March 2021

Mech View

Department Technical Magazine

DEPARTMENT OF
MECHANCAL ENGINEERING

VR SIDDHARTHA ENGINEERING COLLEGE

INSTITUTE VISION

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.

DEPARTMENT VISION

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.

PROGRAMME EDUCATIONAL OBJECTIVES

PEO1: Progress in professional career with a solid foundation in mathematics, science and Engineering sciences.

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 2021

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.

Student Articles

Robotic Arm Trainer

Student Article

A.R. Raj Varma*, B. Siva Lohith*, G. C. Krishna*, P. S. Sai Charan*, V. Sudheer Kumar#

Mentor; *B. Tech student

Robot, any automatically operated machine that replaces human effort, though it may not resemble human beings in appearance or perform functions in a humanlike manner. Robotic arm trainer, helps in controlling the robotic arm by interfacing the computer with robotic arm and training its motion. The present paper shows the model of robotic arm and robotic arm training procedure.

Introduction

Robot, any automatically operated machine that replaces human effort, though it may not resemble human beings in appearance or perform functions in a humanlike manner. By extension, robotics is the engineering discipline dealing with the design, construction, and operation of robots.

Uni-mate introduced its first robotic arm in 1962. The arm was invented by George Deval and marketed by Joseph Engel Berger. The first industrial arm was installed at one of the General Motors plants Ternstedt Manufacturing Company, New Jersey, for automated diecasting.

A robot arm has a mechanical structure that alters its form using a group of electric motors that behave like servo motors, pneumatic, or hydraulic actuators. They attempt to reproduce movement similar to a human arm.

A common term that's used when a robot arm is designed is the DOF (degrees offreedom); it is related to roll, yaw, and pitch. Figure, shows a representation of these movements in 3D space.

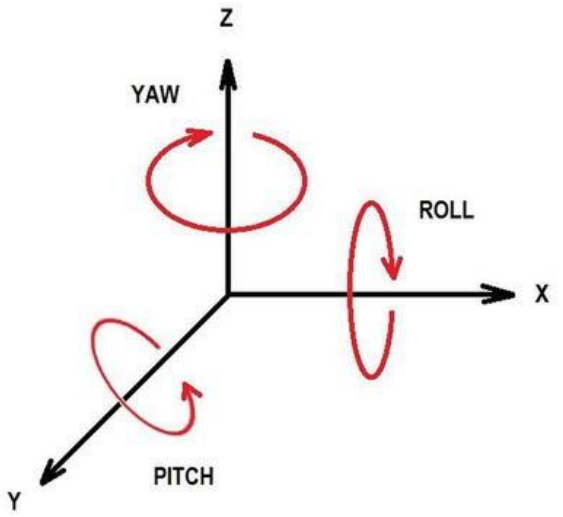

Fig. 1. Roll, Pitch and Yaw movements in 3D Space

It can be designed to perform spinning, gripping, welding, and assembly operations. A robotic arm can be fitted with a variety of end effectors. One of the most commonly fitted end effectors is the one which resembles the human hand. It is used extensively for picking, gripping, and carrying different types of objects.

Researchers have made a breakthrough in the field of noninvasive robotic device control.

Using a noninvasive brain-computer interface (BCI), researchers have developed the first-ever successful mind controlled robotic arm exhibiting the ability to continuously track and follow a computer cursor.

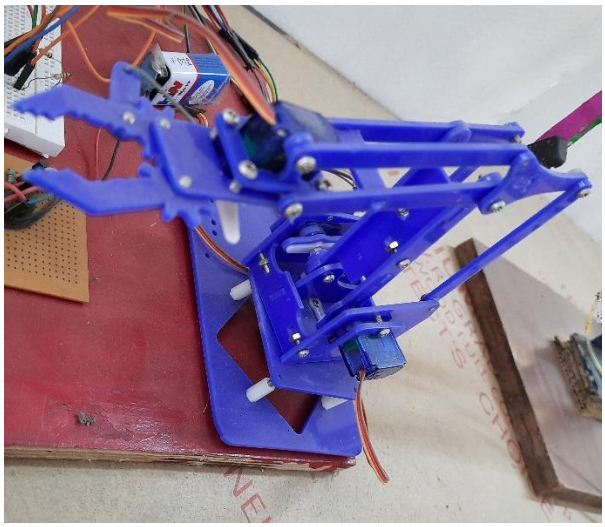

Fig. 2. The robotic arm prototype prepared for the current study.

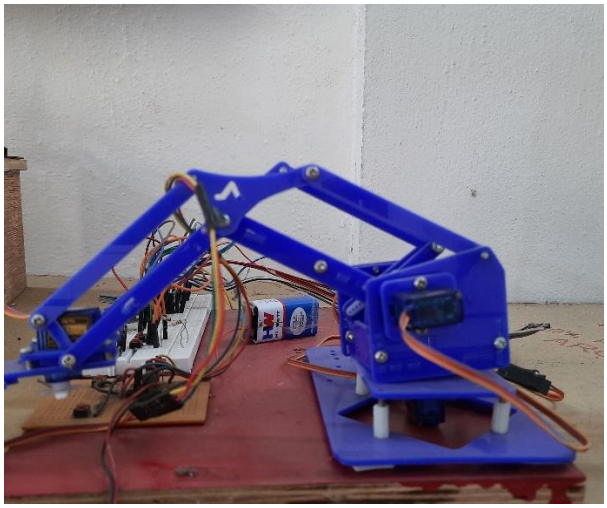

Fig. 3. The Robotic arm with controller circuit.

Figures 2 and 3 show the robotic arm model prepared to demonstrate the robotic arm training. The trained model can do the predetermined tasks with out human interface and can work on its own.

