

March 2019

Mech View

Department Technical Magazine



**DEPARTMENT OF
MECHANICAL ENGINEERING**

VR SIDDHARTHA ENGINEERING COLLEGE

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To nurture excellence in various fields of engineering by imparting timeless core values to the learners and to mould the institution into a centre of academic excellence and advanced research.

INSTITUTE MISSION

To impart high quality technical education in order to mould the learners into globally competitive technocrats who are professionally deft, intellectually adept and socially responsible. The institution strives to make the learners inculcate and imbibe pragmatic perception and pro-active nature so as to enable them to acquire a vision for exploration and an insight for advanced enquiry.

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The Department of Mechanical Engineering endeavours to become a centre of academic excellence and research.

DEPARTMENT MISSION

Prepare graduates by providing a comprehensive knowledge and experience in a state-of-the-art mechanical engineering education to become creative, inquisitive and innovative professional in global environment.

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PEO2: Solve real time engineering problems using professional knowledge and skills resulting in significant societal development.

PEO3: Demonstrate multidisciplinary skills to analyse engineering issues in a broader perspective with ethical responsibility towards sustainable development.

PEO4: Demonstrate interpersonal skills, leadership and team building to achieve organization goals and pursue lifelong learning and higher education necessary for successful profession.

MECH VIEW

Department Technical Magazine

March 2019

Mech view is a student run magazine publishes the ideas and projects of the final and third year students. The objective of the magazine is to provide a platform for senior students to publish their projects and an avenue for the juniors to brainstorm the ideas. Currently, the publication frequency of the magazine is one issue per year.

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Student Articles

1	Design, Fabrication and Testing of After-Treatment Device to Reduce Emissions	1
	<i>Y. Ritesh, S. Sai Leeladhar, V. Vivek, G. V. B. Sri Hari, M. A. Nagendra Kumar, V. Vasu</i>	
2	Design and Fabrication of Solid State Refrigerator	3
	<i>R. B. Phani Kumar, Ch. Manisha, K. Sushma, K. Omkar, Sk. H. Hameed, K. Ravi Kumar</i>	
3	Shock Absorber Power Generation System	5
	<i>B. Raghu, P. Chandra Vamsi, R. Sai Bhargav, S. Jagadeesh, R. Sravanth, V. V. Venu Madhav</i>	
4	Design and Fabrication of Regenerative Roller Braking System	7
	<i>V.Chinna Kalu Naik, G.Bindu Sarika, A.Dheeraj pramodh, K. Srikanth, Mrs.G.Srivalli</i>	
5	Effect of Turbocharging on the Performance and Emissions of SI Engine	9
	<i>D. Eswar, U. Sarath Chandra, B. Seshavenkat Naidu, G. Venkata Rama Krishna, G. Jamuna Rani</i>	
6	Air Umbrella	11
	<i>K. Saiteja, G. Abhinavbharath, B. Satish, Y. Praneeth, L. Praveen, Nagamalleswara Rao K</i>	
7	Design and Fabrication of Hybrid Aqua Silencer (HUAS)	13
	<i>M. Satish, N. Venkatesh, Ch. Madhu Sai Krishna, M. Gnana Prakash, P. Venkatesh, K. Srinivas</i>	
8	Automated Screw Jack	15
	<i>M. Siva Kumar, R. Chandra Mohan, P. S. S. Swaroop, P. V. Raviteja, K. Krishna Sai Reddy, M. Balaji</i>	
9	Compressed Air Engine	17
	<i>G. Satish, N.V.S. Kamesh, B. Yashwanth, S. Srinivas Prasad</i>	
10	Drum Seeder	19
	<i>S Dileep Kumar, O Vamsidhar, V Hemanth Kumar, B Narasimha Rao, M. Balaji</i>	
11	Dual Axis Solar Tracking System	21
	<i>B. Prasad Rao, K. H. Sai Kumar, P. Murali, O. Naga Nikhila, D. Ravi Kumar, V. V. Venu Madhav</i>	

Design, Fabrication and Testing of After-Treatment Device to Reduce Emissions

Y. Ritesh*, S. Sai Leeladhar*, V. Vivek*, G. V. B. Sri Hari*, M. A. Nagendra Kumar*, V. Vasu#

Supervisor; * –B. Tech student

Diesel power inevitably finds a very important role in the development of the plant's economy and technical growth. Objective of this project is to design, fabricate & test a simple system, in which the toxic levels are controlled chemical reaction to more agreeable level by using a catalytic convertor through nonmetallic substances. There is no need to separate the silencer. The whole assembly is fitted in the exhaust pipe; it does not give rise to any complications in assembling it. In this project 3D model was created by using Design-NX (10.0) Software followed by fabrication and testing of the nonmetallic after treatment system.

Introduction

Diesel engines are playing a vital role in Road and sea transport, Agriculture, mining and many other industries. Considering the available fuel resources and the present technological development, Diesel fuel is evidently indispensable. In general, the consumption of fuel is an index for finding out the economic strength of any country.

In spite, we cannot ignore the harmful effects of the large mass of the burnt gases, which erodes the purity of our environment every day. While, constant research is going on to reduce the toxic content of diesel exhaust, the diesel power packs find the ever increasing applications and demand.

This project is an attempt to reduce the toxic content of diesel exhaust, before it is emitted to the atmosphere. This system can be safely used for diesel power packs which could be used in inflammable atmospheres, such as refineries, chemicals processing industries,

open cost mines and other confined areas, which demands the need for diesel power. For achieving these toxic gases are to be reduced to acceptable limits before they are emitted out of this atmosphere, which otherwise will be hazardous and prone to accidents.

Working

The high temperature high pollutant exhaust gas is allowed to pass through the perforated tube assembly of the scrubber in the first phase. The perforated tube at the inlet is approximately 2 ½ times more in an area is that of the inlet. This allows the exhaust gas to expand considerably. This expansion allows the gas to cool, because the temperature is a function of pressure. This considerable reduction of backpressure allows for the additional involved due to the introduction of water and lime stone container. The venture effect of the bell – mouth is minimized because the exhaust gas

escapes out of the perforated tube randomly along the periphery.

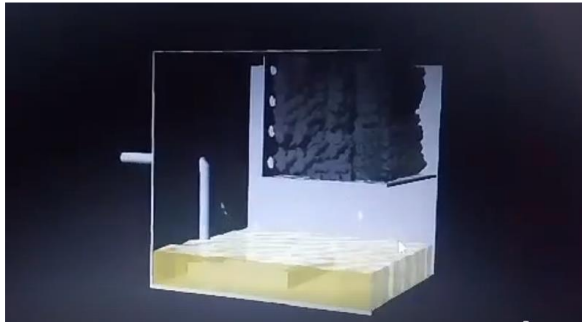


Fig. 1. Model of the Emission Control Device

After expansion, the emission comes in contact with alkaline solution where the obnoxious products of combustion are scrubbed through it. The perforation allows for more contact area with water, so the effective cooling takes place with in the short span of time available for the gas to pass through the oil. The length can be increased by the solution level in scrubber tank.

