System Design of Shrimp Fishery Water Supply from Solar Panel

W Wardana[1]

[1] Study Program Mechanical Engineering, Faculty of Engineering, University of Bandar Lampung, Village Caravan Dipasena Mulya Block 09 Line 51 No. 07, District Rawajitu Timur, TulangBawang (34 596). e-mail : Cahwisnu745 @ gmail. com

Abstract. Keeping the state of water in shrimp ponds is very important because the shrimp are very sensitive to changes in their environment. Water conditions should remain good so that the shrimp can be convenient and fast pertumbuhanya. To supply water for shrimp farming requires a water pump to move the water from the inlet to the pond. Ir pumps are already on the market in general use fuel or electricity from PLN to pump function. New and renewable energy began to receive attention from the onset of the energy crisis the world is in the 70s and one of the energy is solar energy. Abundant sunlight and even for a tropical country, Irradiating the sun almost all years.Therefore solar power plant is suitable for application in Indonesia. Solar power has several advantages such as energy provided free of charge, Maintenance is easy and there are no moving parts so it does not make a sound / noise, as well as able to work automatically. But solar power also has disadvantages that the energy produced depends on the intensity of sunlight is not available 24 hours a day so we need a storage medium as a source of energy in the form of a battery when the light intensity decreases, or even none at all. The battery charging process is set with a battery charger.**Keyword;**Solar Panels, Renewable Energy

1. Introduction

Solar poweris suitable for application in Indonesia. Solar power has several advantages such as energy provided free of charge, Maintenance is easy and there are no moving partsso it does not make a sound / noise, as well as able to work automatically. But solar power also has disadvantages that the energy produced depends on the intensity of sunlight is not available 24 hours a day so we need a storage medium as a source of energy in the form of a battery when the light intensity decreases, or even none at all. The battery charging process is set with a battery charger.

2. Basic Theory

2.1 Solar Cells

Solar cells is also known*(Photovoltaics)* is a semiconductor device that can convert solar energy directly into electric energy DC (direct current) using crystal Si*(silicon)* thin. A cylindrical crystal Si Si obtained by heating it with the pressure that is set so that it turns into a conductive Si

2.2 Batteries

Is a device containing electrical cells that can store energy that can be converted into power. Type - the type of batteries:

1. Acid Batteries*(LeadAcid Storage* Acid) battery acid electrolyte material is a solution of sulfuric acid*(sulfuricacid* = H2SO4). In acid batteries, electrode - its electrode consists of a plate – plate timah peroksida PbO2*(LeadPeroxide)*as the anode (polepositive) and pure tin Pb*(leadsponge)*as a cathode (polenegative). Feature - general characteristics:
   a. The nominal voltage of 2 volts per cell
   b. per cell battery sizes greater than alkaline batteries.
   c. Electrolyte specific gravity value is proportional to the capacity of the battery.
   d. Electrolyte temperature greatly affects the value of the density of the electrolyte, the higher the temperature theelectrolyte lower thedensity and vice versa.
   e. The value of standard weight electrolyte types depending on the manufacturer.

f. Improved battery life depending onthe operation and maintenance usually can reach 10-15 years

g. Thevoltage chargingper cell should be in accordance with theinstructions operating and pemeliharahan. manufacturer's For example:

a) Charging the beginning *(Initial* Charge): 2.7 Volt Charge: *Floating* 2,18 Volt
b) Charging *Equalizing:* 2.25 Volt
c) Charging Boozting: of 2.37 volts
d) discharge voltageper cell*(Discharge):* 2.0 - 1.8 Volt