Conclusions

The conclusions of the study are, a model of the robotic arm was manufactured using servo motors and plastic arms. The control circuit and the computer interface were made.

Student Article

Pedalling Sand Filter

N. Vineetha*, Ch. Mahalakshmi*, T. Prathibha*, M. Radha Devi*, P. Uma Maheswari*, V. Sudheer Kumar#

Mentor; *B. Tech student

The present paper discusses the design and working of the pedalling sand filter. The pedalling sand filter uses the pedalling power to filter the sand used in building construction.

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 sand filter and separation. An individual can generate four times more power (1/4 HP) by pedalling than by hand cranking. At the rate of ¼ HP, continuous pedalling can be served for only short periods, approximately 10 minutes. However, pedalling at half this power (1/8 HP) can be sustained for close to 60 minutes but power capability can depend upon age. As a consequence of the brainstorming exercise, it was apparent that the primary function of pedal power one specific product was particularly useful: the bicycle. Many devices can be run right away with mechanical energy. Sieving machine serves is to remove large grains with a small grain through a sieve. Separation occurs when the sand is placed on top of a filter having holes size. The first sieving is done to get rid of the sand with a larger than standard withholding sand filter and the second sieving is done to get rid of the sand with a size too small means that the sand filter is ignored. A sieve is a device for separating wanted elements from unwanted material or for characterizing the particle size distribution of a sample, typically using a woven screen such as a mesh or net or metal.

Generally, while preparing the concrete for construction purpose, the process of sieving and mixing is carried out separately. These processes are carried out manually. Sieving of sand is carried out using rectangular mesh which is inclined at certain angle. In the present sand sieving method, the sample is

subjected to horizontal or vertical movement in accordance with the chosen method.

Fig. 1. Filter used for filtering the sand.

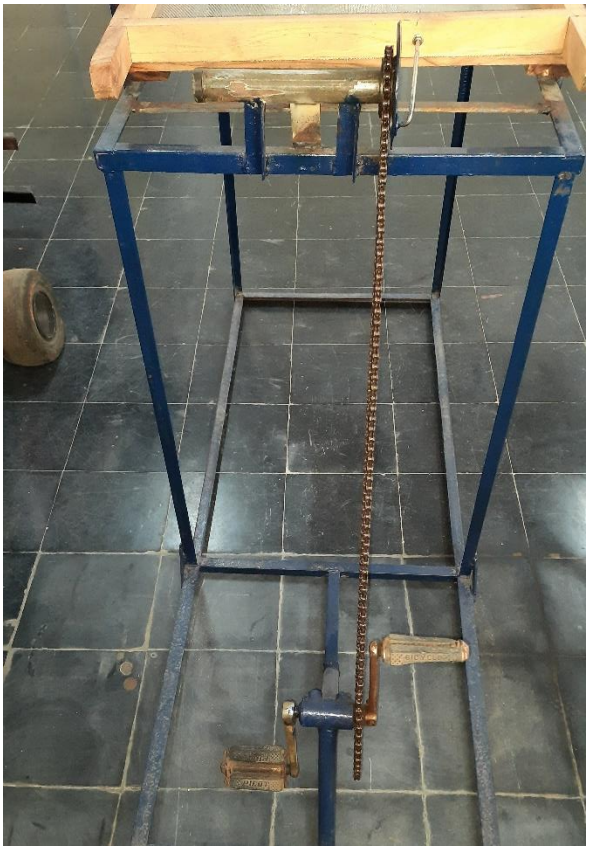

Fig. 2. Pedalling Mechanism

This causes a relative motion between the particles and the sieve. Depending on their size the individual particles either pass through the sieve mesh or retained on the sieve surface.

If we boost the research on pedal powered technology - trying to make up for seven decades of lost opportunities - and steer it in the right direction, pedals and cranks could make an important contribution to running a post-carbon society that maintains many of the comforts of a modern life. The possibilities of pedal power largely exceed the use of the bicycle. Pedalling a modern stationary mechanism to produce electricity might be a great workout, but in many cases, it is not sustainable. While humans are rather inefficient engines converting food into work, this is not the problem we want to address here; people have to move in order to stay healthy, so we might as well use that energy to operate machinery. The trouble is that the present approach to pedal power results in highly inefficient machines. Ever since the arrival of fossil fuels and electricity, human powered tools and machines have been viewed as an obsolete technology. This makes it easy to forget that there has been a great deal of progress in their design, largely improving their productivity. The most efficient mechanism to harvest human energy appeared in the late 19th century: pedalling. Stationary pedal powered machines went through a boom at the turn of the 20th century.

Student Article

E – Smart Power Sprayer

K. S. M. Harshith*, L. Sampath Kumar*, S. Manoj*, Sk. Khawaja Moin*, A. Naga Babu*, B. Raghava Rao#

Mentor; *B. Tech student

The article presents an innovative way of chemicals spray in farm fields by reducing the weight to carry and effective mixing for better result.

Introduction

A sprayer is a device used to spray a liquid, where the liquid can be any fertilizer, pesticides, insecticides used to kill harmful pests and insects and other chemicals to achieve better crop production. In agriculture, a sprayer is a piece of equipment that is used to apply herbicides, pesticides, and fertilizers on agricultural crops. Sprayers range in size from man-portable units (typically backpacks with spray guns) to trailed sprayers that are connected to a tractor, to self-propelled units similar to tractors, with boom mounts of 4-30 feet up to 60–151 feet in length depending on engineering design for tractor and land size.

Sprayers are fully integrated, mechanical systems, meaning they are composed of various parts and components that work together to achieve the desired effect, in this case: the projection of the spray fluid. This can be as simple as a hand sprayer attached to a bottle that is pumped and primed by a spring-lever, tube, and vacuum-pressure; or as complex as a 150-foot reach boom sprayer with a list of system components that work together to deliver the spray fluid.