The high temperature high pollutant exhaust gas is allowed to pass through the perforated tube assembly of the scrubber in the first phase. The perforated tube at the inlet is approximately 2 ½ times more in an area is that of the inlet. This allows the exhaust gas to expand considerably. This expansion allows the gas to cool, because the temperature is a function of pressure. This considerable reduction of backpressure allows for the additional involved due to the introduction of water and lime stone container. The venture effect of the bell mouth is minimized because the exhaust gas escapes out of the perforated tube randomly

along the periphery.



Fig. 2. Emission control device

After expansion, the emission comes in contact with alkaline solution where the obnoxious products of combustion are scrubbed when bubbled through it. The perforated also allows for more contact area with water, so the effective cooling takes place faster. The length of bubbling can be increased by the solution level in the scrubber tank.

But this will increase the backpressure, which inadvertently affect the performance of the engine. The perforated tube is a multipurpose component, to allow for reduction in back pressure, and provides for an increased contact area with the scrubbing agent. After bubbling through the solution, it comes in contact with bubbles, which encourage turbulence of the exhaust gas with in and below the solution surface without unduly increasing the back pressure of the exhaust. This allows for the thorough scrubbing of the emission, so that more obnoxious product is absorbed in the allowed time.

Design and Fabrication of Solid State Refrigerator

R. B. Phani Kumar*, Ch. Manisha*, K. Sushma*, K. Omkar*, Sk. H. Hameed*,
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Supervisor; * B. Tech student

The increase in demand for refrigeration due to the changing climate and ever-increasing applications like air conditioning, food preservation, medical services and most importantly temperature control of the electronic components. This paper deals with idea of the refrigeration using thermoelectric effect. In the present, the fabrication and the generation of the refrigeration effect using Peltier effect is demonstrated.

Introduction

The increase in demand for refrigeration globally in the field of air-conditioning, food preservation, medical services, vaccine storages, and for electronic components temperature control led to the production of more electricity and consequently an increase in the CO₂ concentration in the atmosphere which in turn leads to global warming and many climatic changes.

Thermoelectric refrigeration is a new alternative because it can reduce the use of electricity to produce cooling effect and also meet today's energy challenges. Therefore, the need for thermoelectric refrigeration in developing countries is very high where long life and low maintenance are needed. The design of thermoelectric refrigerator requirements is to cool the volume to certain temperature within a short time.

The main components are

Cooling fan:

To cool the heat pump used in the refrigerator.

Battery:

The energy from the solar panels stores in the battery and is utilized when the supply is reduced or refrigeration load is increased.

Solar panel:

It is the power source for the refrigerator. The solar energy is converted into electrical energy and supplied to the battery for storage.

Refrigerator:

The refrigerator is the chamber where the objects that need refrigeration are stored and heat pump is used to cool the chamber.

Switch:

Switch is used to switch the power of refrigerator on or off depending on the need.

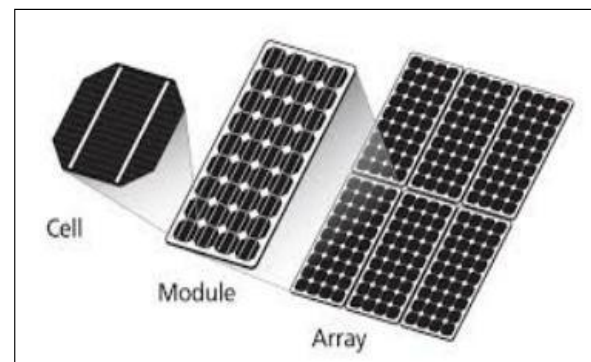


Fig. 1. Cell Module

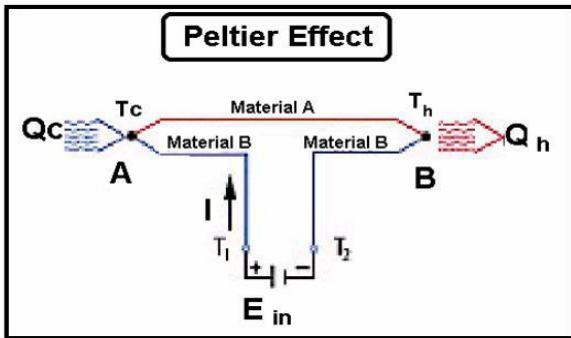


Fig. 2. Schematic showing the Peltier Effect
Thermoelectric cooling uses the Peltier effect to create a heat flux between the junction of two different types of materials. A Peltier cooler, heater or thermoelectric heat pump is a solid-state active heat pump which transfers heat from one side of the device to the other, with consumption of electric energy depending on the direction of the current.



Fig. 3. Solid State Refrigerator.

Such an instrument is also called a Peltier device, Peltier heat pump, solid state refrigerator, or thermoelectric cooler (TEC). It can be used either for heating or for cooling and also can be used as temperature controller.

Result

Since Peltier cooling is not efficient comparatively and due to its small size applications, it is not widely used. It found its application only in electronics cooling etc. But there is a huge scope of research in this field about thermoelectric materials, its fabrication, heat sink design etc. Researchers are working on reducing irreversibility in the systems, because Peltier cooler has more potential which is the vast difference between value of first law efficiency and second law efficiency. When designing a thermoelectric application, it is important that all of the relevant electrical and thermal parameters be incorporated into the design process. Once these factors are considered, a suitable thermoelectric device can be selected. This system is provided with a solar panel which can be easily used to charge the battery. In addition, the battery charger which runs on normal 220V AC supply is provided which can be used to charge the battery.

