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Onshore Integrated Wave And Solar Power Generation

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Abstract: ***Energy crisis is now being one of the most significant issues faced by man. Hence studies are going on for finding new cost effective energy sources. Since the use of fossil fuels have led to a stage where the CO2 emissions are being at a higher scale causing environmental pollution, and also the fossil fuel sources are getting drained out, maximum studies are now towards environmental friendly renewable energy sources. One such unexploited source is the ocean waves. We can convert the energy obtained from tides into useful forms of power, mainly electricity. Although not yet widely used, tidal power has potential for future electricity generation. Tides are more predictable than wind energy and solar power. In this situation, we have come up with a project aiming at producing electric power from wave energy, also accompanied by a solar power generation system, and the prototype is meant to be installed on sea shores.***

Keyword: Renewable energy, wave energy, Non conventional power production

I. INTRODUCTION

The main problem faced by the global economy is energy crisis. Hence studies are going on for finding new cost effective energy sources. Due to the increasing environmental issues and pollution out of control, we have reached a stage where green energy technologies are inevitable. Since the use of fossil fuels have led to a stage where the carbon dioxide emissions are being at a higher scale causing environmental pollution, and also the fossil fuel sources are getting drained out. The science and research wings around the world are after new renewable and non conventional energy sources. One such unexploited source is the ocean waves. We can convert the energy obtained from tides into useful forms of power, mainly electricity.

II. LITERATURE REVIEW

- ✓ *Kesayoshi Hadano: "Wave energy conversion utilizing vertical motion of water in the array of water chambers aligned in the direction of wave propagation", Dept of Marine Environmental Engineering, Yamaguch University, Japan*

  Wave energy converter by using vertical motion of water in the multiple water chambers were developed to realize actual wave power generation as eco-environmental renewable energy**.**
- ✓ *S.A. Sannasiraj: "Assessment of wave energy potential and its harvesting approach along the Indian coast", Dept of Ocean Engineering, IIT Madras, India.*

  Energy market is highly volatile due to large oscillation in the fossil fuel prices, the high energy demand is partially met non conventional energy sources such as wind, tidal and solar energy.

II. METHODOLOGY

As a new technical approach, wave energy converter by using vertical motion of water in the water chamber was developed to realize actual wave power generation as eco-environmental renewable energy. And practical use of wave energy converter was actually to require the following conditions: (1) setting up of the relevant device and its application to wave power generation; (2) workability in installation and maintenance operations; (3) high energy conversion potential; and (4) low cost. In this system, neither the wall of the chambers nor the energy conversion device, are exposed to the impulsive load due to water wave. Also since this system is profitable when set along the port, jetty or along a long floating body, installation and maintenance are done without difficulty and the cost is reduced. In this project, we have made a system which consists of a float, a shaft connected with another shaft, a rack and pinion arrangement, a unidirectional drive, and rotary type generator. This unit can be cascaded and installed on feasible port, jetty etc for medium scale energy harvesting.

III. LAY OUT AND DESIGN

The design that we have come up with is small in size and is simple in construction compared to other projects which makes use of hydraulic arrangements and turbines. A layout block diagram representing the different units comprised in the proposed design of our project is shown in Fig

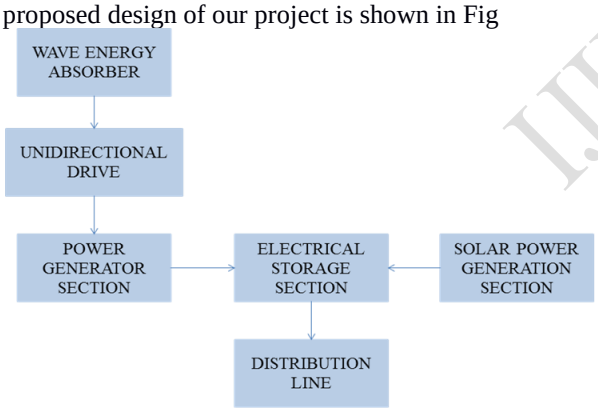

Figure 1

IV. DESIGN

A 3D detailed cad drawing of the proposed model has been designed with the help of modeling software google sketch up pro 2015.

