friendly graphical interface has been developed, aiming to simplify the machine operation process.

Computer Numerical Control (CNC) refers to the process of managing and directing the operations and motions of a machine tool by utilizing a prearranged program that consists of alphanumeric data.CNC can control various aspects, such as workpiece or tool motions, input parameters (e.g., feed, depth of cut, speed), and functions like spindle and coolant control. The advantages of CNC include high manufacturing accuracy, shorter production time, increased flexibility, simpler fixturing, contour machining capabilities (2 to 5-axis), and reduced human

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errors. Some of the drawbacks associated with CNC systems include high costs, the need for regular maintenance, and the requirement for skilled individuals who can program the parts effectively.

CNC finds applications in both machine tool and non-machine tool areas. In machine tool applications, CNC technology finds extensive application in various machines such as lathes, drill presses, milling machines, grinding units, lasers, sheet-metal press working machines, tube bending machines, and other similar equipment. Highly automated machine tools like turning centers and machining centers, which can automatically change cutting tools under CNC control, have also been developed. Apart from machine tool applications, CNC technology is also employed in non-machine tool contexts. These include welding machines, coordinate measuring machines, electronic assembly systems, as well as machines used for working with composites such as tape laying and filament winding.

CNC machining is a computer-controlled manufacturing process that is widely utilized in various industries. It involves the utilization of machine tools such as lathes, mills, and grinders to produce precise and accurate components and products. The CNC acronym stands for Computer Numerical Control. This project presents the idea of a CNC spindle drill, a small CNC machine capable of drawing images on surfaces such as paper. This machine is also used for manufacturing purposes.

There are various types of CNC machines, with the common ones being two-axis and three-axis machines. Two-axis machines can move vertically and horizontally along the X and Y axes, while three-axis machines have movement along the X, Y, and Z axes, with the Z axis parallel to the spindle. The CNC machine operation starts by collecting data from computer-aided design software. The program then generates a computer file, which is transformed into commands for operating the machine. These commands are transferred through a post-processor and loaded into the CNC machine to initiate the machining process.

The primary focus of this paper is the design and implementation of a sophisticated 3-axis CNC machine incorporating a microcontroller and a spindle drill. The program generates a

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computer file, extracts commands, and transfers them to the CNC machine for machining operations.

Working Principal

The structure which supports the whole machine is called frame. It can be made of mild steel cause low cost and easy to weldability. Generally, box like structure is preferred and they made using above materials.the working process of a CNC drill can be described as the following. A 775 motor is used in the CNC machine to power the spindles and secure the chucks, drill bits, and other movable parts. These components are activated by an operator through the control panel. A mobile app is employed to adjust the direction, feed rate, and position of the spindles while cutting holes with specific depths and diameters.

A drill is a cutting tool consisting of a cutting point at the tip of a shaft with a helical cutting angle. Drill bits, another type of cutting tool, are utilized to remove material and create holes, typically of circular cross-section. Drill bits are available in various sizes and shapes, enabling the creation of different types of holes in various materials. They are usually attached to a drill, which provides the rotational power to cut through the workpiece. The chuck of the drill holds the upper end of the drill bit, known as the shank. Different types of drill bits include twist drill bits, point drill bits, brad-point bits, fishtail-point bits, and taper-point bits.
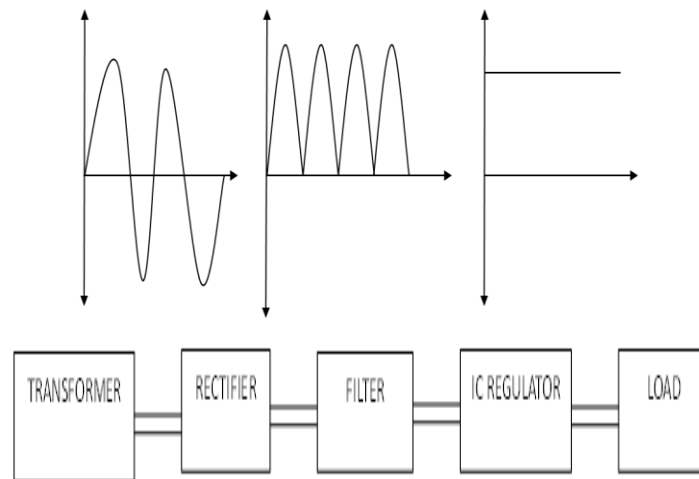
The DC motor is the device which converts the direct current into the mechanical work.it works on the principle of Lorentz law, which states that the current carrying conductor placed in a

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magnetic and electrical field experiences a force and that force is called as Lorentz force. The flaming left hand rule gives the direction of the force. The DC motor is used for drilling purpose. The Arduino board are operating on 5V and motor are operating on high voltage ranging from 12 V to 36 V. So there is need of driver which can take command from controller and drive the motor. There are many motor driver IC are available in market.

