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CRITERIA – 3

INNOVATION ECOSYSTEM

3.2.1 Institution has created an ecosystem for innovations and has initiatives for creation and transfer of knowledge (patents filed, published, incubation center facilities in the HEI to be considered)

INNOVATIVE PROJECT

MECHANICAL

S.No	Name of the Document	YEAR
1	Design and fabrication of two wheeler silencer using catalytic converter	2023-2024
2	Design and Fabrication of 360 Degree Rotating Vehicle	
3	Design and Fabrication of a Pedal Driven Hacksaw Machine	
4	Design & Fabrication of Wooden Lathe Machine	
5	Design and experimental analysis of porter governor Mechanism	
6	E-Bike	

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**DESIGN AND FABRICATION OF TWO WHEELER
SILENCER USING CATALYTIC CONVERTOR**

DESIGN AND FABRICATION OF TWO WHEELER SILENCER USING CATALYTIC CONVERTOR

ABSTRACT:

The automotive and chemical reactor application is one of the engineering technologies that can be used to reduce air pollution is the use of catalytic converter mounted on gas exhaust duct. Catalytic converters are employed for reduction and oxidation of toxic gases byproducts produced during the burning of fuels. Unfortunately, these tools are very expensive, because the catalyst was made from expensive metals and rarely available such as Palladium, Platinum and Rhodium. Besides, the catalyst is susceptible to fuel with low levels of lead which results in the loss of the function of the catalyst due to blockage in the basic structure of Catalytic Converter. Therefore, research needs to be done in the to test the other substrate materials as a catalyst, to study the ability of the catalyst in a catalytic converter to reduce exhaust emissions of Carbon Monoxide and Hydrocarbon. This research is focusses on the history of development of the catalytic converter and the modifications taken place during the recent past years. This report also shows the study of various bimetallic nanoparticles and bimetallic nanocomposites as a catalyst and their performance capabilities such a way to obtain the suitable Catalytic Converter.

INTRODUCTION:

The catalytic converter remains the main pollution control device for modern automobiles and chemical reactor application towards reaching the ever-increasing legislative demands for low emission standards. The catalytic converter is expected to attain conversion efficiencies of the order of 90% or above for the main exhaust gas pollutants, like carbon mono oxide, hydrocarbons and NOx. The conversion efficiency is a function of numerous design and operating parameters of the complete system, comprising the system, the exhaust line and the catalytic converter. The design optimization task is especially demanding due to the highly unsteady conditions in the exhaust regarding temperature, flow rate and exhaust composition. A catalytic converter provides an environment for

supporting a chemical reaction, wherein unwanted gaseous combustion by-products from an internal combustion engine are converted to more inert gases, which are generally discharged into the atmosphere outside of the vehicle. The high temperature allows a chemical reaction within the monolith to occur. Ideally, all harmful gasses are converted to safer byproducts such as nitrogen gas, carbon dioxide, water, etc. However, when engine exhaust contains excessive amount of unwanted contaminants including high levels of nitrous oxides (NO_x), carbon oxides (CO_x) and unburned hydrocarbons (HC), conventional catalytic converters may not be able to effectively treat such an excessive amount of unwanted contamination. In such cases, it may be desired to use some catalyst which help to increase the area of contact and increase the time of reaction inside the catalytic converter.

BETTER AND LOW COST CATALYST PREPARATION AND FABRICATION:

The experimental methodology consists of two different parts. First one is catalyst and substrate preparation and fabrication of Catalyst. And the other one is emission test in this work different type of configuration are chosen for the work. 1) Wire mesh substrate type. 2) Pellets types. But we are working on pellet type catalytic convertor. Method of preparation of above mentioned configuration is disused below.

MATERIAL SELECTION:

Titanium oxide, Sodium silicate, Calcium oxide, and Kaolin and Cobalt oxide were used as metal oxide catalyst. The pure cobalt oxide is used as reducing agent and other oxides as oxidizing agent. With each of above listed oxidizing metal oxide and cobalt oxides were paired for the catalyst as below. Metal oxides in the following combination were selected for the preparation of catalyst. 1) Titanium oxide and Cobalt oxide 2) Calcium oxide and Cobalt oxide

EXPERIMENTAL SETUP:

Titanium dioxide:

Titanium dioxide (TiO_2): Titanium dioxide, TiO_2 served as dual function: catalyst and a titanium substrate for the wash coat. It is white in colour. TiO_2 occurrence in nature in the three form rutile, anatase and brookite. In which Rutile form of TiO_2 was chosen because of its thermal stability from 500°C and high durability. Both metastable anatase and brookite phase converter to rutile upon heating, density of TiO_2 is 4.23 g/cm^3 , its melting point is 1843°C and boiling point is 2972°C .

Zinc oxide:

Zinc oxide nanoparticles are nanoparticles of zinc oxide (ZnO) that have diameters less than 100 nanometres. They have a large surface area relative to their size and high catalytic activity. The exact physical and chemical properties of zinc oxide nanoparticles depend on the different ways they are synthesized.



FIG : 1.5 STARTING EMISSION CHECKING

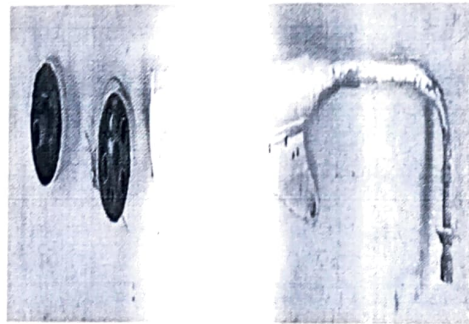


FIG : 5.2 SILENCER CUTTING MUFFLER

CONCLUSIONS:

Catalytic converter design and modification of catalytic materials can be an alternative to overcome the high air pollution problem from the automotive and chemical reactor sector, especially particular Carbon Monoxide and hydrocarbon exhaust emissions. The use of bimetallic nanocomposites as a catalyst in the catalytic converter was significantly able to increase the reduction of Carbon Monoxide and hydrocarbon from exhaust emissions. Researchers are trying to synthesize more and more new bimetallic nanoparticles with desired and controlled geometrical as well as magnetic properties. It can also be concluded that bimetallic nanoparticles are of greater importance as compared to other because of enhanced properties. These particles have greater surface area as a result of which they act as catalyst and helps in effectively catalysing various reactions.