Shock Absorber Power Generation System

B. Raghu*, P. Chandra Vamsi*, R. Sai Bhargav*, S. Jagadeesh*, R. Sravanth*,
V. V. Venu Madhav#

Supervisor; * B. Tech student

The article presents an overview of SHOCK ABSORBER POWER GENERATION SYSTEM. It discusses the evolution of SHOCK ABSORBER POWER GENERATION SYSTEM, its applications, and fabrication technology in brief

Introduction

Fossil fuels are being consumed with very fast rate. Also, the cost of fuel is increasing with a very fast rate. So, somebody has to work on saving of the fuel consumption. Our aim is to demonstrate how the kinetic energy from the suspension of a vehicle can be utilized to achieve our goal of obtaining maximum energy that would otherwise have gone waste. We propose a design plan that converts the mechanical energy in vehicles to electrical energy much more efficiently than it has been done before. The electricity generated will then be used to recharge the vehicle battery for further use for functioning of the vehicle. There is a wide scope for regeneration of energy like regeneration of braking systematic. We have decided to work on utilization of suspending mass of a vehicle through regeneration system with the help of shock absorber. Shock absorbers are having reciprocating motion in it. Although the reciprocating distance is very low the suspending mass is very high i.e., the mass of total vehicle. When vehicle is on a normal road then also shock absorbers are working

due to uneven roads, sudden breaking or sudden acceleration and also a running condition. So, this reciprocating motion of shock absorbers can be converted into rotary motion and through small gearbox arrangement, i.e., rack & pinion attached to doubly fed induction generator, electricity will be generated when shock absorbers will be reciprocating.

The loss of energy from the damping of the shock loads from the unevenness of the roads is utilised for the power generation in the present concept. The usage of the DC power generators in the shock absorber mechanism, the generation of power and its storage in the batteries, the usage of this power as auxiliary power to run the secondary units are presented with this concept.

Description

The purpose of this concept is to go through the main topics of interest. The concept is concerned with design of spur gear, DC generator, Design of Shaft, selection of bearings & shock absorber with theoretical and experimental evaluation. The objective of this project is to design a regenerative

shock absorber which can harness the energy. A regenerative shock absorber is modelled and analysed for emf generated using a soft Maxwell and a physical model was built to validate the model. A regenerative shock absorber model with NdFeB magnet as core and three piston stacked generated 12 volts AC operated at a speed of 1 m/s and the physical built based on this computational model developed 2 volts when operated at the same speed but with steel as core. If vehicular motion can be put to generate useful power, it can be put to effective use.

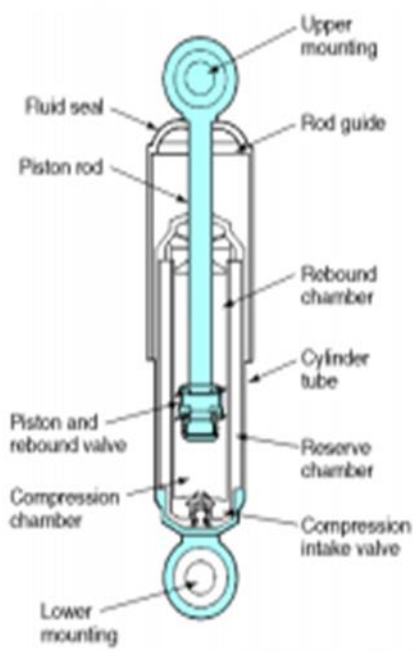


Fig. 1. Schematic of a Traditional Shock absorber.

A rack and pinion mechanism are attached to the shock absorbing shaft to utilize the linear motion of the shock absorber to impart rotary motion to the attached shaft. A DC generator is connected to the shaft and the rotary

motion imparted to the shaft is utilized to create electrical energy. This energy is stored in the battery and can be utilized as the auxiliary power unit.



Fig. 2. Power generation through shock absorbing mechanism.

Conclusion

If this power regeneration system is installed for all the four wheels, then the generation of the power is at its highest. This electric power can be accounted for the working of vehicle air conditioner or refrigeration system of vehicles. This suspension system will be mostly useful for heavy vehicles, milk trucks, fire brigade trucks and also those having high requirement of electricity inside it. The generation of the power from the unit described can be compared with the additional fuel cost to the vehicle due to its weight and effectiveness of the model can be determined in future. This study helps to decide the feasibility of the concept in the heavy weight commercial vehicles.

Design and Fabrication of Regenerative Roller Braking System

V.Chinna Kalu Naik*, G.Bindu Sarika*, A.Dheeraj pramodh*,K. Srikanth,*
Mrs.G.Srivalli[#]

Guide/ Mentor; * – 4th Year B Tech;

The article presents an overview of Regenerative roller braking system. It discusses the evolution of energy, increase in overall efficiency and fabrication technology in brief.

Introduction

A regenerative braking is a method that slows down object or vehicle by transforming kinetic energy to a form that can be either stored or utilized immediately. In case of normal braking system, the extra kinetic energy is transformed into heat because of friction in the brakes which is wasted. Regenerative braking system improves the overall efficiency and also greatly enhances the existence of braking system as the parts do not wear quickly. The common thing about regenerative braking system is it contains an electric motor which acts as an electric generator. A hybrid vehicle of hydraulic type preserves energy as compressed air by using hydraulic motors. These hydraulic type vehicles give out low vehicle range and power density which is quite attractive for its relatively high efficiency. It uses conventional type internal combustion engine as important source of power. The air stockpiling can be utilized for regenerative braking and to improve the cycle of cylinder motor which isn't similarly effective at all power/RPM

levels.

Problem Statement

The innovation of Regenerative Braking System is seen as an answer for these 4 issues, as it recouped squandered vitality and reestablished to end up another type of helpful vitality.

Battery is basic to supply DC control for the alternator rotor and for the capacity of created control. An electric battery is a contraption containing no less than one electrochemical cells that convert set away substance essentialness into electrical imperativeness. Each cell contains a positive terminal and a negative terminal. Electrolytes empower particles to move between the anodes and terminals, which empowers current to stream out of the battery to perform work. Battery utilized is 12V, 10 Ah rating. The battery is a two-terminal gadget that gives DC supply to the inverter area when the AC mains are not accessible. This DC is then changed over into 220V AC supply and yield at the inverter yield attachment. Car's kinetic energy is transformed into heat with the extra

friction is obtained between the slowed down wheels and road surface



Fig. 1. Final Assembly of Prototype

. On the other side majority of braking vehicles system with the help of regenerative brakes. The experimental details are presented in the table 1.

Table 1: Experimental Details

S NO	NOTATIONS	VALUE
1	D	250 mm
2	d	210 mm
3	N	1000 rpm
4	V	12 V
5	m	1.659 kg
6	t	20 mm

7	V	13.09 m/sec	Velocity
8	F	5.429 N	Force
9	T _b	0.570 Nm	Braking torque
10	P	2*12.56=25.12 W	Power

Table 2: Experimental Results.