The controller is used for converting the G-code machine language. The most widely used and low cost controller is Arduino. It is a microcontroller-based board which have wide application and can be programmed for multipurpose use. It can drive servo and stepper motor along with DC motor. For controlling 3 stepper motor Arduino UNO will sufficient. But for 3D printing machine were more. Controlling power is required Arduino Mega 2560 board is used. The GRBL controller which converts the G code in to machine language is flashed on microcontroller (ATmega328 in case of UNO and ATmega2560 in case of Mega 2560) of the board.
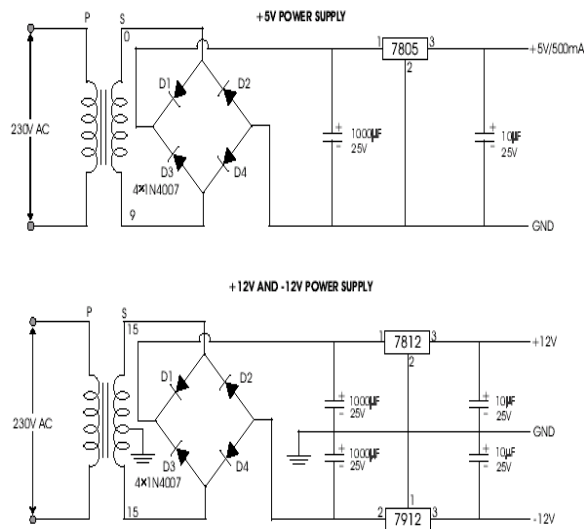
Conclusions

Due to the rising need for precise small-scale components across different industries. The market for small-scale machine tools has experienced substantial growth in recent times. Utilizing small machine tools for manufacturing small-scale parts offers advantages such as flexibility, efficiency, and reduced capital costs, making it particularly advantageous for small business

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owners. This is the motivation behind the design of our small-scale two-axis mobile-controlled machine.

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Design and Development of Hybrid Drive System for Space Vehicle

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Abstract

In the heavenly bodies, our astronauts are exploring and discovering many mysterious objects. For that they are using space vehicles. Many hurdles are faced by the vehicles. Normally the space vehicle does not have any manual interruption. It is governed by space scientist. So, in this situation of bad road conditions like slippery, sloppy, steep, and so on, the vehicle cannot perform effectively. There are chances to tilt, slip or slide, turning draw backs. In order to overcome those hurdles, we design a hybrid vehicle which can perform well and efficiently at those situations. We are attaching spokes which extrudes from the wheel and used at required times. Simultaneously, the spokes surrounding the wheels fulfill the difficulties first faced during slippery road conditions.

Keywords: Chassis, car body, drive motor, disc link mechanism, pendulum resistor mechanism

Introduction

Our project focuses on issues of sliding, tilting, and improper turning. First of all we prepare a model as like that of chassis of a car. To prevent sliding, the wheels are designed with spokes coming out from the wheels which can move to and fro according to the necessity. And next we have to prevent the tilting. Here we have to adjust the height of the link such that its Centre of Gravity point remains at the same position. The link assembly contains a disc which rotates to change the height on both sides of the vehicle. Another idea for preventing improper turning of the vehicle is when the

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wheel alignment is changed, this makes the wheel turn against the skidding position. There are mechanisms which govern the operation of the vehicle. They are pendulum-resistor mechanism and disc-link mechanism.

Problem Identification

We are associated with two main problems in our issue. One is tilting and the other is slipping or sliding. We are solving those problems by our innovative design and simulating the design for verification.

Methodology

Titling

This space vehicle tends to tilt when the vehicle stairs down the slope. This is caused due to weight in the down part of the vehicle and less coefficient of the friction between the road and wheel.