Fabrication of 360 Degree Rotating Vehicle

Abstract

The pursuit of enhanced vehicle maneuverability and flexibility in diverse operational environments has led to the development of a groundbreaking 360-degree rotating vehicle system. This paper presents an in-depth exploration of the design, engineering, and performance evaluation of a vehicle that employs a combination of rack and pinion mechanisms and spur gears to achieve full rotational capabilities. Unlike traditional vehicles constrained by linear steering angles and limited maneuverability, the proposed system leverages innovative mechanical and control technologies to enable continuous, unrestricted rotation and superior agility.

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1. Introduction

Background

The ability to rotate a vehicle 360 degrees continuously is a significant advantage in various applications, including robotics, automated systems, and material handling. Traditional vehicles often lack the ability to rotate fully due to mechanical constraints. The integration of a rack and pinion system with spur gears offers a promising solution to achieve smooth, precise, and continuous rotational movement.

In contemporary transportation and robotics, the ability to execute precise, omni-directional movements is becoming increasingly valuable. Conventional vehicles, characterized by their fixed steering mechanisms and limited rotational capacity, face challenges in environments requiring high maneuverability. The integration of rack and pinion systems with spur gears represents a novel solution to these limitations, offering a versatile vehicle capable of

360-degree rotation. This paper provides a comprehensive overview of the development process, from conceptual design to practical implementation and performance analysis

Problem Statement

Current designs for rotational mechanisms face limitations in achieving full 360-degree rotation due to mechanical and design constraints. This project addresses these limitations by utilizing a combination of rack and pinion and spur gear mechanisms to create a vehicle capable of continuous and precise rotation.

Scope of the Report

This report details the entire process of designing, fabricating, and testing a 360-degree rotating vehicle. It covers the rationale behind the chosen mechanisms, the design process, material selection, fabrication steps, and testing outcomes.

2. Literature Review

Previous Work

Numerous studies and projects have explored rotating mechanisms and their applications. Rack and pinion systems are well-documented for converting rotational to linear motion, and spur gears are widely used for transmitting rotational motion between parallel shafts. Previous work has demonstrated the effectiveness of these mechanisms in various engineering applications, including robotics and automated systems.

Technological Advances

Recent advancements in gear technology, such as improved materials and manufacturing techniques, have enhanced the performance and durability of rotational mechanisms. Innovations in gear design, such as optimized gear ratios and surface treatments, contribute to more efficient and reliable systems.

Gaps in Knowledge

Despite advancements, challenges remain in optimizing gear systems for continuous 360-degree rotation. The integration of rack and pinion with spur gears has not been extensively explored in terms of achieving smooth and precise rotation. This project aims to fill this gap by developing a vehicle that effectively combines these mechanisms.

3. Objectives

Primary Objective

To design and fabricate a vehicle capable of achieving continuous 360-degree rotation by integrating a rack and pinion system with spur gears.

Secondary Objectives

- To ensure smooth and precise rotational movement of the vehicle.
 - To achieve stability and reliability under various operational conditions.
 - To validate the design through comprehensive testing and performance evaluation.
-

4. Design and Methodology

Conceptual Design

The initial design involves integrating a rack and pinion mechanism with spur gears to achieve 360-degree rotation. The rack is fixed to a stationary base, and the pinion, mounted on the rotating platform, engages with the rack to facilitate rotational movement. Spur gears are used to transfer rotational motion from the drive motor to the pinion, ensuring accurate and controlled rotation.

Design Overview:

- **Rack and Pinion Mechanism:** Converts rotational motion into linear motion and drives the vehicle's rotation.
- **Spur Gears:** Transfer motion from the drive motor to the pinion, ensuring smooth and precise operation.

Diagram 1: Conceptual design of the rack and pinion mechanism.

Detailed Design

Rack and Pinion System:

- **Rack:** A linear gear attached to the vehicle's stationary base. It is designed to be long enough to accommodate the desired rotation.
- **Pinion:** A circular gear mounted on the rotating platform. It engages with the rack to produce rotation.

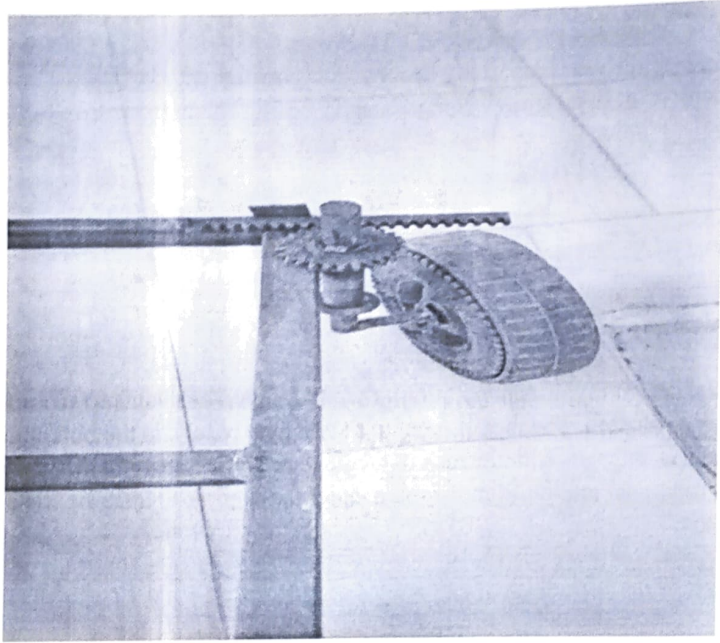
Spur Gears:

- **Drive Gear:** Connected to the motor. Its rotation drives the pinion.
- **Driven Gear:** Engages with the pinion to ensure efficient transmission of rotational motion.

Design Specifications:

- **Gear Ratios:** Calculated to achieve the desired speed and torque.
- **Material Selection:** High-strength steel for durability and wear resistance.

Diagram 2: Detailed design of the gear mechanisms.



Gear Mechanisms

Rack and Pinion Calculation:

- **Gear Ratio:** Determined based on the desired rotation speed and torque requirements.
- **Load Distribution:** Ensures even load distribution across the gear system.

