



PRELIMINARY STUDY OF MODEL HYBRID SOLAR CELL-PIEZOELECTRIC FOR LOW POWER IN INDONESIA

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ABSTRACT

Indonesia is a country that has the new and renewable energy sources are not yet developed and massive excavated and used, especially energy solar cells and energy rainwater. The advantages of the tropical climate, the rain and heat, should be developed on a massive scale and the diversification of energy. Not only fossil energy is used, but the energy that is around us. One of this rain water energy by using Piezoelectric. The piezoelectric material capable of converting mechanical energy into electrical energy becomes a major source of discussion in this study. The amount of energy generated from impact of rain water can be calculated using mechanical-electric models. The amount of energy that can be produced depends directly on the size of the piezoelectric membrane, the size of raindrops and frequency. As well as solar cells used as electricity. When the two are combined energy such as whether the result. In this research will be assessed on the design and testing of model and simulation of hybrid solar cell - Piezoelectric.

Keywords: solar cells, piezoelectric, energy, hybrid, model.

1. INTRODUCTION

In the process of converting energy into other forms of energy needed a tool called the Transducer. In a broader sense, the transducer is sometimes also defined as an equipment change the style or mechanical displacement into electrical signals. Piezoelectric transducers are one type of active transducer with the working principle of power generation of piezoelectric crystal material due to a force from the outside [1]. This type of transducer can accept Input in the form of noise, vibration and acceleration in the way it works.

Therefore we need alternative energies other than fossil energy that can be used as a substitute for fossil energy. The developed energy must be new and renewable energy. New and renewable energy is the energy that has not been prevalent in the community as well as recycling or easy and abundant resources. New and renewable energy has been developed in the world in general is the energy that has the characteristics of each in every region. As Dutch windmill in the country where the Dutch region has a large wind speed throughout the year. Indonesia has two seasons, summer and winter, has the potential of renewable energies of the two seasons. Namely solar power and energy collisions of rain [2].

Piezoelectric is a material that, when given the pressure will produce an electric current According to previous research on the development of piezoelectric already applied in some areas, for example in the form of a piezoelectric Yogyakarta as an earthquake early warning system, and as a producer of electricity produced by applying pressure to the piezoelectric. Piezoelectric development as a producer of electricity is applied with some application, for example placed in footwear, balls, mats doormat and the bumps. The number of piezoelectric manufacture some application encourages researchers to make piezoelectric utilizing natural energy; it aims to reduce the use of electricity from the government [3-4].

Indonesia is a tropical country, thus making Indonesia has two seasons: the rainy season and dry season. Utilization of natural as electrical energy in the dry season exploited by utilizing the heat of the sun as an energy stored during the day and exploited or used as electricity at night. However, during the rainy season there is no utilization of energy that can be exploited or used as electrical energy. So in this case the researchers intend to use the energy generated from water pressure rain that falls from the sky as a press on a piezoelectric energy. With the help of rain water pressure on a piezoelectric, the piezoelectric can produce electrical energy which can be used for everyday purposes, such as lighting [5-7].

Besides solar energy can be utilized with the help of other equipment, i.e. by converting solar radiation to forms other. There are two ways to change the energy of solar radiation into another, namely through the solar cell and collector [8]. There is no doubt that solar energy is one of the energy sources that are environmentally friendly and very promising in the future, because there is no pollution produced during the energy conversion process, and also a source of energy widely available in nature [9]. Therefore, the application of technology of Solar Power Generation Plant (SPP) to exploit the potential of solar energy available in the location of these sites is the right solution [10]. PLTS or better known as solar cells (photovoltaic cells) would be more desirable because it can be used for various purposes that are relevant and in places such as offices, factories, housing and more. So it was deemed necessary for further investigation. In order to obtain a comprehensive study in engineering [11-12].

In realizing Solar cells XGY 42x42 mm are one of the solar cell OTC market in Indonesia through online electronic stores. Solar cell XGY 42 X 42 as solar cell commercial used to recharge small 1.5 volt battery. As for the power of rain, Pick up Piezoelectric as being used as an interpreter vibration in the musical instrument that was



translated into power amplifier into one of the electrical energy for power plants rain. Because of the collision energy in the rain can be converted into vibrations that can generate electricity by Pick up Piezoelectric. In this research the piezoelectric transducer with a specified amount of energy used as media conversion is the compressive force of rain falling into electrical energy. So it will be known how much electrical energy is generated. To determine the amount of its energy value then conducted simulation experiments of water that falls on piezoelectric transducer as well as the rain that falls later combined with sun rays are captured by solar cells. So it will find the optimal power output of the compression force piezoelectric and solar cells into electrical energy.

2. RESEARCH METHOD

Methodologies or approaches that will be done is the initial modeling of the design that will be used for the membrane piezoelectric and solar cells as a media producer of electrical energy that comes from the influence of compressive force or impact that comes from rain water droplets and also sunshine by region in Indonesia. Step-by-step methodology, as follows:

- a) Conducting literature study and analysis was based on initial data from the study of membrane manufacture piezoelectric and also about changes in the electrical energy derived from the compressive force that have been done and the study of literature regarding the solar cells to be used.
- b) Creating models and simulation design tools Hybrid models of the solar cell power system and rain water power.
- c) Perform data analysis and the final calculation, in order to obtain the output of the design or model is made in order to obtain estimates of the electrical power obtained from the model.

Research flowchart is shown in Figure-1.