Figure 1: Tilting Angle of space vehicle

Slipping

When the car starts climbing the slope, due to lack of friction between the when slope its starts to slide back although the wheels are halted after the breaks are applied. This is one of the main problems in vehicles in square. This problem has to be rectified in order to save fuel and also to advance the motion of the vehicles. In order to abide by the solution, the wheels should not slip after brake application. The wheels should stick on to the floor to get through the obstacle. So we are using caterpillar wheels to avoid the problem. When we use it we eradicate it. But we face another problem that is our problem is not fully solved. The wheel may undergo wear and be wasted. So, in muddy areas we use spokes extruding from the sprocket wheels. Take for instance,

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the vehicle is travelling on a plain road. Suddenly a slope exists in a situation. Consequently, the spokes on the wheels get firm contact with the road. This makes the vehicle to hold the road tightly without slipping.
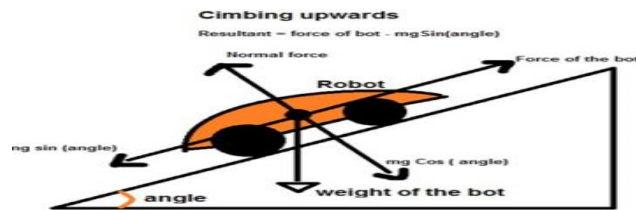
Figure 2: Slipping angle of Vehicle

Components used

- Chassis
- Body
- Drive motor
- Disc link mechanism
- Pendulum resistor mechanism
- Joint mechanism
- Gear box assembly
- Wheel assembly

Chassis

Chassis is the vehicle's main support structure, also known as the 'Frame.' It bears all the stresses on the vehicle in both static and dynamic conditions. In a vehicle, it is analogous to the skeleton of a living organism. The origin of the word Chassis lies in the French language. Whether it is a two-wheeler or a car, or a truck, every vehicle has a chassis-frame. However, its form, obviously, varies with the vehicle type.

Figure 3: Chassis

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Drive Motor

Siemens has developed a solution for integrating an electric car's motor and inverter in a single housing. Until now, the motor and the inverter, which converts the battery's direct current into alternating current for the motor, were two separate components.

Figure 4: Engine

The new integrated drive unit saves space, reduces weight, and cuts costs. The solution's key feature is the use of a common cooling system for both components. This ensures that the inverter's power electronics don't get too hot despite their proximity to the electric motor, and so prevents any reduction in output or service life

Gear Assembly

Reducing the number of gears inherently requires that each meshing gear pair accomplish more of a gear reduction than might be possible or practical when constrained by the use of catalogue gears. The original design used off-the-shelf gears to meet the time and budget constraints for the fabrication of the original gearboxes. For the second generation gearbox, after considering many different gearing configurations, the simplest approach that still met the speed range criteria was adopted. Custom-made high-strength gears allowed the use of fewer (7 instead of 12) and lighter gears.

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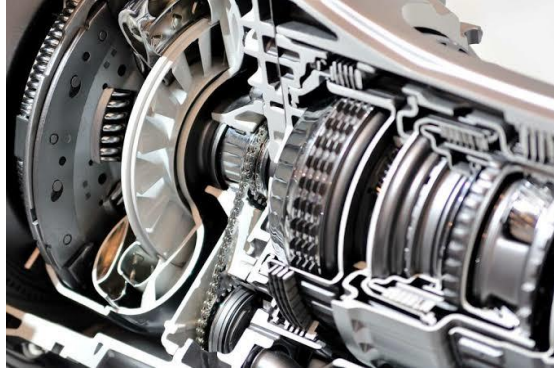College of Engineering & Technology
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Figure 5: Gear Assembly

Two electric clutches, similar to those in the original gearbox, were mounted in series on the same shaft. This also allows the gear casing profile to be reduced in size, thus contributing to making a more compact and lighter final product.

Working

The hybrid drive system in space vehicle that is designed to move on the surface of a celestial body, such as a planet or a moon. For example Rovers are typically used in space missions to explore the surface of these celestial bodies and to gather data and samples. The design of a rover depends on the specific mission requirements, but typically includes a set of wheels or tracks, a power source, communication equipment, and scientific instruments for collecting data. Some rovers are also equipped with robotic arms for collecting samples or manipulating objects on the surface. Rovers are controlled remotely from Earth, with commands sent to the rover through a communication link. The rover's on board computer then executes these commands and sends back data and images to Earth. Some of the most well-known rovers include NASA's Mars rovers, such as the Curiosity rover and the Perseverance rover, which are currently exploring the surface of Mars. Other space agencies, such as the European Space Agency and the Chinese National Space Administration, have also sent rovers to explore the Moon and Mars.

