International Journal of Research
Available at https://edupediapublications.org/journals
p-ISSN: 2348-6848
e-ISSN: 2348-795X
Volume 06 Issue 11
October 2019

Fulfillment Of Feeding Waterwheel By Solar Energy

Wen-Bin Lin
Department of Electronic and Optoelectronic Application Engineering,
Far East University, Taiwan 744, ROC
Email:lawrence@mail.feu.edu.tw

Abstract:

Because aquaculture fishery being popular in west coast area of Taiwan, Waterwheel is easily seen in a fish farm. Waterwheel runs all day long, it also needs human-made spray the food to fish, thus waste electricity and human power. To meet the requirement of circumstance, we improve the solar cell and feeder to be installed in the waterwheel. The electricity power can turn on the waterwheel, feeder can be set constant period for automatically feeding. Thus, we can obtain the benefit of saving-time, saving electricity, saving-human power, and environment protection.

Keywords

Waterwheel, solar cell, feeder, aquaculture fishery

1. Introduction

The production method uses a four-wheel drive motor to connect two sets of acrylic blades made of acrylic and external automatic spreading equipment. The power is all powered by solar cells. In order to prevent it from hitting the side, it will use styrofoam around to increase buoyancy and protection. In this era of promoting environmental protection and energy conservation and carbon reduction, this is one of the priorities of the current design. It is not only environmental protection but also power saving for using solar energy to generate electricity to turn the waterwheel and spray the feeder automatically. The farming tool has the function of protecting the earth and environmental protection.

2. Taiwan Aquaculture Fisheries Related Information

Taiwan is surrounded by the sea and has a coastline of more than 1,100 kilometers. The west coast faces the Taiwan Strait. It is a shallow shed with a water depth of less than 200 meters. It is also a good habitat for water production. The east coast faces the Pacific Ocean. The slope is steep. There is a mainstream of Kuroshio, and the migratory fish resources are extremely abundant. It has congenital conditions for the development of offshore, offshore and coastal fisheries.

In addition, the coast of Taiwan is the spawning ground for most economic water-producing products, and the production of fish, shrimp and shellfish is abundant. The shallow sea area of the offshore and coastal areas covers an area of 40,000 hectares. There are no less than 30,000 hectares on the beach. Weather and environmental conditions are highly suitable for the development of aquaculture in the subtropical region. There are hundreds of species of cultured aquatic products. In recent years, there have been more developments of new cultured species. The development of aquaculture fisheries is very vigorous in Taiwan. From 1952 to 1987, the average annual growth rate of fisheries is 7.7% due to the superior geographical environment, the hard work of fishermen and the efforts of researchers [1]. The aquaculture industry not only fully provides the protein that Taiwan people need, but also promotes the development of related industries such as shipbuilding, fishing port, fishing net, feed, refrigeration and machinery.

Figure 1. Common aquaculture and waterwheels.

In recent years, the fishing grounds of ocean-going fishing vessels have been limited by the number of countries that have announced the economic zone of 200 nautical miles. The resources along the offshore fishery make the operation of fisheries increasingly difficult due to pollution problems such as industrial wastewater.

Therefore, countries around the world are striving for the development of farming. Figure 1. shows the common aquaculture and waterwheels

3. Solar cell introduction Literature discussion

Solar cells are used to absorb sunlight and convert them into electrical energy for storage in batteries. The electrical energy is applied the operation of the waterwheel. By using solar energy to generate electricity, we can save electricity bills and continue to charge during without using. It can be as a source of electricity for the automatic feeder. If there is no endless use of electricity stored in the battery.

The basic structure of a solar cell is formed by bonding P-type and N-type semiconductors. This structure is called a PN junction.

When sunlight strikes a general semiconductor, electrons and holes are generated. But they will combine soon, and converting energy into photons or phonons. If such an event occurs in the depths of the N- or P-type material, the newly created free electron and hone will quickly be absorbed by other electrons and holes, resulting in recombination. Photons are related to energy, and phonons are related to momentum. Therefore, the life of electrons and holes is very short. In the P type, the holes generated by light have a longer lifetime due to the higher hole density. Similarly, electrons have a longer lifetime in N-type semiconductors. Due to different carrier concentrations at the P-N semiconductor junction, diffusion will create a built-in electric field from N to P. Therefore, when the photons are absorbed by the semiconductor at the junction, the generated electrons will be moved to the N-type semiconductor by the electric field. The hole is moved to the P-type semiconductor. One electron and one hole will have been added to our previously balanced recombination and generation currents. We will have a net current of one electron (or one hole), which the voltage will promptly shove into any wire attached to the end of the crystal. As these photons cascade down into photovoltaic cell, they knock trillions of electrons out of valence band, creating trillions of electron-hole pairs. Many of those pairs do nothing but quickly recombine, heating up the crystal in the process, but those pairs created in the depletion region are quickly swept apart and propelled into the metal base or wire mesh by the voltage across the PN junction.