S.No	Speed (S) RPM	Voltage (V) Produced
1	0.00	0.00
2	102	0.67
3	445	3.65
4	530	5.25
5	624	6.35
6	753	8.65
7	795	10.35
8	854	12.67
9	890	15.67
10	950	17.25
11	1000	18.47

CONCLUSION

Regenerative stopping mechanism is powerful strategy to improve vehicle proficiency and life range is starting at now being utilized various EVS. The development to do it exists and is frequently supported, in spite of all the inconvenience for the most part depends upon the winder choice of EVS are more removed enhancement of water driven recuperation systems. The regenerative stopping mechanism utilized in the vehicles fulfills the motivation behind sparing a piece of the vitality lost amid braking. The outcomes from probably the test led demonstrate that around 30% of the vitality conveyed can be recuperated by the framework. Regenerative slowing mechanism has a wide degree for further improvement and the vitality reserve funds. The utilization of more proficient frameworks could prompt enormous reserve funds in the economy of any nation.

Effect of Turbocharging on the Performance and Emissions of SI Engine

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Supervisor; * B. Tech student

In a conventional IC engine, exhaust gasses carry heat away and this energy is wasted. To recover waste heat in order to increase the efficiency of engine by reducing the fuel consumption, turbocharger is used with the engine. The present study uses 4-stroke 3-cylinder SI engine of a Maruti Suzuki Omni vehicle, which has with a rated power of 35 BHP. ST- 9403 is used as turbocharger attached to the engine by blow through type. Ethanol (10%) blended with petrol (90%) is chosen as an alternative fuel to petrol in the present study. Mileage test is conducted for fuel efficiency and emission test is conducted to determine the emission levels produced. Petrol shows better mileage compared to E10 alternative fuel, but E10 gives lower emissions (CO emissions decreased by 20.6%). With turbocharged engine using E10 fuel, there is increase in mileage and decrease in CO emission level by 11.2%

Introduction

A Maruti Suzuki Omni 5 STR engine with carburate fuel supply system vehicle is used for the analysis. Turbocharger is mounted in between the engine exhaust manifold and muffler and is kept near the exhaust manifold to reduce heat losses and improve the efficiency. Mileage test and emission test are conducted on the engine to study the performance and emission characteristics. Petrol and E10 are used as fuels and the experimentation is carried out with and without turbocharger. Initially, mileage test is conducted for standard petrol fuel. Then, E10 fuel (Petrol-90% + Ethanol- 10%) is used for conducting the mileage test on the vehicle. Ethanol blend is used as an alternative fuel source for SI engine. Mileage refers to the fuel consumption. Higher mileage indicates lower fuel

consumption, which in turn indicates better performance of the fuel. It is the total distance travelled by automobile for a specified quantity of fuel. Here, in the present study mileage is measured in kilometres per litre (kmpl).

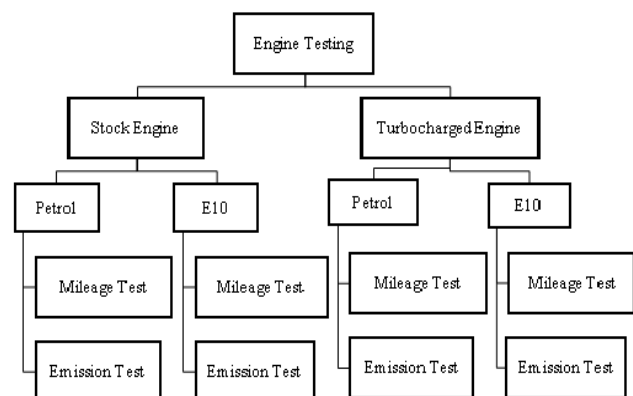


Fig. 1. Line diagram showing experiment Methodology.

Due to the combustion of fuels in the vehicle, exhaust gases are produced such as hydrocarbons, carbon monoxide (CO),

nitrogen oxides (NO_x), sulphur oxide etc. This is called emission of gases in an automobile. In the emission test, the exhaust gases are measured with the help of a five gas analyser.



Fig. 2. Turbocharger Attachment to the Vehicle

Results and Discussions

Mileage testing is done by running the vehicle with and without turbocharger using petrol and petrol-ethanol blend in 10% by volume and the values are noted for three runs. The Mileage of the vehicle is decreased initially due to the turbo lag. Later, the mileage is increased.

In the trail run 1, the mileage decreased by 10.77%, then in trial run 2 and 3 the mileage increased to 29.70% and 27.51% with respect to the initial condition of the vehicle. Mileage of the vehicle with turbocharged engine run with petrol increased significantly by 42% in three trails compared to that of the engine without turbocharger. Mileage of the vehicle with turbocharged engine run with E10 blend

increased by 13.4% in three trails compared to that of the stock engine.

Engine emissions CO, CO₂ and HC are measured using gas analyser while running the vehicle with and without turbocharger using petrol and petrol-ethanol blend with 10% by volume. In turbo charged engine running with E10 blend emissions CO, CO₂ and HC reduced by 11.2%, 6.9% and 19%, respectively compared with petrol.

Conclusions

The following conclusions are drawn from the experimental results obtained:

- Turbo charging decreases the fuel consumption of the vehicle and leads less emissions
- Petrol gives better mileage when compared to E10 blend.
- E10 blend gives fewer emissions compared to petrol.

Thus, it can be concluded that turbocharger can be attached to SI engine in order to reduce fuel consumption as well as emission levels. Though E10 shows lower level of emissions, it is not suggested to use in SI engine due to its lower fuel efficiency.

Air Umbrella

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* – B. Tech Student, # Supervisor

The article presents an overview of air umbrella, its applications, and fabrication technology utilized in brief.

Introduction

Umbrellas have always protected us from the rain but closing it can result in unnecessary splashes. Here’s where a revolutionary new device comes into the picture. Air umbrella prototype, instead of fabric, the umbrella uses air to protect users from the rain. This is a real “invisible umbrella”, which takes advantage of the air flow as shelter from the rain (Please refer Figure1 & 2).

summarized in the table 1.

Table 1: Applications of Air Umbrella

<i>Product type</i>	<i>Applications</i>
Air Umbrella	<ol style="list-style-type: none"> 1. The air umbrella is water proof 2. Suitable for the urban citizens or people who has a car.

