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# ENERGY SAVING DAILY APPLIANCES USING HYBRID SUPPLY

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## Abstract :

The development of an energy-saving daily appliance that utilizes a hybrid power supply. The appliance is designed to reduce energy consumption and minimize environmental impact. The hybrid power supply combines two or more sources of energy, such as solar power and grid electricity, to provide a reliable and efficient source of energy. The energy-saving daily appliance is designed to operate on low power and can be used for a variety of household tasks, such as cooking, heating, and lighting. The hybrid power supply ensures that the appliance can be used even during power outages, ensuring a continuous supply of energy.

The appliance is also equipped with energy-saving features such as automatic shut-off and temperature control, which further reduces energy consumption. The appliance can be easily installed in homes and is user-friendly, making it accessible to a wide range of consumer. With the agreement to phase out coal, it is imperative to explore alternative sources of energy to power our daily appliances. Among the various renewable energy sources available, solar power is a free and abundant source of energy that can be harnessed using solar panels. However, the initial investment in a solar panel system can be significantly higher compared to the electricity bill.

***Key Words***: solar, hybrid supply,cooler, power saving

### 1.1 INTRODUCTION :

The energy-saving daily appliance that utilizes a hybrid power supply is designed to reduce energy consumption and minimize environmental impact. brid phower supply combines two or more sources of energy to provide a reliable and efficient source of energy. Equipped with energy-saving features such as automatic shut-off and temperature control, the appliance can be easily installed in homes and is user-friendly. With the agreement to phase out coal, it is necessary to explore alternative sources of energy such as solar power, which is a free and abundant source of energy that can be harnessed using solar panels.

### 1.2 HARDWARE :

## 1. Block diagram

Below is the given block diagram of prototype design where solar panel, AC supply followed by SMPS is connected to switching circuit and switching circuit followed by super capacitor bank connected to load accordingly.

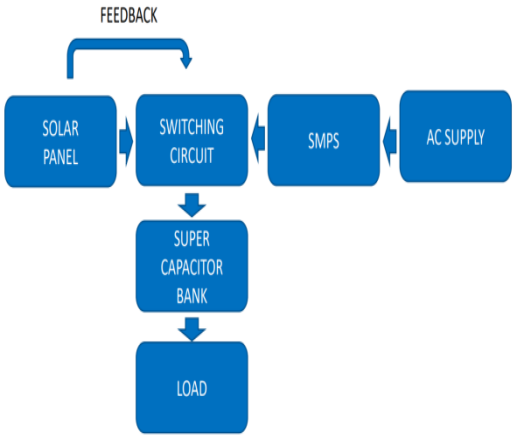



**Figure: Block Diagram**

### 2.1 Solar Panel

A solar panel, also known as a photovoltaic (PV) panel, is a device that converts sunlight into electricity using the photovoltaic effect. The basic structure of a solar panel consists of layers of

silicon cells, which are sandwiched between a protective glass layer and a backing material. When sunlight hits the silicon cells, it creates an electric field that causes electrons to flow, generating direct current (DC) electricity. This electricity can then be used to power a variety of devices, from small electronics to homes and businesses.

### 2.2 Microcontroller

It is one kind of microcontroller board. This microcontroller is based on Atmega168 or Atmega328p. It is fairly similar to Arduino Uno board but when it comes to pin-configuration and features, this Nano board has replaced Arduino Uno due to small in size. As we know that while designing an embedded system small size components are preferred. It can be built with a microcontroller like Atmega328. This microcontroller is also used in Arduino Uno. It is a small size board and also flexible with a wide variety of applications. It doesn't have any DC jack so that the power supply can be given using a small USB port otherwise straight connected to the pins like VCC & GND. This board can be supplied with 6 to 20 volts using a mini USB port on the board.

### 2.3 SMPS

An SMPS (Switched Mode Power Supply) 2Amp/12V is an electronic circuit that uses a switching regulator to convert AC voltage input to a regulated DC voltage output. Specifically, it takes an AC voltage input and converts it to a DC voltage output of 12V with a current of up to 2 amps. SMPS 2Amp/12V is commonly used in electronic devices such as computers, audio equipment, and LED lighting. It offers several advantages over linear power supplies, including higher efficiency, smaller size, and lighter weight. Additionally, SMPS can operate on a wide range of input voltages, making them suitable for use in different countries with different AC voltages.