For more complex sprayers, such as agricultural sprayers, common components include: the spray nozzle, sometimes with a spray gun, fluid tank, sprayer pump, pressure regulators, valves and gaskets, and fluid plumbing. The sprayer pump can be just as important as the sprayer type itself as there are many sprayer pump design types with various construction materials, inlet/outlet sizes, and performance specifications. Common sprayer pump types include diaphragm, centrifugal, and roller pumps.

Advantages of the Present Model

Gross weight of the sprayer is reduced: Generally, the gross weight of the power sprayer is about 20 kg weight, but in this model, we are reduced it to the 3 to 5 kg weight. We actually removed the tank.

Performance of the farmer increases: The before statement describes how the performance of the farmer is increased.

Spraying can be done for larger area: Compared to the traditional one which can only spray for about 20 cents of land

(approximately) but this model has capacity to sweep over near about a hectare land (which is about 12.5 times more area) approximately.

Fig. 1. Process Diagram

Additional labor cost will be reduced: Generally, in traditional spraying the process of spraying requires an additional labour to help in mixing the chemicals in water and arranging them to the worker (person who is spraying).

Spraying time will be reduced: In this innovative model there is a process of simultaneous mixing of chemical and water leads to decrease in time where refilling of chemical-water mixture required.

Precise mixing of chemical in the water: Here is technique of special injection of chemical in to the stream of water which has an efficient mixing of chemical in the water with a manufacturer standard composition (regulated by the farmer).

Compatible to every person

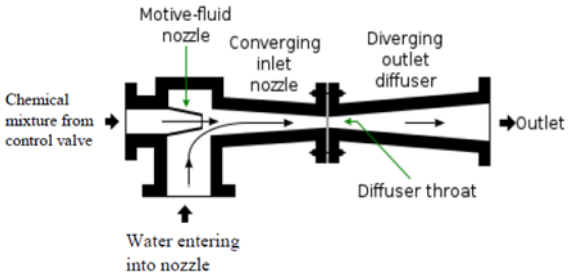

Fig. 2. Nozzle Model

Conclusions

The following conclusions can be arrived once the e-sprayer is tested.

- Weight is reduced by 20kg.
- Performance of the farmer increases.
- Additional labor cost will be reduced.
- Spraying time will be reduced.
- Precise mixing of chemical composition in water.
- Level sensor indicates the chemical level helps to maintain proper quantities.

Student Article

ELECTRICITY GENERATION BY WAVES(EGBW)

G. Sai Niteesh Reddy*, M. Divakar Yadav*, M. Mohith*, M. Amruth Vardhan*, K. Srinivas
Supervisor, * B. Tech Student

The article presents an overview of Electricity Generation by Waves. It discusses the evolution Wave power, its applications, and Hydroelectricity technology in brief

Introduction

Electricity Generation by Waves, the present invention describes several fluid pumping apparatuses and their applications in extracting energy from waves or flowing currents. The pumping apparatuses are driven by a float, an oscillating pontoon, an oscillating paddle, an impeller, a vertical rotary wheel or a pendulum member. The pumped fluid (water and/or air) is supplied to drive a fluid motor or a turbine, which in turn operates a generator to produce electric power.

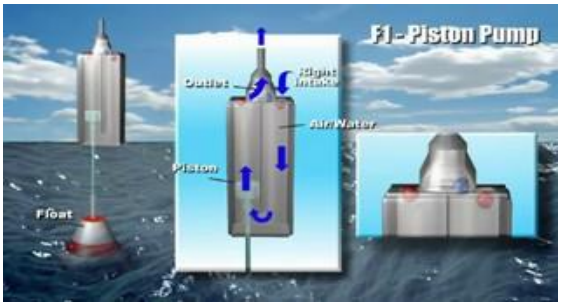

Fig. 1(a) Rising wave

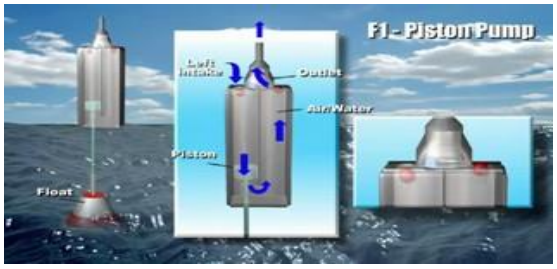

Fig. 1(b) Falling wave

Most significant EGBW applications are summarized in the table 1.

Table 1: Applications of EGBW

Product type	*Applications*
Piston Pump	Used to convert mechanical motion into electricity
Float	Attached to piston
Generator	Used for generation of power
Battery	Used to store energy without wastage

Advantages of EGBW

The advantages of the electricity generation by waves include

- The Ocean is full of kinetic energy available for us to harness. A large percentage of people staying near the coastlines can benefit from this renewable energy, which is clean and green. Some other advantages are:
- Harness different forms of fluid currents.
- Generic construction, simple device.
- Easily available parts.
- Simple, unsophisticated design.
- Mass production.
- Silent operation

- No technological incertitude

Electricity generation by waves: A Hydroelectricity technique

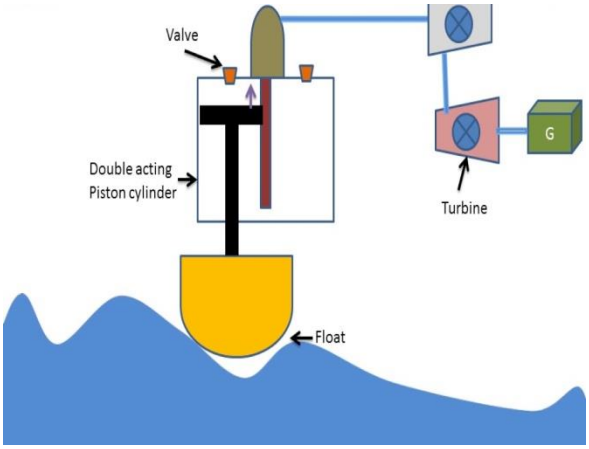

Fig. 2: Working model

The present invention provides double acting pump mechanisms when the piston reciprocates inside the piston chamber as the piston is driven by a float according to rising and falling waves. Based on the fundamental working principle and variations of the above fixed and moving devices, many designs of energy converters can be configured. In this example, a submerged pump is operated to pump water to an elevated storage tank. Water from the storage tank is channelled to rotate a fluid motor or a turbine, which in turn rotates a generator to produce electricity. Figure 3 shows certain significant piston pump products.