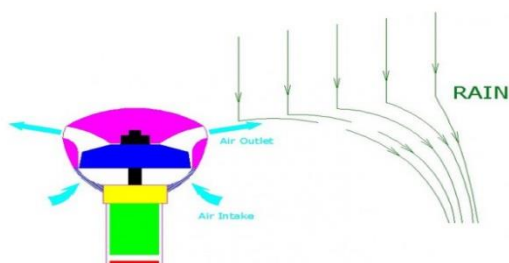


Fig. 1. Working Principle of Air Umbrella

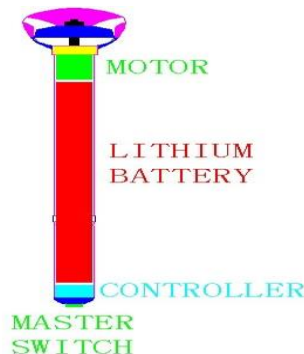


Fig 2 Air Umbrella

Description of Air Umbrella

In contrast to an ordinary umbrella, the Air umbrella is divided into 3 main parts, the controller to switch the device on and off, the lithium battery that powers a fan and the motor which controls the air mechanism on top. So once switched on, the device channels air out the top and blows away falling raindrops, thus creating an invisible cover above the user, essentially protecting them from rain.

Most significant wind turbine applications are

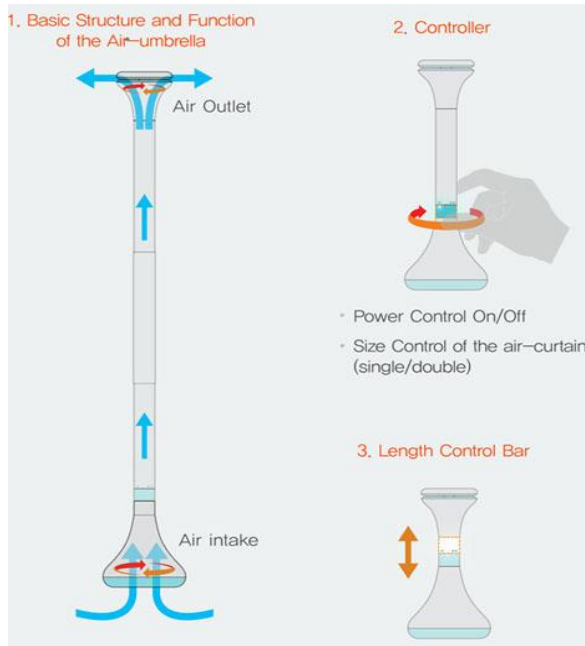


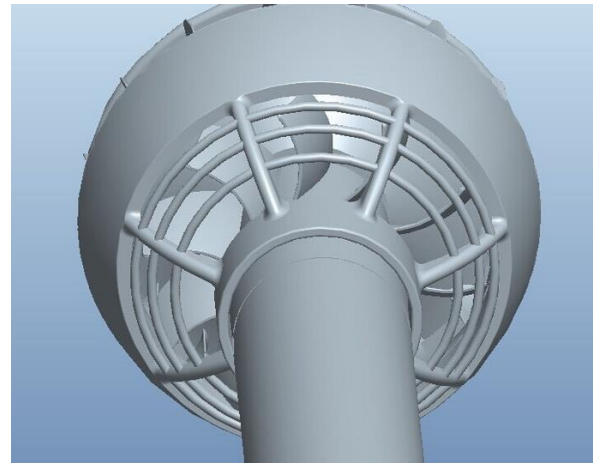
Fig. 3. Parts of Air Umbrella

Air Umbrella Fabrication



Fig.4. Fabricated Air Umbrella

Air is everywhere on the earth. The flowing air can change the moving path of the object. The faster the air moves, the greater the energy is. The jet airflow can isolate some objects. So, when we make use of the airflow, we can protect ourselves from the rain drops. Then the airflow forms an umbrella without a visible cover. Air umbrella-bit is the basic style. The umbrella is 50 centimeters in length and 800 grams in weight. The battery life is about 30 minutes.



1.

Fig 5 (a). Design Drawing

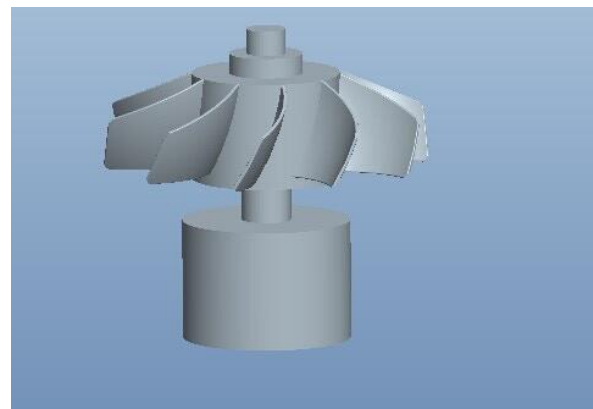


Fig 5 (b). Design Drawing

CONCLUSION

In this paper working model of air umbrella is fabricated and demonstrated.

Design & Fabrication of Hybrid Universal Aqua Silencer (HUAS)

M. Satish*, N. Venkatesh*, Ch. Madhu Sai Krishna*, M. Gnana Prakash*, P. Venkatesh*, Dr. K. Srinivas#
 # Supervisor; *Year B Tech;

The article presents an overview of Design & Fabrication of Hybrid Universal Aqua Silencer. It discusses the evolution of Aqua Silencer, its applications, and technology in brief

Introduction

An Aqua Silencer comprises of a perforated tube which is introduced toward the finish of a fumes pipe. The perforated tube has openings of various distances across.. Along with little opening, a filler plug is additionally mounted at the highest point of the holder. At the inlet of the fumes pipe a non-return valve (NRV) is given, which keeps the reverse of gases and additionally water

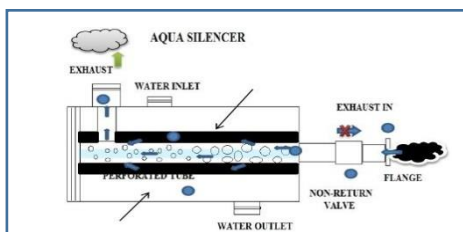


Fig. 1(a). Schematic diagram of Hybrid Universal Aqua silencer

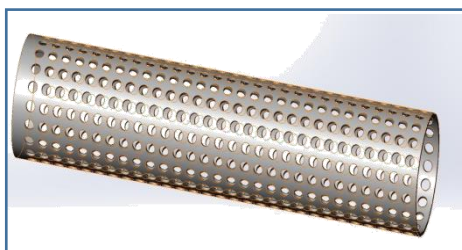


Fig. 1(b). Multi-axis gyroscopes in LGA package

summarized in the table 1.

