

March 2023

# *Mech View*

*Department Technical Magazine*



**DEPARTMENT OF  
MECHANICAL 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.

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**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 2023**

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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# Contactless Cleaning of Solar Panel

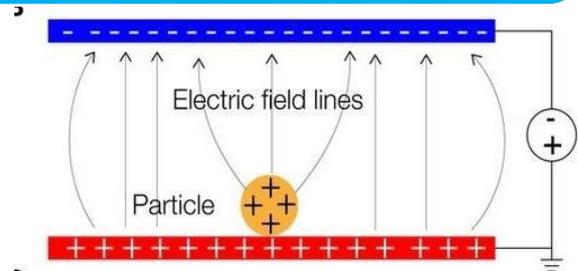
B. Atchuta Rao\*, I. Anand Reddy\*, J. Bhanu Kumar\*, E. N. Eswar Teja\*, E. Vamsi\*  
 Dr.K.Prakash Babu# # Guide/ Mentor; \* B.tech Student

*Most of the dust removal models developed are in contact with the surface of the solar panels, which results in permanent scratching, damaging the very thin glass on the photo voltaic cell. The article describes the contact-less cleaning method to remove dust on solar installations by using electrostatic repulsion.*

## Introduction

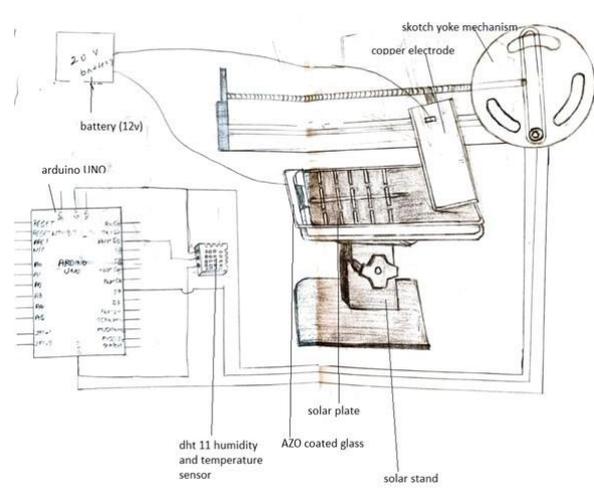
Solar energy leads the way in renewable energies ranking. But there is a problem when the solar farms are installed in desert regions, that is dust accumulated on the surface of the solar panel. Even 1% decrease in efficiency results in a vast loss of power generation. So, the regular cleaning of solar panels is required to produce decent amount of power. Now a days people are using in contact methods to clean the solar panels which causes damage to the glass on the photo voltaic cell.

So, we need to develop a contact less way to clean the surface of the solar panels. We developed this electrostatic repulsion method to remove dust on solar panels in a contact less manner. This new system uses electrostatic repulsion to cause dust particles to detach and virtually leap off the panel's surface. To activate the system, a simple electrode passes just above the solar panel's surface, imparting an electrical charge to the dust particles, which are then repelled by a charge applied to the panel itself.



**Fig. 1 Electrostatic repulsion between two similar charges**

## Description of Contact less cleaning of solar panel:

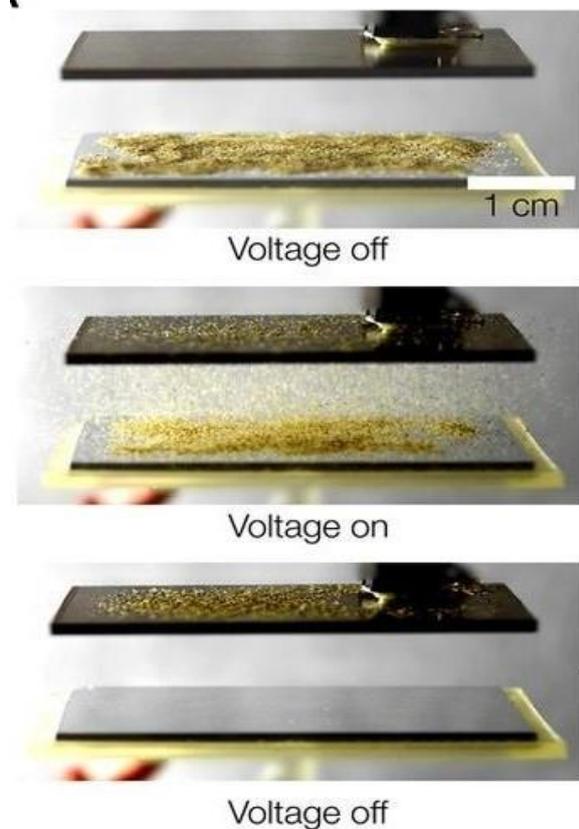


**Fig. 2: Block Diagram of the model**

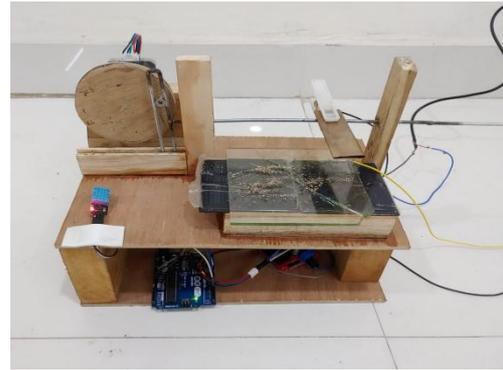
- Solar panel is kept with some dust on it. (lab dust)
- Solar panel coated with transparent conducting system with Aluminum doped Zinc oxides on top of panel.
- The rotor rotates when humidity is greater than 30% and moves the

- electrode plate which is having electricity.
- And the dust on the surface of the panel gets charged and repelled, and it gets electrode to electrode.
- Take down this process till the motor get to and fro motion, then the sand (dust particles) completely removed.
- While running the motor we must supply a certain voltage (6KV-8kV) to AZO doped layer to charge the sand dust.

