

# Design and Analysis of Ultrasmall Power Generator

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**Abstract:-** In the field of power generators, electrical power plant has a great contribution in the world. It is popular due to having efficient and reliable form of clean source of renewable energy. But, these new technologies can be an excellent method of harnessing renewable energy from solar, wind and small rivers and lakes. This technology is mainly designed to be a run-of-river type, because requires very little or no reservoir in order to power turbine. That technology increases the efficiency. This technology means that, the three non-Conventional energy sources producing electrical energy. This has a minimal environmental impact on the local ecosystem. This technology is applied in Hydro power plant. The output for the power generation is also increases

**Keywords:-** Power Generation, Electricity, Solar Energy, Wind Energy.

## I. INTRODUCTION

Man has needed and used energy at an increasing rate for the substance and well-being since time immemorial. Due to this a lot of energy resources have been exhausted and wasted. Proposal for the utilization of solar, wind and tidal energy is very much relevant and important for highly populated countries like India where the villages and urban sectors suffering till now due to lack of electricity seasonally. Nowadays energy power is the one of the basic needs in this modern world. Energy demand is increasing day by day. On the other hand, the many energy resources are getting exhausted and wasted. All these natural resources and obtained daily. This whole energy is wasted. If this energy made possible for utilization, then it will be a great invention. In this project we are converting nonconventional from just walking footstep into electrical energy. This project uses simple mechanism such as Rotor and panel assembly. The control mechanism carries the rotor moment and panel output to the inverter to show output. We have discussed the various applications and further extension. Non-conventional energy system is very essential currently to our nation. Nonconventional energy using renewable resources needs no fuel input power to generate the electrical power. We have discussed its various alternate applications with extension also. The power generation is much worthy, and it does not require much initial cost-effective factors.

## ➤ Ultra-small Power Generator:

In this we have many major components, solar panel, wind turbine, DC motor, universal motor, PVC pipes, pine wood, ball bearing and shafts. shaping today's power generator. Used in remote areas to generate electricity to make their life easier. From this source it will be more help full to produce the power energy in one way or another. From this element we can use multi-source at a time like wind, solar energy, hydro energy.

From this combining all the three form in one elemental source so that it can produce more energy at a time in different manner.

## II. LITERATURE SURVEY

These papers help detailed information related to calculation like Total tractive effort, wheel torque, battery runtime and distance travelled by the vehicle. It gives idea related to motors which are suitable for electric vehicle. It also gives main difference between lithium-ion and lead-acid, which one is more efficient, high durability.

- “Analysis of different types of motors for the use in electric vehicles” Sasha the induction motor is the best choice for high power electric vehicle applications. The brushless DC motor is a viable choice to be used in low power electric vehicles such as electric auto-rickshaws and two –wheelers.
- Comparison of Burnetel this study types for electric Vehicles Ichodean1, B Vargal, N Burnetel, this study presents the autonomy of an Electric Vehicle that utilizes four different types of batteries: Lithium Ion(Li-Ion), molten salt(Na-NiCl2), Nickel Metal Hybride (Ni-MH) and Lithium Sulpur(Li-S).
- “Automotive Chassis1 Design Material selection for Road and Race Vehicles “Shiva Prasad U, Athota Rathan Babu. This work is oriented towards the material usage in the road and race vehicle chassis in the automotive industry.
- Yu Munkata et al made an external motorised system for driving a manual wheelchair with an active caster. In spite of a single drive wheel, 2DOF of the wheelchair is achieved with an active caster drive system that is controlled independently without any constraint.
- California polytechnic State University, A Luis Obispo and Hochsdule Munchen, school of applied sciences jointly designed and built a working portable and detachable hand powered rear will drive wheelchair. They

took local resident points over previous generation wheelchairs and designed a new electrically powered wheelchair.