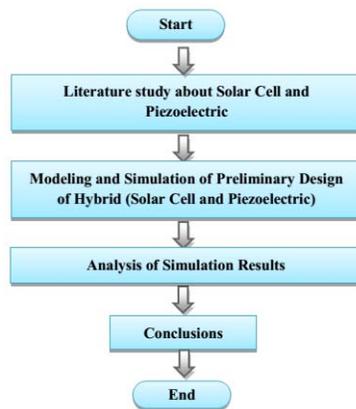


Figure-1. Flowchart of this research.

3. RESULTS AND DISCUSSIONS

The design process begins with measurement components as the basic hybrid mechanical design process

of the hybrid system to be created that solar cell and piezoelectric components. Based on the measurement results piezoelectric and Solar cells it was found that the size of each component can be seen in Figure-2.

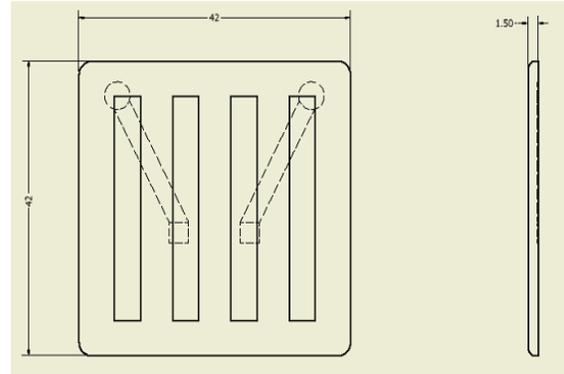


Figure-2. The dimensions of the solar cell.

The measurement result using a caliper on the components of the piezoelectric element generates the dimensions shown in Figure-3.

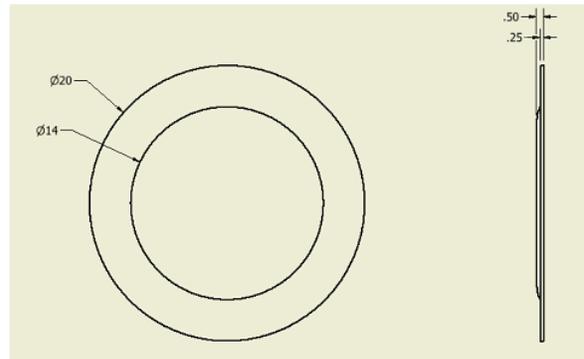


Figure-3. The dimensions of the piezoelectric element.

In planning the design of hybrid solar cells and piezoelectric. Will be performed two analyzes on solar cell design and design for rain or piezoelectric energy. For analysis of the design of solar cell parameter required is the angle, time and voltage can be generated. Corresponding results of experiments carried out according to the Table-1.

Table-1. Voltage experiment 2 solar cell series.

Hour \ Angle	45°	90°	180°
07.00	4.63	4.24	4.74
12.00	4.24	4.03	4.75
17.00	4.45	4.34	4.64



By using the data in Table-1 above can be made charts the relationship between time and angle of solar cell test results, as shown in Figure-4.

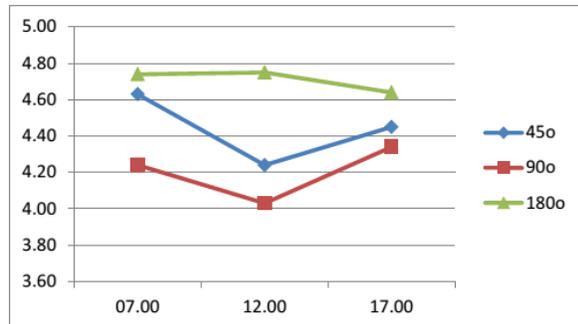


Figure-4. Graph the relationship between the angle (°) and the hour on the solar cell in series.

Based on the graph above it can be proven that the best angle to produce a stable voltage is 180°. So based on the results of the design used for the hybrid solar cell and piezoelectric as shown in Figure-5.

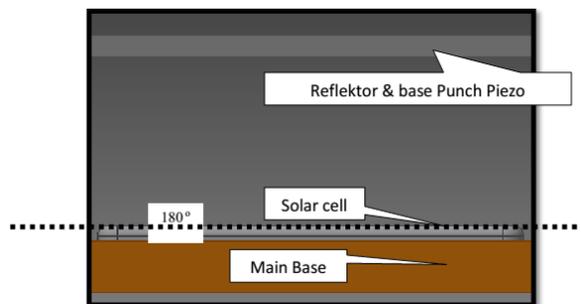


Figure-5. Design of the solar cell and the piezoelectric.

As seen in Figure-5 above, the design of the solar cell and the selected piezoelectric solar cell is directed towards 180° the main base. And it can be seen that at the top of the visible presence of the reflector which serves also as a base punch to be used in the design of piezoelectric as power showers are made from mica.

4. CONCLUSIONS

Based on the results of research, then the conclusion is as follows: Design effective system of power generation hybrid between the piezoelectric adjusted to the voltage charge the battery is at 6 solar cell and 24 Piezoelectric with angles used solar cell is 180 degrees and in accordance with the style of the moment that happens the system is divided into 6 sections that have each section using the 4 piezoelectric as a pedestal.

ACKNOWLEDGEMENTS

The authors would like to thank the Institute for Research and Community Services of Universitas Muhammadiyah Jakarta and Ministry of Research, Technology, and the High Education Republic of

Indonesia, which has provided research grants of Penelitian Produk Terapan in 2017.

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