
SOLAR OPERATED MULTIPURPOSE PESTICIDE SPRAY PUMP**Prof. Poonam Tagade*¹, Prof. Dilip Rangai*², Nitesh P Sontakke*³, Prashik V Nagrale*⁴,
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ABSTRACT

The 70% population of our country lives in villages & their main occupation is agriculture. Similarly more than 40% of these areas do not get regular electricity supply. Most of the farmers uses engine or electrically operated spray pumps, which is costly affair for them. Our prominent aim of this project is to introduce a novel spray which works on solar power i.e. using non-conventional energy sources. Thus solar operated spray pump will help the farmers of remote areas of country where electricity and fuels (like diesel or petrol) availability is irregular. Thus they can perform their regular work as well as saves the electricity and fuel up to large extent. This will going to save the electricity and fuel also reduce the demand of it to substantial extent. In this project we have used the solar energy which operates the multipurpose pesticide spray pump. It would not be wrong to say that the Sun was supplying ample energy which can fulfill the needs of entire human being still man is only relying on non-renewable sources of energy

Keywords-Solar Panels, DC Pump, Sprayer, Photovoltaic Cell (PV), Electricity.

I. INTRODUCTION

Spraying of pesticides is an important task in agriculture For protecting the crops from insects. Farmers mainly use Hand operated or fuel operated spray pump for this task. This conventional sprayer causes user fatigue due to excessive bulky and heavy construction. This motivated us to design and fabricate a model that is basically solar sprayer In our design, here we can eliminate the back mounting of Sprayer ergonomically it is not good for farmer's health point of view during spraying. in this way here we can reduce the users fatigue level. There will be elimination of engine of fuel operated spray pump by which there will be reduction in vibrations and noise. The elimination of fuel will make our spraying system eco-friendly. So with this background, we are trying to design and construct a solar powered spray pump system. Now days there are non-conventional energy sources are widely used. The energy which is available from the sun is in Nature at free of cost. In India solar Energy is available around 8 months in year .so it can be used in spraying operation. Solar pesticide sprayer can give less tariff or price in effective spraying. Solar energy is absorbed by the solar Panel which contains photovoltaic cells. The conversion of the solar energy into electrical energy is done by these cells. This converted energy utilizes to store the voltage in the DC Battery and that battery further used for driving the spray Pump. Solar spray are the ultimate cost effective solution at the locations where spraying is required. This solar-powered spray pump system uses solar energy as source. Solar energy is first used to charge a storage battery. The solar energy stored in the battery is utilized to operate motor which functions as pump. As the name of the paper suggests, it deals with the constant discharge of pesticide, compress air control system, solar power, battery charging, monitoring as well as timer and non-conventional power controlling techniques. As far as controlling is concerned, it include the parameters such as pressure, pesticide level, battery voltage, current, solar cell and discharge condition. In this paper we are trying to make unique equipment for cultivation users. Mostly in the forming process pesticide spray is taking a critical role due to poison properties of chemical. So, in this paper we have committed to do something unique and useful equipment with non-conventional source technique. Also reduce the weight of unique solar spray jet as compare to diesel spray jet.

II. LITRATURE REVIEW

The conventional energy sources will be exhausted before the end of this century. Hence there is need to search an alternative source of energy to replace this conventional type of fuels. The energy which has the above qualities is solar energy. So we decided to use solar energy for agriculture purpose for spraying pesticides. The

main part of the spray pump is centrifugal pump and solar panel. The solar panel of (12 V. 18 Watt) converts solar energy into electrical energy. which stored in Battery (12V), the centrifugal pump is operated on battery. The pesticide solution is pressurized by pump and converted into fine particles by means of nozzle, so we can save 30% - 40% pesticide solution. Ultimately it reduces cost of the pesticide. The running cost of the project is negligible because of practically zero maintained,