### 2.4 Super Capacitor

A super capacitor with a rating of 5.5V/1F means that it has a maximum voltage rating of 5.5 volts and a capacitance of 1 farad. Capacitance is the ability of a capacitor to store electrical charge, and it is measured in farads. The higher the capacitance of a super capacitor, the more electrical energy it can store. Super capacitors are a type of electrochemical energy storage device that are similar to batteries, but they have some key differences. While batteries store energy in chemical form, super capacitors store energy in an electrical field. Super capacitors can charge and discharge much more quickly than batteries, making them ideal for applications that require rapid energy transfer. Super capacitors are commonly used in applications such as regenerative braking systems in electric vehicles, backup power supplies, and energy harvesting systems. They can also be used in electronic devices such as cameras, handheld gaming devices, and portable media players.

### Load

If you have a 12V DC load, you can use a super capacitor to provide the necessary energy. Super capacitors can be charged using a DC voltage

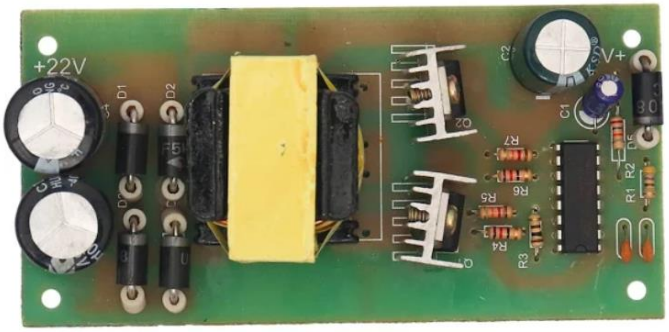
source, such as a power supply or battery, and then discharge the stored energy to power the load. To use a super capacitor with a 12V DC load, you will need to make sure that the voltage rating of the super capacitor is higher than 12V to ensure that it can provide the necessary voltage. A super capacitor with a voltage rating of 16V or higher should be sufficient for this application.

You will also need to consider the capacitance of the super capacitor, which will determine how much energy it can store and how long it can power the load. A super capacitor with a higher capacitance will be able to store more energy and power the load for a longer period of time. When using a super capacitor with a load, it is important to ensure that the discharge current does not exceed the maximum rated current of the super capacitor. You should also monitor the voltage of the super capacitor to ensure that it does not drop below the minimum safe operating voltage.

**DC-DC Converter**

A DC-DC converter 3Amp/12V is an electronic circuit that converts a DC voltage input into a different DC voltage output. Specifically, it takes a DC voltage input with a current of up to 3 amps and produces a DC voltage output of 12V. This can be useful in a variety of applications where the input voltage needs to be stepped up or stepped down to a different voltage level.

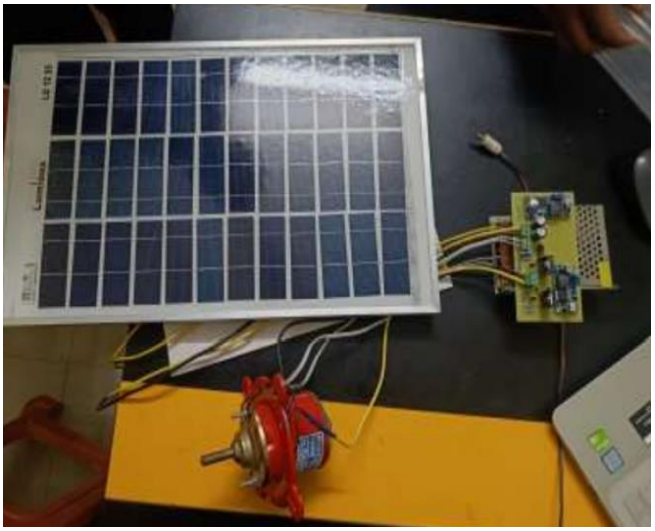
DC-DC converters are widely used in electronic devices that require a stable and regulated power supply, such as in automotive, industrial, and consumer electronics. They are particularly useful in battery-powered devices, where the voltage output of the battery can fluctuate due to variations in charge level or temperature. DC-DC converters help to maintain a constant voltage output regardless of the input voltage, thus improving the overall reliability and performance of the device.




## Components Specification

| Components | Specification | Quantity |
|---|---|---|
| Microcontroller | Arduino Nano | 1 |
| DC-DC Converter | 3Amp/12v | 1 |
| SMPS | 2Amp/12v | 1 |
| Super Capacitor | 5.5V / 1F | 6 |
| Load | 12V DC | 1 |
| Solar panel | 25W/12V | 1 |

**RESULT :**



**CONCLUSION**

The energy-saving daily appliance that utilizes a hybrid power supply is designed to reduce energy consumption and minimize environmental impact. The hybrid power supply combines two or more sources of energy to provide a reliable and efficient source of energy. Equipped with energy-saving features such as automatic shut-off and temperature control, the appliance can be easily installed in homes and is user-friendly. With the agreement to phase out coal, it is necessary to explore alternative sources of energy such as solar power, which is a free and abundant source of energy that can be harnessed using solar panels