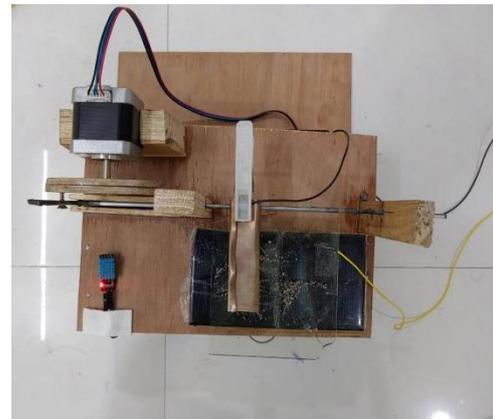
After removing the dust on the solar panel, we must put off the voltage.



**Fig. 3: removal of dust from solar panel**



**Fig 4.1. Experimental setup of the model**



**Fig 4.2. Experimental setup of the model**

## CONCLUSION

A movable electrode mechanism with electrostatic repulsion and Arduino controller enhances 12.5% of efficiency of solar panel power output. If this is employed in the solar farms in a large scale, we can see a huge increment in the production of solar power. And, this method helps in the saving of billions of liters of water which we annually use to clean the solar panels.

# Fabrication of Mini Solar Water Heater

K. Chaitanya Sai Teja\*, L. Naveen Babu\*, M. Sai Dileep\*, S. Nikhil\*,  
D. Sai Rohith\*, Dr. G. Jamuna Rani#

# - Guide; \* - 4<sup>th</sup> Year B Tech Student

*The article presents an overview of the fabrication of Mini Solar Water Heater. It discusses the concept, its applications, and fabrication in brief*

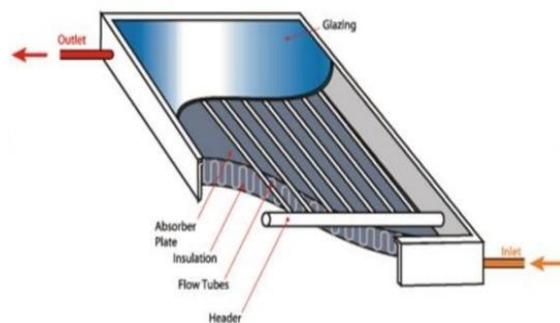
## Introduction

Solar water heating systems use solar collectors and a liquid handling unit to transfer the load, generally via a storage tank. This system is designed to provide hot water without consuming electricity. This system works on the thermosiphon principle and is designed to provide hot water without consuming expensive electricity. This is the most effective way to generate hot water thereby saving costly power and is also environment friendly. The size of the systems depends on availability of solar radiation, temperature requirement of customer, geographical condition and arrangement of the solar system, etc. A Mini Solar Water Heater can be developed for domestic purposes, using efficient coiling and Flat Plate Collector Technology that can heat up water more efficiently at a faster pace than a traditional water heater.

## Flat Plate Collectors

The choice of collector is determined by the heating requirements and the environmental conditions in which it is employed. There are mainly three types of solar collectors like flat

plate solar collector, evacuated tube solar collector, concentrated solar collector.



**Fig.1 Flat Plate Collector**

## Design Procedure

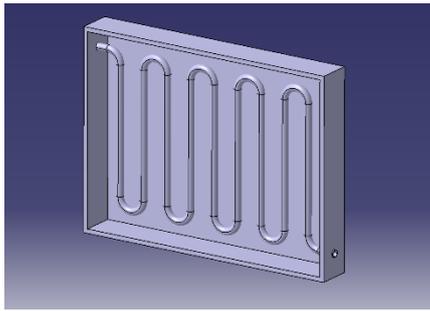
The steps involved in the designing the mini solar water heater are mentioned below,

- ✓ Location of Residence
- ✓ Estimation of available solar resource
- ✓ Load Estimation
- ✓ Estimation of required absorber area
- ✓ Estimation of Direction and Optimal Tilt Angle

By following the above steps, the mini solar water heater is designed, and the outcomes are given below.

The Average value of Solar Radiation is obtained as 4.903197 kW-hr/m<sup>2</sup>/day. The absorber area required is obtained as 0.2681 m<sup>2</sup>. Hence, the dimensions of the collector will be 600mm x 450mm. The optimum tilt angle of the collector is obtained as 44° and the optimum collector direction is facing South Direction.

