



Hybrid Power House(Hyporho) : Design Tools Based DSSC (Dye-Sensitized Solar Cell) Using Nanoparticles (Titanium Dioxide) As Drinking Water Supply Solution for People in coastal regions and small islands in Indonesia

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ABSTRACT

Water is a very important factor in human life. Every day people are expected to require minimal bersh water as much as 100 liters per-person, such as for drinking, cooking, bathing, washing, and others. The coastal water is needed by people who live in the area. But the scarcity of fuel subsidies to support the operation of water treatment technology is also a problem for people, especially coastal fishing communities. On the other hand, by the Ministry of Energy and Mineral Resources, 2007, a potential 9,290 MW of wind power and solar power potential of 8.8 kWh / m² per day. Both of these renewable energy sources can be used as an energy supply clean water treatment technologies. The purpose of this paper is to design the design and determine the relevance of the use of the Hybrid Power House (HYPORHO): Design-Based Tools DSSC (Dye-Sensitized Solar Cell) Using TiO₂ nanoparticles (titanium dioxide) as a Solution for Community Water Supply in the Coastal Regions Small -miami in Indonesia. Results of this writing them, HYPORHO design consisting of a water distillation system with thermal solar collectors, wind turbines, solar cells, and the water distribution system to the public. In addition the use HYPORHO very appropriate for coastal communities because it is affordable, inexpensive, environmentally friendly, long-term investment and the technology is easy to operate.

Keywords : DSSC, Hybrid Power House, Coastal

INTRODUCTION

Water is a very important factor in human life. Every day people are expected to require minimal clean water as much as 100 liters per person, such as for drinking, cooking, bathing, washing, and others. The higher the growth rate of the population of a country, the more the water consumption needed. The Indonesian archipelago and tropical climate, has many sources of water such as oceans, lakes, and rivers (Taty Hermaningsih, 2007).

Energy is one of the challenges we face in the 21st century. According to a survey conducted by Professor Ricards Smalley of Rice University regarding the greatest problems facing mankind for the next 50 years, it was ranked first energy. Reserves of fossil energy sources around the world starting from 2002, ie 40 years for oil, 60 years for natural gas, and 200 years for coal. With the state of the depletion of the fossil energy sources, in today's world there is a shift from the use of energy sources not renewable toward energy sources that terbahurui. Of the many renewable energy sources such

as wind, biomass and hydro power, energy use through solar cell / solar cell is the most potent alternative. This is because the amount of solar energy that reaches the earth is huge, about 700 megawatts per minute. When calculated, the number is 10,000 times greater than the total world energy consumption (Septina, Wilman 2007). With Indonesia's natural potential such as wind and sunlight can be used as an energy sourcealternatives to fossil fuels. Based on the Ministry of Energy and Mineral Resources, 2007, 9,290 MW of potential wind power and solar power potential of 8.8 kWh / m² per day. Both of these renewable energy sources can be used as an energy supply technology processing clean water (Nugroho, 2014).

METHODS

Literature and data sources

The author in this paper uses library research (literature). Research library is a writing method using an object of research studies that focus on literature - literature.

Data processing

Data processing is done by combining some of the information to be used as an argument and perspective problems. So it can be said of data and information processing techniques performed by the argumentative descriptive, with writing that is descriptive, describing Hybrid Power House (HYPORHO). Overall this has a scientific paper processing pattern as follows,

1. Assessment of the state of drinking water in coastal areas.
2. Identify permasalahan related to drinking water on the coast.
3. Formulate the problem so that the problem can be more focused on examined later in further analysis.
4. Collect theories and related materials with a focus issue was appointed as reference material to support the precision and sharpness of the analysis of the issue.
5. Develop a method of writing that paper systematically arranged.
6. Analyze and discuss and provide solutions related issues that have been raised.
7. Drawing conclusions based on formulation of the problem and the results of analysis done.
8. Providing advice.
- 9.