Future Scope

This project was mainly done to make avoid of accident due to plants in between the roads by this project the accident may get lesser and avoid workers in between the roads for maintenance

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Conclusion

The conclusion about drive system of space vehicle is that they are an important tool for space exploration and have been used to explore the surfaces of several celestial bodies, including Mars and the Moon that are designed to operate in harsh environments and are equipped with scientific instruments to gather data and samples. They are controlled remotely from Earth and are powered by various sources, such as solar panels or nuclear generators. For example Rovers have provided valuable information about the geology, atmosphere, and potential habitability of other planets and moons in our solar system. They have also helped pave the way for future human missions to these celestial bodies.

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Design and Analysis of E-Scoot

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Abstract

In this study, the method and methods utilized to design and construct an electric hoverboard are discussed. Internal combustion vehicle emissions are increasing every day. The amount of traffic in cities has increased dramatically over time. Traffic congestion results in increased car emissions and poorer air quality. Although there is no quick answer to this problem, another option for traditional personal transportation is the hoverboard. As a result, hoverboards are gaining in popularity. However, complicated electronics, such as the accelerometer and gyroscope, make it prohibitively expensive. The design, analysis, and manufacture of an electric three-wheeled hovercraft are all part of this project. The speed can be controlled by a potentiometer and moves back and forth using a DPDT switch. A small wheel is utilized to balance the vehicle, eliminating the requirement for a gyroscope. The purpose of this research is to develop a hoverboard that is both inexpensive and efficient.

Keywords: E-scoot, Low cost, Less maintenance, High balance

Introduction

In this study, the method and method utilised to design and construct an electric hoverboard are discussed..The amount of traffic in cities has increased dramatically over time. Traffic congestion results in increased car emissions and poorer air quality. Although there is no quick answer to this problem, another option for traditional personal transportation is the hoverboard. As a result, hoverboards are gaining in popularity so the dimenstions to be desined and analysed.

Literature Review

In the present days we are dealing with a problem of increase in number of vehicles with ever-lasting demand of fuel to run them. If this situation remains with time it would be difficult for us to save our future from increasing pollution and fuel demand. With time the population on earth increases obviously; which cannot be controlled so to fulfill the demands of fuel or energy in future world, effective steps should be taken as soon as possible. Our dependence on fuel can be reduced with an eco-friendly such as, use of battery operated vehicles. New technology should be implemented; use of eco-friendly vehicles should be encouraged. Segway is an electric scooter of future technology; it is often used to transport a user across mid-range distances in urban environments.

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Methodology

Chassis

Chassis is the structural foundation of a vehicle upon which all other components are getting to be fabricated. Everything related to the vehicle except its body is contained by the chassis and is consists of a frame, motor, wheels, and control system.

The main function of the Chassis is to provide safety, carry the utmost load, and hold all the components during running
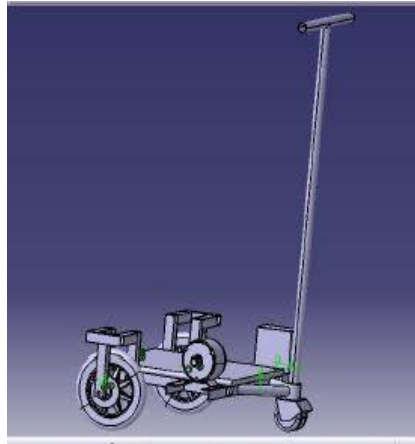
Figure 1: Design of Chassis

Material Selection

Here Structural Steel is used for manufacturing the chassis. The main reason behind using structural steel here is because of its ability to absorb the impact produced in a collision, it is low cost compare to other materials. It has a better strength-to-weight ratio i.e it has high strength and less weight which results in improvements in the performance of the scooter.

Design Specification

Mass of the vehicle = 100 kg
Weight of the vehicle = (100 *9.81) N = 981 N
Speed Of Vehicle = 60 km/h = 60*(1000/3600) = 16.67 m/s
(For Calculating Resistance due to motion)
1. Force due to climbing hills (F gradient)
 Fh = W sin Φ (Angle of incline Φ is 2.5)
 = Mg sin Φ
 = 981x sin 2.5
 = 42.79 N

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Rolling resistance

Fr = Cr W cosΦ (for asphalt roads Cr=0.004)= 0.004 x 981 x cos2.5 = 3.92 N

3. Air resistance:

 Fd= 0.5 ρ Cd A V2 (Cd value is 0.5 for frontal area A=0.7 m2) = 0.5 x (1.2) x 0.5 x 0.7x 16.672 = 58.35 N (ρ is density of air 1.2 kg/ m3)

Total Force on the Vehicle is, F = Fh+ Fr + Fd = 105.06 N

Power required for propulsion, P = F*V = 105.06*16.67 =1752 Watt

Performance Analysis

Motor Requirement

As the total power required to move the vehicle is 1752 watts. We have to rake a motor having power more than it.