Table 1: Applications of MEMS

Product type	Applications
Perforated Tube	To change substantial mass bubbles to lighter mass bubbles.
Charcoal layer	High absorption area, warming 1500°C
Outer Shell	Made up of iron or steel kept inside external shell
Non-return valve (NRV)	Which permits liquids (fluid or gas) to pass only in single direction

Description of Hybrid Universal Aqua Silencer:

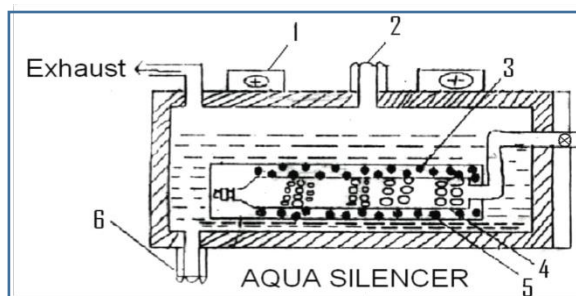


Fig. 2. Block Diagram representation of MEMS

An Aqua Silencer comprises of a perforated tube which is introduced toward the finish of

Most significant MEMS applications are

the fumes pipe Alongside the perforated tube, a little opening is likewise given at the highest point of the compartment to expel the fumes gases and a drain plug is given at the base of the holder for customary cleaning of the compartment. A filler plug is additionally mounted at the highest point of the holder. At the inlet of the fumes pipe a non-return valve (NRV) is provided, which keeps the reverse of gases and also water.

Advantages of MEMS:

1. No vibration happens when the motor or engine is in running condition.
2. Engine begins effortlessly.
3. Controlling limit of conveyed or toxic particles is high.
4. Reduction in noise is high.
5. Carbon is precipitated.
6. Cost is less when compared with normal single unit silencer.

Hybrid Universal Aqua Silencer: fabrication technique



Fig. 3. Aqua Silencer Fabricated model

As the fumes and gases enter in to the Aqua Silencer, the perforated tube converts over substantial mass bubbles into lighter mass

bubbles. After that they goes through charcoal layer which again cleans the gases. This layer is very permeable and have additional free valence electrons so it has high absorption capacity. After passing over the charcoal layer a portion of the gases may broke down into the water and lastly the fumes gases escape through the opening into the environment. Hence forth Aqua Silencer diminishes noise and air contamination.

Figure 4 shows certain Non-Return Valve



Fig. 4(a). Non-Return Valve

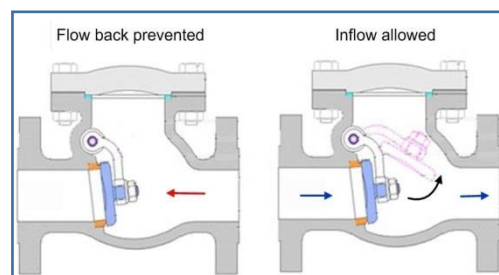


Fig. 4(b) Working of non-return valve

CONCLUSION

The Aqua Silencer is more successful in the diminishment of discharge gases from the engine fumes utilizing perforated tube and charcoal. By using perforated tube containing holes of different measurements the backpressure will remain constant throughout the length of the pipe.

Automated Screw Jack

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Supervisor; * B. Tech student

A car jack is a mechanical device that allows drivers and mechanics to get underneath a car, usually to change a tire, oil or some car part like brakes. Most car jacks that are included with cars are screw types. The article presents the design and fabrication of an automated screw jack.

Introduction

There has been tremendous advancement and improvement all over the world practically due to science and technology. The need for the car jack is often necessitated by flat tires that need repair or replacement. Other cases include repairs that will require going under the vehicle and so to get access to such areas, the car jack is needed. The type of the car jack used will determine the amount of physical labor to operate them to raise the car to the required height and most times result in much exertion from the individuals and could be energy sapping. The objective of this work is to include electronic control with necessary mechanisms that will make the job of jacking cars for maintenance easier and friendly. The system will control the upward movement of the car jack through a remote control. This will help to conserve energy and save time. The jack is controlled downwards by manually adjusting the valve for downward movement control of the jack.

The jack is placed on a flat, concrete surface. There is a lot of weight supported by the jack,

the car descends by reversing the process: turn the screw counter clockwise, making sure to tighten the lug nuts after the car's tire has minimal weight on the surface, and then lowering the jack the rest of the way to unit should be able to raise up loads placed on it.

Although a jack is a simple and widely used device, the use of any lifting device is subject to certain hazards. In screw jack applications, the hazards are dropping, tipping or slipping of machines or their parts during the operation. These hazards may result in serious accidents.

Equipping motorists with car jacks has provided many benefits to those who are on the road. Most importantly, jacks have equipped drivers with the ability to change a tire in an emergency situation without having to call for assistance, which can save service fees and potential towing fees as well. Car jacks also provide the home auto enthusiast with a tool to use in maintenance of their own vehicle with the simpler tasks such as changing brake pads, oil and belts. When used appropriately with safety in mind, car jacks

are an essential resource for anyone owning or operating a motorized vehicle.

Motorized Screw jack

The fabrication part of it has been considered with case for its simplicity and economy, such that this can be accommodated as one of the essential tools on automobile garages.

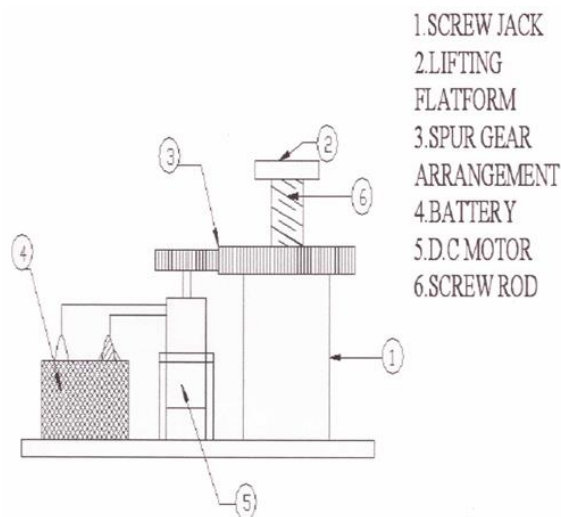


Fig.1 Line Drawing of Automated Screw Jack



Fig. 2. Automated Screw Jack

The motorized screw jack has been developed to cater to the needs of small and medium automobile garages, which are normally man powered with minimum skilled labor. In most of the garages the

vehicles are lifted by using screw jack. This needs high man power and skilled labor.

In order to avoid all such disadvantages, the motorized jack has been designed in such a way that it can be used to lift the vehicle very smoothly without any impact force. The operation is made simple so that even unskilled labor can use it with ease.

The D.C motor is coupled with the screw jack by gear arrangement. The screw jack shaft's rotation depends upon the rotation of D.0 motor. This is a simple type of automation project.

