

Simple Solar Panel (*PASUSS*) From Used DVD (Digital Versatile Disc) As Insect Repellent on Agricultural Land

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Keywords

DVD, solar panels, insects, agriculture

Abstract

Waste becomes a major problem, especially electronic waste, which is hard to decompose and often causes environmental problems. One of the electronic wastes that can still be used as a simple solar panel material is DVD. This material can absorb solar heat energy. So, this study aims to explore unused DVDs (Digital Versatile Discs) as an alternative material for solar panels (monocrystalline). The research method was through experimentation based on literature review/literature study, direct practice, and product-based. The research results are that a series of arranged DVDs produced high electric power. It is also in line with Ohm's law theory. High electric power production is suitable for manufacturing simple solar panels (*PASSUS*) used as insect-repellent devices on the field.

Introduction

Solar energy is a source of inexhaustible energy. Solar panels have changed views about energy and provided an alternative to generating electrical energy without using fossil fuels. Solar panels can well-operate in almost all parts of the world that are exposed to sunlight (Kurniawan et al., 2021). Indonesia is a country located on the equator. It causes Indonesia to be exposed to sunlight for 10 to 12 hours per day and possibly produce solar energy. 4.8 kWh/m². Therefore, Indonesia benefits from using solar energy as renewable energy (Azis et al., 2020).

Indonesia is also well-known as an agricultural country where most people cultivate crops. The climate also supports farming activities and the soil structure (Astutik et al., 2018; Widayoko, 2020). However, many fields lack land productivity. Some fields still have difficulties in water irrigation and often rely on rainwater, commonly called rainfed. The potential of this field is quite fertile, and it can be planted with various crops that produce and support the community's needs. Farmers often have to prepare small wells with diesel pump water. Other farming problems often arise with outbreaks of pests, insects, rodents, and other animals that interfere with crop production. Some farmers have tried various ways to reduce that pest, one of which is by making scarecrows or even traps (Ilman et al., 2022).

The opportunities for developing alternative energy, environmentally friendly or often referred to as new renewable energy, are urgently needed to develop potential in the agricultural aspect. This aspect has the potential to be developed, especially as one of the strategic sectors in improving and maintaining food security and the national economy (Mulyaningsih et al., 2021). The use of new and renewable energy has also become on the national agenda, as concrete action, vision, and mission are formulated "to realize efficient, clean, reliable and affordable energy in the framework of sustainable development"(Suyatna et al., 2018).

One of the efforts that can be made is by utilizing electronic waste that can be recycled and used as a simple solar panel. One of them is by utilizing unused DVDs. This DVD has recently been abandoned and replaced by higher technology. The DVD contains content that can absorb solar heat energy and be used as a simple solar panel (Auliya et al., 2019; Sulhi et al., 2017). The used DVDs can be directed to developing simple solar panels (PASSUS) to repel insects on the field. Therefore, the purpose of this article is to explain more deeply the DVD content that will be used in the *PASSUS* prototype for an insect repellent on the field.

Method

Research Methods using the experimental method. It is based on a literature review, direct practice, and product-based. Based on the results of the literature review, it can be concluded that used DVDs have the potential to be developed as a substitute for solar panel functions. In addition, based on the experiments, it can be found that the truth about used DVDs will be developed into a *PASSUS* prototype with functions almost the same as solar panels.

Results and Discussion

Table and Figure 1 describe the power generated by solar panels from DVD. Based on these results, the more DVDs used, the higher the power generated. Each DVD can produce high electrical power (Auliya et al., 2019).

Table 1. The power generated by the solar panel

DVD (Disc)	P (Watts)	V (Volts)
1	3.2	3.3
2	6.2	6.1
3	9.1	9.2
4	12.2	12
5	15.1	15.2
6	18.2	18