So the power of the motor is 2000 watts.

The motor used here is BLDC Hub motor 48 volt 200 watt.

5.2 Battery requirement:

Watt hour = 2000 w.hr

Battery Watt hour required = 2000*(1+0.1)= 2200 w.hr

Voltage = 48 volt

Current in battery = 2200 w.hr /48 v = 45.83 A.h

The battery used here is a Lithium-Ion battery that has a capacity of 48 volts and 50 Amp

Charger requirement

Battery watt-hour = 2200 w.hr

Preferred charging time = 3 hr

Therefore, Wattage of charger = (Battery watt hour/ Preferred charging time) = 733.33 watt

Voltage of charger = 48 volt

Current rating of charger = (Wattage of charger/voltage) = 15 Amp

The charger used here is 48v/18Amp

Working

Supplying the necessary amount of electricity is a vital process which we achieved through a electric circuit drawn from a power source. The challenge now is to direct the power in such a way that it could actually make the Hover board move front and back. For this, the location of each switch has been strategically chosen to be closer to the front side at the rider's finger tips. This is done so that when the operator closes the circuit, the current is utilised by the motors through which the tyres rotate and it moves the hoverboard in the specified direction. For moving the Hoverboard sideways, we are using the basic steering principle, if one wheel is made

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to stop then the body will rotate at the axis of rotation of the stationary wheel. When the push switches are made open and close the circuit then the power supply to the motor is paused and the rotation takes place concerning the stationary wheel.

Specification

Table 1: Material Specification

Material Property	Value
Density ρ	≈ 7850 kg/m^3
Unit weight γ	≈ 78.5 kN/m^3
Modulus of elasticity E (Young's modulus)	210000 MPa
Shear modulus G	$G = E / [2 \cdot (1 + v)] \approx 81000$ MPa
Yield strength f_y	see table below
Ultimate strength f_u	see table below
Poisson's ratio in elastic range v	0.30
Coefficient of linear thermal expansion α	12×10^{-6} °K^{-1}

Result

The left motor will frequently stop for no reason which makes the vehicle turn left disturbing the pathway direction. The device was quiet at the start of the journey increasing in sound has been observed after a few minutes of working. As a result, the equipment was unable to perform to its full potential. The wheels collected any dust and tiny items on the ground. Due to the debris and random dust that accumulated on the casters, they were more hesitant to swivel. The motors are heating up after the increase in the sound of the motors. The battery's problem couldn't get understood sometimes it is working well as expected whereas it doesn't work sometimes even though it is fully charged. The wheels collected any dust and tiny items on the ground.

Conclusion

With the increase in population, the use of automobile vehicles is also increasing day by day. As major vehicles are using petrol or diesel as fuel it causes environmental pollution by the exhaust gas. To overcome this problem we must have to adopt some other method. E scooter is a perfect replacement for gasoline engines as it is not causing any environmental issues sound pollution, air pollution. This vehicle can also be used in rural areas where there is no proper availability of petrol or diesel. With the rise in fuel price future of Electic

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vehicles is going to be very bright. This paper provides a basic outline of electric scooters, their components, and their requirement.

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Performance and Emission Characteristics of Biofuel Using Sewagewater

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Abstract

Municipal sewage sludge is a solid, semisolid, or liquid, muddy-looking residue that results after plain old sewage (human and other waste from households and industries) is treated at a wastewater treatment plant. The recent limitations imposed on the utilization of sewage sludge have led to a rise in disposal challenges. Sewage sludge comprises a mixture of organic and inorganic compounds found in wastewater. Organic materials present in the wastewater are detergents, pesticides, fats, oil, and grease, colorings, solvents, phenols, etc. Municipal wastewater management. It is estimated that urban centers, including cities and towns with populations exceeding 50,000, generate approximately 38,254 million liters of wastewater per day. This is the current situation; we need to find more solutions to control waste through harmful uses and remedies. Wastewater after treatment can be utilized for irrigation purposes or as utility water, while the sludge generated can find applications in pisciculture, irrigation, forestry, and horticulture. In the present era, the vast reservoir of human knowledge has enabled the use of sewage sludge as an energy source for producing renewable biofuels such as biodiesel, bioethanol, and biogas (including bio H2, bio CNG, bio LNG) as well as biosolids. This paper examines the different processes involved in biofuel production from municipal wastewater and sewage sludge, focusing on keywords like biofuel, sewage sludge, biodiesel, bioethanol, and biogas.