Conclusion

Screw Jacks are the ideal product to push, pull, lift, lower and position loads of anything from a couple of kilograms to hundreds of tonnes. The need has long existed for an improved portable jack for automotive vehicles. It is highly desirable that a jack become available that can be operated alternatively from inside the vehicle or from a location of safety off the road on which the vehicle is located. Such a jack should desirably be light enough and be compact enough so that it can be stored in an automobile trunk, can be lifted up and carried by most adults to its position of use, and yet be capable of lifting a wheel of a 4,000-5,000 kilograms vehicle off the ground. Further, it should be stable and easily controllable by a switch so that jacking can be done from a position of safety.

Compressed air Engine (CAE):

G. Satish*, N.V.S. Kamesh*, B. Yashwanth*, Dr. S. Srinivas Prasad#

Supervisor, * – B Tech Student.

The article presents an overview of compressed air engine (CAE). It discusses the evolution of CAE, its applications, and fabrication technology in brief

Introduction

A Compressed-air engine is a pneumatic actuator that creates useful work by expanding compressed air. A compressed-air vehicle is powered by an air engine, using compressed air, which is stored in a tank. Instead of mixing fuel with air and burning it in the engine to drive pistons with hot expanding gases, compressed air vehicles (CAV) use the expansion of compressed air to drive their pistons. The laws of physics dictate that uncontained gases will fill any given space. The easiest way to see this in action is to inflate a balloon. The elastic skin of the balloon holds the air tightly inside, but the moment you use a pin to create a hole in the balloon's surface, the air expands outward with so much energy that the balloon explodes. Compressing a gas into a small space is a way to store energy. When the gas expands again, that energy is released to do work. That's the basic principle behind what makes an air cargo. Some types rely on pistons and cylinders, others use turbines. Many compressed air engines improve their performance by heating the incoming air, or the engine itself. One manufacturer claims to

have designed an engine that is 90 percent efficient. Compressed air propulsion may also be incorporated in hybrid systems, e.g., battery electric propulsion and fuel tanks to recharge the batteries.

Description of Components

Crank shaft: The crankshaft, sometimes casually abbreviated to crank, is the part of an engine which translates reciprocating motion into rotary motion or vice versa. Crank shaft is shown in Fig.1



Fig. 1 Crank shaft

Connecting rod: Connecting rod is a part of the engine which is used to transmit the push and pull from the piston pin to the crank pin and is shown in Fig.2. The usual form of connecting rod used in engines has an eye at the small end for the piston pin

bearing, a long shank, and a big end opening which is usually split to take the crankpin bearing shells.



Fig. 2 Connecting rod

Ball Bearings

Bearings reduce friction by providing smooth metal balls or rollers, and a smooth inner and outer metal surface for the balls to roll against. These balls or rollers "bear" the load, allowing the device to spin smoothly.



Fig.3 Cut view of a ball bearing

The assembled engine is shown in Fig. 4



Fig. 4. Compressed Air Engine

Advantages

The advantages of the compressed air over other vehicles include

- a) Like electrical vehicles, air powered vehicles would ultimately be powered through the electrical grid.
- b) Transportation of the fuel would not be required due to drawing power off the electrical grid.
- c) Compressed air technology reduces the cost of vehicle production by about 20%.
- d) Air, on its own, is non-flammable.
- e) High torque for minimum volume.
- f) The mechanical design of the engine is simple and robust.
- g) Low manufacture and maintenance costs and maintenance.
- h) Compressed-air tanks can be disposed of or recycled with less pollution than batteries.
- i) Compressed-air vehicles are unconstrained by the degradation problems associated with current battery systems.

CONCLUSION

The model designed by the team is a small scale working model of the compressed air engine. When scaled to higher level it can be used for driving automobiles independently or combined (hybrid) with other engines like I.C. engines. Main advantages of Compressed Air Engine (C.A.E.) are: 1. Zero emission. 2. Use of renewable fuel. 3. Zero fuel cost (the cost is involved only in the compression of air).

Drum Seeder

S Dileep Kumar*, O Vamsidhar*, V Hemanth Kumar*, B Narasimha Rao*, Dr.M.Balaji#

* B. Tech Student, # Supervisor

The article presents an overview of sowing paddy seeds in wetland field. Drum seeder has eliminated the need of transplantation. This implement ensures uniform plant population throughout the field.

Introduction

DRUM SEEDER is one of the revolutionary equipment that changed the face of sowing paddy seeds in wetland field. Direct paddy drum seeder has eliminated the need of transplantation and hours of manual work which will literally break the back of the farmers involved in sowing the paddy seeds to the field. At one stretch with single operator effort, it covers 8 rows of 20 cm row to row spacing at a time. Made up of plastic material, which makes it easy.

Salient Features

- Labor cost is reduced drastically
- Uniformity in seed sowing and Plant population.
- Continuous drilling of seeds is eliminated.
- Reduction in seed rate and thinning cost.
- Crop matures 7-10 days earlier than the transplanted paddy.
- Light in weight and easy to handle.
- An area of 1 hectare per day can be shown.

Planting Paddy with Drum Seeder Directly

Direct Drum Seeder is an efficient and inexpensive implement for row sowing of pregerminated paddy seed in wet land field. Drum Seeder covers 8 rows of 20 cm row to row spacing at a time. This implement ensures uniform plant population throughout the field.



Fig. 1 Schematic of the drum seeder.

Field Preparation

- Field must be well puddled and leveled.
- Water must be drained out at least 24 hrs. before sowing to form hard slurry pan of puddle soil.
- At the time of sowing, only paper thin of water should be maintained in the puddled field.

- Water should be flooded to the puddled field once in three days after sowing and drained out immediately.
- This practice must be continued for 12 days. Thereafter depending upon the height of the seeding, Water should be allowed to stand in the field.



Fig. 2. Drum Seeder

Table 1 Specifications of Drum Seeder

Specification	
Row to Row Spacing	20 cm
Number of Rows	8
Diameter of Wheel	60 cm

Table 2: Capacity of Drum Seeder

General	
Shape of Seed Drum	Hyperboloid
Area of Coverage	One hectore per day
Seed Requirements	10 kg per acre

Operation Procedure

- After assembling, fill the drums with pre-germinated seeds. Remember only two-third of the drum are to be filled at a time.
- Close the mouth with the knob provided.
- Pull the seeder manually at a normal walking speed (1 Km/h) in the backward position as in the photo.
- The wheel impression in the first pass will serve as a maker.
- In the second pass the wheel should pass on the same wheel impression of the previous pass to maintain the row-to-row spacing of 20 cm.
- Occasionally watch the dropping of the seeds through the holes of the seeder.
- Refill the drum when it reaches one fourth capacity.
- Continue the seeding operation.

