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INTEGRATED BIOMASS ASH SMARTPHONE ELECTRICITY: THE UTILIZATION OF INCENSE ASH WASTE TO RENEWABLE ELECTRICITY BASED MOBILE APPLICATION IN THE VILLAGE OF NUSA PENIDA, BALI TO REALIZE INDONESIA ON ENERGY OBJECTIVES 2045

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ABSTRACT

Incense is a tool used worship in some religions. The ash of the result of burning incense will be thrown away. Whereas, the composition of the result of the burning incense contains 25%-45% calcium carbonate, less than 10% of potassium, and a variety of heavy metal. Based on Problem new innovation called ELSTATE, which is a mobile app-based tool. This tool can produce electric source from incense ash waste as a substrate with smartphone integrated. The method is Biophotofuel Cell (BPFC), which uses photoanode TiO2 and catode O2-reductor in order to make a decomposition of photoelectrochemical. The result produces electric power with a certaint amount of voltage. This app is hoped be able to control voltage and can be switched on and off automatically. This app will soon be developed in a form of interface so the user can easily use it. This technology is also hoped to minimize the electrical crisis in an area that has lots of incense ash waste but bad at utilizing it. With the voltage of DC 12 V to AC 220 V 500 W which has level of voltage efficiency up to 95%, so that it can answer SDGs Point 7 about Clean Energy.

Keyword: biophoto fuel cell (BPFC), incense, ash, mobile app, energy

1. INTRODUCTION

Energy requirements are crucial for human life. In the past 10 years, energy demand particularly for electricity have increased. Based on data from the international Energy Agency (IEA) global energy demand annualy. ncrease by 2.1% in the current era, the demand for alternative energy, especially electrical energy, has increased drastically. The use of electricity in Indonesia itself has increased quite significantly in 2014 as much as 98.4% with growth in electrical energy of 7.2% per year. The increasing use of electricity is caused by a large number of electronic goods used in the community. With the increase in electronic goods, innovative storage is needed in addition to batteries, capacitors, and fuel cells [1]. One of the causes of the electrical energy crisis is the amount of fuel. Realizing that in 2015, the development of Renewable Energy (EBT) still reached 6%. One of the technologies that can become a new alternative energy source is the Biophoto fuel cell (BPFC). One of the materials that can be used as biomass material is an incense combustion system that contains 25% - 45% carbonate, less than 10% potassium, less than 1% phosphate, and various types of heavy metals. This has the potential for incense ash to be processed as a material to produce electrical energy. Therefore we need an electrical energy innovation that can be generated and can be used by the community as a source of electrical energy and the international government program Sustainable Development Goals (SDGs) in point 7 that clean and affordable energy

can ensure access to affordable, reliable energy. Sustainable and modern for all, so that the realization of an energy sovereign Indonesia in 2045.

2. MATERIAL AND METHOD

2.1 Material

Material used is Incense ash waste, Pipe tube, Aquades, HCL 1 M, Anode TiO_2, Cathode O^{2-} , Cable, Storage Chamber, IC 4047, Resistor 100 Ohm, Transistor *MOSFET IRFZ44*, and Boostconverter.

2.2 BPFC Process

In the process, Elstate is made using the BPFC (biophotofuel Cell) method. Biophotofuel cell technology (BPFC) is a technology in generating electricity from concentrated biomass solutions stimulated by photodecomposition using TiO_2 photoanodes and O^{2-} reducing cathodes. The use of fuel cell decomposition with these 2 materials will result in photoelectrochemical decomposition. The production of electrical energy obtained by BPFC technology utilizes carbon emissions from incense ash.

2.3 Mobile System

The boost converter consists of a circuit that functions as a DC to AC voltage amplifier. While DC to AC inverting consists of a circuit that functions to change and increase the value of direct voltage (DC) to alternating voltage (AC) and uses a step-up transformer to increase the voltage value and is connected to an outlet. The mobile application system, which consists of the integration of Wemos D1 Mini and Relay (switch) as a circuit breaker, both from the anode and cathode sides. The first step is to connect the device with the application service provider server. Once connected, the new system can be operated with a visual application. This system will be visualized using a mobile-based application.

