

Solar Oxygen Tree

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Abstract: Urbanization and Industrialization are a main impetus for a nation's development. Industrialization requires good amount of area and this can be achieved at the cost of deforestation, contamination, corruption of nature and living beings. We need to discover elective approaches to satisfy the demands. One of the conceivable answers to maintain a strategic distance from these issues is the usage of a framework that utilizes an inexhaustible wellspring of vitality to fill diverse needs. This venture therefore aims at developing a system called "Artificial Solar Oxygen Tree". It fundamentally utilizes an electrolysis pack to create oxygen artificially. The voltage required for the electrolysis to take place, is provided by PV Modules that convert solar energy into electrical energy which is used for the decomposition of water into Hydrogen and Oxygen. Oxygen is released in the air. LCD is used to indicate temperature, dampness, battery level, notices, etc. To make these different aspects work, a microcontroller is used as it is a device that is capable of handling the entire system altogether and controlling the process. The conditions required for proper functioning are controlled by microcontroller according to the system needs. Energy required is obtained through PV modules and a rechargeable lead acid battery which is used to store the energy.

I. Introduction

Trees are a part of the life cycle and play an important role in our life. They are our source of Oxygen. They produce Oxygen naturally by absorbing the Carbon Dioxide from the environment. But with the increasing problems of lack of land for Industrialization, people are cutting down trees, not only for creating land available for Industries but also for producing paper, furniture, building supplies and other uses. As a result, oxygen levels are dropping with reduced number of trees. This leads to smog in air due to low oxygen levels and also respiratory problems for human beings as well as animals and other natural habitats. Other than the measures like carpooling and reducing use of fossil fuels, the most efficient way to control air pollution is to use Solar Oxygen Tree. Undoubtedly, Solar Energy is a great source of Energy. There is a great need to harness and spread awareness regarding this source of energy. The idea behind using photovoltaic modules is that it uses sunlight to convert solar energy directly into electrical energy and it also does not leave any residual elements that may lead to air pollution. Also, it is a renewable source of energy. The main aim of this project is not only to decompose water into oxygen and hydrogen and releasing the gases but also to prevent air and water pollution to a great extent. Artificial Solar Oxygen Tree has lower power consumption, constitutes of various inexpensive components like processors, protection modules, battery, sensing units consisting of various sensors, level indicators, process kits including Electrolysis Kit, other interfacing components along with power sources in a tiny and robust package onto a multipurpose processor. This device is capable of working autonomously for long period, even with no maintenance and can adapt to various changes in atmosphere and outer environment. It consists of a TFT Touchscreen panel to display the various required fields of the system and also to ease the maintenance for technicians. It is a cost-effective method to limit the ongoing problem of pollution and prevents scarcity of amount of oxygen needed in atmosphere.

II. Objective

This particular exposition focuses on producing oxygen artificially with the use of solar energy. The main aim of this exposition is to generate awareness about advantages of renewable resources among people. We all know that use of non-renewable resources has increased. This has its own consequences as it is limited in environment it may get extend in near future. So, we have to find alternate measures for limiting the use of non-renewable resources and reduce pollution. We have also concentrated on the use of waste water for the electrolysis process. We know that waste water from companies or industries is discharged into different bodies of water, such as rivers, lakes and even sea. These hazardous chemicals are not only fatal for aquatic habitat when they are released into the water, but also lead to water pollution. Thus, we will be creating awareness to release water into water treatment plants and to use this treated water for electrolysis process. In addition to oxygen, hydrogen is also produced in this process, which can be further used. Also known as future fuel,

hydrogen has a number of applications. In this dissertation we also offer alternative ways to generate electricity using renewable resources. The goal is to use less electricity. In this dissertation, we investigated that people in rural areas do not have easy access to electricity, so that this project can help them provide the necessary electricity and oxygen and can also be used as street light during the nights.

III. Problem Statement

1. Air Pollution

Air pollution is one of the major problems the world is facing today. The carbon dioxide content of the atmosphere is increasing, leading to global warming and other serious problems. In urban areas, air pollution is increasing. The oxygen content in the atmosphere does not suffice for a large population. As a result, there is an imbalance in the oxygen and carbon dioxide ratio that has adverse effects on people. This gives rise to the need of generation of oxygen artificially.

2. Water Pollution

Waste water from buildings and industries is thrown into the sea and into other bodies of water, which is a major problem. This affects both underwater life and people living near these polluted bodies of water. The Ganga River is the best example of the effects and causes of pollution by water. It is heavily polluted by human practices. If water from industry and buildings is filtered and treated, it will not affect the water bodies in the surrounding area for electrolysis.

3. Lack of Land

The demand for land keeps on increasing with increase in urbanization and industrialization. This increasing demand is fulfilled by chopping off the trees in our surrounding. In metropolitan cities like Mumbai and Delhi it is nearly impossible to plant trees and maintain them. Delhi has 11,297 living per square kilometer, which makes Delhi as the most populated location in India. It is not possible to plant trees in the surroundings or to have gardens in such locations. Therefore, we have developed an artificial solar oxygen tree that produces oxygen similar to trees. It requires less support and less space than trees. This would help to some extent.