SOURCES FOR POWER GENERATION- The present advanced technology is based on the availability of energy in large quantity at reasonable prices. The cost of energy is increasing day by day due to increase in demand & deficiency of sources. Hence there is a need of such source of energy, which is available at very low cost and in large quantity. Under this category they are tidal energy, Hydal energy, geothermal energy & solar energy etc. Hydal energy cannot be obtained anywhere. The time required for developing a hydraulic project is relatively high. Also the time required for its hydrological, topographical and geothermal investigations is relatively high. Lack of suitable site adds to this problem. Also it may be affected by natural calamities such as poor rainfall, changing catchment area, changes in wind patterns etc. As considering thermal power plants the present capacity of coal in India is \$1000 million tones, which is localized in west Bengal, Bihar, M.P, A.P. The coal used for power generation is of low grade and has high ash content (20 to 40%) due to this it gives bad performance and low efficiency of the exiting steam power plants. Also there is a big problem of ash disposal. Nuclear power plants are failed up to some extend due to the problem of disposal of radioactive watts and possibility of explosion. Wind energy is also a good source of energy. But on earth wind flow patterns constant and also its speed varies from place to place. After discussing all these sources of energy it is seen that these sources will be exhausted before the end of the century. So there is a urgent need to search for an alternative source of energy to replace conventional type of fuels. The energy, which has the above qualities, is SOLAR ENERGY. The solar energy is radiated on earth continuously. The temp. of radiation surface is estimated to be 5000° k. the rate at which the solar energy is incident on earth is about 1 KW/m² (an altitude above the atmosphere it is about 1.5 KW/in²). Due to this low rate of energy incident on earth and that high rate of energy lost in the surroundings from any heated surface it is found impossible to reach the temp. Higher temp 100° C on this surface if directly exposed to solar radiation.

SOLAR ENERGY UTILIZATION- Solar energy can be effectively utilized for many purposes. We have to collect the energy from sun and store it for various applications. With the help of energy collectors and converters thermal power generation photosynthesis photovoltaic power generation etc. can be performed in easier manner.

1. THERMAL POWER GENERATION

Solar energy can be converted to thermal energy by flat plate or focusing collector. This thermal energy is used to drive a heat engine thus converting solar energy into mechanical energy. The solar energy supply system works best at low temp, while the heat engine is most efficient with energy input at high temp. The solar energy is first collected using a solar panel or any type of collector. This is used to increase the internal energy or temp of fluid. The fluid may be directly used in any of the known cycle such as Rankin Brayton or Sterling or Parses through the heat exchanger to heat a secondary fluid (working fluid), which is being used in the cycle to produce mechanical power from which electrical power can be produced easily.

2. PHOTO SYNTHESIS

Solar energy is stored in the form of chemical energy in the process of photosynthesis. In this mode the energy is not transformed to heat but it is utilized automatically controlled atomic and molecular systems, which undergoes chemical changes and biomass produced. Photosynthesis is an example of biological conversion of solar energy into sugar and starches, which are energy rich, compound. This process is extremely complex. It is the most important reaction on the earth. Radiation energy of the sun is absorbed by the green pigment chlorophyll and chemical bond energy. In this reaction water and co₂ molecules are broken down and carbohydrates are formed with the release of pure oxygen.

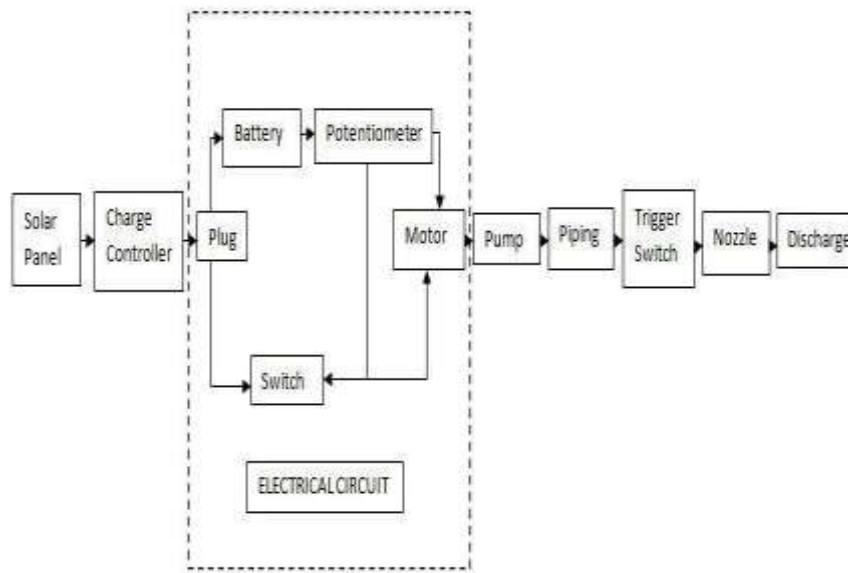


Figure 1: Block Diagram of Spraying System.