## Product Design



**Fig.2 Design of Flat Plate Collector**

## Materials Used

S. No	ITEM
1	Acrylic Sheet
2	Polycarbonate Sheet
3	Steel Tubes
4	Aluminium Sheet
5	Water Pump - 15W
6	Water Tubes (Plastic)
7	Water Can - 20 litres

## Working Model



**Fig.3 Mini Solar Water Heater**

## Results and Discussion

### □ Efficiency Analysis

Efficiency is obtained as  $\eta = 74.3\%$

Compared to other Traditional Solar Water Heaters, they are efficient up-to 68% - 71%. So, Mini Solar Water Heater is efficient that Traditional Solar Water Heater.

### □ Economic Analysis

Total cost for fabricating the Mini Solar Water is Rs. 4500/-. But the traditional solar water heater cost will be starting from Rs. 15000/-. Thus, mini solar water heater is economical than the other traditional solar water heaters.

### □ Payback Period

Traditional Solar Water Heaters have payback period of 5 years 4 months. Whereas, the Mini Solar Water Heater have payback period of 1 year 7 months, which is less than traditional solar water heater.

## Conclusion

Mini Solar Water Heater is more efficient and also has less payback period than a Traditional Solar Water Heater. The efficiency of a Traditional Solar Water Heater is from 68%-71%, Whereas Mini Solar Water Heater is 74.3% efficient. Hence, this Mini Solar Water Heater will be economical and also efficient for domestic hot water requirement purpose of 60-80 litres per day.

# Modelling of Mini Refrigerator Using Peltier Element

K. Chaitanya Sai Teja\*, L. Naveen Babu\*, M. Sai Dileep\*, S. Nikhil\*,  
Dr. G. Jamuna Rani<sup>#</sup>

# - Guide; \* - 4<sup>th</sup> Year B Tech Student

*The article presents an overview of the modelling of mini refrigerator using peltier element. It discusses the concept, its applications, and fabrication in brief*

## Introduction

Refrigeration systems are an essential process in industry and home applications as they perform cooling or maintain room temperature at a desired value. The term refrigeration means cooling a space, substance or system to lower and maintain its temperature below the ambientone. In other words, refrigeration is artificial cooling. Energy in the form of heat is removed from a low-temperature reservoir and transferred to a high-temperature reservoir. A cycle of refrigeration consists of heat exchange, compression and expansion with a refrigerant flowing through the units within the cycle.

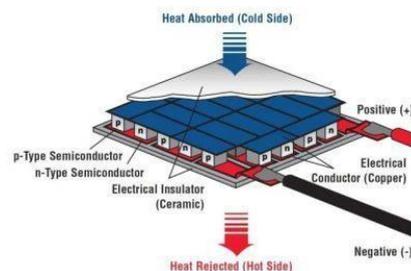
## Peltier Element

Peltiers is a device that gives instant cooling using electricity at lower costs. Thermoelectriccoolers operate according to the Peltier effect. The effect creates a temperature difference by transferring heat between two electrical junctions. A voltage is applied across joined conductors to create an electric current.

When the current flows through the junctions of the two conductors, heat is removed at one junction and cooling occurs. Heat is deposited at the other junction.

**Fig.1 Peltier Element**

A Mini Refrigerator can be developed by using peltier element by connecting the cooling end of the peltier element to the inner

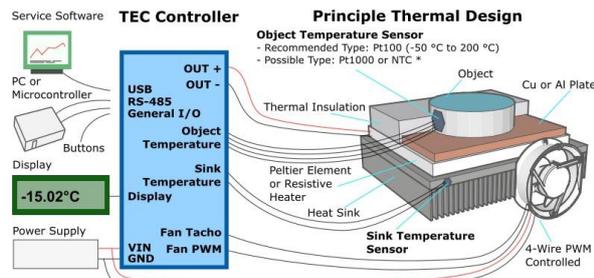


metal frame to pass on cooling to the contents of the fridge, and the heating end is connected to a heatsink to pass on the heat into environment using cooling fan.

## Thermoelectric Cooling System

Thermoelectric cooling (TEC) is the cooling effect that occurs as a result of current flowing between two different conductors or semiconductors; heat is produced at one juncture and a cooling effect at another juncture, creating a temperature differential. This can be used to transfer heat from one

place to another. Each features an array of alternating n and p - type semiconductors. The semiconductors of different type have complementary Peltier coefficients. The cooling effect of any unit using thermoelectric coolers is proportional to the number of coolers used.



**Fig.2 Thermoelectric Cooling System**

The basic parts of thermoelectric cooling system are

- Peltier Element
- TEC Controller
- Heat Sink

### Design Procedure

The design steps are given below,

- Estimating Heat Load
- Selecting a Peltier Element
- Selecting a TEC Controller
- Choosing a Heat Sink

The outcomes of the above design procedure are given below

The heat load is estimated as 52.5 W. A peltier element of 12V and 6A is selected. A TEC Controller (TEC-1091) with  $\pm 4A$  output current and  $\pm 21V$  output voltage, and aluminum heatsink is selected. The cabin capacity is 4.5 Liters.

### Components Used

- ✓ Medium Density Fibre-Board
- ✓ Peltier Element (12V 6A)
- ✓ TEC Controller – 1091
- ✓ Temperature Sensors (Pt100)
- ✓ Aluminium Frame
- ✓ Insulation Foam
- ✓ Heat Sink (Aluminium)
- ✓ Aluminium Block
- ✓ D.C. FAN (140\*140mm)

### Model Images



**Fig.3 Mini Refrigerator**

### Conclusion

This is to conclude that the Mini Refrigerator worked as planned and the frame held together properly. From the normal room temperature (i.e., 25 °C), it took approximately 20 to 30 minutes to cool down by 10°C.