Introduction

In the world most number of wastes and waste waters are being produced and dumped in everyday life. The volume of wastewater generated from domestic, industrial, and commercial sources has increased in correlation with population growth, urbanization, improved living conditions, and economic development. Sewage sludge is a combination of domestic and industrial waste. According to studies conducted by the Central Pollution Control Board (CPCB), there are 269 sewage treatment plants (STPs) in India, with only 231 of them currently operational. Municipal wastewater management is a significant concern, given that an estimated 38,254 million liters per day of wastewater is generated in urban centers comprising cities and towns with populations exceeding 50,000.

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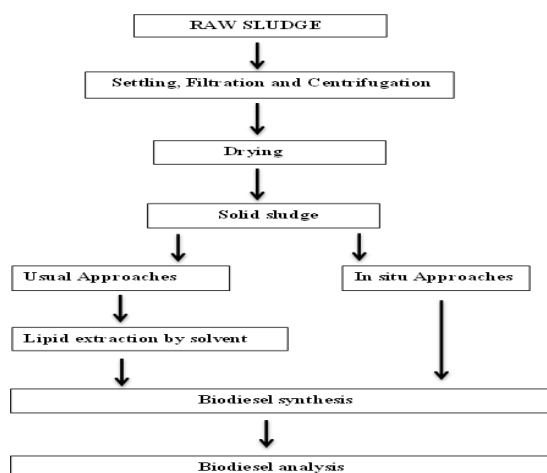College of Engineering & Technology
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Given this scenario, it becomes imperative to explore additional solutions for converting these waste materials into harmless and useful substances. Wastewater treatment plants are promising in converting sewage water into treated water, which can be used as utility water for pisciculture, irrigation, forestry, and horticulture. Nowadays, with extraordinary human knowledge, municipal wastewater sewage sludge can be used to produce energy in the form of renewable biofuels. The conversion process of sludge into biofuels is a complex but economically feasible process, which can be simplified through the utilization of biological methods. This approach facilitates the production of biofuels such as biodiesel, bioethanol, and biogas (including bio H2, bio CNG, bio LNG) as well as biosolids. Sewage sludge is an abundant organic waste or byproduct generated in wastewater treatment plant (WWTP) facilities after primary and secondary treatment processes.

In a wastewater treatment facility employing the activated sludge process, two main types of sludge are generated: primary sludge and secondary sludge, also referred to as activated sludge. The primary sludge consists of a combination of floating grease and solids collected at the bottom of the primary settler after screening and grit removal. The secondary or activated sludge is composed mainly of microbial cells and suspended solids produced during the aerobic biological treatment and collected in the secondary settler. Activated sludge refers to a solid or semi-solid material that is formed during the biological treatment of industrial and municipal wastewaters. It comprises a diverse range of microorganisms, which utilize the organic and inorganic compounds in the water as a source of energy, carbon, and nutrients. Typically, 0.5 to 1.5 kg of waste sludge containing 1-2% solids is concentrated to approximately 10% solids through gravity thickening or air flotation. In many cases, the concentrated sludge is then introduced into either an aerobic or anaerobic digester as a step to mitigate the presence of pathogens and minimize odors (stabilization). During aerobic treatment, 0.5-1.5 kg of activated sludge consists of a complex heterogeneous mixture of organic and inorganic materials. The solids typically consist of 60%

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- 80% organic matter. Organic materials in primary sludge are comprised of 20% - 30% crude protein, 6% - 35% fats, and 8% - 15% carbohydrates.

Overall biodiesel production scheme

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                    ┌──────────────────────┐
                    │      RAW SLUDGE      │
                    └──────────────────────┘
                               │
                               ▼
              ┌──────────────────────────────────────┐
              │ Settling, Filtration and Centrifugation │
              └──────────────────────────────────────┘
                               │
                               ▼
                    ┌──────────────────────┐
                    │        Drying        │
                    └──────────────────────┘
                               │
                               ▼
                    ┌──────────────────────┐
                    │     Solid sludge     │
                    └──────────────────────┘
                         │              │
                         ▼              ▼
          ┌─────────────────────┐  ┌─────────────────────┐
          │   Usual Approaches  │  │  In situ Approaches │
          └─────────────────────┘  └─────────────────────┘
                    │                          │
                    ▼                          │
          ┌───────────────────────────┐       │
          │ Lipid extraction by solvent │      │
          └───────────────────────────┘       │
                    │                          │
                    ▼                          ▼
          ┌────────────────────────────────────────┐
          │           Biodiesel synthesis          │
          └────────────────────────────────────────┘
                               │
                               ▼
          ┌────────────────────────────────────────┐
          │           Biodiesel analysis           │
          └────────────────────────────────────────┘
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Biodiesel