Spur Gear Calculation:

- **Gear Ratio:** Sets the relationship between the motor speed and pinion speed.
- **Torque and Load:** Ensures gears can handle expected operational loads.

Equation 1: Gear ratio calculation.

5. Materials and Components

Materials Used

Gears:

- **Material:** High-strength steel for gears to withstand operational loads and stresses.
- **Properties:** Hardness, wear resistance, and durability.

Frame:

- **Material:** Lightweight aluminum to provide structural support and reduce overall weight.
- **Properties:** Strength and lightweight.

Bearings:

- **Material:** High-quality bearings to minimize friction and ensure smooth rotation.
- **Properties:** Durability and low friction.

Components

- **Rack and Pinion Gears:** Custom-machined to precise specifications.
- **Spur Gears:** Fabricated to ensure compatibility with the pinion and motor.
- **Drive Motor:** Provides the necessary rotational force for the system.

Table 1: Specifications of key components.

6. Fabrication Process

Manufacturing

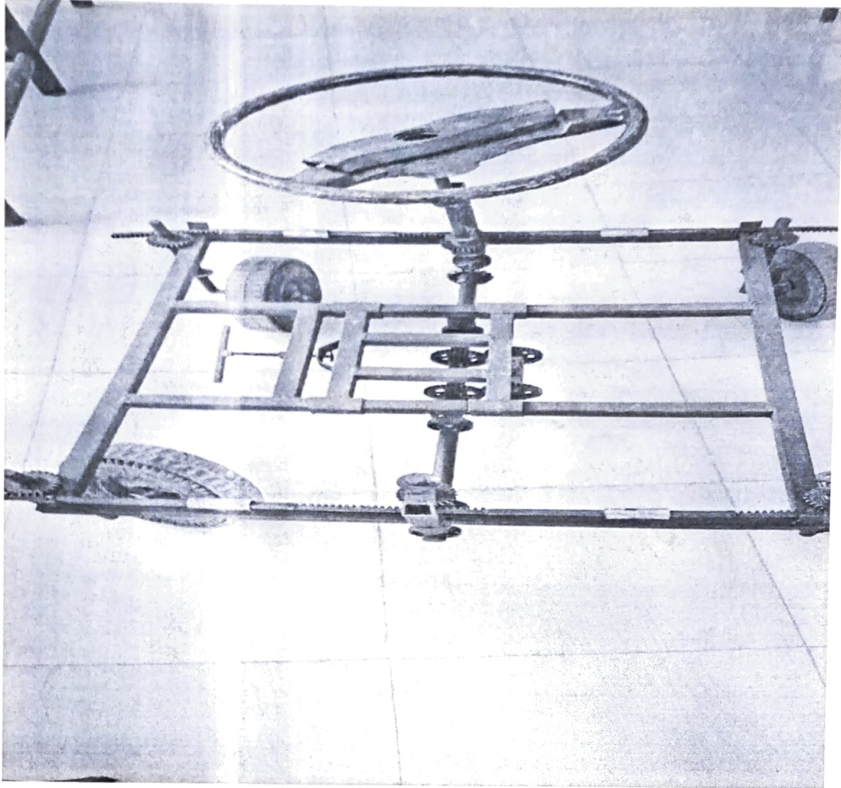
Gear Production:

- **CNC Milling:** Used for precise machining of gears.
- **Heat Treatment:** Applied to enhance hardness and durability.

Assembly:

- **Alignment:** Ensured accurate alignment of the rack, pinion, and spur gears.
- **Integration:** Assembled the gear systems into the vehicle structure.

Diagram 3: Assembly process of the vehicle.



Challenges and Solutions

- **Alignment Issues:** Addressed by precision machining and careful assembly.
- **Material Constraints:** Overcome by selecting appropriate materials and manufacturing techniques.

Quality Control

- **Inspection:** Regular inspections to ensure components meet design specifications.
- **Testing:** Functional testing to verify assembly and performance.

7. Testing and Results

Testing Procedures

- **Rotational Accuracy:** Measured to ensure the vehicle achieves smooth 360-degree rotation.

- **Stability:** Assessed under different loads and conditions.
- **Operational Smoothness:** Evaluated to confirm effective gear operation.

Test Setup: Detailed description of the testing equipment and procedures.

Results

- **Performance:** The vehicle achieved continuous 360-degree rotation with minimal mechanical play.
- **Data Presentation:** Charts and graphs illustrating rotational accuracy, stability, and operational smoothness.

Figure 1: Performance data of the rotating vehicle.

Analysis

- **Design Validation:** Results confirmed that the design met rotational movement and stability objectives.
- **Performance Evaluation:** Identified areas for potential improvement and optimization.

8. Discussion

Interpretation

The integration of rack and pinion with spur gears successfully enabled 360-degree rotation, providing a robust solution to the problem of limited rotational capability. The design achieved smooth and precise movement, demonstrating the effectiveness of the chosen mechanisms.

Limitations

- **Mechanical Wear:** Noted during extended use, suggesting a need for periodic maintenance.
- **Design Constraints:** Identified areas where further optimization could enhance performance.

Future Work

- **Gear Optimization:** Explore alternative gear ratios and materials for improved performance.
- **Design Improvements:** Investigate enhancements to extend the vehicle's operational life and functionality.

Summary

The project successfully fabricated a 360-degree rotating vehicle using a combination of rack and pinion and spur gear mechanisms. The design achieved continuous and precise rotational movement, meeting the project objectives.

Achievements

- **Effective Rotation:** Achieved smooth 360-degree movement.
- **Performance Validation:** Confirmed through comprehensive testing.

Recommendations

- **Future Research:** Suggested to explore alternative materials and design modifications.
 - **Application Expansion:** Potential for further applications in robotics and automation.
-

10. References

- **Books:** Relevant engineering textbooks and manuals.
- **Journal Articles:** Research papers on gear mechanisms and vehicle design.
- **Technical Papers:** Industry publications on gear technology and rotational systems.