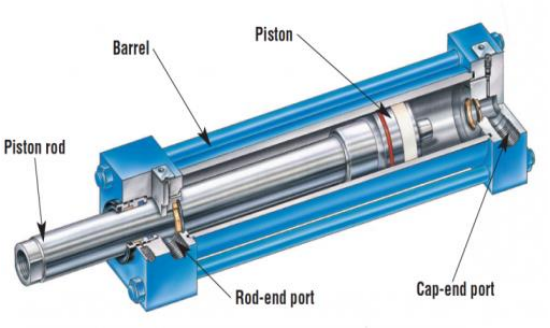

Fig. 3(a) Piston pump

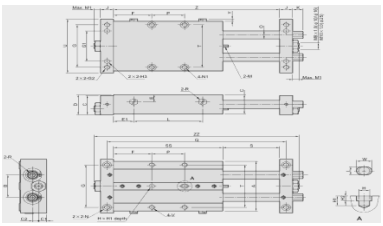

Fig. 3(b) Piston design

CONCLUSION

The Ocean currents around us are available for us to harness. These racks and pump energy converter devices give us a chance to convert wave or flowing currents into electricity. The concept design is simple, unsophisticated and cost effective, thus allowing us to harness huge unlimited renewable energy from our surrounding. Help the Earth now.

Student Article

Design of Smart Helmet

N. Praveen Sagar*, G. Gokul Srinad*, Y. Deemanth*, G. Chaitanya*, Ch. Naga Raju#

Mentor; *B. Tech student

The article presents a smart helmet design which can be used to detect and alert the rider if the alcohol level in breath is more than acceptable level.

Introduction

Helmets for riders are extremely important and many lives can be saved by the use of these Helmets in the event of accidents. Motorcyclists have a perception that wearing a helmet causes discomfort and they do not appreciate its importance, especially the youth. And perhaps the most misleading idea is that short trips do not involve any risk. Smart helmet helps to curb riding by ensuring that the rider mandatorily wears the Helmet while driving and also controls the fuel supply to the engine. In this present work an attempt was made on smart helmet to detect the alcohol levels of the rider.

MQ3 Alcohol Sensor

MQ3 is one of the most commonly used sensors in the MQ sensor series. It is a Metal Oxide Semiconductor (MOS) type of sensor. Metal oxide sensors are also known as Chemoreceptors, because sensing is based on the change of resistance of the sensing material when exposed to alcohol. So by placing it in a simple voltage divider network, alcohol concentrations can be detected.

Internal Structure of MQ3 Alcohol Sensor

MQ3 is a heater-driven sensor. That's why it is enclosed in two layers of fine stainless-steel mesh called an Anti-explosion network. It ensures that heater element inside the sensor will not cause an explosion, as we are sensing flammable gas (alcohol).

It also provides protection for the sensor and filters out suspended particles so that only gaseous elements are able to pass inside the chamber.

This is what the sensor looks like when outer mesh is removed. The star-shaped structure is formed by the sensing element and six connecting legs that extend beyond the Bakelite base. Out of six, two leads (H) are responsible for heating the sensing element and are connected via a Nickel-Chromium coil (a well-known conductive alloy). The remaining four leads (A & B) responsible for output signals are connected using Platinum Wires. These wires are connected to the body of the sensing element and convey small changes in the current that passes through the

sensing element.

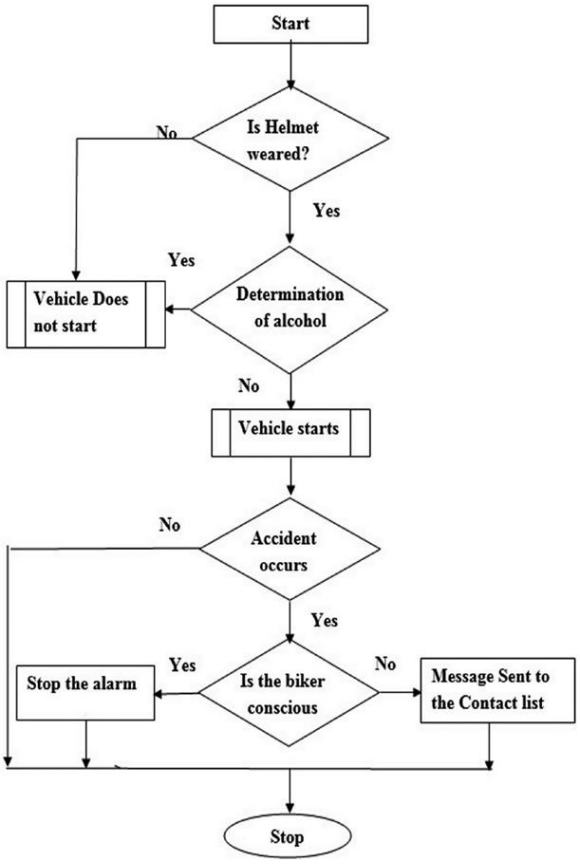

Fig. 1. Process flow of the working of Smart Helmet

The tubular sensing element is made up of Aluminium Oxide (Al_2O_3) based ceramic and has a coating of Tin Dioxide (SnO_2). The Tin Dioxide is the most important material being sensitive towards alcohol. However, the ceramic substrate only increases the heating efficiency and ensures that the sensor area is continuously heated to the working temperature.