3. RESULTS

BPFC technology on waste incense uses TiO_2 photo anodes and O_2 reducing cathodes, which leads to photoelectrochemical decomposition. The result of this photo-electrochemical decomposition generates electrical energy due to the movement of electrons in the incense ash. Waste incense is collected in a transparent container and water is added in a 1: 1 ratio to form a sol. This is to give a less dilute ash biomass solution. It was then mixed with a 0.1 M HCl solution of 1% from the previously prepared biomass ash solution to form an electrolyte reaction [2]. The mixed ash solution is connected to the TiO_2 cathode and the O_2 anode to allow electrons to move. Photoanode TiO_2 and cathode O_2 reducing agent react with incense ash, which is produced as a solution so that the electrolysis process can run properly. Place the container in the sun and connect it with a cable [3]. The amount of voltage was measured on the multimeter to get the amount of voltage that can be converted. The results of the electrolysis are stored in a battery so that they can be used for daily needs. The voltage generated from this BPFC is a DC voltage, which is used to supply electrical energy to an electronic device that requires an AC voltage that is sufficient to flow every electronic component on a device. The output voltage generated by ELSTATE can reach a value of 6 V where the voltage value of that size is enough to then inverting into AC voltage using a DC to AC inverter with an input power of 500 W. ELSTATE connected with mobile application system which consists of the integration of Wemos D1 Mini and Relay (switch) as a circuit breaker connected to one of the BPFC connections, both in terms of anode and cathode in the application, a system will also be developed to

monitor the voltage at the BPFC output and the current size. which will flow to the DC to AC inverter and can find out the rest of incense ash waste that is in the ELSTATE.

REFERENCES

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ATTACHMENT

Part of Design ELSTATE.

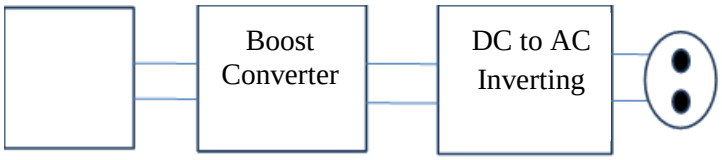

Figure 1. BPFC Circuit Outlet (AC voltage source)

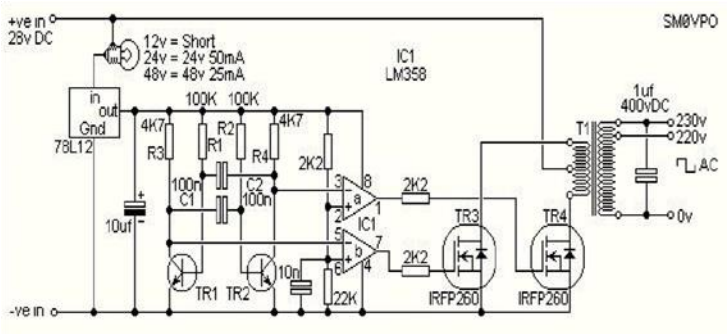

Figure 2. Energy conversion circuit

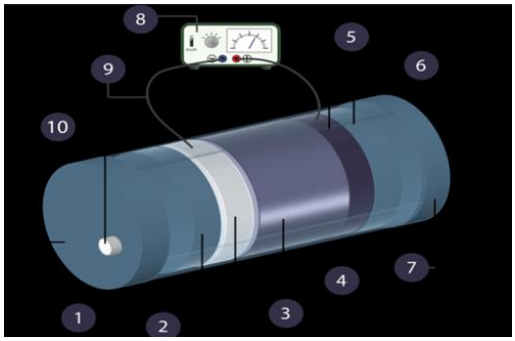

Figure 3. The Structure

Based on the test results obtained data:
Time to generate electricity = Continuous
Voltage = 220 Volts
Power = 500 Watts

Figure 4. Experimental results

Figure 5. Mobile app design of ELSTATE

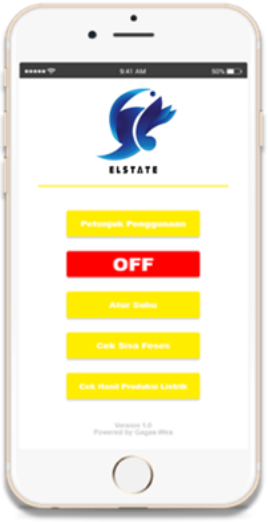

Figure 6. Mobile app design of ELSTATE

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Sekian, terima kasih.

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