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Innovative Project Cell

Department of Mechanical Engineering

Design and Fabrication of Pedal Operated Hack Saw

A. J.
HOD/MECH

10/10/24

P. S. S.



Department of Mechanical Engineering

Design and Fabrication of Pedal Operated Hack Saw

Abstract:

In this Pedal operated hacksaw machine which can be used for industrial applications and Household needs in which no specific input energy or power is needed. This project consists of a crank and slider mechanism. In the mechanism pedal is directly connected to the hacksaw through crank and slider mechanism for the processing of cutting the wooden blocks, metal bars, and PVC materials.

The objective of the modal is using the conventional mechanical process which plays a vital role. The main aim is to reduce the human effort for machining various materials such as wooden blocks, steel, PVC etc.

The power hacksaw machine, which runs on human power, works on the principle of the conversion of rotational motion to oscillatory motion. Importance of this project lies in the very fact that it is green project and helps us to reduce our electricity need.

Secondly, this cutter can be used and transferred to our working place easily. Moreover, if we want we can generate electricity with our project by connecting it to dynamo, diode and battery.



Introduction:

Pedal power is the transfer of energy from a human source through the use of a foot pedal and crank system. This technology is most commonly used for transportation and has been used to propel bicycles for over a hundred years. Less commonly pedal power is used to power agricultural and hand tools and even to generate electricity. Some applications include pedal powered laptops, pedal powered grinders and pedal powered water wells.

Some third world development projects currently transform used bicycles into pedal powered tools for sustainable development. This project concentrates on pedal powered hacksaw machining.

Components Required:

- Hack saw blade
- Pedal arrangement
- Stand setup parts
- Crank and slider mechanism
- Hack saw assembly
- Metal slab

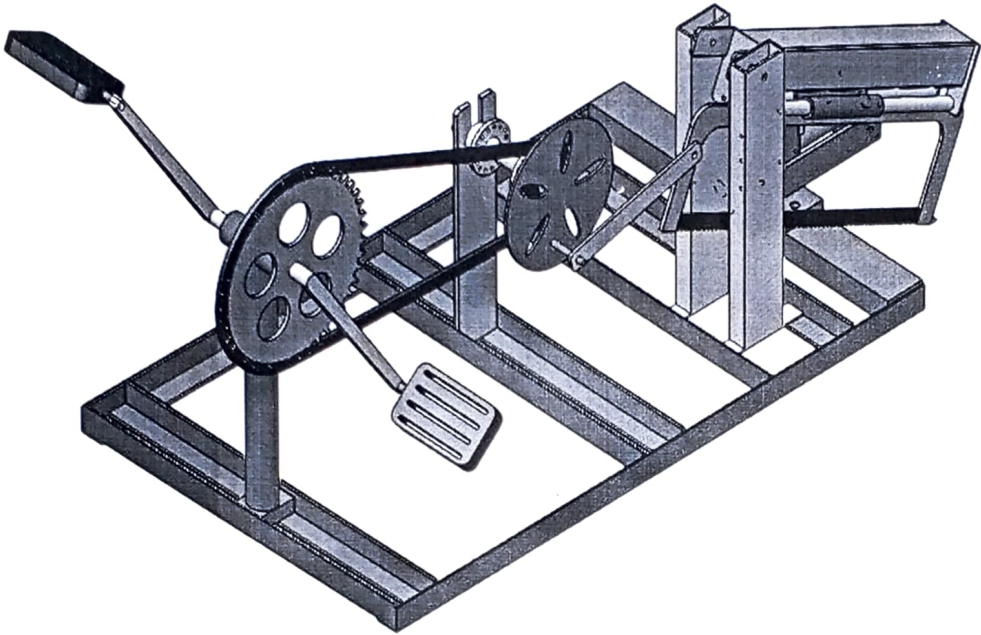
There are three types of cutters available in the market:

- Simple hacksaw which can be used for hand cutting things.
- Small Electrically Hacksaw for personal uses.
- Large Cutter Machines used for Industrial Purposes.

From the above three, first one will be used for our project



Pedal Operated Hack Saw:



Stand Setup Parts

Stands are introduced to immobilize the apparatus. Various components used are fixed to this arrangement. The chassis of the bicycle is used as the stand setup parts. The stand described here is designed to support most bicycle

Crank and Slider Mechanism

This mechanism is used to convert the rotary motion of the crank into the reciprocating motion of hacksaw. The lengths of the crank and connecting rods are made using trial and error method. The hack saw is guided by a steel plate. The vertical movement of the hacksaw will be guided by to iron rods. The vertical movement will act as a feeding unit.

Metal Slab

We used a guide to control the hacksaw blade which is used to cut the metal. Metal slabs were fitted on the hacksaw blade to ensure pressure on the object to be cut and linear movement of the blade. A clamp, with 360 degree rotation, was fixed



to hold the metal pieces while cutting, and to allow them to be cut in any shape and angle.

- **Reciprocating Power Hacksaw**

It uses a blade that moves back and forth across the work. The blade cuts on the backstroke. There are several types of feeds available. Positive feed- produces an exact depth of cut on each stroke. The pressure on the blade varies with the number of teeth in contact with the work. Definite pressure feed-yields a pressure on the blade that is uniform regardless of the number of teeth in contact with the work. The depth of the cut varies with the number of teeth contacting the work.

- **Selecting a Power Hacksaw blade**

Proper blade selection is important. Use the three-tooth rule at least three teeth must be in con-tact with the work. Large sections and soft materials require a coarse-tooth blade. Small or thin work and hard materials require a fine-tooth blade. For best cutting action, apply heavy feed pressure on hard materials and large work.

Use light feed pressure on soft materials and work with small cross sections. Blades are made in two principal types: flexible- back and all-hard. The choice depends upon use.

1. **Flexible-back blades** should be used where safety requirements demand a shatterproof blade. These blades should also be used for cutting odd-shaped work if there is a possibility of the work coming loose in the vise.
2. **All-hard blade** for a majority of cutting jobs, the all- hard blades best for straight, accurate cutting under a variety of conditions. When starting a cut with an all- hard blade, be sure the blade does not drop on the work when cutting starts. If it falls, the blade could shatter and flying pieces cause injuries.

- **Pedal Arrangement**

A pair of pedals is attached to the stand setup in which the power will be generated manually. A typical Bicycle arrangement is used.