So, to summarize, the Nickel-Chromium coil and Aluminium Oxide based ceramic forms a Heating System; while Platinum wires and coating of Tin Dioxide forms a Sensing System.

The MQ3 gas sensor is used to detect the alcohol consumption of the bike rider and the sensor output is compared with the normal levels by the Microcontroller. If the levels are not in normal range, it will cut the fuel to the ignition system to stop the starting of the bike. The proposed system also uses the GPS and GSM modules to track the bike. The system will also helpful to provide automatic assistance to the rider if he went into unconscious due to the accident. The system will send the location of the bike to the numbers stored in his address book and emergency medical services for immediate rescue.

Conclusion

The designed, intelligent helmet has a small appliance that is mounted on the helmet that controls the fuel supply to the engine. The primary function of this device is the detection of alcohol levels. It can detect alcohol levels in human respiration. If the alcohol level exceeds the allowed level, it reduces the fuel supply to the engine. Another feature that is complemented by this device is GPS-GSM MODEL for transmitting GPS information.

AEOLIPILE

Student Article

M. Ravi Kumar*, P.N. Bharadwaj*, S. Sri Charan*, Syed Nazeer*, Y.B. Sai Prakash*, Dr C. Mahesh#
#Guide / Mentor, *B Tech student

The article presents an overview of Aeolipile. *It discusses the utilization of principle of* Aeolipile in steam turbine *in brief.*

Introduction

An aeolipile (or aeolipyle, or eolipile), also known as a Hero's engine, is a simple, bladeless radial steam turbine which spins when the central water container is heated. Torque is produced by steam jets exiting the turbine, much like a tip jet or rocket engine. In the 1st century AD, Hero of Alexandria described the device in Roman Egypt, and many sources gave him the credit for its invention.

Principle:

The Aeolipile consists of a vessel, usually a "simple" solid of revolution, such as a sphere or a cylinder, arranged to rotate on its axis, having oppositely bent or curved nozzles projecting from it (tip jets) as shown in Fig. 1. When the vessel is pressurized with steam, steam is expelled through the nozzles, which generates thrust due to the rocket principle as a consequence of the second and third Newton's laws of motion. When the nozzles, pointing in different directions, produce forces along different lines of action perpendicular to the axis of the bearings, the thrusts combine to result in a rotational moment (mechanical couple), or torque, causing the vessel to spin about its axis. Aerodynamic drag and frictional forces in the bearings build up quickly with increasing rotational speed (rpm) and consume the accelerating torque, eventually cancelling it and achieving a steady state speed.

Fig.1 Model of Aeolipile

Advantages:

- Since the steam turbine is a rotary heat engine, it is particularly suited as drive mechanism of an electrical generator.

- Thermal efficiency of a steam turbine is usually higher than that of a reciprocating engine.
- Very high power-to-weight ratio, compared to reciprocating engines.
- Fewer moving parts compared to reciprocating engines so less wear and tear.
- Steam turbines are suitable for large thermal power plants. They are made in a variety of sizes up to 1.5 GW turbines used to generate electricity.
- In general, steam contains high amount of enthalpy (especially in the form of heat of vaporization). This implies lower mass flow rates compared to gas turbines.
- In general, turbine moves in one direction only, with far less vibration than a reciprocating engine.

Disadvantages:

- Although approximately 90% of all electricity generation in the world is by use of steam turbines, they have also some disadvantages.
- Relatively high overnight cost.
- Steam turbines are less efficient than reciprocating engines at part load operation.
- They have longer startup than gas turbines and surely than reciprocating engines.

Conclusion:

Steam turbines the major power sources of the humanity utilizes the concept of aeolipile, having very high power-to-weight ratio and also to cater the bulk needs of electric power about 1.5 GW turbines

Student Article

Rocker Bogie Mechanism

S. Charan*, J. Avinash*, T. Divakar*, S. Sai Pavan*, Sk. Jilani*, B. Supraja Reddy#

Mentor; *B. Tech student

Rocker bogies are important for conducting in-situ scientific analysis of objectives that are separated by many meters to tens of kilometres. Current mobility designs are complex, using many wheels or legs. They are open to mechanical failure caused by the harsh environment on Mars. A four wheeled rover capable of traversing rough terrain using an efficient high degree of mobility suspension system. The primary mechanical feature of the rocker bogie design is its drive train simplicity, which is accomplished by using only two motors for mobility. Both motors are located inside the body where thermal variation is kept to a minimum, increasing reliability and efficiency. Four wheels are used because there are few obstacles on natural terrain that require both front wheels of the rover to climb simultaneously. A series of mobility experiments in the agriculture land, rough roads, inclined, stairs and obstacles surfaces concluded that rocker bogie can achieve some distance traverses on field.