Biodiesel is derived from an oil source containing triglycerides or fatty acids, which undergoes transesterification to produce a liquid resembling diesel fuel. Edible and non-edible oils are categorized as first-generation biofuel sources, while second-generation biofuels primarily rely on biomass. Biodiesel is a renewable, biodegradable, and safer alternative to store and handle compared to traditional diesel. It offers excellent lubricity and comparable energy density. When burned, biodiesel emits lower levels of CO_2, CO, and particulate matter than petroleum diesel, although it may still produce NOx emissions. Biodiesel is composed of fatty acid alkyl esters (FAAEs) resulting from transesterification catalyzed by base or acid, often using alcohol. Biodiesel produced using methanol in the transesterification process is known as "methanol biodiesel." Sewage sludge is a common source of lipids used for biodiesel and glycerol production. Municipal sewage sludge contains a significant lipid fraction comprised of oils, greases, fats, and long-chain fatty acids derived from domestic and industrial sludge, as well as phospholipids found in microorganisms, their metabolites, and by-products. Research suggests that these lipids in sewage sludge hold promise as potential feedstock for biodiesel production.

Pretreatment of sludge

Pretreatment of sludge deals fully with the process involved in the preparation of sludge for biodiesel production. Published data described the separation or extraction of oil starting from dry or

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lyophilized sludge. 2 Municipal sewage sludge originates from wastewater treatment plants, where the water content poses a challenge for oil extraction. Therefore, collected sludge undergoes a dewatering step to remove water and pathogens. Samples of sludge are collected from the wastewater treatment plant. Primary sludge is generated through mechanical wastewater treatment processes. Sludge samples are collected from wastewater treatment plants. Primary sludge is produced through the mechanical wastewater treatment process. The sludge amassing at the bottom of the primary sedimentation basin is also called primary sludge. The composition of this sludge depends on the characteristics of the catchment area. Primary sludge consists of a high proportion of organic matter, such as faeces, vegetables, fruits, textiles, paper, etc. Activated sludge, the removal of dissolved organic matter and nutrients from wastewater, takes place in the biological treatment step.

Liquid extraction and transesterification

The production of biodiesel faces significant challenges in achieving optimum efficiency. Typically, the lipids containing fatty acids are extracted and then subjected to transesterification. Alternatively, pyrolysis, a heat-induced conversion method with or without a catalyst in the absence of air or oxygen, can be employed. Pyrolysis offers simplicity, minimal waste generation, pollution-free operation, and effectiveness compared to other cracking processes. Researchers in South Korea have recently developed a novel process for converting lipids derived from sewage sludge into biodiesel. This innovative approach not only demonstrates lower production costs compared to conventional biodiesel methods but also achieves significantly higher yields. The team, based at the Research Institute of Industrial Science and Technology, discovered that the lipids obtained from sewage sludge produced approximately 2,200 times more lipids per gram than soybeans, and at a much lower cost.

Pyrolosissetup

Biogas is a mixture of methane and carbon dioxide produced through the process of anaerobic digestion, carried out by anaerobic microorganisms. The composition of biogas typically consists of methane (55-75%), carbon dioxide (25-45%), and trace amounts of hydrogen (0-1%). It possesses a calorific value of approximately 20 MJ/m3. Biogas can be generated from biodegradable waste materials or by using energy crops as feedstock in anaerobic digesters, enhancing gas production. The anaerobic digestion process involves the conversion of biomass into biogas with the aid of microorganisms. This process relies on the metabolic activity of microorganisms in an oxygen-free environment, leading to the production of methane (CH_4).