- **Pedal**

A bicycle shoe crank bottom bracket bicycle pedal is the part of a rider pushes with their foot to propel the bicycle. It provides the connection between the cyclist's foot or the allowing the leg to turn the spindle and propel the bicycle's wheels.

Design

- **Base Frame:**

Plan view of frame in support position.

- **Upright Support:**

Make two pieces of upright supports are welded all joints.

- **Bearings**

There are two types of bearings used in this attachment,

- Ball Bearings
- Thrust Bearings

Working Principle:

It consists of the pedal arrangement which rotates the crank and through it slider consists of oscillating mechanism. The power is transmitted to the crank and slider mechanism. This mechanism is used to rotate the crank disc; the disc which is having an extended rod is connected to the sliding portion of the hacksaw directly by means of a linkage. The hacksaw is passed through the guide ways by means of maintaining the cutting axis. As the user operated the pedal, the hack saw cuts the various materials automatically with less power. The dead weight is for compressive force while the user operated the foot pedal.

Disadvantages:

- It's totally manually operated
- Time consuming as compared to electrical power hacksaw
- Without human effort it's not operated
- Not fit for heavy production

Applications

- In a furniture making industry at production it is widely used.
- It can perform cutting operation in various kinds of industries.

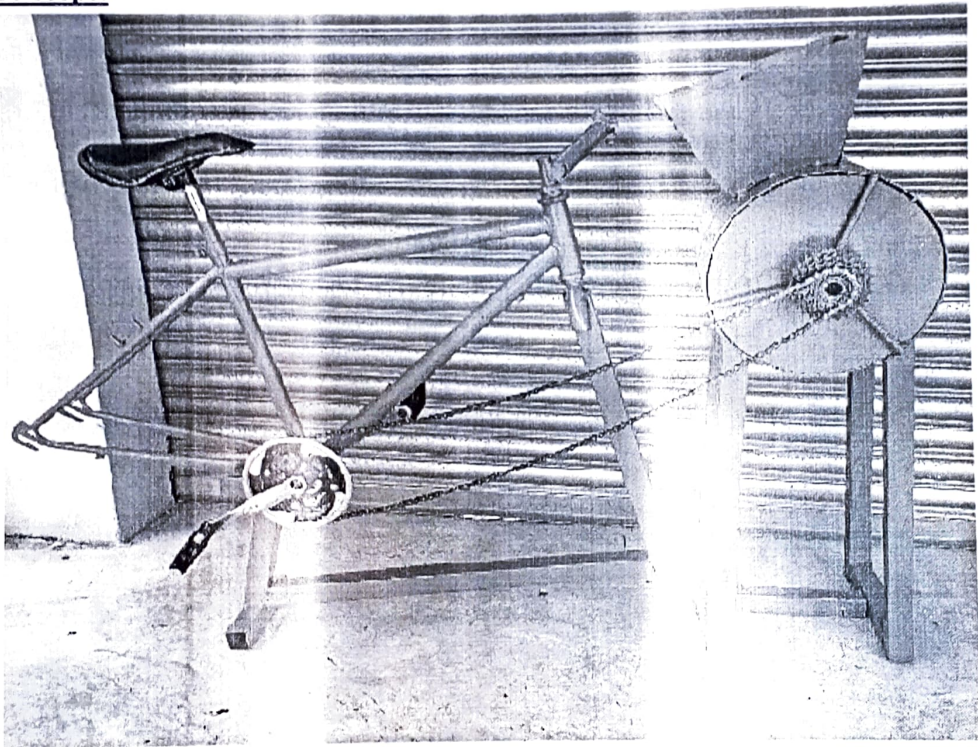


- This machine can be applied in carpentry and plumbing works also.

Conclusion:

Thus a low cost can enhance day today household needs and daily day to day purposes and it can be also and simple design pedal operated hacksaw machine is fabricated. This machine reduces the human effort and hence we don't need two persons to cut the wooden logs. This simple design of conventional design which used in for industrial applications during power shut down scenarios. By using this method we can do any operation as per our requirement without the use of electricity. So we can save the electrical power.

Future Scope:



Bicycle Operated Corn Shelling

Rajan
(R. RAJASEKAR)



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DEPARTMENT OF MECHANICAL ENGINEERING**

FIELD PROJECT

Academic Year -2017-2018

WOODEN LATHE

Metals are easily fabricated with advanced machineries. Whereas the efforts put in fabricating wooden parts is more. This can be eliminated with the use of Wooden lathe developed by the mechanical students. This Wooden lathe enables faster fabrication of wooden parts. The speed of operation is also controlled enabling a good surface finish with the help of a speed controller. Our final year students Selvan. R.Vadivelan and his team members done this project successfully.



PRINCIPAL
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DEPARTMENT OF MECHANICAL ENGINEERING

**PROJECT REPORT
ON**

**DESIGN AND EXPERIMENTAL ANALYSIS OF
PORTER GOVERNOR MECHANISM**

ABSTRACT

A governor, also known as a speed limiter or controller, is a device that regulates the speed of a machine, such as an engine or hydraulic turbine. It automatically maintains the engine's rotary speed within a specified range, even when the load on the engine varies. The function of a governor is to regulate the mean speed of an engine, when there are variations in the load e.g. when the load on an engine increases, its speed decreases, therefore it becomes necessary to increase the supply of working fluid. On the other hand, when the load on the engine decreases, its speed increases and thus less working fluid is required. The governor automatically controls the supply of working fluid to the engine with the varying load conditions and keeps the mean speed within certain limits. A little consideration will show, that when the load increases, the configuration of the governor changes and a valve is moved to increase the supply of the working fluid ; conversely, when the load decreases, the engine speed increases and the governor decreases the supply of working fluid.

The Porter governor is a modification of a Watt's governor, with central load attached to the sleeve. The load moves up and down the central spindle. This additional downward force increases the speed of revolution required to enable the balls to rise to any predetermined level.