Introduction

Over the past decade, the rocker-bogie suspension design has become a proven mobility application known for its superior vehicle stability and obstacle-climbing capability. Following several technology and research rover implementations, the system was successfully flown as part of Mars Pathfinder's Sojourner rover. When the Mars Exploration Rover (MER) Project was first proposed, the use of a rocker-bogie suspension was the obvious choice due to its extensive heritage. The challenge posed by MER was to design a lightweight rocker-bogie suspension that would permit the mobility to stow within the limited space available and deploy into a configuration that the rover could then safely use to egress from the lander and explore the Martian surface. When building a robot you'd like it to be as simple as possible. In most cases you'd never need a suspension system, but there were several instances when a suspension system cannot be avoided. The term "bogie" refers to the links that have a drive wheel at each end. Bogies were commonly used as load wheels in the tracks of army tanks as idlers distributing the load over the terrain. Bogies were also quite commonly used on the trailers of semi-trailer trucks. Both applications now prefer trailing arm suspensions. The rocker-bogie design has no springs or stub axles for each wheel, allowing the rover to climb over obstacles, such as rocks, that are up to twice the wheel's diameter in size while keeping all six wheels on the ground. As with any

suspension system, the tilt stability is limited by the height of the centre of gravity.

Design

The important factor in manufacturing of rocker bogie mechanism is to determine the dimensions of rocker and bogie linkages and angles between them. The lengths and angles of this mechanism can be changed as per requirement. In the work aim is to manufacture the rocker bogie mechanism which can overcome the obstacles of 150 mm height (like stones, wooden blocks) and can climb over stairs of height 150 mm. Also, another target is to climb any surface at an angle of 45˚. To achieve the above targets, we had designed the rocker-bogie model by assuming stair height 150 mm and length 370 mm. Using Pythagoras theorem, find the dimensions of the model. It has both angles of linkages are 90˚. A. Design calculation the objective of the research work is stair climbing. To achieve proper stair climbing the dimensions of linkages should be proper. Assume the stair height and length 150 mm and 370 mm respectively. To climb stairs with higher stability, it is required that only one pair of wheel should be in rising position at a time. Hence to find dimension of bogie linkages, first pair of wheels should be placed at horizontal position means at the end of the rising as shown in. And second pair should be placed just before the start of rising. There should be some distance between vertical edge of stair and second pair of wheel to striking of wheels.

Fig. 1. The Rocker Bogie

Conclusion

This work shows how rocker bogie system works on different surfaces. As per the different weight acting on link determines torque applied on it. By assuming accurate stair dimensions, accurately dimensioned rocker bogie can climb the stair with great stability. The design and manufactured model can climb the angle up to 45˚. Also we tested for the Web cam with AV recording mounted on rocker bogie system and found satisfactorily performance obtains during this test camera has rotated around 360˚. During stair climbing test for length less than 375 mm (15 inch) system cannot climb the stair. It can be possible to develop new models of rocker bogie which can climb the stairs having low lengths.

Student Article

Design and Fabrication of Friction Stir Welding Machine

S. Naga Surya Sai Vinay*, M. Surendra*, D. Vijay Kumar*, M. Manoj Kumar*, P. Pranay Ram*, M. Balaji#

Mentor; *B. Tech student

The aim of the project is to fabricate a friction stir welding machine which is useful for understanding the process of friction stir welding and for the demonstration purposes in technical field. The working principle of this machine is different to that of other welding machines.

Introduction

Friction welding method is one of the most simple, economical and highly productive methods in joining similar and dissimilar metals. It is widely used in the Automotive, Aircraft and Aerospace industrial applications. For many applications it is often necessary to join aluminium to make finished part. In this project the main aim is to weld the aluminium plates. Here the aim is to fabricate a friction welding machine with simple parts like A.C induction motor, bush, frame stand, friction tool, universal vice, vertical moving bed, horizontal moving bed, etc. A prototype is developed to monitor the forces developed and tool temperature during the operation. The pressure of a gripper plays a significant role in tool rotation and developing torque.

Working Principle

In Friction Stir Welding, a cylindrical shouldered tool, with a threaded or unthreaded probe (nib or pin) is rotated at a constant speed and fed at a constant traverse rate into the joint line between two pieces of sheet or plate material, which are to be joined together. The parts to be welded should be clamped rigidly in a manner that prevents the abutting of joint faces from being forced apart. The length of the nib is slightly less than the weld depth required and the tool shoulder should be in intimate contact with the work surface. The nib is then moved.

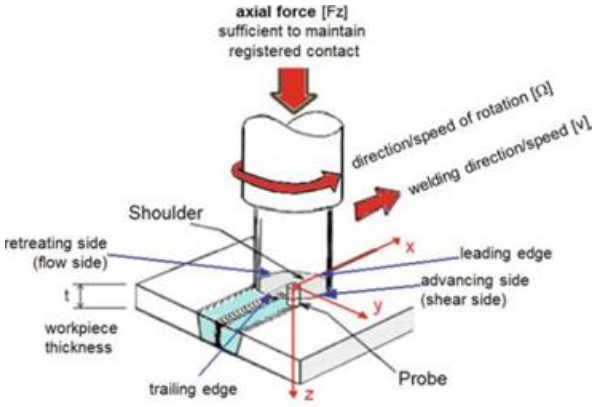

Fig. 1. A Schematic diagram of the FSW process.

Construction

The definition of friction welding according the American Welding Society abstract is as follows:

"In the direct drive variation of friction welding, one of the work pieces is attached to

a motor driven unit, while the other is restrained from rotation. The motor driven work piece is rotated at a predetermined constant speed. The work pieces to be welded are moved together, and then a friction welding force is applied. Heat is generated as the faying surfaces (weld interface) rub together. This continues for a predetermined time, or until a preset amount of upset takes place. The rotational driving force is discontinued, and the rotating work piece is stopped by the application of a braking force. The friction welding force is maintained or increased for a predetermined time after rotation ceases (forge force)".

Fig. 2. Assembled view of Friction Stir Welding Machine.

Several parameters are vital in friction welding, and these are: speed of the moving or rotating component, forge pressure, displacement and the duration of the spinning component. The parameters are interdependent and in most cases several trials are done before the mass production. The trials are performed in order to maximize the properties of welds on the welding piece. It has been found that almost any thermoplastic material can be friction welded.