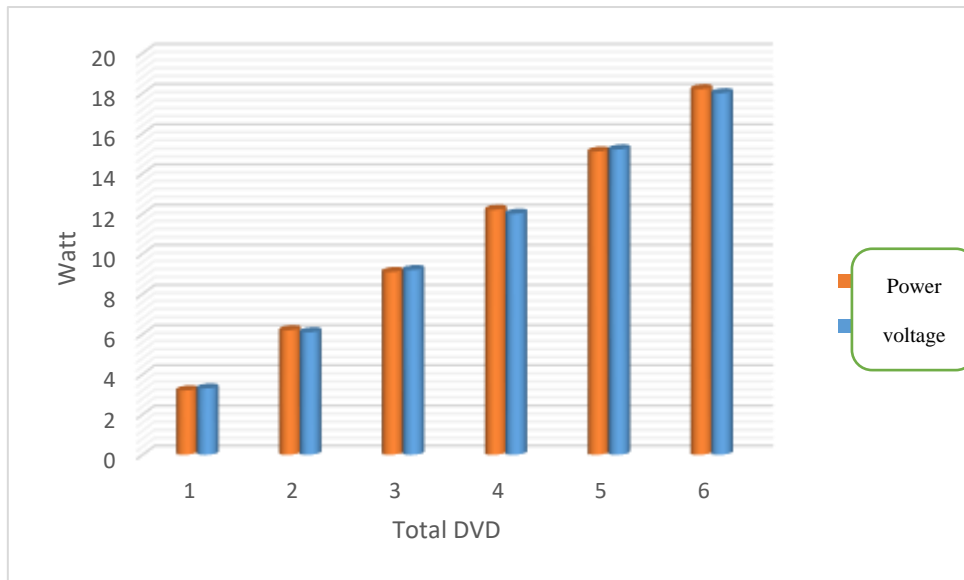


Figure 1. The power generated by the solar panel from the DVD

A Series of DVDs arranged from one to six discs will produce greater power. Ohm's law theory supports it. Ohm's law governs the relationship between electric voltage, current, and resistance. Ohm's law states that the electric current in a closed circuit is directly proportional to the voltage and inversely proportional to the resistance. Mathematically, it can be written as:

$$i = V/R$$

Note: *i* is the electric current (Ampere (A)); *V* is the electric voltage (Volt (V)), and *R* is the electric resistance (Ohm (Ω)).

Table 2 and Figure 2 are the analysis with time variation to test the power capability of solar panels with DVDs, the average power produced by six DVDs is 18.1 watts.

Table 2. The solar panel from the DVD generates the power for each time variation

t(hour)	P(Watts)
0.5	18.2
1	18.2
1.5	18.1
2	18.1
2.5	18
3	18
3.5	18
4	17.9

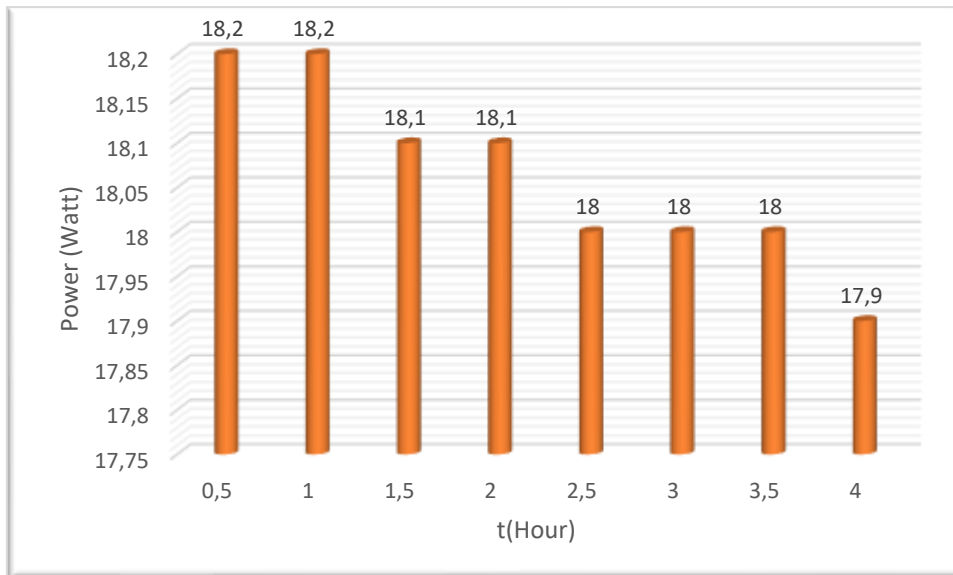


Figure 2. The solar panel from the DVD generates the power for each time variation

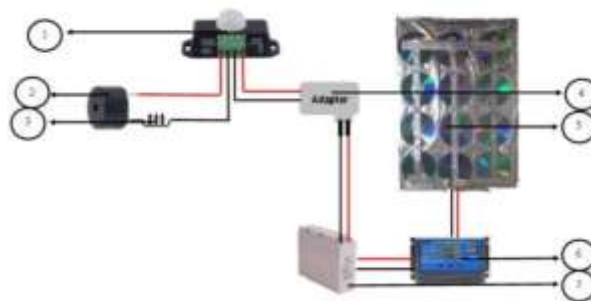


Figure 3. Solar panel DVD prototype design

1. Buzzer
2. Copper Coil
3. Solder Wire
4. Cable
5. Duct tape
6. PIR DC sensor
7. Adapter
8. Cable
9. Simple Solar Panel

Conclusion

New and renewable energy development is urgently needed in the agriculture sector. Moreover, combining and utilizing unused electronic waste due to increasingly sophisticated technology. One that can be used and developed as an alternative energy for simple solar panels is DVD. A series of DVDs arranged in series can produce high electric power, as stated in Ohm's law theory. Each DVD can produce high electrical power, so the development of using used DVDs can be directed to manufacture simple solar panels (*PASSUS*) for repelling insects on the field.

Recommendation

It is expected that the results of this activity, a series of community service activities carried out in the Plembutan Farmer Group, can be carried out in various regions. It also reflects the awareness and support in realizing sustainable national development, namely, independently

producing food. Then, it also can maintain the development of technological innovations in the form of new and renewable energy by utilizing electronic waste in DVDs.

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