CONCLUSION

Direct paddy drum seeder has eliminated the need of transplantation and hours of manual work which will literally break the back of the farmers involved in sowing the paddy seeds to the field. There by Labor cost is reduced drastically. Crop mature 7-10 days earlier than the transplanted paddy. Mainly there will be uniformity in seed sowing and Plant population.

Dual Axis Solar Tracking System

B. Prasad Rao*, K. H. Sai Kumar*, P. Murali*, O. Naga Nikhila*, D. Ravi Kumar*, V. V. Venu Madhav#
Supervisor; * B. Tech student

The article presents an overview of DUAL AXIS SOLAR TRACKING SYSTEM. It discusses the evolution of DUAL AXIS SOLAR TRACKING SYSTEM, its applications, and fabrication technology in brief

Introduction

Solar power is the fastest growing means of renewable energy. The project is designed and implemented using simple dual axis solar tracker system. In order to maximize energy generation from sun, it is necessary to introduce solar tracking systems into solar power systems. A dual-axis tracker can increase energy by tracking sun rays from switching solar panel in various directions. This solar panel can rotate in all directions. This dual axis solar tracker project can also be used to sense weather, and it will be displayed on LCD. This system is powered by Arduino, consists of servo motor, stepper motor, rain drop sensor, temperature and humidity sensor and LCD.

Description

The proposed system incorporates a stepper motor which provide more torque at low speeds and provide better control for dual axis tracking purpose. In. PIC microcontroller is being used for controlling the PV panel. In solar tracking systems, solar panels are mounted on a structure which moves to track the movement of the sun

throughout the day. There are three methods of tracking viz active, passive and chronological tracking. These methods can then be implemented either in single axis or dual-axis solar trackers. In active tracking, the position of the sun in the sky during the day is continuously determined by sensors.

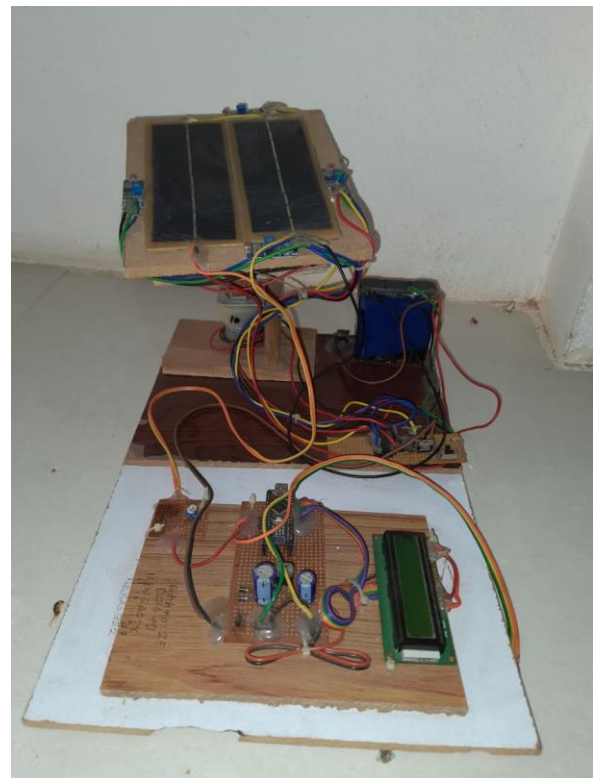


Fig.1 The solar panel assembly with the dual axis tracker.

The sensors will trigger the motor or actuator

to move the mounting system so that the solar panels will always face the sun throughout the day. A passive tracker moves in response to an imbalance in pressure between two points. The imbalance is a result of the solar heat creating gas pressure on a low boiling point compressed gas fluid which then moves the structure accordingly. However, this method of sun-tracking is not accurate. A chronological tracker is a timer-based tracking system. The structure is moved at a fixed rate throughout the day.

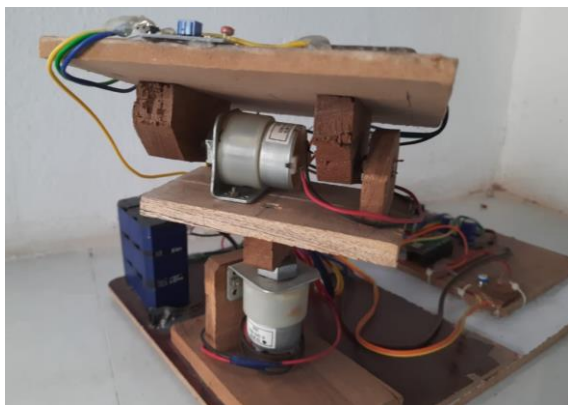


Fig.2. The actuator assembly to rotate the solar panel around both the axis.

The motor or actuator is programmed to continuously rotate at an average rate of one revolution per day (15 degrees per hour). This method of sun-tracking is very accurate. However, the continuous rotation of the motor means more power consumption and tracking the sun on a very cloudy day is unnecessary.

Applications

High Precision Sun Tracking Algorithm

Following the NREL Solar Position Algorithm for Solar Radiation Applications Technical Report, positioning with $\pm 0.005^\circ$ accuracy using the MicroLogix platform can be achieved. The derived angles can be applied in solutions using hydraulic or electrical positioning methods.

Conclusions

Dual axis tracker perfectly aligns with the sun direction and tracks the sun movement in a more efficient way and has a tremendous performance improvement. The proposed system is cost effective also as a little modification in single axis tracker provided prominent power rise in the system.

PROGRAMME OUTCOMES

PO1 Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and engineering specialization to the solution of complex engineering problems.

PO2 Problem analysis: Identify, formulate, research literature, and analyse engineering problems to arrive at substantiated conclusions using first principles of mathematics, natural, and engineering sciences.

PO3 Design/ development of solutions: Design solutions for complex engineering problems and design system components, processes to meet the specifications with consideration for the public health & safety, and the cultural, societal, and environmental considerations.

PO4 Conduct investigations of complex problems: Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6 The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7 Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development.

PO8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 Individual and team work: Function effectively as an individual and as a member or leader in teams, and in multidisciplinary settings.

PO10 Communication: Communicate effectively with the engineering community and with society at large. Be able to comprehend and write effective reports documentation. Make effective presentations, and give and receive clear instructions.

PO11 Project management and finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments.

PO12 Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES

PSO1: Apply their knowledge in the domain of thermal systems to solve engineering problems using modern technological tools.

PSO2: Develop and implement new ideas related to product design and manufacturing for societal and industrial needs using modern CAD/CAM/ CAE tools.



DEPARTMENT OF MECHANICAL ENGINEERING

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