4. Deforestation

Oxygen is the most important factor in the environment and is utilized by all the living organisms. Trees are the only living thing that consumes carbon dioxide in the atmosphere and releases oxygen. Every year, 18 million acres of forest are cut down globally. This is a big number and has led to many environmental problems. For paper, furniture, building supplies and other purposes, we humans cut the forest. Due to deforestation, one of the main problems is the decrease in oxygen levels. This causes a mismatch in the oxygen-carbon dioxide ratio.

IV. Functional Units

Different components used to build the project are mentioned below with general description. Generalized Block Diagram is shown below:

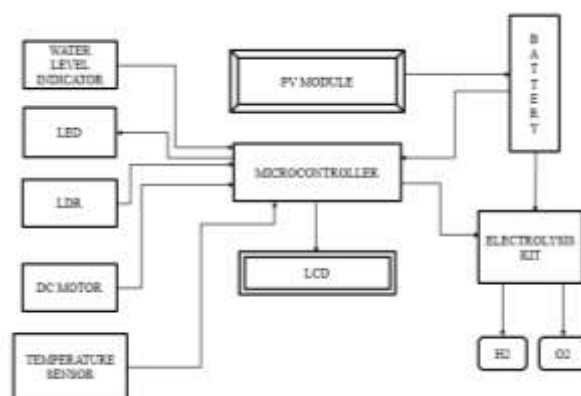


Fig. 1: Proposed Block Diagram

1. Photo Voltaic Modules

It converts solar energy into electrical energy. They are made of number of solar cells which are wired together to form a module. These solar cells are made up of semiconducting material with non-reflective layer and tough glass on the top. We have used 12V, 5W PV module which gives approximate current of 450mA.

2. Electrolysis Kit

When voltage is applied to the electrodes water undergoes the decomposition reaction and splits into hydrogen and oxygen. Two graphite electrodes are used, during the process hydrogen is obtained at the cathode and oxygen is obtained at anode. Electrolysis of pure water requires high potential hence, salts are added as a catalyst to increase the efficiency.

3. Battery

It consists of one or more cells whose chemical reactions create a flow of electrons in a circuit. We have used 6V,4.5Ah SMF (Sealed maintenance free) VRLA (Valve regulated lead acid) battery. A flooded or wet cell battery utilizes electrolyte as sulphuric acid which is a dangerous acid if spilled or externally comes in contact to anything. VRLA batteries don't contain any such liquid, as their electrolyte is formed as gel and absorbed by separator sheets.

4. Temperature Sensor

Temperature sensors are used to detect the temperature of the surrounding. The LM35 is one kind of commonly used temperature sensor that can be used to measure temperature with an electrical output comparative to the temperature (in °C). It can measure temperature more correctly in comparison to a thermistor. This sensor generates a high output voltage than thermocouples and may not need amplified output voltage. The LM35 has an output voltage that is proportional to the temperature.

5. TFT Touch Screen

A TFT touch screen is a combination device that includes a TFT LCD display and a touch technology overlay on the screen. TFT screens, are a type of active matrix LCD display capable of displaying millions of high-contrasts, clear and bright color pixels. In our project, this panel will be used to display various conditions of the system like battery percentage, temperature, etc.

6. Light Emitting Diode

It is a two terminal semiconductor device which emits light when active. It consumes less power and has low maintenance. They are also cost efficient. We have used LED strips with LDR which helps our project to work as a street light in the dark.

7. Light Dependent Resistor

LDR is a light dependent resistor. Its resistance decreases as the intensity of the light increases. When the intensity of light falling on the LDR decreases, the street lights will be turned on.

8. Relay

Relay are electromagnetic switches. They control one electrical circuit by opening and closing contacts in another circuit. An electrical contact is a component found in relays. Normally Open (NO) contact is a contact that is open or in a non-conductive state when it, or device operating it, is in non-energized state. Similarly, Normally Close (NC) contact is in a closed or conductive state in non-energized state.

9. Microcontroller

Microcontroller will be used to control the entire process of the system. All the devices are interfaced with this central component.

10. Air Quality Monitoring sensor

This sensor monitors and displays the quality of air by detecting various gases and their amount in the atmosphere and displays the value in PPM on TFT screen.

V. Methodology

Solar energy is converted to electricity using PV modules. This energy is stored in rechargeable batteries. This battery is used as a source for the whole system. This system also consists of electrolysis kit which carries out the process of electrolysis of water that decomposes water into oxygen and hydrogen. LDR will detect the intensity of light that falls on it, turning the LEDs on at night. Even temperature sensors were used to detect the surrounding temperature, i.e. If the temperature exceeds a certain point, it triggers a relay to stop the supply given to the electrolysis kit. The water which will be received by the electrolysis kit will be obtained by using the pump and motor. Depending upon the capacity of electrolysis tank, the motor is stopped

when the tank is full with the help of microcontroller. Touchscreen panel is used for displaying parameters such as temperature, water level, battery level, etc. The touchscreen panel is also used for advertisements.

VI. Conclusion

The electrolysis process is expected to be sufficiently efficient to produce a good amount of oxygen. Its other features should also work with the help of a microcontroller in a controlled way. The system should be able to turn on the lights in the dark and display the temperature and other features correctly and operate accordingly. The LCD should be able to display the correct information. The battery should be able to run the system all the time.

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