

Innovation of a 3 kW PV Air-Compressed System for Water Treatment Applications

“CLEAN WATER WITH CLEAN AIR FOR CLEAN EARTH”



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Introduction and fact of water treatment

Nowadays, in the wastewater treatment involves the process of transforming the pollutants in wastewater into a state that is safe enough not to harm the receiving water bodies. There are three main types of wastewater treatment: primary treatment, which focuses on removing large solids using mechanical equipment; secondary treatment, which involves biological processes to degrade dissolved organic matter; and tertiary treatment, which further purifies the water to meet higher quality standards. However, in every process, we used the electricity and power from fossil fuel, that mean we treatment water but increasing the air pollution and more CO2 emission which caused of the global warming problem. Especially, In the process of oxygen or air for water treatment pound to gain the Oxygen Dissolve (DO) for the point of the water quality standard in anyway of water and pound using electricity generates from fossil fuel.

The Design Concept

A 3 kW PV Air-Compressed System for Water Treatment Applications is designed to mitigate the environmental impact associated with traditional water treatment processes that rely on fossil fuels. By using this system, it can reduce greenhouse gas emissions and lowers the reliance on non-renewable energy sources. The system can enhance oxygen levels in water bodies, supporting aquatic life and improving water quality. Implementing such technology not only aids in effective water treatment but also aligns with sustainable practices by harnessing renewable energy.

Results Data and System Conclusions

Air Flow Rate: Approximately 400 litter/min at the solar density approximately of 500 W/M². The system operates about 5-6 hours per day that coverage capacity of the air to the system that approximately 1,500 cubic meters of air compressed to the waste water pond. From the site test, and data recorded, the calculation for electricity usage related to air supply indicates that it requires 0.2 units of electricity per a cubic meter air, this consequently to the system reduces approximately 30 units of electricity used per day. At a rate of 5 baht per unit in Thailand electric bill, this amounts to daily savings of around 150 baht, equating to an average annually saving of about 55,000 Baht or approximately USD1,600. Furthermore, the associated reduction greenhouse gas emissions is calculated at 0.5 kilograms of CO2 per unit of electricity leading to an annual reduction of approximately 25 tons of CO2 emission to the Globe.

Technical Specifications

3kW Air-Compressed using 3 PV System for Water Treatment Applications

- PV module : 3 kWp of Monocrystals PV type
- Floating structure : MDPE Drinking Water Grade Resisting UV 8++
- Motor Gear: 3HP AC @1500 RPM, 3Phases at 50 Hz, Gear ratio 1:3
- Air compressor: Piston type with special coating valve 500-800 rpm at 800 liters/min Max .Pressure 8 Bar
- Air tank: 300 liters at Max. Pressure of 8 bar
- AC/DC inverter : 2.5Kw variable speed control constant frequency
- Controller Arduino

The System was designed for solar float ,solar land and mobile unit for water treatment application and also can be applied to aquaculture, or the farming of aquatic organisms, involves the breeding, raising, and harvesting of fish, shellfish, and aquatic plants.