# Design and Fabrication of River Cleaning Boat

G.Venkata Chaitanya\*, J.Karthik\*, N.Sai kiran\*, J.John paul\*, Dr.V.Bapi Raju#

# Supervisor; \* 3<sup>rd</sup> Year B-Tech student

*This project focuses on " Floating River Cleaning Boat". In India water pollution is increasing day by day so this is becoming serious problem for rivers, ponds etc. This mainly consist of impurities like waste Water debris, plastics, garbage on floating Water surface. These impurities mainly effect on health of human being and also effect on life of aquatic animals. Normally this project based on renewable energy sources, so there is reduction in use of non-renewable energy sources like oil, petroleum and all of mineral sources. So, by this non-renewable energy sources are saved. so this project helps to reduce the water pollution on floating bodies.*

## Introduction

The "River cleaning machine" used in that places where there is waste debris in the water body which are to be removed. This machine is consisting of water wheel driven conveyer mechanism which collect & remove the wastage, garbage & plastic wastages from water bodies. This also reduce the difficulties which we face when collection of debris take place.



Fig. 1: Waste in River

A machine will lift the waste surface debris from the water bodies, this will ultimately result in reduction of water pollution and lastly the aquatic animal's death to these problems will be reduced. It consists of Belt drive mechanism which lifts the debris from the water. The use of this project will be made in rivers, ponds, and other water bodies for to clean the surface water debris from bodies.

## Objectives

The main aim of the project is to reduce the man power. time consumption for cleaning the river. To reduce the pollution in water bodies. Facility of removing waste particulate floating on water surface. To maintain the automation during working towards cleaning River. To perform the fast & reliable operation during cleaning River. Improve the water quality of a water bodies. To work for society for clean up a section of a stream or river. To record the amount of garbage removed from the water way & give solutions to local to provide better environment to aquatic animals and human life.

## Need

Waste water is defined as the flow of used water from homes, business industries, commercial activities and institutions which are subjected to the treatment plants by a carefully designed and engineered network of pipes. The biggest impact of cleaning the chemical wastes can cause respiratory diseases and it plays a challenging issue for the municipality officers. Nowadays, even though automation plays a vital role in all industrial applications in the proper disposal of sewages from industries and sewage cleaning is still a challenging task. Drainage pipes are used for the disposal of sewage and unfortunately sometimes there may be loss of human life while cleaning the blockages in the drainage pipes. As such condition the river cleaning machine is used to solve such type of

problems.

### **Working Methodology**

In this project the main aim of this machine is to lift waste debris from the water surface and dispose them in the tray. It consists of an arrangement of conveyor which is placed on the shaft of a motor. Due to the rotation of the motor, the conveyor rotates. As the conveyor moves, it collects water debris, waste garbage, and plastics from water bodies. As the machine is placed in the water, the waste debris in the water will get lifted and it moves in the upward direction. As the waste debris reaches the upper extreme position, it will get dropped into the tray. Hence, this will result in cleaning of water surfaces on the river and run with the help of a PMDC motor. The total electrical devices are controlled by an RF transmitter and receiver which are used to control the machine remotely.



**Fig. 2: River Cleaning Boat**

### **Advantages**

- This cleaning system is easy to operate and flexible.
- This system is Eco-friendly.
- This requires less man power.
- This requires more use of renewable energy sources.
- This system is Cost effective (Initial and Maintenance cost is low).
- This is an efficient method.

### **Applications**

- Useful to reduce the water pollution in river.

- It is applicable to reduce water debris, impurities, and all types of impurities which are floating on the water surface in a swimming pool.
- It is useful to remove the environmental marine.
- It is useful in a fishery plant to collect dead fishes.

### **Disadvantages**

- Waste collecting capacity is limited.
- Only useful to collect waste which is floating on the river surface.

### **Conclusion**

We are able to conclude that it is an innovative technique of minimizing manual stress and therefore very much reliably stabilizing inside the river. Here we are using solar as a prime source of energy as it is a renewable resource in the universe, we think we can extract the sufficient energy required to run the river cleaning boat. The reason behind using solar energy is to eliminate pollution caused by fossil fuels. Although this system is in a position to collect the garbage from the lake with human intervention. The goal of the undertaking was efficaciously achieved and we will implement the cleaning of the water.

# Nano Fillers used in Composite Materials

P. Ram Reddy\*, A. Sai Sree\*, M.Aksash\*, Ch. Venkata Prasad#

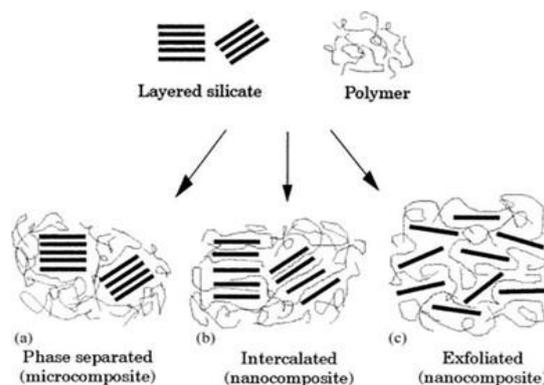
# Guide/ Mentor; \* – B.Tech student

*The article shows different types of nano-fillers that can be used to improve the characteristics of polymer composite materials.*