**ACKNOWLEDGEMENT:**

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## 5.1 References

1) Gong, S.; Cheng, W. Toward Soft Skin-like Wearable and Implantable Energy Devices. Adv. Energy Mater. 2017, 7, 1700648.
2) Varma, S.J.; Sambath Kumar, K.; Seal, S.; Rajaraman, S.; Thomas, J. Fiber-Type Solar Cells, Nanogenerators, Batteries, and Supercapacitors for Wearable Applications. Adv. Sci. 2018, 5.
3) 1Khan, Y.; Ostfeld, A.E.; Lochner, C.M.; Pierre, A.; Arias, A.C. Monitoring of Vital Signs with Flexible and Wearable Medical Devices. Adv. Mater. 2016, 28, 4373–4395.
4) Zurbuchen, A.; Haeberlin, A.; Bereuter, L.; Wagner, J.; Pfenniger, A.; Omari, S.; Schaerer, J.; Jutzi, F.; Huber, C.; Fuhrer, J.; et al. The Swiss Approach for a Heartbeat-Driven Lead- and Batteryless Pacemaker. Hear. Rhythm 2017, 14, 294–299.
5) Husain, A.; Zi, W.; Guanzhou, L.; Xinfang, J.; Ertan, A.; Fuqiang, L. An Integrated Solar Cell with Built-In Energy Storage Capability. Electrochim. Acta 2020, 349, 136368.
6) Zhai, P.; Lee, H.; Huang, Y.T.; Wei, T.C.; Feng, S.P. Study on the Blocking Effect of a Quantum-Dot TiO2 Compact Layer in Dye-Sensitized Solar Cells with Ionic Liquid Electrolyte under Low-Intensity Illumination. J. Power Sources 2016, 329, 502–509.
7) Luo, J.; Yao, X.; Yang, L.; Han, Y.; Chen, L.; Geng, X.; Vattipalli, V.; Dong, Q.; Fan, W.; Wang, D.; et al. Free-Standing Porous Carbon Electrodes Derived from Wood for High-Performance Li-O2 Battery Applications. Nano Res. 2017, 10, 4318–4326.
8) M.I. Fahmi, Rajkumar R., Arelhi R, Rajkumar R, Isa D. The Performance of a

Solar PV System Using Supercapacitors and Varying Loads. IEEE Student Conference on Research and Development (SCOReD). 2014.

9) [Online] Nippon Chemi-Con Corporation. Electric Double Layer Datasheet. http://www.chemi-con.co.jp/e/. 2013.
10) S. Vazquez, S. M. Lukic, E. Galvan, L. G. Franquelo and J. M. Carrasco, "Energy Storage Systems for Transport and Grid Applications," IEEE Transactions on Industrial Electronics, vol. 57, no. 12, pp. 3881-3895, 2010.
11) Glavin ME, Chan PKW, Armstrong S, Hurley WG. A stand-alone photovoltaic supercapacitors battery hybrid energy storage system. In: Proc. of power electronics and motion control conference EPE-PEMC; 2008. p. 1688–95.
12) Glavin ME, Hurley WG. Ultracapacitor/battery hybrid for solar energy storage. In: Proc. of universities power engineering conference UPEC; 2007. p. 791–5.
13) Y. Chia, L. Lee, N. Shafiabady and D. Isa, 'A load predictive energy management system for supercapacitors-battery hybrid energy storage system in solar application using the Support Vector Machine', Applied Energy, vol. 137, pp. 588-602, 2015.
14) S. Liu, R. E. White and R. A. Dougal, "Power and Life Extension of Battery-Ultracapacitor Hybrids," IEEE Transactions on Components and Packaging Technologies, vol. 25, no. 1, pp. 120-131, 2002.
15) F. Liu, J. Liu, H. Zhang and D. Xue, "Stability Issues of Z+Z Type Cascade System in Hybrid Energy Storage System (HESS)", IEEE Trans. Power Electron, vol. 29, no. 11, pp. 5846-5859
16) Kouchachvili, W. Yaïici and E. Entchev, "Hybrid batterylsupercapacitor energy storage system for the electric vehicles", Journal of Power Sources, vol. 374, pp. 237-248, 2018.
17) Yu Zhang, Zhenhua Jiang, Xunwei Yu, " Control Strategies for Battery/Supercapacitor Hybrid Energy Storage Systems " , IEEE Energy2030, Atlanta, GA USA ,17-18 November, 2008.
18) Dezza, F.C.; Musolino, V.; Piegari, L.; Rizzo, R. Hybrid battery-supercapacitor system for full electric forklifts. IET Electr. Syst. Transp. 2019, 9, 16–23