IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

National Level Conference – AITCON 2K25

Adarsh Institute of Technology & Research Centre, Vita, Maharashtra

Vol. 12, Special Issue 1, March 2025

WATER PURIFIER BY USING SOLAR SYSTEM

Mr. V. N. Karande [1] , Mr. Rohit M. Rajmane [2], Mr. Sujal N Patil [3], Mr. Juned A Shaikh [4], Mr. Prajval V Patil [5]

HOD, Electrical Engineering, AITRC Vita, India[1]

Student, Electrical Engineering, AITRC Vita, India[2]

Student, Electrical Engineering, AITRC Vita, India[3]

Student, Electrical Engineering, AITRC Vita, India[4]

Student, Electrical Engineering, AITRC Vita, India[5]

Abstract: This mega project focuses on the development of an innovative water purification system powered entirely by solar energy. The system aims to provide access to clean and safe drinking water in remote and underserved communities, particularly in regions with limited access to electricity and reliable water sources.

The project integrates cutting-edge technologies such as solar photovoltaic (PV) panels, efficient water filtration systems (e.g., membrane filtration, UV disinfection), and intelligent control systems. The solar PV system converts sunlight into electricity, powering the water purification process and ensuring continuous operation during daylight hours.

The project will address critical challenges such as energy storage, water quality monitoring, and system maintenance. It will also explore the economic and social impacts of the technology, including its affordability, accessibility, and sustainability.

The successful implementation of this solar-powered water purification system has the potential to significantly improve public health, reduce water-borne diseases, and enhance the quality of life in communities facing water scarcity and limited access to clean water resources.

I. INTRODUCTION

The energy requirement of world is increasing at a tremendous rate due to increase in population industrialization, higher standards of living etc. Today major contribution in the generation of electrical energy is fossil fuels such as coal, oil, gas, etc. but these are conventional and nonrenewable energy sources. That means one day they may get vanish and can't be regenerated again for further use. The records tell that, till now human have consumed more than 60% of all conventional energy sources. If the rate of consumption of these nonrenewable energy sources is continues and get increases with increasing energy demand then no source will left in future for electricity generation.

On the other hand we have renewable (nonconventional) energy sources, means the energy sources that get reform again and again and which can't get deplete as they are used and most important thing is, this renewable energy source is free of cost i.e. the running cost of producing electrical energy through renewable energy source is comparatively low. There are many non-conventional energy resources like geothermal, tidal, wind, solar, biogas etc. Although them the solar energy is available in ample quantity in our country and various advanced systems have made the utilization of solar energy to generate electricity with very easy manner

II. PROJECT AIM AND PLAN

On the basis of current energy scenario and to aware the people about the use of renewable energy sources for electricity generation, we have select project namely "Solar Based Water Purifier". The basic idea of project is to produce electricity by using solar panel and to use this electricity to provide purified water to our department.

The availability of solar energy in India is concern we can conclude roughly that sun is available for 300 days out of 365 days of the year. So in rainy season and in some other day's solar energy is not available to generate the energy needed to run the water purifier. For that purpose, our guide suggests to use battery for back up purpose and also suggest to make provision of MSEB supply in case of discharging of battery. Hence because of MSEB supply provision we keep our load AC.

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

National Level Conference – AITCON 2K25

Adarsh Institute of Technology & Research Centre, Vita, Maharashtra

Vol. 12, Special Issue 1, March 2025

III. RENEWABLE ENERGY

Renewable energy is energy produced from sources that do not deplete or can be replenished within a human's life time, the most common examples include wind, solar geothermal, biomass and hydropower. This is in contrast to non-renewable sources such as fossil fuels. Renewable energy often provides energy in four important areas: electricity, generation air and water heating, transportation and rural (off-grid) energy services. Globally, there are an estimated 7.7 million jobs associated with the renewable energy industries with solar photovoltaic being the largest renewable employer. As of 2015 worldwide, more than half of new electricity capacity installed was renewable. Renewable energy sources exist over wide geographical areas, in contrast to other energy sources, which are concentrated in a limited number of countries. Rapid deployment of renewable energy and energy efficiency is resulting in significant energy security, climate change mitigation and economic benefits.