Since the electricity generated by the solar cell is direct current, a DC to AC inverter must be installed on the circuit. Thus it can be used for automatic feeders. Due to the water-wheel motor is a DC motor, we can use the transformer to adjust the voltage required for the motor.

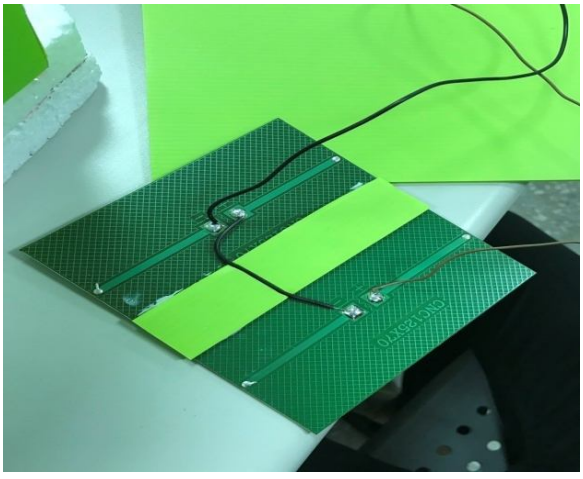
4. Automatic feeder related information

Compared to the ancient blast-type feed machine, new feed machine enhances in the following. 1.Feeding time without manual operation, 2. Energy-saving, 3.Scattered around the fishing pond instead of a fixed point to reduce the collision loss of aquatic products. Use high-tech methods to reduce breeding costs, increase production and improve fishermen timing.

New feed machine has a timer. When the set time arrives, the spring will pop up within the new feed machine. The machine will be powered on and operate, and automatically power off after the arrival time.

There is no need to manually switch the power supply through the manual, and the machine can be prevented from being idling and damaged.

In the operation process of the traditional feed machine, because the feed outlet is a slender water pipe, it must consume more electric energy to send the feed. The new machine is delivered by air pressurization and post-injection. Thus, it saves a lot of energy. When the old feed machine is feeding, it is discharged through a water pipe in a specific area. Thus, it causes the fish to be damaged by collision with each other due to foraging. After the high-pressure injection, the new feed machine has a very wide range of spreads, allowing the fish to feed without interference [2].



International Journal of Research
Available at https://edupediapublications.org/journals
p-ISSN: 2348-6848
e-ISSN: 2348-795X
Volume 06 Issue 11
October 2019

Figure 2. Solar cell back view.

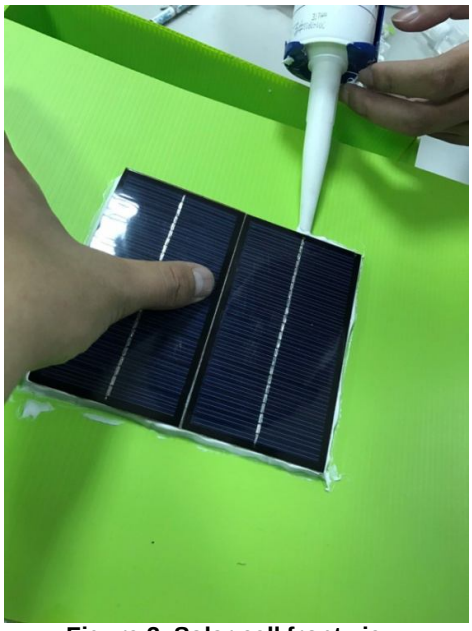


Figure 3. Solar cell front view.

Figure 4. Solar cell front view.

Table 1. Battery specifications

Type		YTX5L-BS
Voltage (V)		12
Capacity (AH) 10HR		4.0
Dimensions (mm)		113
No liquid weight (kg)	Length (mm)	70
	Width (mm)	105
	Height (mm)	1.5
Amount of electrolyte (L)		0.24
Recharging current (A)		0.4

5. Material introduction and installation

5.1 Solar cells

As shown in Fig. 2 and Fig. 3, the power source of the whole set of waterwheels comes from this solar cell, which is changed from two (12V) series to 24V. It is fixed to the upper cover to facilitate the conversion of sunlight into electricity.

5.2 Battery

As shown in Figure 4, it is the battery on the old scooter. The output voltage is 12V, and its specifications are shown in Table 1.

