Wave Energy Converter

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Abstract- *We have developed an innovative technology that produces clean power supply from ocean and sea waves. Wave energy converter generates clean and affordable electricity, using a simple design that allows the wave energy converter uniquely shaped floaters to be attached to existing man-made structures, and thereby simplifying the installation process, as well as maintenance and accessibility. In this wave energy converter we have found two different techniques to generate electricity, first one is to convert kinetic energy of water into mechanical energy and mechanical energy to electric energy by rotating barrel for power generation and second one is As the waves come, they create an up and down movement and mounting rack & pinion system. Driving the rack linearly cause the pinion to be driven in a rotation. Which rotate a generator, turning this motion into power supply mode. The aim of this wave energy converter is to generate power by two different techniques from ocean waves.*

I. INTRODUCTION

Wave is available 90% of the time compared to wind and solar resources which are available 30% of the time. Wave energy provides somewhat 15-20 times more energy per square meter than wind or solar. There is approximately 8000-80000 TWh/year or 1-10 or wave energy in the entire ocean, and on average, each wave crest transmits 20-50 kW/m.

Many type of wave energy convertor are used to convert kinetic and potential energy of moving wave of ocean into electrical energy. Like,

1. Wave activated bodies
2. Oscillating water column
3. Overtopping Devices
4. Point absorbers
5. Attenuators
6. Terminators

Floater type and gilbarator type wave energy convertor working principle is the wave come they create up down movement of floats and this floats is connected to Rack and Rack is attached with Pinion. So motion of Rack is up and down and Rack is rotated to pinion which rotated a generator turning its motion into electrical power. But this type of wave energy convertor in two stroke of rack forward and backward but energy generation in only forward stroke. During backward stroke energy is not produce and efficiency of this wave energy convertor is low.

This wave energy convertor increase the efficiency we decide to design the rotating barrel and generate electricity energy by two different techniques.

II. CONCEPT AND METHODOLOGY

The main concept of wave energy convertor is convert wave energy of ocean into electrical energy. This device produces electricity by two different techniques.

First one is convert kinetic energy of water into mechanical energy and mechanical energy to electrical energy by rotating barrel. Second one is waves are comes and create up and down movement and mounting rack& Pinion system.

Driving the rack linearly will cause the pinion to be driven into a rotation. Which spin a generator, turning this motion into electricity. The aim of this wave energy converter is to generate electricity by two different techniques from ocean and sea waves.

The concept of this project is to increase the efficiency, increase the electrical power generation, decrease or reduce capital cost, reduce the production cost of electrical power and reduce size and weight of wave energy convertor and generate environment friendly power.

III. DESIGN AND IMPLEMENTATION

Rotating barrel

In the first design we decide the material of rotating barrel use mild steel. But we face a problem regarding weight of barrel, corrosion problem and high cost of material.

Then we decide to use PVC material, PVC is light in weight, corrosion resistance and good strength and cost is also less. So decide to use this material to manufacture for barrel.

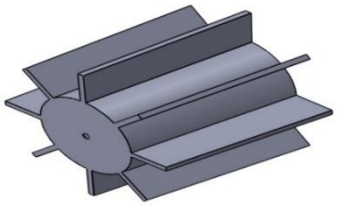

Fig.3D design of Rotating Barrel

Fig. Actual design of Rotating Barrel

Blade of the Rotating Barrel

In the first design we decide to blade material of barrel use stainless steel. But the weight of the barrel is increase and cost of stainless steel is high, so we decide to use wood material for the manufacture. Wood is lightweight, corrosion resistance, less cost and easily available. It is also use to build a boat.

Fig. Blade of Rotating Barrel

Flange:-

In the first design we decided the material of flange use mild steel. But then we face some problems,

1 Corrosion problem
2 Weight is higher
3 Cost is high

Then we decide to use aluminium material. It is the best material for flange because Light in weight, Strong, Corrosion resistance, Non-toxic, Heat conducting.

Fig. 3D design of Flange

Fig. Actual design of Flange

The mostly parts of wave energy convertor are manufacture in mild steel like 1.Rack & pinion, 2.frame, 3.pulley, 4.nut-bold, 5.shaft. Because Mild steel is efficiently malleable, Compare to high carbon steel mild carbon steel is lighter, greatly affordable, strength is higher than PVC material.