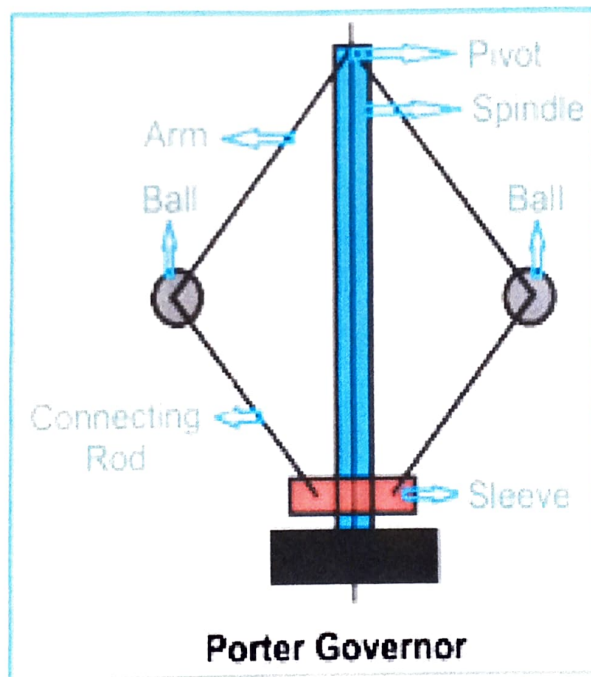
INTRODUCTION:

WHAT IS PORTER GOVERNOR?

The Porter governor is an improved version of the Watt governor and is a type of mechanical governor used to regulate the speed of steam engines. It consists of two equally weighted balls connected to an arm, making its construction simple and easy to maintain. The main purpose of the Porter governor is to reduce fluctuations in engine speed and provide the engine with the required amount of fuel based on the load applied.

The fuel supply is controlled by the displacement of the sleeve, which is lifted with the rotation of the balls. When the balls rotate at high speed, the sleeve is lifted to its maximum point, resulting in maximum fuel supply to the engine.

Porter Governor Diagram



Porter Governor Construction

The various parts of a Porter Governor are:

- **Pivot:** This top-end point connects the arms of the governor.
- **Arms:** These are connected to the balls and rotate along with them.
- **Balls:** The balls are connected to the arms and have specified weights according to the application. They enable the movement of the sleeve in upward and downward directions due to their connection with the sleeve.
- **Connecting Rod:** The connecting rod links the balls with the sleeve.
- **Sleeve:** The sleeve is connected to the balls through the connecting rod and slides on the spindle. It facilitates the flow of fuel from the fuel tank to the engine.
- **Fuel Pump:** The fuel pump supplies fuel from the fuel tank to the engine when the sleeve moves upward and stops when the sleeve reaches the bottom endpoint.

Porter Governor Working

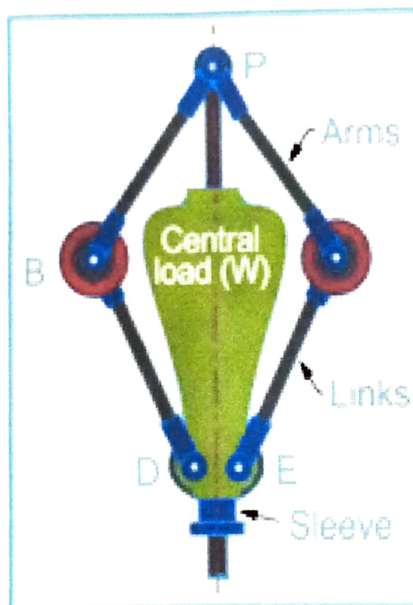


Fig 2: Porter Governor Construction and Working.

- Porter Governor consists of two balls of equal mass, known as governor balls or fly balls, attached to the arms.
- The balls revolve around the spindle driven by the engine.

- The governor has links joined to a sleeve, allowing the sleeve to translate freely on the spindle.
- A central load (W) is added to the sleeve to increase the revolution speed of the balls required to lift the sleeve on the spindle.
- A bell crank lever is connected to the sleeve, with its other end linked to the throttle valve in the fuel supply passage.
- During engine operation, the balls revolve around the spindle at a certain speed and maintain a mean radial position due to centrifugal force.
- If engine speed decreases due to a load, the balls' speed changes, causing them to revolve slightly lower than their mean radial position.
- As a result, the sleeve moves downwards on the spindle through the links, and the bell crank lever opens the throttle valve, allowing more fuel flow to increase the engine speed back to its mean level.

The height of the Porter Governor can be determined by the following formula

$$h = \left[\frac{m + \frac{M}{2} (1 + K)}{m} \right] \frac{895}{N^2}$$

Mass of each ball = m kg

Mass of the dead load on the sleeve = M kg

Inlet radius of rotation = r

Inlet radius of rotation = r

Porter Governor Advantages:

- Simple and easy construction.
- Low maintenance requirements.
- Provides automatic speed regulation in engines.
- Helps maintain a consistent engine speed under varying loads.
- Effective in controlling the fuel supply to the engine.
- Reliable and widely used in various applications.
- Operates efficiently without the need for external power sources.
- Offers stable and smooth engine performance.

Porter Governor Applications:

- Porter governors are used in steam engines to control the speed of the engine and maintain a constant rotational speed.
- They are also used in internal combustion engines regulate the flow of fuel to the engine and ensure a steady speed.
- Porter governors find applications in various industrial machinery, such as pumps, turbines, and generators, to control their speed and prevent over speeding.
- These governors are employed in mechanical power transmission systems to maintain a constant speed in machinery and equipment.
- Porter governors are used in hydraulic turbines to regulate the water flow and ensure efficient turbine operation.
- They are also utilized in agricultural machinery, such as threshers and combines, to control the rotational speed of their engines and enhance efficiency.
- Porter governors find applications in marine engines to control the speed of the ship's propulsion system and maintain stability during navigation.

Conclusion:

In this report includes a small piece of writing of construction, working principle, mechanism, advantages and applications about Porter Governor.



Sri Raaja Raajan College of Engineering and Technology
Amaravathyputhur, Karaikudi.

Report on E-BIKE



*An Innovative Project done by
SRRCET Final Year Mechanical Students*

INTRODUCTION

Electric bikes are becoming increasingly popular throughout the world, as more and more people look for efficient, affordable, and eco-friendly modes of transportation. In order to meet the above requirement, our Final year students have designed and developed an E-Bike by converting the conventional Two stroke petrol engine operated 110 cc bike.