## Introduction

Polymer nanocomposites (PNCs) may be defined as a mixture of two or more materials, where the matrix is a polymer and the dispersed phase has at least one dimension smaller than 100 nm. In the last decades, it has been observed that the addition of low contents of these nanofillers into the polymer can lead to improvements in their mechanical, thermal, barrier and flammability properties, without affecting their processability. The reinforcing effect of filler is attributed to several factors, such as properties of the polymer matrix, nature and type of nanofiller, concentration of polymer and filler, particle aspect ratio, particle size, particle orientation and particle distribution. Various types of nanoparticles, such as clays, carbon nanotubes, graphene, nanocellulose and halloysite, have been used to obtain nanocomposites with different polymers. The evaluation of the nanofiller dispersion in the polymer matrix is very important, since the mechanical and thermal properties are strongly related to the morphologies obtained. Depending on the degree of

separation of the nanoparticles, three types of nanocomposite morphologies are possible. Exfoliated nanocomposites have maximum reinforcement due to the large surface area of contact between the matrix and nanoparticles. This would be one of the main differences between nanocomposites and the conventional composites.



**Fig. 1. Possible Structures of Polymer Nanocomposites**

This article shows the different types of nanoparticles can be used to improve the characteristics of polymer composites.

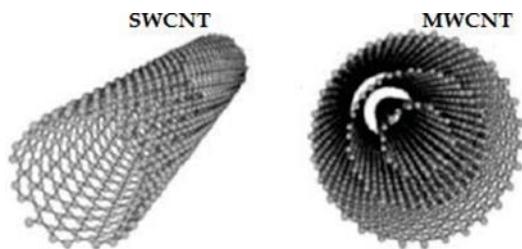
## Nano Fillers

### Carbon based nanofillers

Carbon nano tubes are ultra-thin carbon fibres with nanometre-size diameter and micrometre size length CNTs were discovered in 1991 by Sumio Iijima, and since then, these

nanomaterials have been used in various applications. In addition to the exceptional electrical and conductive properties, the CNTs also present excellent mechanical properties, with an elastic modulus in the order of 1 TPa and maximum tensile strength can reach 300 GPa. However, these fillers are materials of difficult dispersion in polymeric matrices. Problems arising from agglomeration during processing are commonly observed due to the low polymer/CNT interaction. The processing conditions may influence the dispersion state of these nanofillers in the resulting material.

Most significant MEMS applications are summarized in the table 1.

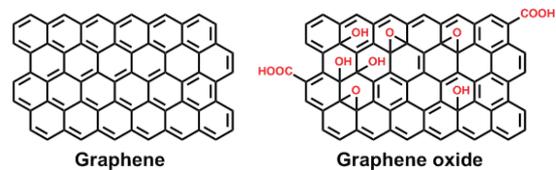


**Fig. 2.** Representation of SWCNT and MWCNT

Graphene was discovered in 2004 by Andre. K. Geim and Konstantin S. Novoselov and has revolutionized the scientific frontiers in nanoscience and condensed matter physics due to its exceptional electrical, physical and chemical properties. The primitive cell of graphene is composed of two non-equivalent atoms, A and B, and these two sub-lattices are translated from each other by a carbon-carbon distance  $a_{c-c} = 1.44 \text{ \AA}$ . Graphene can be produced from graphite by different methods, such as thermal expansion of chemically

intercalated graphite, micromechanical exfoliation of graphite, chemical vapor deposition and chemical reduction method of graphene oxide.

Graphene has Young's modulus of 1 TPa, fracture strength of 125 GPa, thermal conductivity of 5000 W/m.fK and electrical conductivity up to 6000 S/cm . These properties in addition to extremely high surface area (theoretical limit: 2630 m<sup>2</sup>/g) and gas permeability indicate graphene's great potential for improving mechanical, electrical, thermal and gas barrier properties of polymer nanocomposites.

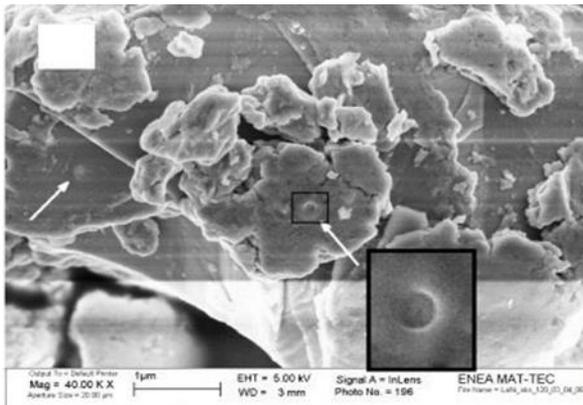


**Fig.3.** Honeycomb lattice of graphene

### Nanoparticles of Metallic Alloys

The possibility of using metal hydrides (MH) alloys in hydrogen technology has been attracting interest. These types of material react with hydrogen reversibly, thus being successfully utilized in the solid-state storage of the gas. However, MH alloys under repeated hybridizing/ dehydriding cycling suffer from a pulverization phenomenon due to a large volume mismatch between the hydride and the metal compound. As a consequence, repeated hydrogen loading/unloading cycles produce free metal powder particles in nanoscale size. Particle fragmentation results in a considerable

increasing of the metal surface area with a consequent enhancement of some properties. Anyway, storing hydrogen in MH beds as a chemical compound appears to be a promising, cost-effective and safe method of hydrogen storage in the near future. An example of polymer nanocomposite with MH alloy is shown