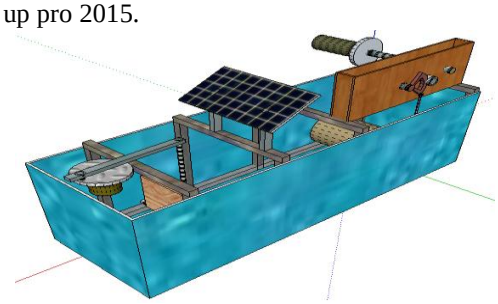

Figure 2: CAD model of the proposed design

V. COMPONENTS

The main components used here are

- ✓ Float drum
- ✓ Rack and pinion mechanism
- ✓ Universal direction drive
- ✓ Power generator
- ✓ Solar panel

RACK AND PINION MECHANISM

A rack and pinion is a type of linear actuator that comprises a pair of gears which convert rotational motion into linear motion and vice versa. A circular gear called "the pinion" engages teeth on a linear "gear" bar called "the rack"; rotational motion applied to the pinion causes the rack to move relative to the pinion, thereby translating the rotational motion of the pinion into linear motion.

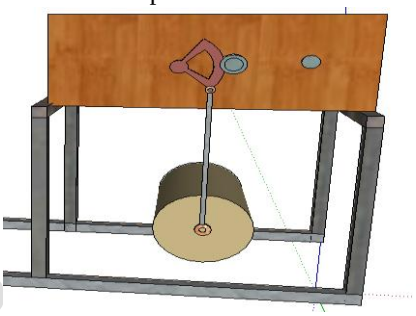

Figure 3: Rack and pinion

FLOAT DRUM

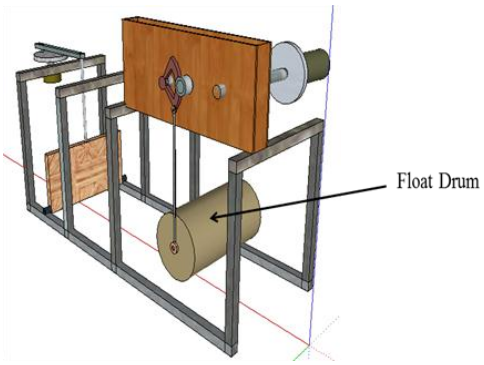

Figure 4: float drum

UNIDIRECTIONAL DRIVE

It converts the bidirectional movement of rack and pinion into uni directional movement

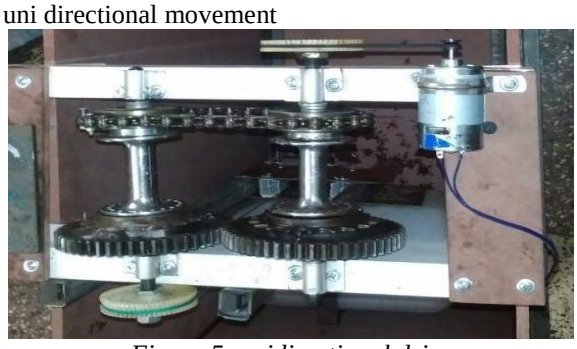

Figure 5: unidirectional drive

VI. WORKING TECHNIQUE

The device works by converting the kinetic energy of waves to mechanical energy and then to electrical energy. A wave generating mechanism is provided for making waves in the working model. A drum floats on water which is connected to a rack and pinion arrangement. Waves cause the drum to move up and down, causing reciprocation to the connecting rod. The reciprocation is converted to unidirectional rotation by the UDD. The unidirectional rotation is used to generate electrical power by a generator unit.

VII. DESIGN CONSIDERATIONS

- ✓ Water reservoir is used instead of installing a unit on the seashore

Due to the difficulty in doing the project in an actual sea shore, the design included a water reservoir instead of the sea water over which the unit is meant to be installed.

- ✓ A hand operated wave generation mechanism is used

Since the project is not done on an actual sea shore, and thus sea waves are not available, a water reservoir is made and artificially created waves are used to show the working of the unit.

- ✓ Less power production scale.

Due to the limitations in project cost, the design had to be limited to a small scale. Thus the power production from the unit is comparatively small. This model can be further made to large sizes and scales and also by cascading the units along waterways, jetties, ports etc to produce certain megawatts of power.

VIII. CONCLUSION

Energy crisis is now the main problem faced by man. Studies are going on for finding new energy sources, which is also consistently available for the future. Among the renewable energy sources, the least exploited one is the wave energy. Kerala is most suitable for harvesting wave energy. In this situation, we find our project relevant and very useful.

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