IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 3, May 2022
Impact Factor: 6.252

# Design and Fabrication of Solar Power Aeration System for Agricultural Fish Pond.

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**Abstract:** *Oxygen was vital to all livelihoods and lives. A life required oxygen to maintain various processes in the body for growth. If oxygen did not exist or existed too little, a life was unable to continue. Amount of oxygen dissolved in water was necessary to aquatic animals' beings. Moreover, it was also an indication of water condition. As the amount of oxygen dissolved in water was diminished, the water became polluted. Therefore, it was essential to increase the oxygen level in water by using an aerator. In general, such aerator used power supply by electricity. Nonetheless, the project is design & development of solar power aeration system. Electricity generated from the solar energy was utilized to supply the aerator. According to the solar cell generated electricity for the aerator gave electric power to a water pump as well as an electricity charge to a battery to efficiently supply while there was no sunlight. The solar cell generated electricity approximately 6-8 hours per day. From the initial use, the aerator using the power from the solar cell increased oxygen amount dissolved in water.*

**Keywords:** Non-Conventional Energy, Solar PV System, Dissolved Oxygen (DO), Mechanical Aeration System, Fish Pond

## I. INTRODUCTION

Biological treatment of organic material and ammonia requires ample oxygen to facilitate degradation and removal. However, minimal Dissolved Oxygen (DO) is typically present in raw wastewater, and must be added to the treatment process to enhance and facilitate biological removal of soluble organic material and ammonia. Water Resource Recovery Facilities (WRRFs) rely on aeration systems to transfer oxygen from a gaseous state to a dissolved liquid form that is available to support biological treatment. Aeration can be provided through mechanical agitation of the liquid surface to entrain DO in the aeration tanks (mechanical aeration) or through introducing oxygen into the aeration tanks through porous devices (diffused aeration).

Aeration systems are designed to increase the air-water interface within a process liquid, allowing for sufficient oxygen transfer required to support the biological processes. Mechanical aeration consists of motor-driven impellers, propeller aspirators, or rotors that generally operate at the liquid surface to provide DO within the aeration tanks. The impeller and rotor transfer oxygen by mixing the liquid surface while the propeller aspirator injects atmospheric air into the liquid. The equipment used depends on which configuration was utilized for the treatment process. There are four general configurations for mechanical aeration systems: radial flow low speed, axial flow high speed, horizontal rotors, and aspirating devices. Radial flow low speed and axial flow high speed utilizes impellers that can be designed at the liquid surface or submerged at varying depths. Horizontal rotors utilize horizontal impellers (rotors) to agitate the liquid surface and deliver oxygen to the aeration tanks. Aspirating devices utilize a propeller aspirator which can be positioned at various angles to reach distinct levels for aeration mixing. The Standard Aeration Efficiency (SAE) of each configuration is dependent upon the design of the equipment used (impeller, rotor, or propeller aspirator), tank geometry, effects of adjacent walls, input power to tank volume, and various other factors.

Oxygen was important to livelihoods and lives as oxygen empowered all body processes for life growth. Provided that there was insufficient amount of oxygen, lives could not survive. Likewise, aquatic animals were in need of dissolved oxygen (DO) in water. In general, it was derived through atmosphere and photosynthesis performed by aqua plants. The amount of dissolved oxygen was inverse with temperature and intensity of minerals dissolved in the water. The higher the temperature and the more intensity of the minerals in the water, the lesser the dissolved oxygen. Furthermore, the dissolved oxygen level was inverse with air pressure. The higher the water, the lesser the dissolved oxygen within.

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Water in nature came with dissolved oxygen value of 5-7 mg/L. If it was lower than 3 mg/L, the water was considered polluted. As pointed out above, the researcher planned the research guideline by inventing a prototype solar energy aerator. Electricity from the solar energy was brought into use to drive the functionality of the aerator and this was used within the pond. Such practice was aimed to mitigate the electricity bill cost and also was to deploy the solar energy which was natural renewable energy resource.

## II. Problem Statement

There was a huge closed pond located in all Nashik cities. In the pond, there was no ventilation. As time went by, water in the pond had become polluted due to the deduction of the oxygen in the water. There were aquatic lives in the pond such as various fish. Due to this issue, aerators were installed all over the pond areas. The recent water treatment devices obtained electricity supplied by the Electricity Authority MSEB Board. This stemmed in significantly huge expenses on a monthly basis electricity cost that they had to bear with in order to maintain and increase the oxygen level in the pond. To overcome that problem it is need to make aerator system using Solar energy use.

