2014 3rd International Conference on Micro Nano Devices, Structure and Computing Systems(MNDSCS 2014)

2014 International Conference on Power Engineering, Energy and Electrical Drives (PEE 2014)

March 1-2, 2014,Singapore

Conference Program Guide

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MNDSCS 2014

2014 3rd International Conference on Micro Nano Devices, Structure and Computing Systems

Abstract

March 1-2, 2014, Singapore

Table of Contents

Certificate

Part I Conference Schedule

Singapore, February 28, 2014		
Time	***Activity***	***Location***
10:00-17:30	Registration	Holiday Inn Singapore Atrium

Singapore, March 1, 2014		
Time	***Activity***	***Location***
09:00-09:30	Opening Ceremony	Holiday Inn Singapore Atrium
09:30-10:20	Plenary Speech Prof. Gerald Schaefer	
10:20-10:40	Coffee Break	
10:40-12:00	Oral Session 1 PEE 2014	
12:00-13:00	Lunch Buffet	
14:00-18:00	Oral Session 2 MNDSCS 2014	

Singapore, March 2, 2014		
Time	***Activity***	***Location***
09:00-12:00	Free Talk	Holiday Inn Singapore Atrium

Part III Oral Sessions

Oral Session 1: PEE 2014

Time: 10：40 - 12：00 March 1

Oral Session 2: MNDSCS 2014

Time: 14: 00 - 18: 00 March 1

MNDSCS 2014 Content

Applying of Piston Mechanism Design used in the Wavelength Electrical Generating of Ocean for Fishing Communities

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Abstract. Pneumatic mechanism widely used in industrial, automotive, aerospace, and etc. The principle of pneumatic like piston is move up and down due to the air pressure inside the piston. Mechanism of piston can be applied to the power plant that utilizes the ocean waves where as use of piston mechanism is very helpful in solving the problem of fossil fuel scarcity as a source of energy in power plants. In this study we will focus on the pneumatic system which utilizing ocean wave that moves longitudinally to encourage buoy that located on the piston shaft to up and down and then the pressing of air out of piston. Output of the piston will be forwarded to the generator (rotor and stator) to produce a voltage. In this paper is focused on the manufacture of pneumatic systems and processes to produce the rotation and voltage. Material of piston tube component made of aluminum and rubber, buoys made of plastic and generator such as of metal and copper coils. Output of the piston will be forwarded to the generator (rotor and stator) to produce a voltage. In this paper is focused on the manufacture of pneumatic systems and processes to obtained the rotation and voltage with aluminum for piston tube material, buoys made of plastic and magnet rotor and copper coils of stator include on the generator and get the results of ocean wave power plant using piston mechanism is 1400 rpm with a voltage of 36 volt.

Introduction

Ocean wave [1, 2] is a resources the energy that can be used as an alternative source of power generation beside on hydropower [3], diesel, solar and others. Some devices of the ocean wave that can be used for ocean wave power plant [1, 2, 3, 4, 5] is Pelamis (Ocean Power Delivery), Oscillating Water Column [2, 6, 7], Wave Surge, Salter Duck, Cockerel Raft and Piston. Advantages of ocean wave power generation system is cheap and easy to manufactured, require no fuel and environmentally friendly [4] but the resulting voltage is unstable due to the movement of the waves are not constant. To overcome this drawback can be done by using battery or electrical energy storage.

Piston mechanism is a tool or machine which can be used for ocean wave power plant. The principle of piston mechanism is using height of ocean waves to push the buoy on the shaft moves up and down. The piston movement pushes the air in the tube piston to rotating rotor in the generator that mounted on the piston tube. Rotation of magnet of rotor and combination with the coils of stator on the generator will be converted into a voltage. The amount of rotation and voltage depends on the dimensions of the piston tube and generator system such as magnet of rotor and coils of stator. For the big dimension of piston tube and amount of high coils of stator and magnet of rotor would be resulting of high rotation and voltage. Therefore in this study we will focus on the manufacture of mechanical and electrical parts for machine of ocean wave power plant which consisting of a piston and a generator that was placed in the vessel.

In this research obtained the Performance of ocean wave power plant without loading test with highest rotation appears at 1400 rpm with a voltage of 36 volt

Components of Ocean Wave Power Plant

Power generation system has two main component are the mechanical and electrical components. Mechanical component is used for processing of the mechanic energy to electric energy through up and down motions of the piston shaft in the piston to push of air out inside piston and rotate the magnet of rotor in the generator. Generator have two main component are magnet of rotor and coils of stator. Mechanical energy resulting by piston will be rotate the magnet of rotor in generator and then by rotate magnet of rotor and combine with the coils of stator can give the result of voltage.

The main component of the ocean wave power plant can be seen in Fig. 1 and the dimensions in Fig. 2. Figure 1 show that the main components of the machine of ocean wave power plant such as a piston tube, piston shaft, buoy and generator (rotor and stator). Dimensions of the main components is piston tube diameter and height is 230 mm and 417.38 mm, for piston shaft is length 1.5 times the height of the tube axis, size of buoys is 112 mm in diameter and tube length 217.85 mm. the number of tubes 3 pieces as shown in Fig. 2 and outlet diameter of air is half -inch of diameter pipe 0.25 inch.