**Fig. 4.** LaNi<sub>5</sub>/ABS after a mechanical dry particle coating process in a tumbling.

## Conclusions

Polymer nanocomposites offer excellent opportunities to explore new functionalities beyond those of conventional materials. The field of nanocomposites has been one of the most promising and emerging research areas. They find special attention due to the unique properties such as light weight, ease of production and flexibility. A defining feature of polymer nanocomposites is that the small size of the fillers leads to an enormous increase in interfacial area as compared to traditional composites. The interfacial area creates a significant volume fraction of interfacial polymer with properties different from the bulk polymer even at low loadings

# Mini Water Purifier with Cooling System and Air Cooler

Sk. Shoaib\*, B. Sai Kumar\*, Md. Musthakheem\*, T. Ravi Kumar\*, A Sai Charan\*, M. Sumalatha#

# Guide/ Mentor; \* – B.Tech student

*The article shows the design and the brief working of the water purifier with cooling system for chilled water and an air cooler system.*

## Introduction

Water is the most important element for all living organisms on the earth. Without water nothing can survive. As a matter of fact, there is only 1% drinking water available on earth. Specially for human being pure water for drinking purpose is very essential as contaminated water cause number of diseases. Our project MINI WATER PURIFIER WITH COOLING SYSTEM AND AIR COOLER is basically to purify water for drinking purpose which is based on filters like (reverse osmosis, ultra-violating, ultra-filtration...etc.) method with water cooling. The main moto of our team is to prevent the people from water causing diseases by this project all the people can get in affordable price and prevent themselves from these diseases like Cholera, Diarrhoea, Dysentery, and polio etc.

## Working Principle

We had used 3 types of filters. First the tap water passes through Sediment it traps rust flakes of metal pipes, sand or mud particles and removes turbidity of water. The basic sediment filter catches unwanted dust, mud

particles present in water. At the second stage the water is made pass through pre carbon filter it is a type of water filter that is designed to remove impurities, such as chlorine, from water. The filter is usually made of activated carbon, which is a type of carbon that has been treated to make it extremely porous. This allows the carbon to adsorb, or bind, to the impurities in the water. At the third stage the water is filtered by the RO membrane (Reverse osmosis), RO water purifier most effective to purify hard, salt water contains dissolved solids and chemicals. The only RO water purifier is capable to remove metal particles like arsenic, fluoride, lead, chlorine, nitrates, and sulphates. The water purification is completed. NOW, The RO membrane releases the wastewater and purified water. The purified water is collected in a container. In that container the Peltier module is attached to the heat sink. The purified water in the container comes contact with the heat sink then the water gets cooled. The wastewater is sent into the air cooler. The cooler intakes the atmosphere air and comes contact with the water and it gives cool air. This is 3 IN 1 process all the 3 processes will

be done at a time. PURIFIER-COOLING-COOLER.

## Design

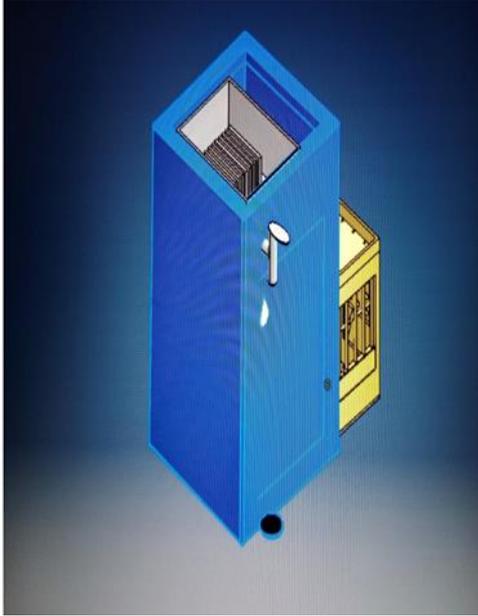


Fig.1. Model of the Water Purifier

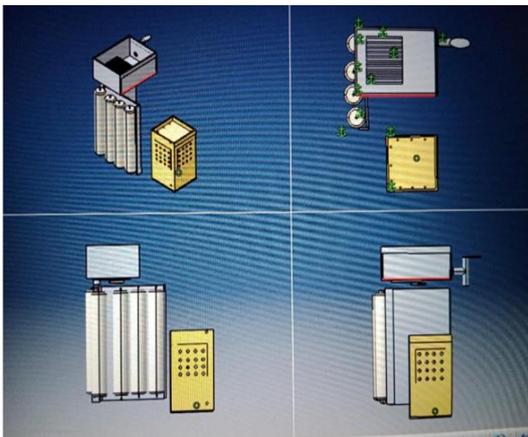


Fig. 2. CAD Model showing the parts of the water purifier.