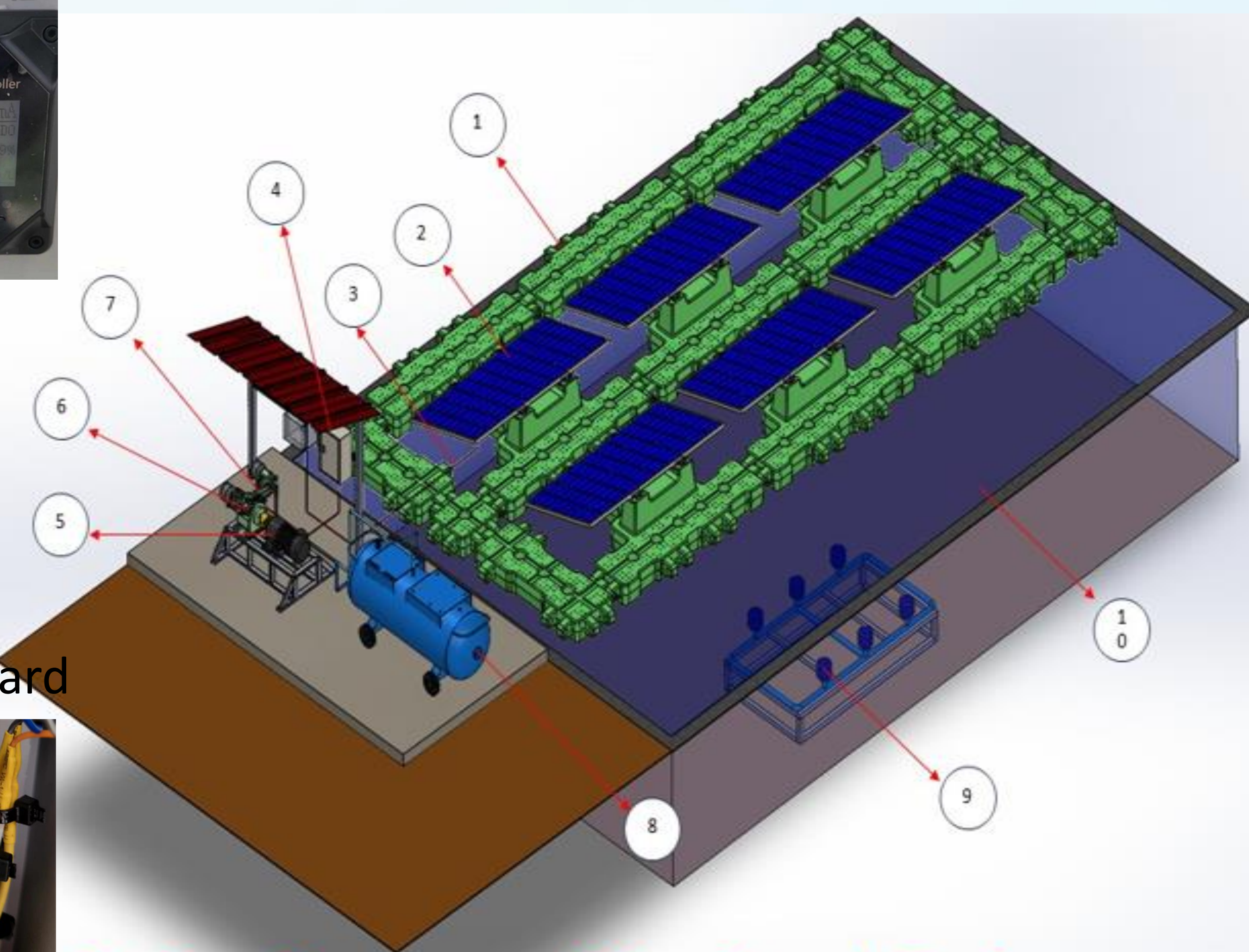
Solutions

To reduce the problem of CO2 emission and electric bill for those problems ,we designed and engineered the Innovation of a 3 kW PV Air-Compressed System for Water Treatment Applications. This system was designed using the 3 kw solar cell to generates electricity and using for 3 HP Air-compressor to press the air to the pound or water treatment tank to increase the oxygen dissolve in the wastewater for improving the quality of water and to gain the standard point which can be applied to other application such as fish and shrimp farm without CO2 emission .This system was not caused the global warming and air pollution to the Globe.