IV. RENEWABLE ENERGY SOURCES

1. Solar
2. Biogas
3. Wind
4. Tidal
5. Geothermal

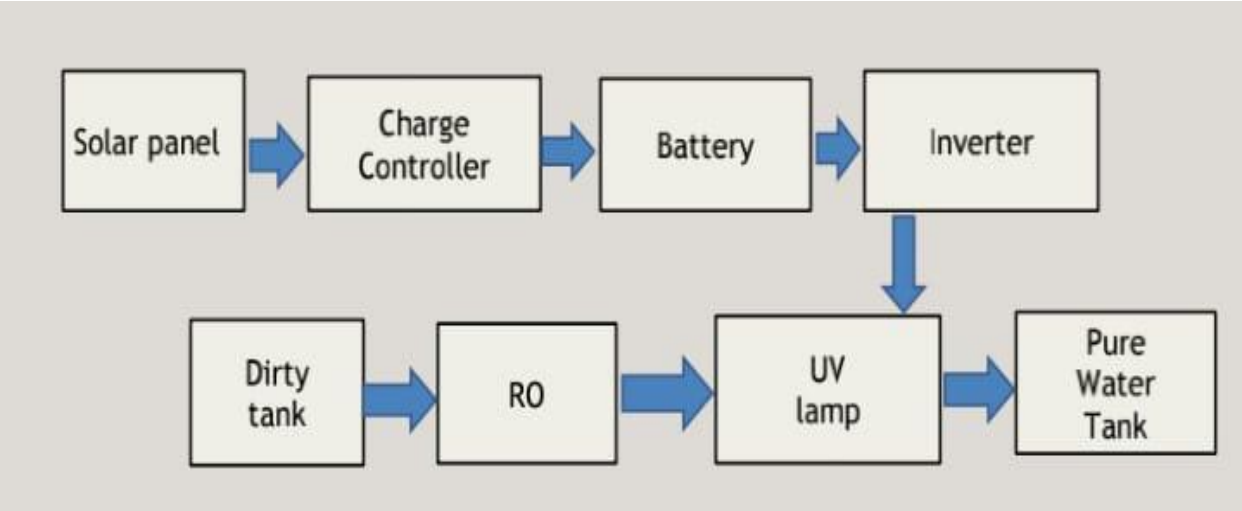
V. SOLAR ENERGY

The Sun is the source of heat and light. The produces heat by various nuclear fusion reactions. As the thermal energy radiated by the sun inexhaustible this energy is called as renewable source of energy. The diameter of the sun is 1.39 * 10 ^ 6 * km The diameter of the earth is about 12000km and the mean distance between the sun and the earth is 1.49 * 10 ^ 0 km. The sun subtends an angle of 32 minutes at the earth surface therefore earth receives the radiations with parallel rays.

VI. LITRETURE REVIEW

Solar water purification involves purifying water for drinking and household purposes through the usage of solar energy in many different ways. Using solar energy for water treatment has become more common as it is a usually low-technology solution that works to capture the heat and energy from the sun to make water cleaner and healthier for human use and consumption. There are four main types of solar water treatment: solar water disinfection (SODIS), solar distillation, solar water pasteurization, and solar water treatment systems. These technologies are quite simple, easy to implement with low financial input, and are proven effective. Development of water purification system by using solar energy is possible. The life of the system is also 15-25 years with maintenance of filter membrane system regularly. From literature review, it is found that numerous methods are developed for treatment of water for domestic use. Conventional, Reverse Osmosis systems are used domestically, but at the cost of waste water. Nonconventional water cleansers like a solar still have unlimited potential, but output is limited. The humidification and dehumidification process, and multi effect purification method with hybrid solar water system can be developed

VII. BLOCK DIAGRAM



IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

National Level Conference – AITCON 2K25

Adarsh Institute of Technology & Research Centre, Vita, Maharashtra

Vol. 12, Special Issue 1, March 2025

Solar panel: A solar panel is a device that converts sunlight into electricity by using photovoltaic (PV) cells. PV cell are made of materials that produce excited electrons when exposed to light. These electrons flow through a circuit and producee direct current (DC) electricity, which can be used to power various devices or be stored in batteries. Solar panels are also known as solar cell panels, solar electric panels, or PV modules

Charge controller : A charge controller is a device that regulates the voltage and current that goes from a power source to a battery. it's also known as a charge regulator or battery regulator.

