

DESIGN AND FABRICATION OF SOLAR POWER VACUUM CLEANER

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Abstract— . The renewable energy is very important for today's world as in near future the non-renewable sources that we are using are going to get exhausted. The solar operated vacuum cleaner is a step in saving these nonrenewable sources of energy. Today more than ever we see and feel the consequences of the climate change. From melting ice caps, to the rising sea levels, weather changes and temperature rises, there are more and more natural disasters that we learn about from the news. The technology that can help us to maintain our environmental climate, and also help in our daily lives. We offer Smart Solar dust collector as one possible solution that can slightly change our way of living for better. Solar vacuum cleaner can help us to reduce the pollution. To collect the sun rays, provide a better platform to collection of dust which helps to environment.

1 INTRODUCTION

T

he Energy is one of the most vital needs for human survival on earth. We are dependent on one form of energy or the other for fulfilling our needs. One such form of energy is the energy from fossil fuels. We use energy for the sources for generating electricity, running automobiles etc. But the main disadvantages of these Fossil Fuels are that they are not environmentally friendly and they are exhaustible. To deal with these problems of Fossil Fuels, we need to look at the renewable energy source of energy. With regard to this idea we have designed dust collector that runs on solar energy. In earlier days we used to the cleaning manually. In further days we use electrically operated vacuum cleaner, but this is restricted for residential & commercial applications only. For cleaning of bigger area, the diesel operated dust collectors are used, but unfortunately this more costly and they create pollution due to (diesel, petrol etc.). This helps to increase global warming. To reduce this drawback, we use solar operated vacuum cleaner. We have pleasure in introducing our new project "INDUSTRIAL VACUUM CLEANER", which is equipped by micro controller, motor driving mechanism and battery. The power stored in the battery is used to drive the DC motor that causes the movement to Vehicle. The speed of rotation of DC motor i.e., velocity of VEHICLE is controlled by the microprocessor controller. This is an era of automation where it is broadly defined as replacement of manual effort by

mechanical power in all degrees of automation. The operation remains an essential part of the system although with changing demands on physical input as the degree of mechanization is increased.

2 LITERATURE REVIEW

A vacuum cleaner is commonly referred to as a vacuum occasionally as a Hoover is a device that uses an air pump to create a partial vacuum to suck up dust and dirt, usually from floors. The dirt is collected by either a dustbag or a cyclone for later disposal. Vacuum cleaners, which are used in homes as well as in industry, exist in a variety of sizes and models: from small battery-operated hand-held devices to huge stationary industrial appliances that can handle several hundred litres of dust before being emptied.

The first manually-powered cleaner using vacuum principle was the "Whirlwind," invented in Chicago, USA in 1868 by Ives W. McGaffey. The machine was lightweight and compact, but was difficult to operate because of the need to turn a hand crank at the same time as pushing it across the floor. McGaffey enlisted the help of The American Carpet Cleaning Co. of Boston to market it to the public. It was sold for \$25. It is hard to determine how successful the Whirlwind was, as most of them were sold in Chicago and Boston, and it is likely that many were lost in the Great Chicago Fire of 1871. Only two are known to have survived, one of which can be found in the Hoover Historical Center. McGaffey was but one of many 19th-

century inventors in the United States and Europe who devised manual vacuum cleaners.

6 DESIGN

The simple Block Diagram of vacuum cleaner is given bellow.

3 PROBLEM IDENTIFICATION: LITERATURE REVIEW

- Though a number of machines have been successfully developed
- A number of urban problems like urban flooding and blockage can be overcome
- There is a need for developing a sustainable machine which uses green energy
- Developing labour in these cases can be very dangerous and time consuming

4 SCOPE OF PROJECT

- Can make it more effective using lithium ion battery for more life because over cost may increase double than the initial budget
- In today's world people looking for more innovative without the manual work, where automation plays an important role to adapt in today's life. using controller board and embedded c programming can be implemented in this system
- Solar capacity can be increased for max efficiency
- This system can be manufactured using plastic for lesser weight
- Atmospheric dust and dust deposition on solar PV both reduce efficiency of solar panel. Experimentally it is seen that efficiency of the solar panel decreases by 30-40% for indoor set up with constant illumination whereas there is loss of 4-5% for outdoor set up with natural lightening condition.
- Most of the cleaning system require human interface to clean efficiently