- Dafne Zulema Morgado Ramirez and Catherine Holloway studied both physical and nonphysical barriers that a wheelchair user faces while operating it. On interviewing many wheelchair users, they found that those who propelled wheelchairs by themselves are prone to upper limb injuries resulting in upper limb joint pain and reducing muscular strength.
- Girish Khope, Rajesh Pandlik Mali, Onkar Pramod worked on the electrical attached of wheelchair for handicapped person.
- Winai chanpeng, Prasert Hachanont worked on design on efficient in wheel motor electric vehicles.
- Askari Mohammad Bagher, Mirzaei Abadi Vahid, Mirhabibi Mohsen. -Types of Solar Cells and Application!. American Journal of Optics and Photonics. Vol. 3, No. 5, 2015.
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#### A. Problem Statement:

A village is considered electrified if it possesses basic electricity infrastructure and 10% of its homes have access to power. However, nearly one-fifth of India rural householders (around 31 million) still remain in acute darkness. The government is committed to reaching these households through the Saubhagya scheme by 31 December 2018- a deadline that has been moved up from 31 March 2019. The Projects ambition is praiseworthy. But is it enough?

The resident of village in the village in the Saurikh area of Uttar Pradesh Kannuj have alleged that electricity connections of their houses were snapped after they refused to take COVID vaccine jobs. India Faces a terrible power reliability situation. Rural electrification by itself means little when load shedding and power outages are frequent enough to make the term a mere technicality. Thus, Dipti Jain notes in Mint, only six states had, on average, 24hours power supply in rural areas as of December 2021. This lack of reliability often discourages households from adopting electricity, which disincentives discoms, thus undermining investment in rural electrification. This makes power supply even more unreliable, perpetuating a vicious cycle. Even resources of fossil fuels is the fundamental need for the survival of mankind. We have only about 25 years of oil reserves and 75-100 years of coal reserves.

Electricity is created by fossil in the power generators. If fossil fuels run out one day, electricity failure will happen. This will produces an undesirable occurrence in hospitals in low-to-middle income countries. Global Transportation is the reason that humans can survive through covid-19. Without fossil fuel, essential items such as masks and PPE are unable to reach to other countries in time. Without global

transportation, food chain logistics will be badly affected. Restaurants will be the first industry to shut down in batches. International trade would grind to a halt. The global economy will be constrained to a semi-local condition as there will be no more fuel to move products around. Foreign goods would become expensive. National economies that depends on international trade would sink into a deep economic depression.

#### B. Motivation for the Proposed Work:

As the availability of conventional energy declines, there is need to find alternate energy sources. All most all the state electricity departments in our country, they are unable to supply the power according to the demand. The power produced by these companies is not even sufficient for domestic utilities; in such critical situation it is very difficult to divert the energy for other public needs. There by an alternative source must be discovered, many people propose for solar energy, but it is going to be a costliest affair, moreover availability of solar energy is poor particularly in rainy & winter seasons, as a result it is not dependable. Hence an alternative cheapest method must be determined for few applications; consequently, this project work has been taken up, which is aimed to generate electricity from other renewable resources, mainly the tidal power. Out of the many alternative energy resources, this technology described in this project report is the ultimate source of all known forms of energy. It is clear, safe, and free, does not pollute the environment.

#### C. Overall Aim:

To eliminate the dependence on only one source of electricity

#### D. Objectives:

- In this project we are converting mechanical energy into electrical energy.
- Through dynamo the rotational energy is converted into electrical energy
- This electrical energy output will be shown by glowing the LED's or showing output in a multimeter.
- Mainly by our arrangement we are converting the renewable energy into rota motion of the dynamo.
- We are trying to utilize the wasted energy in a useful way.

### III. METHODOLOGY

The rotary motion by renewable resources is used to generate the electric power. Now a day's power demand is increased, so the renewable energy is used to generate the electrical power in order to compensate the electric power demand.

**IV. PRESENT WORK**

In this process we have major components such as solar panel, wind turbine, DC motor, universal motor, dynamo, PVC pipe [for spiral blade], pine wood [for the frame], ball bearings and shafts.