## III. Objectives

The followings are some of the objectives behind development of solar power aeration system given below,

1. The main objective of this project is to assess the feasibility and economic viability of utilizing Solar based standalone power supply systems to meet the load requirements for aeration system.
2. To make nonconventional system which will give continues & sufficient power in all working conditions for aeration system.
3. To make energy efficient aeration system as an low cost alternatives to conventional one.
4. To optimize usage of electricity by substituting its mode of generation for aeration system.
5. To develop a small aeration system scale model for assessing feasibility of system.
6. To design the aeration system this is cost effective, reliable and also efficient.

### 3.1 Construction and Working Functions

Solar panel

Solar Charging


Unit Battery

Ball bearings

Shaft

Chain drive

DC Pump

- **Solar Panel:** Solar power is harnessed using solar photovoltaic (PV) technology that converts sunlight (solar radiation) into electricity by using semiconductors. When the sun hits the semiconductors within the PV cell, electrons are freed and bus bars collect the running electrons which results in electric current.
- **Solar Charging Unit**: At its core, solar energy charging from converts the photovoltaic energy from the solar panels into DC electrical energy; which is fed to the EV batteries.
- **Storage Battery:** The storage battery or secondary battery where electrical energy is such a battery electrical energy can be stored as chemical energy and this chemical energy is then converted to electrical energy as when required. This chemical changes absorb energy during their formation.

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- **DC Motors:** The working of DC motor is based on the principle that when a current carrying conductor is placed in a magnetic field, it experiences a mechanical force. The direction of the mechanical force is given by Fleming's Left-hand Rule and its magnitude is given by F=BIL.
- **Ball Bearings:** Bearings reduce friction by providing smooth metal balls or rollers, and a smooth inner and outer metal surface for the ball to roll against. These balls or rollers "bear" the load, allowing the device to spin smoothly.
- **Shaft:** The term shaft usually refers to a component of circular cross-section that rotates and transmits power from a driving device, such as motor or engine, through a machine. Shafts can carry gears, pulleys, and sprockets to transmit rotary motion and power via mating gears, belts, and chains.
- **Chain Drive:** Chain drive is a way of transmitting mechanical power from one place to another …Sometimes the power is output by simply rotating the chain, which can be use to objects. In other situations, a second gear is placed and the power is recovered by attaching shafts or hubs to this gear.
- Frame: To Support the whole body of components.
- **DC Pump**: DC Powered pumps use direct current from motor, battery, or solar power to move fluid in a variety of ways. Motorized pumps typically operate on 6, 12, 24, or 32 volts of DC power. Solar-powered DC pumps use photovoltaic (PV) panels with solar cells that produce direct current when exposed to sunlight.
- **PVC Pipe:** Cut PVC pipe with handsaw, then deburr the inside of pipe to remove any roughness.
- Dry-assemble the pipe and fittings. Use felt-tip marker to draw positioning lines across pipe and fittings.
- Clean pipe end and inside of fitting with PVC
- **PVC Elbow:** PVC Elbow is designed to the flow the flow of a liquid. This allows for the configuration of a piping system to fit in an existing location.
- **Nut and Bolt:** Nuts are almost always used in conjunction with a mating bolt to fasten multiple parts together.

## IV. RESULTS

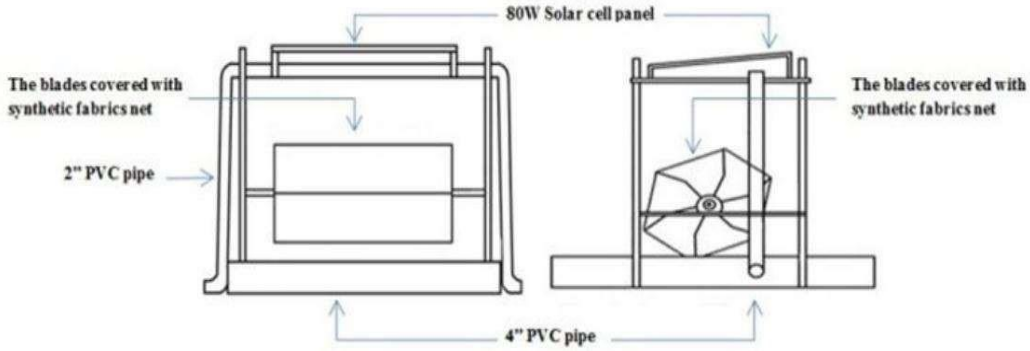


**Figure:** Solar power aeration system

**Figure:** Working model

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## V. CONCLUSION

From this report we conclude that we complete the design and fabrication of the solar power aeration system with great enormous practical experience. In that we implement our mechanical as well as the fabrication of solar power aeration system skills to developed the model of that. as well as we Use Catia software for the design the project. From we improve our design knowledge and finally with the time we complete the project successfully.

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