## Layout

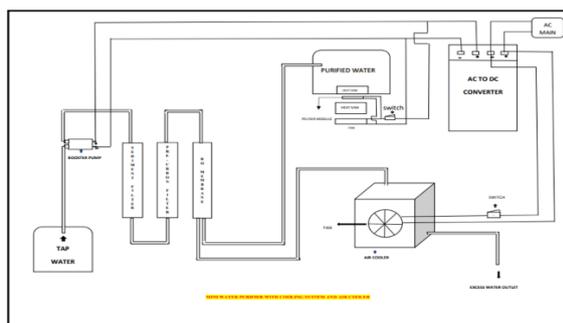


Fig.3. The Layout of the mini water purifier.

## Applications

A water purifier at home is a useful tool for ensuring that the water you drink is clean and safe. Some of the applications of a water purifier at home include:

1. Removing harmful contaminants: A water purifier can remove harmful contaminants such as bacteria, viruses, and chemicals from your drinking water, making it safe to drink.

2. Improved taste and odor: Water purifiers can remove impurities that cause a bad taste and odor, making your drinking water more enjoyable.

3. Health benefits: Drinking clean water is essential for good health. A water purifier can help ensure that the water you drink is free from harmful chemicals and bacteria, reducing the risk of water-borne illnesses.

4. Cost-effective: Having a water purifier at home is more cost-effective than buying bottled water. You can save money in the long run by not having to purchase bottled water.

5. Environmental benefits: Using a water purifier reduces the number of plastic bottles that end up in landfills, which is better for the environment.

6. Convenience: Having a water purifier at home means you don't have to go to the store to buy bottled water. You can have clean, safe drinking water on tap whenever

you need it.

7.Overall, a water purifier at home can provide many benefits, including improved health, taste, and cost savings, making it a worthwhile investment.

8.The waste water is useful for cooling in air cooler.

9. the water is getting cooled inside the system and we can drink cool water.

### **Conclusions**

Our mini water purifier with cooling system and air cooler provides multi facilities at affordable price which is available to all the people. We are happy for our product which is useful for the society.

# Dual Purpose Forearm Machine

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# Guide/ Mentor; \* – B.Tech student

*This article presents an overview of the design of dual-purpose forearm machine. It discusses about the energy harvesting, potential of human power and advantages in brief.*

## Introduction

Energy is everywhere and drives everything. In today's world there is nothing without energy. It is the motive force within our bodies, propelling our vehicles, lighting our world. Consider a dead cell phone battery; living without energy, for even ten minutes, it says how important it is on daily activities. At the same time, the rate of consumption of energy is increasing day by day. If this continues, we will be left out with no energy sources in future. As a result, new sources have been invented. The Pull-up and pull-down power is the transfer of energy from a human source through the use of rack and pinion system. This technology is most used for gym center or house. Less commonly gym power is used to power agricultural and hand tools and even to generate electricity. Some application includes battery charge home appliance. Whenever the person is allowed to pass over the gym pull up pull down with certain RPM these shafts are connected through a chain drive to the dynamos, which converts the mechanical energy into electrical energy and then stored. This forearm machine

hence acts as a dual-purpose machine which not only benefits our health but also produces energy. The continues process of pull-up machine produces more amount of energy which can be used for lighting bulbs, tubes etc., as more people are health conscious nowadays many people enter the gym for their health. If people continuously do the exercise more energy can be produced which is used for other purposes.

## Energy Harvesting

Energy harvesting is the way toward catching the little measures of vitality from at least one happening vitality sources, gathering them together and putting away them for latter utilize. Vitality reaping gadgets proficiently and viably catch, gather, store, condition and deal with this vitality and supply it in a shape that can be utilized to play out an accommodating, undertaking. Thus, a vitality reaping module is an electronic gadget that can play out every one of these capacities to control an assortment of sensor and control hardware for discontinuous obligation applications.

Vitality gatherers are those gadgets that can catch, aggregate, store, and deal with the

vitality into power for utilization. The current power sources are to a great degree inefficient in the utilization of vitality. We can state that the innovations that we use in power era at display is not vitality effective. Customary gas or steam fueled turbines change over warmth to mechanical vitality thusly changed over into power. The greater part of that vitality is disseminated as warmth. Each electronic contraption that we utilize squanders vitality. For instance, the warmth we feel from our advanced 6 mobile phone, portable workstation and so forth is the type of squandered vitality. The vibration we feel or an engine murmur in a cooler is squandered vitality. On the off chance that we can locate the correct materials to match the vitality last to warm, vibration, sound, development and light into power, we can stay away from the wastage of these little measure of energies. On the off chance that we are fruitful in collecting the vitality in future we can utilize the electronic contributions without a battery.

#### Exercise for Energy

Two years ago, Time Magazine reported on a new form of gym: one that is powered by the exercisers using it. Since then, the Green Micro gym in Portland has thrived, and continues to attract customers. The owner of the gym, Adam Boesel, makes claims, like 36% of the power needed for the gym comes from users and solar, and the gym requires 85% less electricity and has a 90% smaller

carbon footprint per square foot than a traditional gym. First, it is necessary to calculate how much energy a person can produce during exercise. If an average workout is around 20 minutes of actual activity, and at an average rate of output of 100W, yields an output of energy of 33.3Wh. This is quite close to the reported number of 37.5 W for the gym. Since power costs 10.6 cents per kilowatt-hour in Oregon, and the output is .0375 kWh, the power produced by the gym user is worth about one third of a penny. With a total membership of 200, if half of the people came to the gym every day, this saves \$0.30 a day. At this rate, it does not seem as though the machines are worth it, but the previous claims were much more impressive. There may be one redeeming reason to convert human power to electricity: it gives us an idea of just how much energy we are consuming. Thirty minutes of sweat and arduous work is worth just a third of a penny of power plant energy.