2. Battery Bases / alkaline*(AlkalineStorage Battery)*

Battery alkaline electrolyte material is an alkaline solution *(PotassiumHydroxide)* comprisingof:

a. Nickel iron alkaline battery Ni-Fe Battery
b. Nickel cadmium alkaline battery

3. Ni-Cd Battery

In general, the most widely used is thealkaline batteries *admium*(Ni-Cd) general characteristics (depending on the manufacturer) is as follows:

a. The nominal voltage per cell is 1.2 volt
b. heavy elektroit type value is not comparable with the battery capacity.
c. Improved battery life depending on useand care, can usually reach 15-20 years.
d. The charging voltage per cell harussesuaidengan instructions operating and pemeliharahan of the manufacturer.
For example:

a) Charging the beginning*(Initial Charge):*1.6 to 1.9 Volt
b) Charging *Floating:* 1.40 to 1.42 Volt
c) Charging *Equalizing* 1.45 eVolts.
d) Voltage discharge *(discharge)*= 1 volt

2.3 Inventor

inverter is a circuittransform DC into AC. Or more precisely move the inverter voltage from DC source to AC loads. Based Inverter type Generated Waves generated by the output waveform, the inverter can be divided into three kinds of *square wave, modified sine*wave,andpure *sine*wave.

1. *Square Wave*

Inverter This is the simplest. Walaupu inverter of this type can produce a voltage of 220 VAC, 50 Hz, but the quality is very bad. So it can be used in some electrical appliance only. This due to the characteristics of this inverter output is to have the level of *" total harmonic distortion "* thathigh. Perhaps because of this reason that the inverter is called*"dirty powersupply ".*

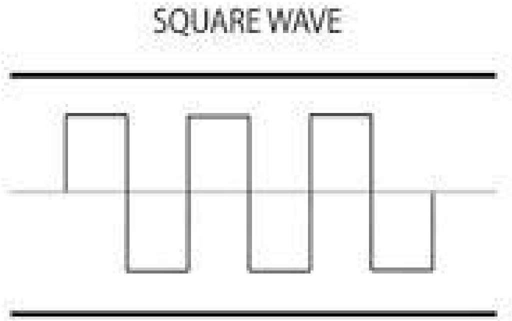

Figure 1. Output Square Wane

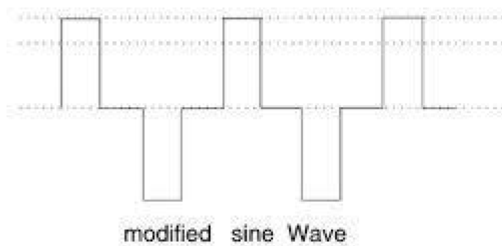

Figure 2. *Modified Sine Wave Output*

2. Modified Sine Wave

Modified Sine Wave calledalso*"Modified Square Wave*" or "*quasy Sine Wave*" because of wave modified sine wave similar to the square wave, but on a *modified sine wave* output touch point 0 for some time before moving to the positive or negative. Moreover, because the *modified sine wave* hasharmonic distortion less than the square wave, it can be used for a number of electrical devices such as computers, tv, lights but no bias to the burdens are more sensitive.

3. Pure Sine Wave

Pure Sine Wave or true sine wave inverter is a wave that is almost like (even better thanwaveform perfect sinusoidalon the power grid in this case PLN. With a total harmonic distortion (THD) <3% making it suitable for all electronic devices. Olen because the inverter ibi also called a " clean power supply ". the technology used inverter of this type is generally called pulse width modulation (PWM) which can transform DC voltage into AC waveform that is nearly equal to wave sinusoid.

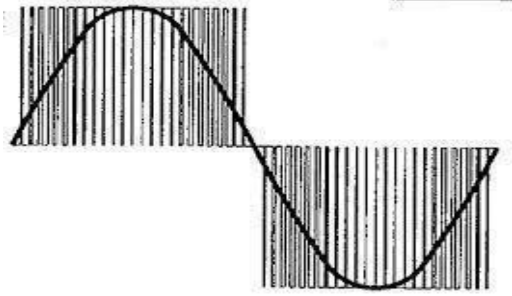

Figure 3. Output Pure Sine wave

Pumps is of one the instruments used to transform mechanical energy (from the engine of a pump) into energy tap on the fluid being pumped. in general, pumps are used to move fluids from one place to another higher place, high tekananya, or for circulation,

2.4 Electric Motors

Electric motor is a tool for mengub ah electrical energy intoenergy. Mechanical A tool that serves conversely, converting mechanical energy into electrical energy is called a generator or dynamo. The electric motor can be found in household appliances such as fans, washing machines, water pumps and vacuum cleaner. In the electric motor power is converted into mechanical energy.

