



Utilization of Sunlight through Spot Charging Development Integrated Trash Can

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ARTICLE INFORMATION

Received: 5 August 2022

Revised: 12 August 2022

Accepted: 30 August 2022

Published: 30 September 2022

ABSTRACT

The city of Blitar is geographically located at the foot of Mount Kelud. With these conditions, the city of Blitar has cool air with an average temperature of 24-34°C, making it comfortable for studying and traveling. One of the cheap tours in Blitar City is Aloon-Aloon Blitar City which is located in the heart of Blitar City. Based on the results of observations, it was found that the level of awareness of visitors to environmental cleanliness was still low. This is shown by the large amount of garbage that is disposed of in any place, causing the beauty of Aloon-Aloon Blitar City to be affected. This study aims to develop appropriate technology that is able to increase visitor awareness of cleanliness. The research method used is development research by developing trash cans that are integrated with solar cell-based charging spots. The result obtained is the creation of a charging spot integrated with trash cans that can increase visitor awareness of waste. On the other hand, this solar cell-based charging spot technology is capable of charging 16 handphones with optimal duration of solar cell exposure to heat.

Keywords: (Sunlight, Charging Spot, Trash Can).

ABSTRAK

Kota Blitar secara geografis terletak di bawah kaki gunung kelud. Dengan kondisi ini membuat Kota Blitar memiliki udara yang sejuk dengan rata-rata temperatur 24-34°C sehingga membuat rasa yang nyaman untuk belajar maupun berwisata. Salah satu wisata murah meriah yang terdapat di Kota Blitar adalah Aloon-Aloon Kota Blitar yang terletak di jantung Kota Blitar. Berdasarkan hasil observasi, ternyata ditemukan bahwa tingkat kesadaran pengunjung terhadap kebersihan lingkungan masih rendah. Hal ini ditunjukkan dengan banyaknya sampah yang dibuang di sembarang tempat, sehingga menyebabkan keindahan dari Aloon-Aloon Kota Blitar ikut terdampak. Penelitian ini bertujuan untuk mengembangkan teknologi tepat guna yang mampu untuk meningkatkan kepedulian pengunjung terhadap kebersihan. Metode penelitian yang digunakan adalah penelitian pengembangan dengan mengembangkan tempat sampah yang diintegrasikan dengan charging spot berbasis solar cell. Hasil yang didapatkan adalah terciptanya charging spot terintegrasi tempat sampah yang mampu meningkatkan kesadaran pengunjung terhadap sampah. Di sisi lain teknologi *charging spot* berbasis *solar cell* ini mampu mencharge 16 *handphone* dengan durasi *solar cell* terkena panas secara optimal.

Kata Kunci: (Sinar Matahari, *Charging Spot*, Tempat Sampah).

DOI: 10.26905/jtmt.v18i2.9474

1. Introduction

Judging from the official website of the Blitar City Government, it is known that geographically Blitar City has a fairly cool air temperature with an average temperature of 24°C-34°C. This is because the location of Blitar City is located at the foot of Mount Kelud [1]. With the advantage of this geographical location, there are not a few places that are used as tourist centers or ecotourism [2-3].

Based on monitoring results, the city known as the City of Proclaimers has several tourist centers or places frequented by city residents spread throughout the city. These places include:

- a) Aloon-Aloon Blitar City
- b) Kebon Rojo
- c) Sports Center
- d) Bung Karno's grave

- e) Supriadi Stadium
- f) Pecut Park
- g) TMP
- h) Sentul Park
- i) PIPP
- j) Green Park.

The names mentioned above are the names of places most frequently visited by residents of Blitar City and tourists. The place offers various charms. An example is Aloon-Aloon, Blitar City, which has a very large area of land that is suitable

for various activities such as sports, family gatherings, playing and so on.

With these various activities, it is possible that environmental cleanliness will decrease. Based on the results of observations, there is still a lot of trash found in tourist attractions or places that are most frequently visited. This is able to reduce the image of Blitar City in the national scope. Even though the City Government has a special cleaning officer, it doesn't mean that visitors throw garbage anywhere. The following is a description of what happened in the public area.



Figure 1. Cleanliness Observation Results in Aloon-Aloon Blitar City

Based on Figure 1 it is known that there are various types of waste that are disposed of in any place. This may indicate that visitors' understanding and awareness of a clean culture of waste is in the low category. Even though it is known that if waste is treated properly, the results can be used optimally [4-6].

In general, waste is divided into two categories, namely organic waste and inorganic waste [7-9]. If organic waste is processed properly, it can be used as a new energy source such as biogas, fertilizer or compost [10-12]. Meanwhile, inorganic waste if processed properly can be used as handicraft products, and can even be used as an alternative to fuel oil [13-14].