#### Potential

When the energy intake of humans is considered, a large potential seems apparent. Considering the standard 2000Kcal of daily consumption, humans take in about 8.368MJ or 2324Wh of energy every single day. This is the same amount of energy stored in the typical car battery (2400Wh). However, the expenditure of energy for common tasks is high.

# Egg Incubator for Small Scale Poultry Farmers

R. Srinivasa Sarath Kumar\*, Sk. Afeef Ahmed\*, M. Gunadeep\*, Nishanth I\*, Ch. Sri Chaitanya<sup>#</sup>

# - Guide; \* - B Tech Student

*The article presents an overview of Egg Incubator for Small Scale Poultry Farmers. It discusses the design, construction and performance evolution and its applications in brief*

## Introduction

Incubation is a technology that provides an opportunity for farmers to produce chicks from eggs without the consent of the mother hen. The developing chick in an egg is called the embryo, and a careful study of the different stages of embryonic development is performed. A broody hen, raised to hatch eggs and raise the chicks, can hatch just about 10-12 eggs at once in 21 days, which reduces its productivity as it takes time to incubate and hatch the chicks. This research aimed to produce a low-cost user-friendly modern incubator to increase the production of day-old chicks for small and medium-scale poultry farmers. The incubator has a hatching capacity of 100 eggs. Factors that were considered during the performance evaluation of the incubator were humidity, 55%, and temperature, 37° C during the first 18 days, and were maintained at 37.5 °C till hatching.

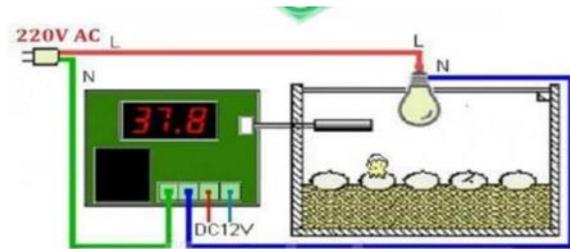


Fig. 1. Block Diagram of Egg Incubator

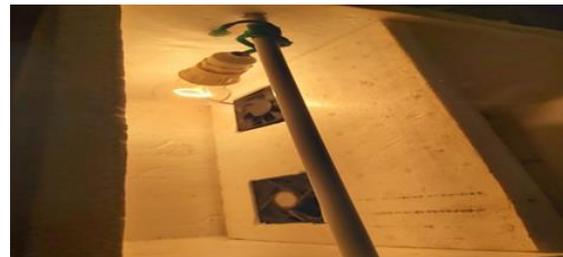


Fig. 2(a) Heat Source

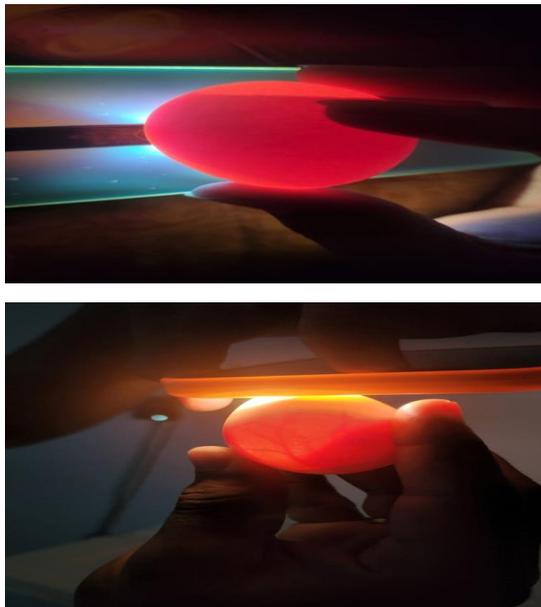


Fig. 2(b) Egg Mover Mechanism



Fig. 2(c). Temperature Controller Working  
First the incubator is positioned at 37° C

i.e., approximately at 99<sup>0</sup> F. The eggs are placed in the normal position for the first day. The temperature gradually increases and is circulated throughout the incubator with the help of fans. The process is carried out by rotating the eggs approximately around 90<sup>0</sup> every day in a daily routine so that all the parts of the egg receive equal amounts of heat. After 18 days the temperature of the eggs is decreased by 0.5 to 1<sup>0</sup> C which accelerates the rate of hatching. Later the chicks which were developed in the eggs grow a sharp nose and break the outer shell of the egg and the hatching is completed by the 21<sup>st</sup> day.



**Fig. 3.** Embryo Growth

Both figures show the periodic growth of the embryo inside the egg. Checking this growth is called the Candling Process.



**Fig. 4.** Hatching

### Advantages

1. Eliminate the problem of seasonal hatching.
2. More Accurate than real hatching
3. Massive Hatching.

### Conclusions

The constructed incubator can accommodate hundreds of eggs which the natural method is short of doing. Apart from that, the eggs fertilized well with little or no affected eggs. This work which focused on the design, construction, and performance of an egg incubator consumes less power and does not require the continual presence of the operator. The machine will boost poultry farming in the country.

## 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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