3. Method Of Design

Tools and Materials: Welding, Grinding Machine, Tang combination, Solder Power, Eyes burrs Cut, Solar Panels, Batrai, Inverters, Motor Power

3.1 Stages Design

1. Design Stand Pump and Batray

Stand pumps and batrai assembled into one and made holo iron 3cm x 3cm. its size is 45 cm long 60cm wide and 40cm high.

2. Design BoxElectrical Panel

Boxelectrical panel used to kesing electrical appliances such as Batrai, ampere meter, volt meter, Carger, inverters andcomponents. other electronic Electrical panel box made of iron plates with a thickness of 1.4 mm.

3. Design of Electrical system Electrical systems shall be designed as neat and as safely as possible. Ystem will be equipped Amper electricity meter and volt meter as an indicator of power consumption. They will also be equipped with NCB or security in case of short-circuit.

4. Test Equipment

Tests conducted in the area of aquaculture shrimp in a swamp area sniper. Parameters to be tested is intensites light and long charging time of ignition of the pump.

4. Calculation

4.1 Equipment Specifications

1. Solar Panel:120 Wp
2. Carger Control:12 Volt
3. Inverter:12V to 220 V, 1200 Watt
4. Battery: 12 Volt 100 Ampere / hour

5. Pump: 100 Watt
6. Cable 3x1,5 mm
7. pipe :1

4.2 Calculation

Tests tool are carried out on the sunny conditions with a temperature of 32 ˚C with 20% kondisbatrai unfilled because the inverter has terseting died when the remaining charge in batrai remaining 20%.

4.2.1 Calculation of capacity Batrai(Eb)

$$Ah = \frac{E_b}{V_5} \qquad (1)$$

Ah = AmpereBatrai
BatraiEb = Capacity
Vs = Voltage Batrai
100 = 12
= 100 × 12
= 1200

4.2.2 Power Needed to Fill Batrai(Cb)

d = Number batraiusedDOD = *deep of discharge* 80% (battery electric energy that can be used)
Cb = Amper that can be used

$$C_b = \frac{AH \times d}{DOD}$$
$$C_b = \frac{100 \times 1}{0{,}8}$$
$$C_b = 80 \, {}^{Amper}/_{Jam} \qquad (2)$$

Based on the above calculation batrai needs charging power is 80 Ampere / hour.

4.2.3 Length of Time Charging optimal

Pengian is to start at 07.30 until 16.30 for the sector to digunaikan current for charging is 10 Ampere / hour. So in a day of electrical power that can be used for charging the battery is 10 amperes x 9 hours = 90 amps so the electrical power produced is

$$AH = \frac{E_b}{V_5}$$
$$90 = \frac{E_b}{12}$$
$$E_b = 90 \times 12$$
$$E_b = 1080 \, watt \qquad (3)$$

As long it takes to charge the battery until full is Cb / 10 Amper the battery full time is 8 hours.

4.2.4 Old Time Pump Nyala.

The pumps are used in the design of this tool are two pumps with electrical power requirement of 100 watts each.

$$Lama\ Pompa\ Bisa\ Bekerja = \frac{Cb \times Vs}{200\ Amper} = \frac{80 \times 12}{200\ Amper} = 4{,}8\ jam \qquad (4)$$

5. Conclusion

1. optimal charging is charging during sunny weather with a long time is 07.30 until 04.30.
2. The electric power obtained from the panel is equal to 1080 watts / hour
3. Charging Lama to meet batrai is 8 hours.
4. Time battery life when used to turn on the pump with a load of 200 watts / hour is 4.8 hours.

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