2. Methodology of Research

The research method used in this study is the development method. The product being developed is a trash can that is integrated with a solar cell-based charging spot.

2.1. Material

In building a trash can that is integrated with a solar cell-based charging spot, there are at least three main components needed apart from designing a trash can. These components include:

a. Solar Charging System

The Solar Charge Controller (SSC) is one of the PLTS components that is useful for setting the incoming electric current (current regulator) from the PV panel as well as the outgoing/used load current and serves to protect the battery from overcharging, using an SSC of the type PWM with a maximum current capacity of 20A at a more affordable price than the MPPT type.

b. Battery

The battery used in this innovation is a 4.2v lithium battery with a capacity of 3000mAh which is arranged in 3 series 5 parallel so that it can produce an output voltage of $4.2v \times 3S = 12.6v$ and a max capacity of $3000mAh \times 5P =$

15000mAh which is equipped with battery management systems (BMS) is a technology system that functions to maximize battery pack life, by optimizing the charging and draining of power on the battery evenly, so as to maintain

battery performance so that the battery has a long service life. The following is a design of a solar cell-based charging spot.

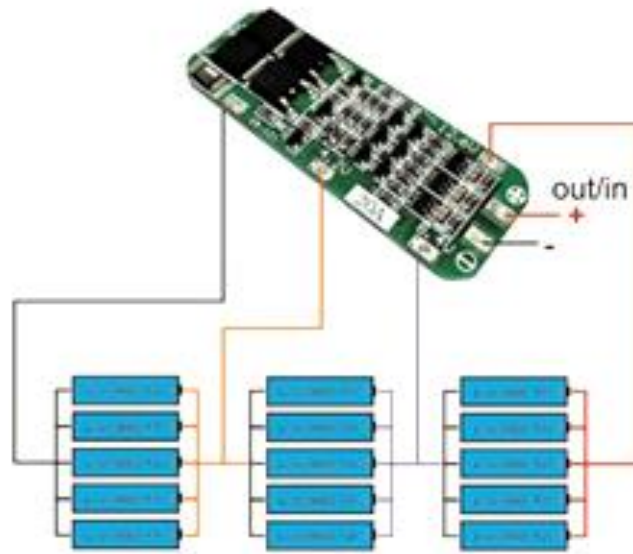


Figure 2 Battery Arrangement



Figure 3 Solar Cell Based Spot Charging Design

c. HP Motor Charger

The HP motor charger is a vehicle accessory component that is capable of converting DC12-24v to DC5v voltage and is equipped with a 2.1A USB port so it is safe for charging

cellphones. The materials used in this development research are shown in detail in Table 1 below.

Table 1 Material Used

No	Name
1	Monocrystalline 60wp solar panel
2	Solar charger controller PWM
3	Used Laptop Lithium Batteries
4	Modul BMS 3S 40A
5	18650 Battery Holder Bracket
6	18650 Battery Nickel Plate 12mm x 8mm
7	Electrical Panel 20cm x 30cm x 40cm
8	Heatsink LED
9	Relay
10	Fuse DC + Holder
11	MCB 2P DC
12	Rail MCB
13	Watt Meter DC
14	Step Down Buck Converter DC CC 9A 300W 5-40V
15	USB
16	Tin
17	Hollow iron 4cm x 4cm

3. Result and Discussion

The following are the results of the appropriate technology that has been developed.



Figure 4 Solar Cell-Based Charging Spot integrated with Trash

Based on Figure 4 it is known that at the top is a solar cell-based charging spot display integrated with the trash can from the back side. In this section there is a trash can that can be taken easily and can be returned to its original state. Next in Figure 5 below is the view from the front. On the right and left sides are also equipped with seats and USB ports that can

be used to charge mobile phones. The energy reserve system obtained from the solar cell is at the bottom of the solar cell table.

The workings of a solar cell-based charging spot integrated with a trash can is to convert heat from sunlight into electrical energy that can be used to charge batteries on cellphones. The simple trash can is intended to invite visitors to live clean by disposing of trash in its place.

4. Conclusion

The development of a solar cell-based charging spot integrated with trash cans has been successfully carried out. Based on the results and discussion, it can be concluded as follows.

- In building a solar cell-based charging point integrated with trash bins, five main components are needed, consisting of solar cells, solar charging systems, batteries, mobile phone chargers, and 4cm x 4cm hollow metal.
- For battery optimization, the batteries are arranged in 3 series 5 parallel.