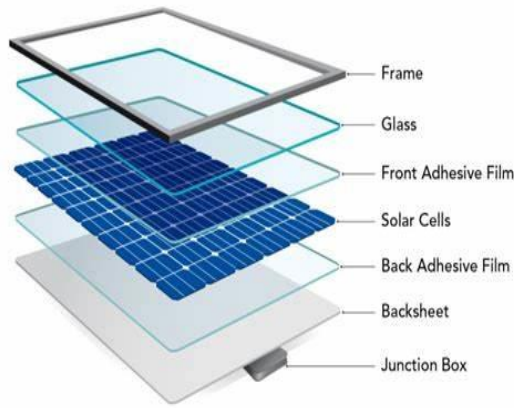


Fig 1: Solar panel

In this arrangement the mechanical energy is converted into electrical energy. Such an arrangement of a solar panel (Fig 1: Solar panel) wind fan (Fig 2: Wind mill) and a spiral blade water turbine are mounted together on a single frame as to combine all three energy and obtain high generation of electricity.



Fig 2: Wind mill

Solar panels are used to obtain the solar power, similarly wind fan is used to obtain wind energy. Where in as tidal power (Fig 3: Water turbine) it varies. A slant frame is used which blocks straight flow of water and pressurises by downward movement of the plate and water flows through spiral blade which results in rotation of the shaft of an electrical generator fitted in the device, to produce electrical energy.

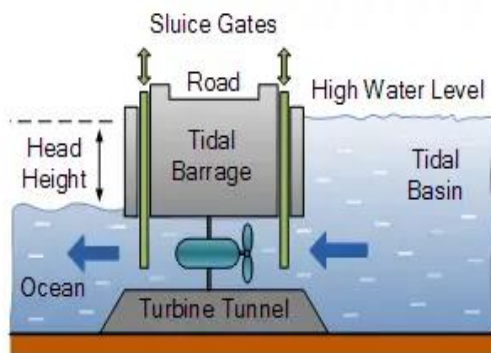


Fig 3: Water turbine

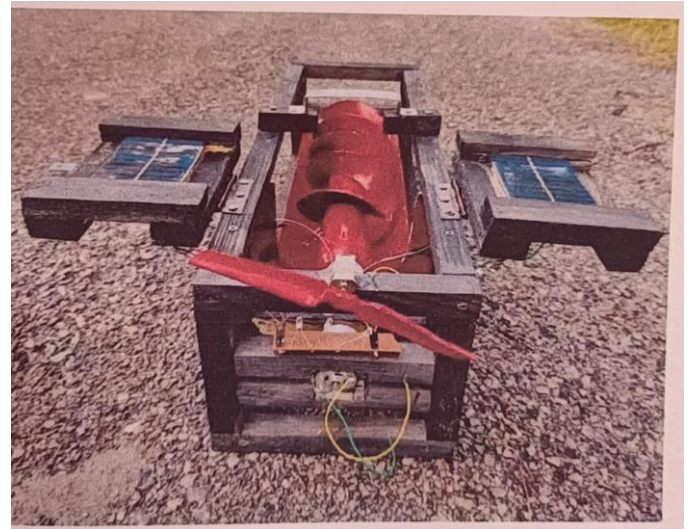


Fig 3: Finished model (Side view)

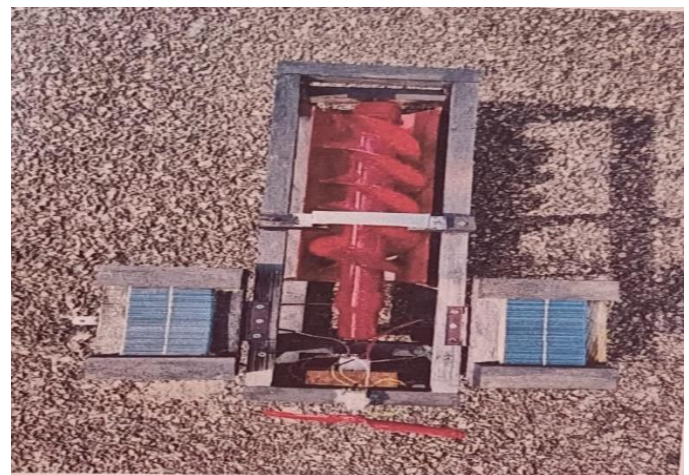


Fig 4: Finished model (Top view)

At first the PVC pipe is cut and blended to form a flat shape on that the circle is marked to form the blades and then we have to cut the inner circle part to make a hollow circle. In the next step we will bend and make it into the shape of blades and next we have taken another PVC pipe which will act like support to which the blades made in the previous step will be attached. Then we have used glue to stick blades to the pipe and also we have added metal paste for better rigidity. Next we have painted and then mounted on the outer framework which is made of pine wood. Then we have connected one end of the shaft to dynamo and other end to the frame and then solar panels and wind turbine to the frame (Fig 3: Finished model) and then lastly connecting the all output source to light.