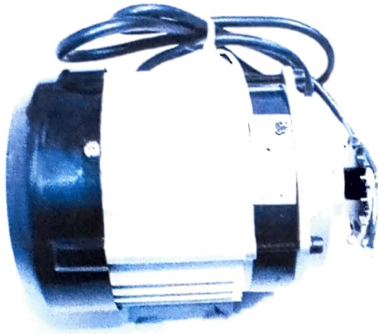
The scope of Project involves the following steps:

- 1. Design and selection of suitable electric motor, battery source, electronic controller, drive sprocket and chain arrangement, etc*
- 2. Replacement of Two stroke IC Engine with Battery powered DC Electric motor.*
- 3. Replacement of Gear box with Variable speed Electronic Controller to vary the speed of motor.*
- 4. Replacement of Ignition starter with Motor starter switch.*
- 5. Replacement of drive sprockets at the motor end to match the speed ratio.*
- 6. Introduction of Tripper switch to protect the electrical system from short circuiting and over load.*
- 7. Mechanical fixing arrangements for the Battery, DC Motor, Controller mechanisms, etc. with structural supports and covers.*
- 8. Installation of all electrical components after removing the mechanical engine drives.*

REPORT

ELECTRIC MOTOR

Electric are not something new to this world, but with the technological advancement and increased concern on controlling pollution has given it a tag of future mobility. The core element of the EV, apart from Electric Vehicle Batteries, which replaces the Internal Combustion engines is an Electric motor. The rapid development in the field of Power electronics and control techniques has created a space for various types of electric motors to be used in Electric Vehicles. The electric motors used for automotive applications should have characteristics like high starting torque, high power density, good efficiency, etc.



Motor Specifications:

Rated Operating Voltage: 48V

Rated Power: 750W

No Load Current: 4.0A

No Load Speed: 500 RPM

Rated Speed: 400 RPM

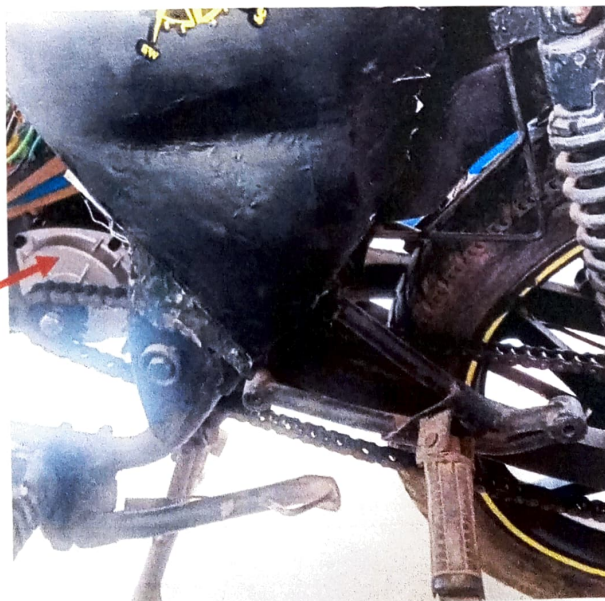
Rated Current: 13.4A

Efficiency: 80%

BLDC MOTOR

A 48 volt 750 watt BLDC geared motor is used in this project. It has a planetary gear box for speed reduction. The motor has a maximum speed of 3000 revolution per minute and the gearbox ratio of 6:1 and it has a maximum torque of 102 Kg-cm

MOTOR



BLDC MOTOR CONTROLLER:

A sine wave BLDC controller is used in this project. The controller shell is made of aluminum alloy with groove design, which can protect the inner circuit and good for heat dissipation to avoid thermal overloading. This item is a brushless motor controller; it can provide steady speed and sensitive control of braking and direction changes. Sine wave controller works smoothly.



MOTOR CONTROLLER

The wires and interfaces for the controller and interfaces are durable, and ensure sturdy working for long time use.



BATTERY:

A 48 volt 36 amp hour Lithium Ion Phosphate (LiFePo4) battery pack is used in this project. Lithium iron phosphate is a newer type of battery gaining recognition in the manufacturing industries due to its cost-effective materials and stability with high temperatures.



BATTERY



Battery Charger

BATTERY MANAGEMENT SYSTEM:



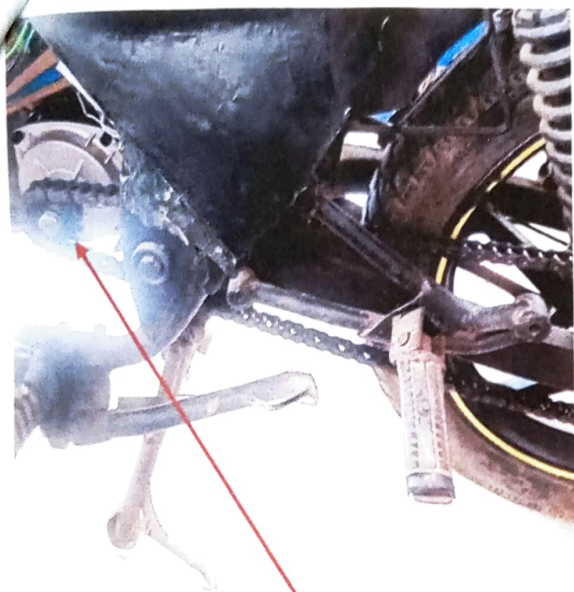
Battery Management System

Battery management system was used to protect the battery pack from over charging and over discharging. This BMS for the battery pack will monitor the battery voltage and temperature and protect the battery from the short circuit and over loading and the main purpose of the battery management system is balancing the charging voltage between the batteries.

VEHICLE ASSEMBLY:



After removing the Engine parts from the TVS -110 cc bike, the frame structure is further modified by welding to accommodate the Battery, Motor and controller. Then all the electrical parts are assembled on the structure and electrical wiring is done. The sprocket on the motor end also fitted on the motor shaft and chain assembly is done. After checking the electrical functions, the rear wheel drive and mechanical stability of the vehicle is checked. Finally the covers are fitted and the Electric Bike is established. The run test also conducted on road and the performance is found satisfactory. It is observed that the distance covered for each charging (full charge) is around 180 km.