Pretreatment of sludge

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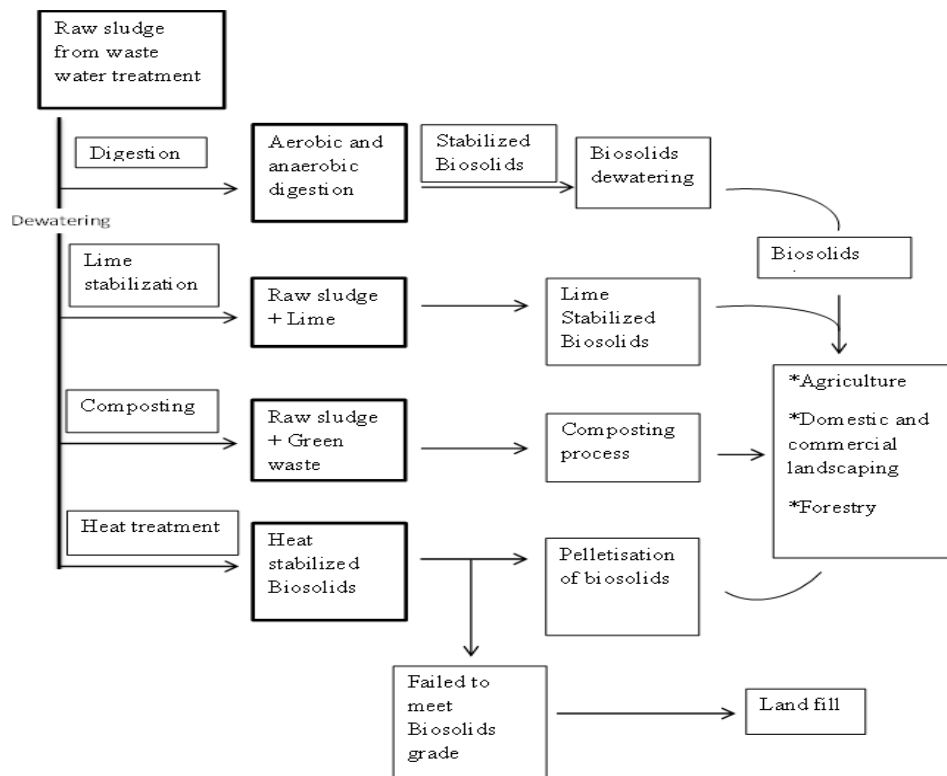
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Production system for biosolids

Biosolids refer to organic materials that contain valuable nutrients and are obtained from the treatment of domestic sewage in wastewater treatment facilities (referred to as treated sewage sludge). They serve as a beneficial resource, as they contain essential plant nutrients and organic matter, making them suitable for recycling as fertilizers and soil amendments. Biosolids used for landfilling and agricultural purposes can come directly from sewage sludge or be derived from the production of biofuels. Improperly designed sanitary landfills and open dumps can pose a threat to public health by polluting surface and groundwater.

Due to the increasing scarcity and rising costs of land near urban areas, the use of dumps and landfills has become less practical and more expensive. The agricultural industry, which heavily relies on chemical and energy inputs, has depleted soils of their natural nutrients and organic matter, leading to widespread contamination of surface and groundwater.

Biosolids offer a solution by serving as a fertilizer to enhance and maintain productive soils while promoting plant growth. They are also utilized in gardens, parks, and the reclamation of mining sites. The

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quality of biosolids produced depends on the quality of the sewage entering the treatment plant and the effectiveness of the treatment process.

Fermentation of sewage sludge and Distillation

When it comes to sludge biomass, it consists primarily of cellulose waste and paper sludge, which typically do not require any pretreatment and can be directly fed into the fermentation process. The cellulose component undergoes reduction through a hydrolysis process. In the case of sludge composed entirely of cellulose, it can be utilized in a separate hydrolysis and fermentation (SHF) process. Researchers have also employed simultaneous saccharification and fermentation (SSF) processes for ethanol production. Recent studies on biomass-to-ethanol conversion have explored the use of recombinant and genetically modified organisms for fermentation purposes.

Engine Performance Parameters

The engine performance is indicated by the term efficiency (η). The Five important efficiencies of the engine and other related engine performance parameters are given below:

- Indicated Thermal Efficiency
- Brake Thermal Efficiency
- Mechanical Efficiency
- Volumetric Efficiency
- Mean Effective Pressure
- Specific Fuel Consumption
- Air-Fuel Ratio
- Calorific Value of the fuel

Conclusion

The importance of converting waste into reusable products has been increasingly recognized in today's world. Alongside this, alternative methods for obtaining biofuel products from sewage raw materials are being extensively researched. To gain an overall understanding of sewage-to-biofuel conversion, it is necessary to conduct detailed characterizations of lipid and sugar fractions, carbon-to-nitrogen ratio, organic loading, and other relevant parameters in various sewage samples.

Advancements in bioprocess technologies and integration methods hold the potential for significant improvements in the bio-refinery platform. These advancements can help reduce process expenditure and make fuel production more economically viable for renewable energy, contributing to the creation of a safer world for future generations.

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