RESULT AND EXPLANATION

MAKING PROCESS BASED DYE SOLAR CELLS SENSITIZ (DSSC)

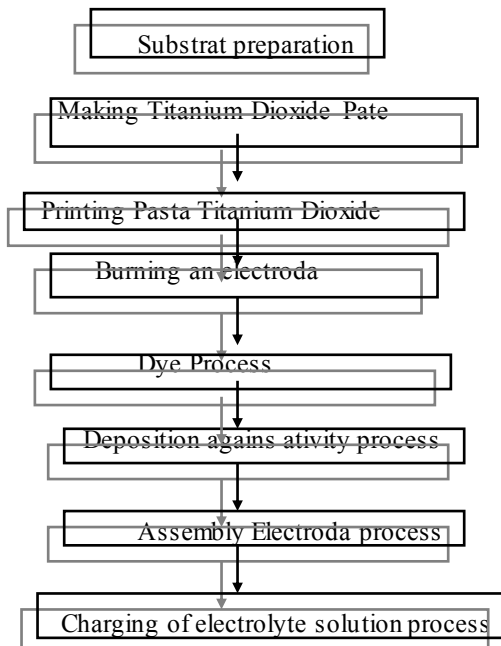


Figure 1. Process scheme DSSC(Sukowati, 2014)

In the design stage of the design analysis process design that can be used optimally. The design of this design is an improvement and delivery of innovation to the existing design. Basically hybrid power house (hyporho) utilizing renewable energy sources, namely wind energy and solar energy that is converted into electrical energy for the needs of home distilled. At the stage of designing the tools of course refers to three things: functionality, aesthetics and cost. These three things really become a major consideration in designing a technology.

1. Function

HYPORHO is home to desalination systems (distillation) using thermal solar collectors to produce potable water. These systems utilize renewable energy as a power processing by distillation.

2. Aesthetics

HYPORHO designed so that the use of highly easy, in the application (the application) on the coast can be adjusted.

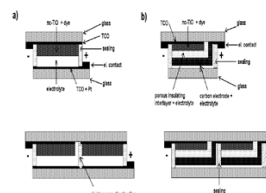
3. Cost

HYPORHO early development is quite costly. But when the long-term use HYPORHO is the right solution because it is cheap and sustainable environmentally friendly technologies.

HYPORHO a water supply system that utilizes the coastal area of wind energy and solar energy as a processor and distributor of water to the community. The constituent components of this system are as follows,



Wind turbines are already integrated with a generator is a tool that can change the movement of the wind into motion triggered by a turbine blade.



Schemes of Two General Structure DSSC cells (top) and the module (bottom). Solar cell is an electronic component that will convert light energy into electrical energy for.



Solar water distillation that will turn sea water into fresh water good to drink.

Regulator as a regulator and a voltage stabilizer of wind turbines and solar cells

Batteries or battery / batteries are electronic devices as electrical energy storage



Fig 2. HYPORHO (Hybrid Power House)

HYPORHO is a house that became the center of production and management of water into fresh water potable and become a distributor of water to coastal communities. The components of the above will work interconnected in one system. Will then form a better workflow for each energy supply backup. Overview of hybrid energy system applied to HYPORHO.