3. PHOTO VOLATIC POWER GENERATION

One way of utilizing solar energy is to generate electricity directly from sun light by photovoltaic process. The generation of an electromotive force as a result of the absorption of ionizing radiation. The energy conversion devices which are use to convert sunlight to electricity by the use of photovoltaic effect are called as solar cell.

Semiconductors are use for photovoltaic effect. When photons from the sun are absorbed in a semiconductor, they create free electrons with high energies then the electrons which provide the bonding with the base crystals. Once these free electrons are created there occurs an electric field which induces these high energy electrons to flow out of the semiconductors to do useful work.

Some types of solar cells are as follows

1. Silicon solar cell.
2. Cadmium solar cell.
3. Sulphide solar cell.
4. Gallium solar cell.

Solar cells offer a potentially attractive means for direct conversion of sunlight into electricity with high reliability and low maintenance as compared with solar thermal systems. The disadvantages are high cost and difficulty of storing large amount of electricity for major application.

III. WORKINGPRINCIPLE

The system consists of Solar panel, charging unit, battery, pump and sprayer. The solar panel delivers an output in the order of 12 volts and 20 Watts power to the charging unit. The charging unit is used to strengthen the signal from the solar panel. The charging unit delivers the signal which charges the battery. According to the charged unit, the pump operates, such that the sprayer works. Here fertilizer can be stored in tank. When the sun rays are falling on the solar panel electricity will be generated through the solar cells and stored in the battery. By the electric power in the battery the pump operates and therefore fertilizers from the tank is sprayed out through the sprayers. The layout of solar sprayer is shown in fig.1. There is no maintenance cost and operating cost as it is using solar energy and no pollution problem. Its working principle is very easy and it is economical for the farmers, which has one more advantage that it can also generate power that power is saved in the battery and it can be used for both for spraying and well as to light in the houses when there is no current supply.



Figure 2: Fabricated solar pesticide sprayer

IV. CONCLUSION

Main objective of the project was to utilize inherently available solar energy in spraying operations thus achieving zero electricity. Proposed model made it possible using simple and effective principle of storing sun energy in battery through constant supply of voltage from solar charge controller and then with the use of selected pump and nozzle, spraying operation can be carried out. Fatigue and Stress that usually generates during working condition for the farmers has been reduced considerably after adopting ergonomic techniques during designing. Hence analyzing the function v/s cost with the presently available equipment in market, solar sprayer equipment is more efficient with comparatively lesser cost.

V. REFERENCES

- [1] Sukhatme, S.P., "Handbook of solar energy", New Delhi, Tata McGraw-Hill: ISBN 0-07-462453-9, 2001.
- [2] World Energy Outlook, Paris: IEA, 2015. Retrieved on 24/06/2017.
- [3] Akshay, M.N. and Waghmare, G., "Design and fabrication of solar operated sprayer for agricultural purpose" National Conference on Innovative Trends in Science and Engineering, Vol. 4, No. 7, 2016.
- [4] Pritam J.M., Yogesh G.A., Akash S.B. and Rajendra S.k., "Solar operated spray pump" International Research Journal of Engineering and Technology (IRJET), Vol. 03, No. 02, 2016.
- [5] Joshua, R., Vasu, V. and Vincent, P., "Solar Sprayer - An Agriculture Implement", International Journal of Sustainable Agriculture 2 (1): 16-19, 2010.
- [6] Chavan, R., Hussain, M., Mahadeokar, S., Nichat, S. and Devasagayam D., "Design and construction of solar powered agricultural pesticide sprayer" International Journal of Innovations & Advancement in Computer Science, Vol. 4, No. 4, 2015.
- [7] Pritam J.M., Yogesh G.A., Akash S.B. and Rajendra S.k., "Solar operated spray pump" International Research Journal of Engineering and Technology (IRJET), Vol. 03, No. 02, 2016.
- [8] S. Charvani, K.Sowmya, M.Malath, P.Rajani, K.Saibaba "Design And Fabrication Of A Solar Sprayer" National Conference on Innovative Trends in Science and Engineering, page no 237to244 may 2017