DO Meter

Arduino Board

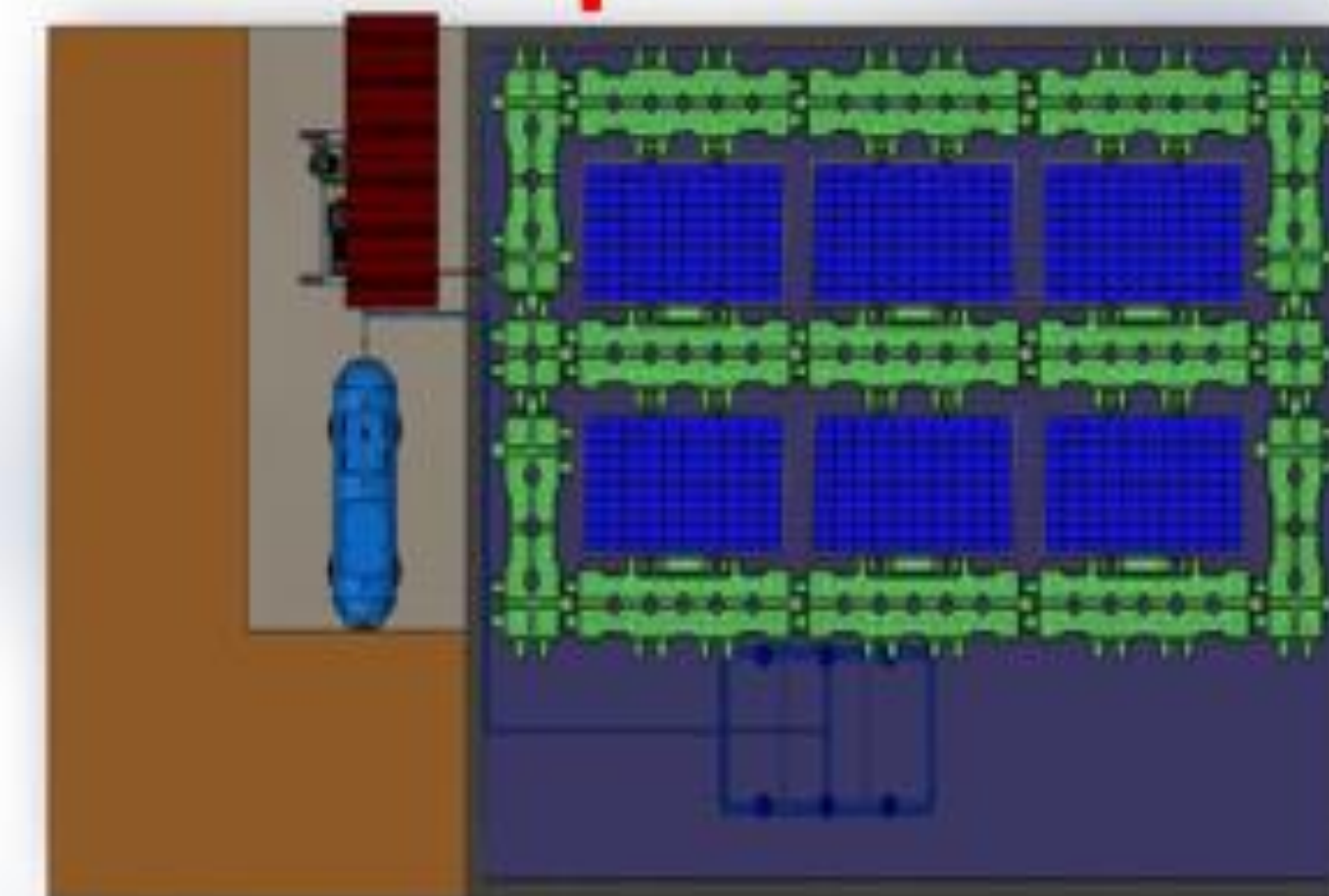


System Diagram and No. of each Device

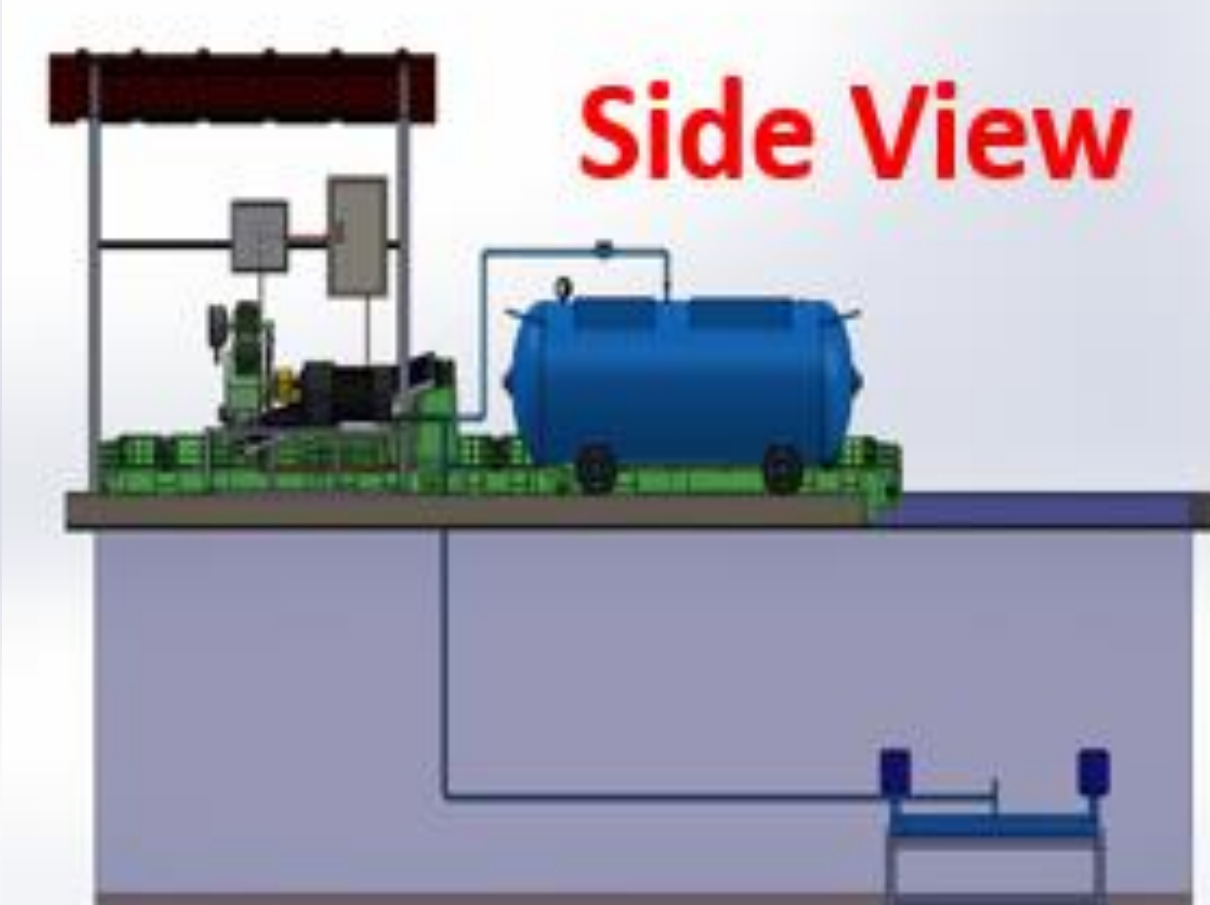
Air flow meter



Top View



Side View



(1) Floating device, 3 kW PV Module, and DC Cable Power



(2) DC/AC inverter and controller units



(3) 3HP AC motor and Gear reducing unit



(4) 3HP Air Compressor



(5) Air pressure tank



(9) Air stone



(10) Water Treatment Pound