Battery : A battery is a device that stores chemical energy and converts it to electrical energy. Batteries are used many devices,

Inverter : An inverter can be defined as it is a compact and rectangular shaped electrical equipment used to convert direct current (DC) voltage to alternating current (AC) voltage in common appliances. The applications of DC involves several small types of equipment like solar power systems.

Dirty tank : Unpolluted water means water of quality equal to or better than the effluent criteria in effect or water that would not cause violation of receiving water quality standards and would not be benefited by discharge to the sanitary sewers and wastewater treatment facilities provided.

RO (Reverse Osmosis) : The RO process, or Reverse Osmosis process, is a water purification method that uses pressure to remove contaminants from water. The process uses a semipermeable membrane that only allows water molecules to pass through.

UV lamp : Ultraviolet (UV) rays are part of the light that comes from the sun. The UV spectrum is higher in frequency than visible light and lower in frequency compared to x-rays. This also means that the UV spectrum has a longer wavelength than x-rays and a shorter wavelength than visible light; the order of energy, from low to high, is visible light, UV, than x-rays.

Pure water tank : Ultraviolet (UV) rays are part of the light that comes from the sun. The UV spectrum is higher in frequency than visible light and lower in frequency compared to x-rays. This also means that the UV spectrum has a longer wavelength than x-rays and a shorter wavelength than visible light; the order of energy, from low to high, is visible light, UV, than x-rays.

VIII. POTENTIAL ENERGY

The energy emitted by the Sun in space is 3.7 x 1025 watts. Out of which 5x10-19th part of the solar energy is received by the earth which is equivalent to the 107 x 1017 watts. The energy emitted by the Sun within 3 minutes is equivalent to the world energy consumption during a year. Thus the importance of the solar energy is justified and it would full fill the major requirement of demand of energy in next few years.

Most of the solar radiation reaches the earth as electromagnetic waves about 0.25 to 3 µ wave length. About half of these radiations are visible as light and the rest is infrared which accounts for heat. The intensity of the solar radiations is reduced by clouds, dust, etc. The intensity of solar energy in India is approximately 1.12 km/m² and the monthly average solar energy in India is 50 kJ/cm³/month (as per the metrological department of India).Solar energy has three attractive characteristics, first the Sun is essentially an infinite source of energy, second this energy is available to all nations and third this can be harnessed with minimum detrimental effects on the environment.

IX. SOLAR CONSTANT

The solar constant, a measure of flux density, is the amount of incoming solar electromagnetic radiation per unit area that would be incident on a plane perpendicular to the rays, at a distance of one astronomical unit (AU) Le. Roughly the mean distance from the Sun to the Earth. The solar constant includes all types of solar radiation, not just the visible light. Its average value was thought to be approximately 1.366kW/m², varying slightly with solar activity, but recent recalibrations of the relevant satellite observations indicate a value closer to 1.361kW/m is more realistic.

X. CONCLUSION

As per the project system is concern i.e. solar panel, DC converter along with battery it will produce electricity free of cost and without any pollution. It will help to maintain continuity and reliability of supply. Our project help to reduce electricity demand belong to lighting load in our department and hence will reduce the electricity bill also. Because of this project we are able to design a solar system consisting of solar panel. DC converter along with battery on the basis of given load.

REFERENCES

[1]. Prashant Basavaraj Bhagawati, “mobile solar water purifier”, IRJET Transactions, 2017
[2]. Sheikh Usman Uddin, “Design and Analysis of a Solar Powered Water Filtration System for a Community in Black Tickle-Domino” IEEE Transactions, 2017
[3]. Vamsy Gedela, “Solar powered automated water pumping system for eco-friendly irrigation” IEEE Transactions, 2017
[4]. Lagouge Tartibu, “Design and Development of a Water Purifier System “IEEE Transactions, 2023
[5]. C. Abraham, IoT based solar powered air purifier with air quality monitoring system, IEEE Transactions, 2024
[6]. Prakalya E ,”Solar- Powered Water Purification System”, IRJET Transactions, 2017
[7]. Gazi Nazia Nur, “Design and Construction of Solar Water Purifier”, ICMIME, 2017
[8]. Akshay Acholkar,” Solar Water Purifier”. IRJET Transactions, 2015
[9]. Z. M. Husin**,”**Solar power based portable water purification system” IRJET Transactions, 2019
[10]. Jromed C. Cheng,” Solar-Powered Atmospheric Water Generation and Purification System”. IRJET Transactions, 2009