SPROCKET- CHAIN ASSEMBLY



COVER ASSEMBLY

COST ESTIMATION:

The cost estimation detail is as below:

Material	Cost
	Rs
BLDC Drive motor	4000
BLDC motor controller	2000
Wiring harness	1800
Battery pack	20000
Vehicle frame	2000
Charger	2800
Other expenses	2500
Total	35100

Advantage of Electric Bike:

- *The electric bike can travel up to 150 – 180 km for each charging.*
- *No Air pollution due to release of gases such as CO₂ and NO_x.*
- *No dependency of petrol. Hence reduced resource depletion.*
- *Charging can be done as per the user convenience at home.*
- *More cost-effective than regular bikes*
- *Cheaper to maintain because they have fewer moving parts*
- *Creates less noise pollution as there is no IC engine in the e-bike.*



ELECTRIC BIKE



SRI RAAJA RAAJAN
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(Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai)

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CRITERIA – 3

INNOVATION ECOSYSTEM

3.2.1 Institution has created an ecosystem for innovations and has initiatives for creation and transfer of knowledge (patents filed, published, incubation center facilities in the HEI to be considered)

INNOVATIVE PROJECT

MECHANICAL

S.No	Name of the Document	Year
1	Hybrid electric two wheeler	2021-2022
2	Hydraulic bearing puller	2020-2021
3	Robotics and automation lab	2020-2021
4	In built hydraulic jack	2019-2020
5	Cost effective electric bike	2018-2019



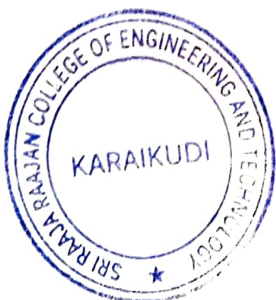
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DEPARTMENT OF MECHANICAL ENGINEERING**

FIELD PROJECT

Academic Year- 2021-2022

HYBRID ELECTRIC TWO WHEELER

The next year, another batch of mechanical students came up with an idea of an “Hybrid Electric Vehicle” that eliminates the cons of electric bike and enhances the pros of Combustion engine. This hybrid electric vehicle runs on both petrol and electric. The advantage of this bike is that the battery gets charged when the vehicle runs on petrol thereby eliminating the need to charge the battery separately though it has a universal charging port. By combining the petrol and electricity as fuel, this bike is proven to be innovative and efficient. Now-a-days this hybrid electric two-wheeler should be very useful to the public.




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FIELD PROJECT

Academic Year - 2020-2021

HYDRAULIC BEARING PULLER

Removing a bearing from a component has always been a problem for laborers of various fields. With the use of fluid power, this process is made simple. The component having the bearing is held in the vice provided and held firm. The arm is actuated by fluid power which multiplies the force given, enabling the user to separate the bearing from the component. This process eliminates the change of complete component simply by replacing the bearing alone.




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FIELD PROJECT

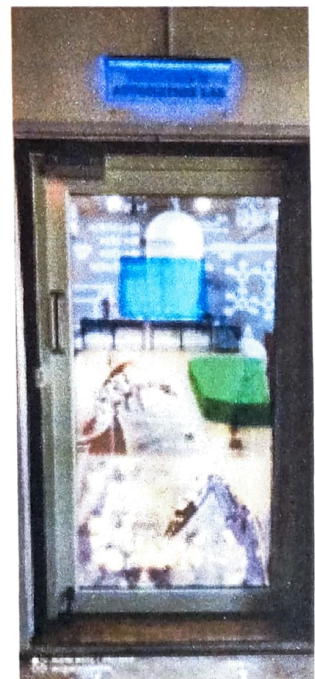
Academic Year-2020-2021

ROBOTICS AND AUTOMATION LAB

Students of Mechanical engineering, who always has the hunger to learn came up with a massive idea of setting up “ Robotics and Automation Laboratory”. This lab incorporates advanced technologies like IoT controlled equipments, Microprocessor controlled equipments, 3D printer and many more. A large group of students under the supervision of Faculty of Mechanical engineering were involved in the design and development of lab. The lab focusses on training students with basic automation to advanced automation with recent technologies. The lab is also supported with backup power generated using Solar energy. Our final year students Selvan. Arunakanth and his team members done this project successfully. This lab should be very useful to the up coming budding Engineers.



Robotics and Automation Laboratory



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FIELD PROJECT

2019-2020

IN-BUILT HYDRAULIC JACK

With the need for simplification, the students of mechanical engineering decided to focus on automobile sector. Whenever the car experiences a flat tyre, the driver has a huge and tiring task. With the inbuilt hydraulic jack in cars, the driver can simply lift the car with a press of a button. The hydraulic jack is connected with an electric motor which can be operated by a push button located inside the car. This simplifies the procedure of changing flat tyre which is a boon for drivers. Our final year students Selvan. M.Sabareesan and his team members done this project successfully.



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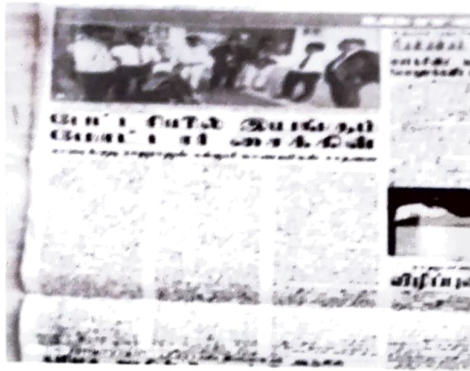


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FIELD PROJECT

Academic Year- 2018-2019

COST EFFECTIVE ELECTRIC BIKE



Outcome of Innovation and Start-up Cell - Cost Effective E-Bike



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FIELD PROJECT

Academic Year- 2018-2019

COST EFFECTIVE ELECTRIC BIKE

The final year students of Mechanical Engineering Came up with an idea of “Cost effective Electric bike”. The bike has a range of 100kms when charged fully. It takes a maximum of 3hrs to fully charge. The uniqueness of this bike is that it does not need a charging station to charge the vehicle. It can be charged using a universal charger which is suitable for home/ office. The total manufacturing cost of the bike is about Rs 35,000/- only. Hence it takes approximately about 6paise per Km which makes it to be used among the low-income groups. This bike is focused as a daily commuter. Our final year Selvan. Mahadeer Mohammed and his team members done this project.