Because of the problem of not being able to charge on a cloudy or rainy day, We use a battery to store electricity. Since the two 12V solar cells are connected in series with each others, The voltage is 24V. In order not to damage the battery, we connect a 150Ω resistor to reduce its voltage. The electrical energy converted by the solar cell is stored in the battery. The battery provides the power required by the waterwheel-motor and the feeder. Figure 5.is the component connection circuit diagram.

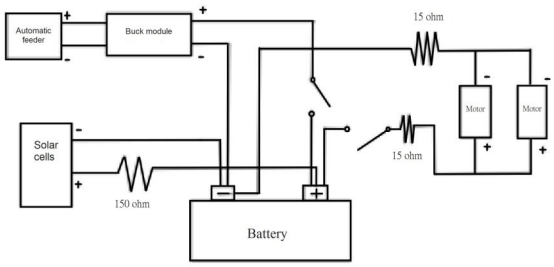


Figure 5. Component connection circuit diagram.

5.3 Automatic feeder

As shown in Figure 6, we use a small feeder in a general family fish tank to simulate.

The feeder starting voltage is 3V. The battery supply voltage is 12V. If the voltage is too high, the automatic feeder will be damaged. We connect the buck module (LM2596) [3] to lower the voltage and supply the voltage to the feeder. The feeder has a switch for easy use.

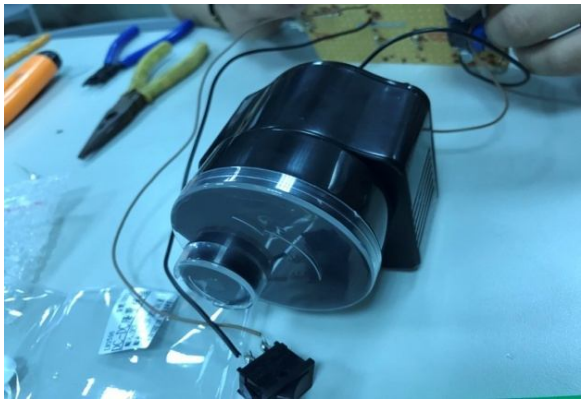


Figure 6. Automatic feeder [4].

5.4 DC-DC Buck module (LM2596)

As shown in Figure 7, the input voltage of this module is DC 3V~40V, and the output voltage is DC 1.5V~35V. Our input voltage is 12V, which is within the safe input voltage of this module. Since the output voltage needs to be adjusted to 3V, it is necessary to use a multi-meter to measure and adjust [4-6].

Figure 7. LM2596 Buck module.

Figure 8. Waterwheel-motor for pumping oxygen into the water.

Figure 9. System organization.

5.5 Waterwheel-motor for pumping oxygen

As shown in Figure 8, the waterwheel-motor is responsible for pumping oxygen into the water. The DC motor requires voltage is 12V, this voltage is similar to the battery we use. Waterwheel-motor speed is quite fast. We use the battery to connect the two waterwheel-motors in parallel to provide power. A 15Ω resistor is added between them to reduce the voltage, and the speed.

5.6 System organization and installation

As shown in Figure 9, the base is made up of two pieces of Styrofoam to increase buoyancy. At the same time, the Waterwheel for pumping oxygen are placed inside the Styrofoam board to avoid encountering sundries. In order to avoid the water into the electronic parts, the plastic plate is used around the top of the device. The circuit board is also erected so that we don't have to worry about running into water.

Figure 10. System launch test.

6. Test results and conclusions

As shown in Figure 10, after the launching test, the weight of the whole set of waterwheels just makes the waterline at the height of the motor and the blade. It will not sink and the solar cell can just

be charged electricity by light, and the use of the feeder is normal. The product hardware is finished. This hardware is just a concept prototype. If we want to use it in a fishing field, we should adjust the waterwheel according to the environment.

7. References

[1] Weicheng Su, and Fuguang Liu, "Sustainable Management of Aquaculture in Taiwan". No.385, Scientific Development, 2005.

[2] https://www.peopo.org/news/268083

[3] http://www.icshop.com.tw/product_info.php/products_id/16396

[4] http://www.pcstore.com.tw/aquagod/S228330.htm

[5] Benyuan Chen, Operational Amplifier Specification Sheet, Quanhua Science and Technology Books Co., Ltd., Taiwan, January, 1983.

[6] Caifu Wu, and Yuzhen Chen, Sun Optoelectronics Power Supply and Lighting System Review (Second Edition), Quanhua Book Co., Ltd., Taiwan, January, 2007.