Conclusion

This project work has provided us an excellent opportunity and experience, to use our limited knowledge.

The friction welding process was very efficient in the welding of dissimilar materials as aluminium. It is expected by the results of tension mechanical tests that presented mechanical properties which are not possible to achieve by means of fusion welding processes. Micro hardness drop was observed in the Weld region of FSW joints and an increase in values of micro hardness when increasing welding speed. Material loss during friction and forging is minimum making the friction welding a viable economic alternative.

Student Article

Safety System for Bike Riders

P. Raghava*, G. Srivalli#

Mentor; *B. Tech student

The article presents an overview of Safety system for bike rider. It discusses the evolution of air bags in bikes which is a safety application and fabrication technology in brief

Introduction

According to statistics in every country per hour 4 people are affected due to bike accidents. This device is placed at safety rod of a bike at the both ends. this device consists of several sensors, chemical components and Air Bags. When a bike moves on road. The position of the bike is 90 degrees. When the person on a bike wants to take turnings the bike position tilts up to 15 to 20 degrees on both sides. So, when the bike tilts more than 15 to 20 degrees i.e., the person is falling from bike either left side or right side then the air bag opens and it protects the person from the road accidents when falls side.

Working Methodology

During the ride, if the end of device touches the ground when the vehicle tilts during accident, the air bag opening mechanism activates. The activator for the air bag is a push switch when activated, an air filling motor starts. The motor pumps air into a balloon shaped bag which on inflating acts as protective layer for the rider.

Fig. 1. Colliding vehicles during the accident

Figure 1 shows the collision of the vehicles, similarly when the vehicle skids or touches other bodies or vehicles, the mechanism that is attached to the frame of the vehicle gets force. The force on the mechanism activates the push button switch.

Fig. 2. The prototype of the bike safety mechanism.

The prototype of the above-described

mechanism was manufactured using wooden frame, a push button switch, 9 V battery for power, air pump and a balloon for air bag. The when wooden frame come into contact with the road, the syringe mechanism used here will push the button to actuate the air pump.

The air pump then pumps the air into the balloon. The balloon inflates and acts as the safety for the rider.

Other devices like a body suit which can be worn by the rider as shown in figure 3 can also be used for the safety of the rider. These suits contain chemical in its sheets.

Fig. 3. Chemical based body suits for the riders which provide cushion during accidents.

The chemical in the suit will gets activated on the impact and suits will be inflated. The inflated suits absorb all the energy of the impact and keeps the body of the rider safe. The drawback of the body suits is that they are heavy to carry and rider feel uncomfortable in harsh weather conditions. These can be used in by young riders who can carry some weight when riding in cold climates.

Conclusions

The bike rider safety system is designed and presented with a prototype. This system can be used as an attachment to the bike and act as a safety system. The main drawback of the current safety system is that the lead time to activate is high and the activation sensitivity is too high and the system may get activated for simple unintentional touch. These drawbacks have to be rectified in future work.

Student Article

Design and Fabrication of Wheel Driven Sprayer

P. Ganesh*, M. Sarith*, M. Rohit Reddy*, V. Devendra Sainath*, M. Yaswanth*, M. Sumalatha#

Mentor; *B. Tech student

The article presents an overview of Design and Fabrication of Wheel Driven Sprayer. It discusses the evolution of sprayer, its applications, and fabrication technology in brief

Introduction

In the modern agriculture, the usage of pesticides is still increasing. Moreover 90% of these pesticides are being applied in the form of spraying which maintains an environment friendly approach. The argument for using existing conventional equipment is that farmers will face economic difficulties in case of chemical and electrically powered pumps and will also face health issues in case of hand operated pumps. One way to overcome this problem is the use of equipment developed for application of the pesticides through the use of mechanical power. In selecting a pump for furnishing a supply of pesticides for farm use or for spraying insecticides, herbicides or fungicides, one may be sure that it is designed for the job to be done. The unit should have sufficient capacity to supply the required amount of spray material in the allowable time.

User Study

While interacting with users' information were collected. During the interaction questions were asked to users to know what the user wants and what sort of problems they are facing while carrying out their routine work.

Fig. 1. Wheel Driven Sprayer

Most of the farmers are using knapsack motorized sprayers. The product and maintenance cost were so high and also fuel was required to run the motor. For electrically operated sprayers life span is less and sometime process will not complete due to battery storage and also the cost is little high. Knapsack hand operated sprayers have less operating cost and the products cost is also not high but the effect of the product on him human health is more because it holds on backbone and was operated by hand continually.

Design

Fertilizer spray tank, Cycle Wheel, Spray

nozzle, connecting pipe, connecting rod, Sprocket and Chain, Eccentric disc, Bearings are the major components used for the model. The wheel motion is transferred to the pinion through chain drive. The rotary motion of the pinion is converted into the reciprocating motion by single slider crank mechanism. Due to this arrangement the connecting rod moves upward and downward which then reciprocate the piston of the pump. In this process of fertilizer spraying, we are using simple mechanical components. It is the modification of hand spray pump.

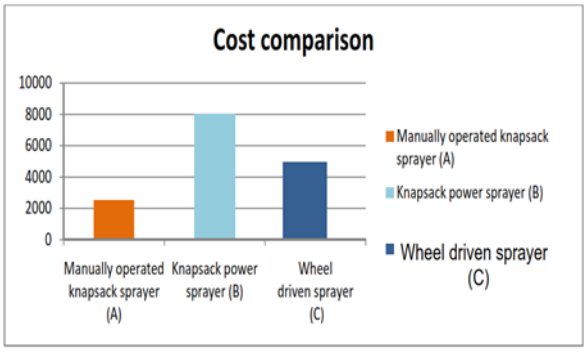

Fig. 2. Cost Comparison of present model with available models.