Fig. Rack and pinion

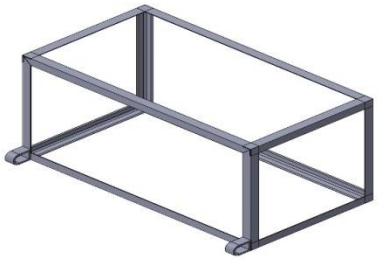

Fig. Frame-1

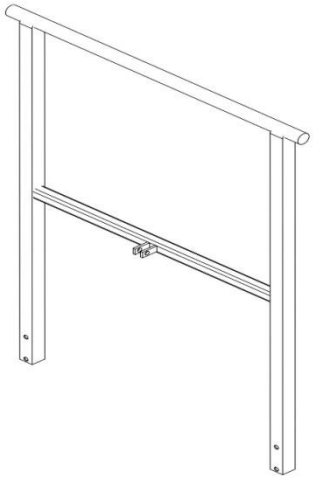

Fig. Frame-2

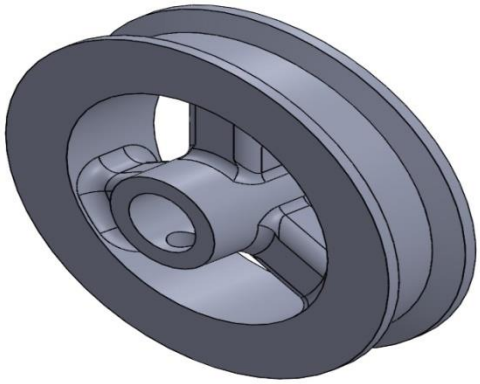

Fig. Pulley

IV. MAIN COMPONENTS OF WAVE ENERGY CONVERTER

1. Rotating Barrel
2. Rack n Pinion
3. Float
4. Pulley
5. DC dynamo or DC generator
6. Bearing
7. Frame
8. Shaft
9. DC battery
10. Inverter circuit

Rotating Barrel:-

Rotating barrel is main component of the wave energy convertor. A rotating barrel convert the kinetic energy of falling water into mechanical energy. Then generator

convert the mechanical energy from the rotating barrel into electrical energy.

Rack and Pinion:-

A rack and pinion is type of linear actuator that comprises a circular gear engaging a linear gear, which operate to translate rotational motion into linear motion or linear motion into rotational motion. Driving the pinion into rotation causes the rack to be driven linearly. Driving the rack linearly will cause the pinion to be driven into a rotation. Pinion is connected to DC dynamo.

Float:-

The main function of float is to rest or remain on the surface of a liquid be buoyant. The hollow cylinder is floated. Floats as support to rotating barrel and rotating barrel is floated on the surface of water.

Pulley:-

A pulley is a rope or wire wrapped around a wheel. It changes the direction of force. A basic compound pulley has a rope or wire attached to a stationary point looped around one wheel and then around a second wheel. Second wheel of DC dynamo.

DC dynamo or DC generator:-

A DC generator is an electrical machine which converts mechanical energy into direct current electricity. Construction of direct current dynamo. It mainly consist of three main parts magnetic field system, armature, commutator and brush gear.

Bearing:-

Bearing is most important component in wave energy convertor. A bearing is a device that is used to enable rotational or linear movement, while reducing friction and handling stress. Into this device plastic casing bearing is used.

Frame:-

The main function of frame in wave energy convertor are to support the device's mechanical components and body. To deal with static and dynamic loads, without undue deflection or distortion.

Shaft:-

A shaft very important component in wave energy convertor. Shaft is rotating machine element, usually circular in cross section, which is used to transmit power from one part to another, or from a machine which produces power to a machine which absorbs power.

DC battery:-

Battery is electrical device. Main function of battery store DC electrical power from DC dynamo. DC battery used to direct current which flow in single direction.

Inverter circuit:-

Inverter circuit is an electrical device. The main function of invertor circuit convert direct current to alternating current. Inverter circuit is used to convert 12V DC current to 220-240V AC current.

V. CONCLUSION

We have to carefully manufacture of this device as we required electricity with maximum efficiency. This wave energy converter have higher efficiency than other devices.

We have carefully design and manufacture this device to obtain or produce maximum electrical energy by two different working principle.

First we need to convert kinetic energy of water into mechanical energy and mechanical energy to electrical energy by rotating barrel, then secondly waves are come as they create up-n-down movement and mounting rack and pinion system. Driving the rack linearly will cause the pinion to be driven into a rotation, which spin a generator turning this motion into electricity. The aim of this wave energy converter is to generate electricity by two different ways from ocean and sea waves.

Capturing wave energy and converting it into electricity is difficult allow for innovate devices to design. Technology produces no greenhouse gas emissions making it a non-polluting and renewable source of energy.

The selection of material is very important process in design of wave energy converter. The material are required light in weight, corrosion resistance, low cost, good strength, and easily available. So we decided to use aluminium, PVC, wood and M.S. material to manufacture different components of wave energy converter.

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