## V. COMPONENTS AND MATERIAL SELECTION

### ➤ Solar Panel

Two solar panels (Fig 5) are used. Its dimension are 70\*70\*3mm. Its works supply current and voltage to 6V and 100 Ma.



Fig 5: Solar panel

### ➤ Wind Turbine

A mini horizontal axis wind turbine with 5 blades. Compared to the traditional three blade wind turbine, a five-blade turbine can increase annual performance by more than 60%.(Fig 6)



Fig 6: Wind turbine

### ➤ Universal Motor.

It is a type of electric motor. It is like a DC series motor. It operates AC and DC (Fig 7). Its Advantages are high starting torque, can run at high speed, and are lightweight and compact.



Fig 7: Universal motor

Then, PVC pipe also used for Easily flow of water can be done at frame using pine wood and also these material is used to Design a Spiral Blade. Two ball bearings are used. Its outer diameter and inner diameter is 20mm and 10mm. At last material The Two Shafts are used at different category it's length and diameter is different.

## VI. RESULTS AND DISCUSSION

In our model prototype the three sources of energy to produce the electricity are solar energy, wind energy and water turbine by combination of these three we can get a maximum output of 20 volts. This is possible only when all three components are producing there maximum, but this will not be the case always. As our model is highly weather depended

The solar panel we have used can produce a voltage of about 6V if we use two of them then we can get 12 volts. For wind turbine also we can produce 3-5V. Through spiral blade arrangement motor we can produce on average of 7V. But during winter season the solar panel will not be able to perform it's best because there will not be enough sunlight. In a similar way during the summer season there will no water flow hence the working of the spiral blade will be near to nil. Also, performance of the wind turbine depends on the direction of flow of the wind and the aerodynamics of the structure.

But the main advantage is that it will be able to perform at all the conditions even one of the components will work and will be able to produce on an average of 25V which is enough of lighting at least LED bulbs which can be used in house hold to save electricity and also help during the emergencies, like during the heavy rain season there is a maximum chances of electricity cut due to various reasons like falling of trees on the electricity line and other damages due to heavy rain during these time periods we can rely on power generator.

We can also save the non-renewable resources like fossil fuels and petroleum products which are depleting in an alarming range. We can also develop a model to increase the output by using low weight material for outer frame and the whole-body weight can be decreased by fabricating suitable low weighing material and speed of the hydro turbine can be increased by researching on design of blade shape and by using high quality

## VII. CONCLUSION

At last, in this model, we have achieved our idea of producing electricity by 3 means of non-conventional energy devices. The energy produced here will be of 12-16 volts in this miniature model which can be extended up to 240volts in bigger instances through turbine. Solar panel produces up to 12volts of energy, wind turbine also produces 12volts of energy. This concept of model is very helpful in all seasons to produce electricity. This can make independent energy production for any house can exempt the dependency up to 70 to 80% from public domain. Depending on the battery or electricity required we can extend the capacity of model.

Even the outer frame and the whole-body weight can be decreased fabricating suitable low weighing material and speed of the hydro turbine can be increased by researching on design of blade shape and by using high quality bearings. As we mentioned earlier by developing this idea further, we will be able to use this for powering of streetlight, now majority of cities are using solar light as the streetlight but during rainy






season these lights fails to perform at that time we can use our model, by making a fine pathway for the flowing of water and placing our spiral blade arrangement water turbine to provide power to the street. This will be a game changer as we are using the waste energy and there will be no harm to environment whatsoever by this process.

Lastly, the future scope would be that we can mount external battery storage to use as UPS in home during power cuts in rainy season in Remote.

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