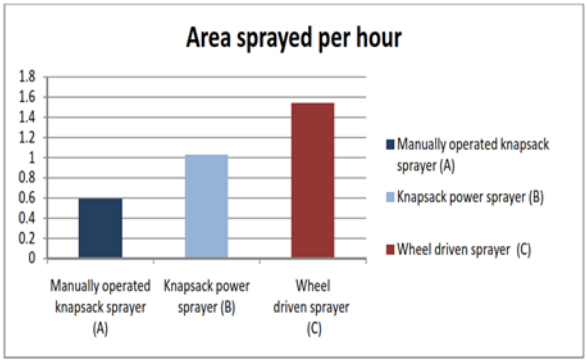

Fig. 3. Comparison of the spray area covered for the current model with the available models.

Conclusions

The suggested model has removed the problem of back pain, since there is no need to carry the tank (pesticides tank) on the back. As suggested, model has a greater number of nozzles which will cover maximum area of spraying in minimum time & at maximum rate.

The control flow valves can also be applied which help in reducing the change of pressure fluctuation and helps to maintain pressure.

Proper adjustment facility in the model with respect to crop helps to avoid excessive use of pesticides which result into less pollution.

The cost of the product can be brought down if mass production can be considered.

The concepts were analysed with the viewers and feedback was obtained where a final concept was selected and it was redesigned to suit the user requirement.

Student Article

Conversion of Wind Energy to Electrical Energy

M. Keerthana*, Puja*, Nagamalleswara Rao K#

* - B.Tech Student, # - Mentor

The article presents an overview of conversion of wind energy to electrical energy, its applications, and fabrication technology in brief.

Introduction

Wind turbines Converts the energy in wind to **electricity** by rotating propeller-like blades around a rotor. The rotor turns the driveshaft, which turns an **electric** generator. Three key factors affect the amount of **energy** a **turbine** can harness from the **wind**: **wind** speed, air density, and swept area. (Please refer Figure1).

Fig. 1. Wind Mills

Description of wind turbine (Mill)

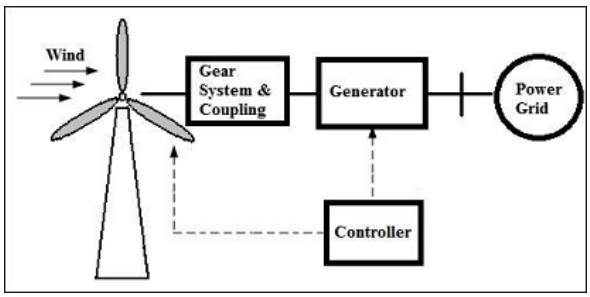

Fig. 2. Block Diagram representation of Wind Mill

The majority of wind turbines consist of three blades mounted to a tower made from tubular steel. There are less common varieties with two blades, or with concrete or steel lattice towers. At 100 feet or more above the ground, the tower allows the turbine to take advantage of faster wind speeds found at higher altitudes.

Turbines catch the wind's energy with their propeller-like blades, which act much like an airplane wing. When the wind blows, a pocket of low-pressure air forms on one side of the blade. The low-pressure air pocket then pulls the blade toward it, causing the rotor to turn. This is called lift. The force of the lift is much stronger than the wind's force against the front side of the blade, which is called drag. The combination of lift and drag causes the rotor to spin like a propeller.

Another key component is the turbine's controller that keeps the rotor speeds from exceeding 55 mph to avoid damage by high winds. An anemometer continuously measures wind speed and transmits the data to the controller. A brake, also housed in the

nacelle, stops the rotor mechanically, electrically or hydraulically in emergencies. Explore the interactive graphic above to learn more about the mechanics of wind turbines.

Wind Mill Fabrication

Fig. 3. Prototype of Wind mill

Working model of windmill is a commo science project given in class 6 and above The idea is to explain conversion of energ from one form to another. Usually parents ar the ones dealing with the dilemma of makin it and end up buying the whole project fron local electronic or project making shops Buying the project kills the whole idea o giving the project in the first place, which i to encourage children to learn while makin something. Others commit a very innocen mistake of attaching motor fixed with fan t the battery cell and end up making a fan run on battery instead of a windmill. We at projectsforschool.com make this daunting task easy by providing all the material and instruction manual to make an easy windmill.

When the wind passes through the blades, the blades experience a lift due to the aerodynamic airfoil shape. Due to the lift produced, the blades move and start rotating. The yaw unit aligns it towards the incoming wind direction when the winds change. The rotation of the blades is transmitted through the gear train and couplings to the generator that generates electricity. The electricity is then transmitted through the wires to the storage batteries or directly to the grid. Materials required1. Plastic fan 2. LED's3. Motor (6v or above)4. Resistor5. Wooden board 6. Plastic pole to mount motor 7. Connecting wire 8. Cello tape

1. Mount the motor onto the plastic stick or whichever material you are going to use to make the pole. Make sure the motor is secured tightly with cello tape. Next place the pole onto the wooden plank or base support material you are going to use.
2. Cut the connecting wire into two pieces and remove the insulation from the connecting wire. Loop in resistor to the terminal in the motor and attach one of the connecting wire to the resistor and other connecting wire to the terminal. Next attach LED terminals to both the ends of the connecting wire.

CONCLUSION

In this paper working model of wind mill for domestic purpose is fabricated and working model is demonstrated here.

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

VELAGAPUDI RAMAKRISHNA
SIDDHARTHA ENGINEERING COLLEGE

(Sponsored by Siddhartha Academy of General & Technical Education)
(An autonomous Institution affiliated to JNTU-Kakinada, Kakinada)
Kanuru, VIJAYAWADA – 520007, Andhra Pradesh
www.vrsiddhartha.ac.in