5. Acknowledgement

The authors would like to thank to the Universitas Negeri Malang for providing opportunities and support through funding sources Non-APBN Program Kemitraan Masyarakat (PKM) with number: 19.5.387/UN32.20.1/PM/2022 Universitas Negeri Malang

References

- [1] A. Laurens, "Sengketa Wilayah Perbatasan Gunung Kelud Antara Pemerintah Kabupaten Blitar Dengan Kabupaten Kediri Ditinjau dari Undang-Undang Nomor 32 Tahun 2004 Jo Undang-Undang Nomor 12 Tahun 2008 Tentang Pemerintahan

- Daerah". *Calyptra*, Vol. 2, No. 1, 1-13, 2013.
- [2] C.A. Nugroho & A. W. Purwantiasning, "Penerapan Teori Linkage Dalam Penataan Kawasan Wisata Pusaka Soekarno Di Blitar". *PURWARUPA Jurnal Arsitektur*, Vol. 1, No. 2, pp. 29-34, 2018.
- [3] R. Kurniawati & N. Marlina, "Analisis SWOT Sebagai Dasar Perencanaan Strategi Pemasaran Pada Agrowisata Belimbing Karang Sari Kota Blitar". *Jurnal Manajemen Dan Bisnis Indonesia*, Vol. 6. No. 2, pp. 191-203, 2020.
- [4] I.L. Kusminah, "Penyuluhan 4r (Reduce, Reuse, Recycle, Replace) dan kegunaan bank sampah sebagai langkah menciptakan lingkungan yang bersih dan ekonomis di Desa Mojowuku Kab. Gresik". *JPM17: Jurnal Pengabdian Masyarakat*, Vol, 3, No. 01, 2018.
- [5] A. Artiyani, & D.A. Anggorowati, "Pengolahan Sampah Terpadu Desa Karangates Untuk Mencapai Zero Waste". *Industri Inovatif: Jurnal Teknik Industri*, Vol. 9, No. 1, pp. 15-20, 2019.
- [6] I.M. Restuaji, F.E. Pujiono, T.A. Mulyati, & P.A. Lukis, "Penyuluhan Pengelolaan Sampah Rumah Tangga". *Journal of Community Engagement and Empowerment*, Vol. 1, No. 1, 2019.
- [7] I. Febriadi, "Pemanfaatan sampah organik dan anorganik untuk mendukung go green concept di sekolah". *Abdimas: Papua Journal of Community Service*, Vol. 1, No. 1, pp. 32-39, 2019.
- [8] S. Amelia, A. Rahayu, & S. Salamah, "Penyuluhan dan pelatihan pemanfaatan sampah anorganik dan organik menjadi ecobrick dan pupuk cair organik". *Jurnal Pemberdayaan: Publikasi Hasil Pengabdian Kepada Masyarakat*, Vol. 3, No. 3, pp. 341-348, 2019.
- [9] I. Dahlianah, "Pemanfaatan Sampah Organik Sebagai Bahan Baku Pupuk Kompos Dan Pengaruhnya Terhadap Tanaman Dantanah". *Klorofil: Jurnal Penelitian Ilmu-Ilmu Pertanian*, Vol. 10, No. 1, pp. 10-13, 2015.
- [10] L.Noviana & T. Sukwika, "Pemanfaatan sampah organik sebagai pupuk kompos ramah lingkungan di kelurahan Bhaktijaya Depok". *Jurnal Pengabdian UntukMu NegeRI*, Vol. 4, No.2, pp. 237-241, 2020.
- [11] R. Gunawan, R. Kusmiadi, & E. Prasetyono, "Studi Pemanfaatan Sampah Organik Sayuran Sawi (*Brassica juncea* L.) dan Limbah Rajungan (*Portunus pelagicus*) untuk Pembuatan Kompos Organik Cair". *Enviagro: Jurnal Pertanian dan Lingkungan*, Vol. 8, No. 1, pp. 37-47, 2015.
- [12] R.P. Dewi, "Studi potensi pemanfaatan sampah organik tpa banyuurip tegalrejo sebagai salah satu sumber energi". *Jurnal Teknik Mesin Mercu Buana*, Vol. 6, No. 3, pp. 155-157, 2015.
- [13] S. Diana, M. Marlina, Z. Amalia, & A. Amalia, "Pemanfaatan sampah plastik menjadi produk kerajinan tangan bernilai ekonomis bagi remaja putus sekolah". *Jurnal Vokasi*, Vol, 1, No. 1, pp. 68-73, 2017.
- [14] G.L. Sari, "Kajian Potensi Pemanfaatan Sampah Plastik Menjadi Bahan Bakar Cair". *Al-Ard: Jurnal Teknik Lingkungan*, Vol. 3, pp. 6-13, 2017.