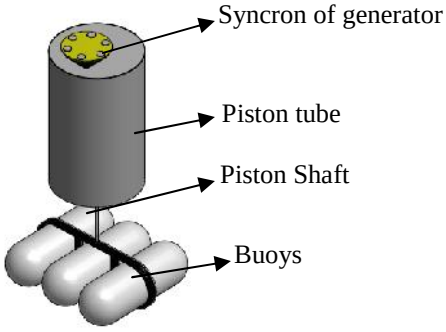


Figure 1. Piston and Generator

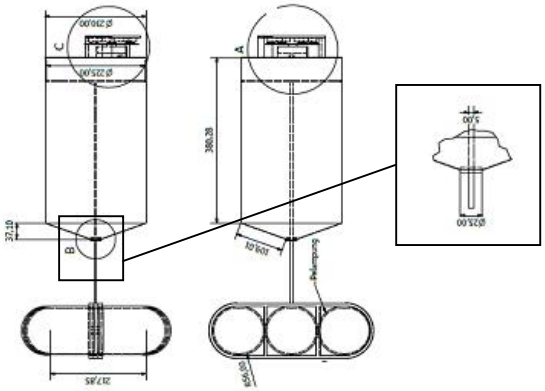


Figure 2 Dimensions of Component Piston and

Manufacture Process of Mechanical Components on the Ocean Wave Power Plant

The manufacture process of mechanical component such as piston (see Fig. 3) is done with the cutting process, rolling process and soldering. Stages of the process are:

1. Manufacturing process of piston tube
   The manufacturing process of piston tube is cutting of aluminum plate and then rolling process for shapes of cylindrical tube. Then connected the piston tube with close of piston tube by soldering and making hole in the center of piston tube about half of 0.25 inches diameter of outlet air in the piston tube.
2. Manufacturing process of piston shaft.
   Piston shaft is made from steel mounted in the piston tube and having thin rubber or acrylic material as cylinder plate for push of air in the piston tube to outside the piston tube. Air flow from output of piston tube goes to generator and rotates the magnet of rotor. Cylinder plate of piston have dimension is 225 mm for diameter and 8 mm for thickness.

Rotation Testing of Mechanical Component on the Ocean Wave Power Plant

Measurements test of rotation will be do after mechanical components ocean wave power plant is assembled. Measurement process of mechanical components and rotate of rotor can be seen in Fig. 4. The results show that the value of rotation is 1400 rpm with outlet diameter of air 0.125 inches.

Electrical Component on the Ocean Wave Power Plant

Electrical component on the ocean wave power plant consisting of magnetic components, coil winding, battery and inverter where as this component is useful as a producer of voltage. Magnetic component is known as rotor and coils component is stator. Rotation of rotor is converted into a

voltage through the magnet and the coil windings are mounted on the top of the piston tube. Results of voltage are stored by the battery and will be converted to AC voltage through an inverter.

The output of voltage and current depends on the type of magnet and coil number of windings. In this study neodymium is used for type of magnet with dimension of diameter is 25 mm and thickness 2 mm. the number of magnet neodymium is 6 pieces and also coils of rotor same as amount of magnet neodymium. For coils of rotor have 5000 and 6000 winding with different diameter of coil such as 18 mm, 20 mm, 12 mm and 15 mm for inner diameter coils and 40 mm, 35 mm, 41 mm and 51 mm for outer diameter of coils. Figure 5 and Fig. 6a show the shape and size of the coil windings and neodymium magnet and testing of performance of magnet of neodymium is seen in Fig. 6b. Figure 6a shows the mechanical and electrical components of ocean wave power plant that is assembled. In Figure 6a shows that the rotor and magnet mounted on top of piston tube and coil of stator placed on the top of magnet of rotor.

a. Close up of

b. Tube of piston

c. Piston shaft

Figure 3. Component of Piston

a. Rotation Testing of rotor

b. Rotor

Figure 4. Rotation Testing of rotor

a. L1

b. L2

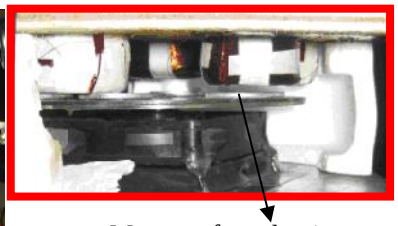
c. L3

d. L4

e. Coils of stator

Figure 5. Coils of Stator

The battery are used in this study for anticipate unstable voltage fluctuations caused by the ocean wave conditions. It is may influence electrical equipment such as lights. The battery has specifications voltage and capacity 12 Volt 18 AH. DC voltage from the battery is converted into AC by using an inverter. Inverters specifications are 12-volt DC voltage and 220 -volt AC voltage with a capacity of 150 watts. Figure 7 shows the battery and the inverter used in this testing of performance of ocean wave power plant.



Magnet of neodymium

a. Magnet of neodymium

b. Current testing of magnet of neodymium

Figure 6. Testing of Rotation and currents of magnet

Performance testing of Ocean Wave Power Plant

The process of testing electrical component on ocean wave power plant is seen in Fig. 8. Table 1 show the value of rotate of magnet of rotor and voltage results from ocean wave power plant with piston mechanism. The Performance of ocean wave power plant without loading test indicated that

the highest rotate appears at 1400 rpm with a voltage of 36.1 volts. Figure 8 show the results of ocean wave power plant with electrical equipment such as light 35 w.

a. Baterry

b. Inverter

Figure 7. Batere dan Inverter

Figure 8. Testing with Light 35w

Table 1 Data of Testing without load

No.	Putaran (Rpm)	Tegangan (v)	No.	Putaran (Rpm)	Tegangan (v)
1	500	13.48	6	1000	26.4
2	600	15.78	7	1100	29.9
3	700	18.7	8	1200	33.4
4	800	21.6	9	1300	34.5
5	900	23.5	10	1400	36.1

Conclusions

The Performance of ocean wave power plant without loading test indicated that the highest rotation appears at 1400 rpm with a voltage of 36.1 volts with the 23000 coils of stator and 6 magnet of rotor and diameter of coil winding is 0.15 mm. The output of voltage and current depends on the type of magnet and number of coil windings where as the increasing the number of magnet of rotor and coils of stator will be obtained the output of voltage and current become high.

Acknowledgement

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