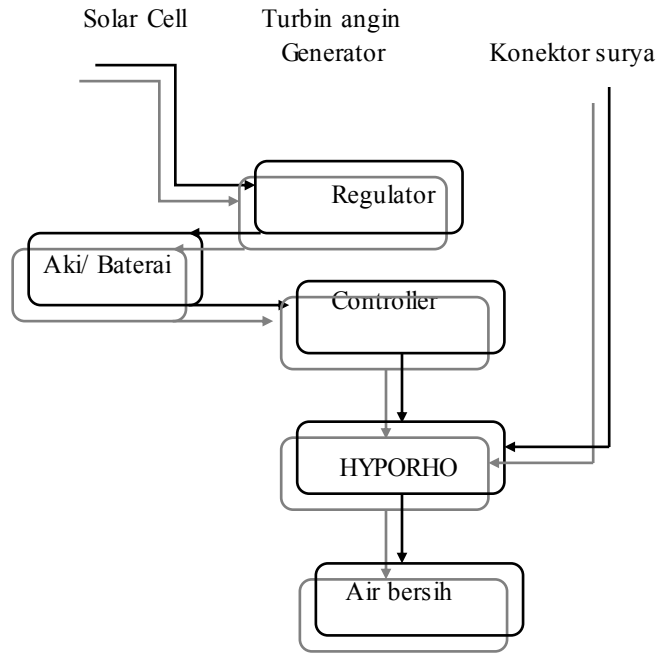
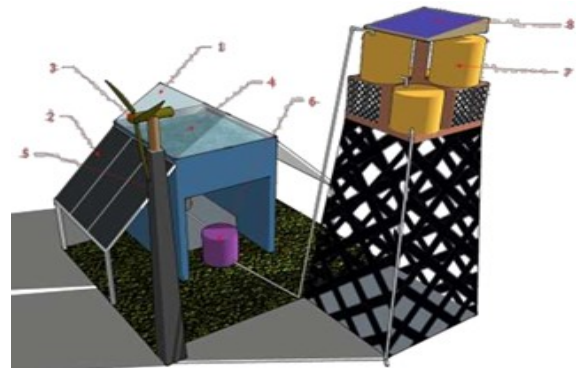


Fig 3. Description hybrid energy system applied to the HYPORHO



1. Glass
2. Solar collector
3. Wind turbines
4. Water reservoirs
5. Distillation
6. Clean water reservoir
7. Water reservoir that is ready to be distributed
8. Solar cell

Fig 4. Desain HYPORHO (Hybrid Power House)

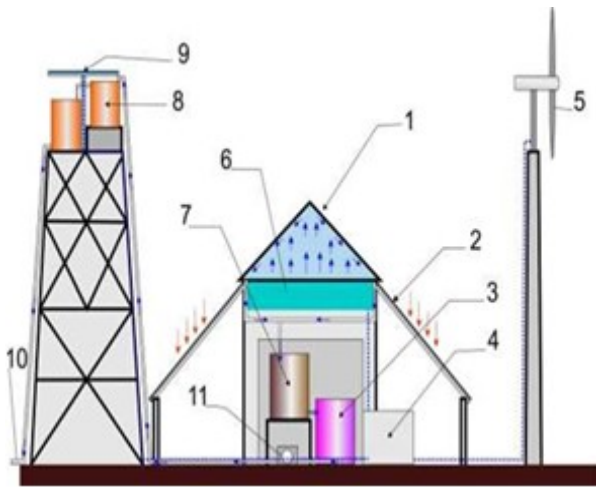


Fig 5. Schematic HYPORHO (Hybrid Power House)

The sea water is sucked up from the sea using a pump (11) and supplied to the solar collector (2). Solar radiation heats the solar collector which contains sea water, after a 70-90 C water piped to the water tank (6). Along with the process, the solar heat also penetrates the glass cover (1) and on the surface of the absorber plate in the tank, the absorber plate will be hot, and the heat energy from the absorber plate will keep the water hot. The water will evaporate and collecting under the surface of the cover glass. Because the air temperature in the tank is higher than the ambient temperature, the condensation is vapor turns into liquid and attached to the inside of the cover glass. Liquid (water) will flow to follow the slope of the glass cover and into the pipeline, continues to flow into clean water reservoirs (3) for further processing by filtering (distillation) (7) so that the water that produced really clean and not acidic. Clean water that has to be accommodated in a high place (8). From the shelter of water ready to be distributed through a pipeline (10) is provided. In the process there is the concept of this HYPORHO use energy derived from solar cells (9) and wind turbines (5) by combining them so that mutual back-up uses a hybrid system.

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