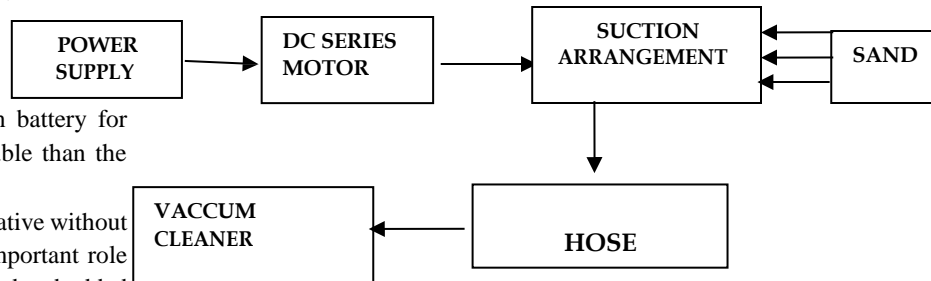
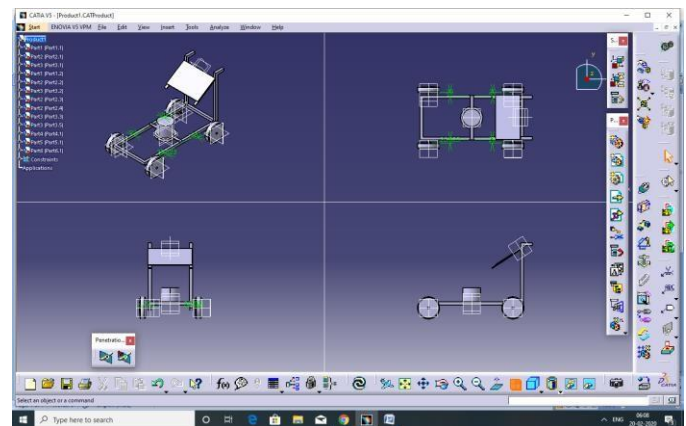
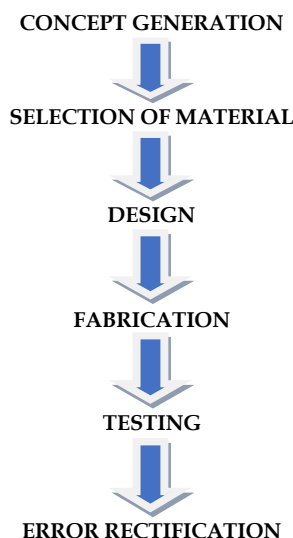


Fig: Block diagram of working principle of solar powered vacuum cleaner.

The 12-voltage battery supply is applied to the A.C series motor. The blower consists of D.C motor and impeller (fans). The D.C motor coupled with the impeller (fan). The impeller consists of a greater number of blades. It is fixed above the frame stand, so that air suction forced from the ground. The flexible hose is used to suction the sand from the ground. The collected sand is kept in a sand container which is made up of mild steel sheet material. The collected sand will be unloaded by the shutter open/close mechanism which is fixed in the sand container.

5 METHODOLOGY



THIS SKETCH DEPICTS THE DIFFERENT ORTHOGRAPHIC PROJECTIONS OF THE VACUUM CLEANER

6.1 TECHNICAL SPECIFICATION:

- Technical specification of the battery: -
 - Weight of battery: 2kg
 - Cost of battery: 1350/-
 - Output power: 12v 7.5 amps
 - Operating voltage: 12v 1amp
 - Current: 1 to 1.5 amps
- Specification of motor: -
 - Weight of motor: 1kg
 - Operating power required: 12v 2 amps
 - Operating voltage: 12v
 - Operating current: 2 amps
 - Motor speed: 55 rpm
 - Motor cost: 2000/-
- Specification of solar panels: -
 - Panel size: 316*217mm
 - Cost of the panel: 2800/-
 - Weight of the panel: 1500gms
- Power rating of solar panel: -
 - Voltage: 12V
 - Current: 15 amp
 - Power: 35W
- Testing of charging time:
 - Instrument used to measure sun radiation: pyranometer
 - The sun radiations are measured in: watts/m trs
 - Required voltage for charging the battery: 12v
- Time measurements:
 - When solar radiation is between 200 to 300 mW/cm²: 3 to 4 hrs
 - When solar radiation is between 300 to 400 mW/cm²: 2 to 3 hrs
 - When the solar radiation is between 400 to 600 mW/cm²: 1hr.
 - Running period: 3 to 4 hrs
 - Operating cost: NIL

6.2 DESIGN CALCULATIONS

A. Volumetric Flow Rate of Suction Fan

$$\begin{aligned} \text{Volumetric flow rate of suction fan (Q)} &= \pi \times D \times L \times N \\ &= \pi \times 0.4572 \times 0.0762 \times 300 \\ (Q) &= 328.34\text{m}^3/\text{min} \end{aligned}$$

B. Storage Capacity of Cylinder

$$\begin{aligned} \text{Storage capacity of cylinder} &= \pi \times R^2 \times L \\ &= 3.14 \times (0.225)^2 \times 0.45 \\ &= 79 \text{ lit} \end{aligned}$$

C. Total Power Consumption (PT)

$$1) \text{ Power consumed by suction fan (PF)} = 12 \times 10 = 120 \text{ Watts}$$

$$2) \text{ Power consumed by brush motor (PM)} = 12 \times 2 = 24 \text{ Watts}$$

$$3) \text{ Total power consumption (PT)} = 120 + 24 = 144 \text{ Watts}$$

7 CONCLUSION

This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, computing and machining while doing this project work. We feel that the project work is a good solution to bridge the gates between institution and industries.

The solar vaccum cleaner will be working with satisfactory conditions. We are able to understand the difficulties in maintaining the quality. We have done to our ability and skill making maximum use of available facilities.

In conclusion remarks of our project work, let us add a few more lines about our impression project work. Automation is a technology concerned with his application of mechanical, electronic and computer based systems to operate and control production.. This project may be developed with the full utilization machines, and materials and money. Also we have followed thoroughly the study of time motion and made our project economical and efficient with the available resources. This system was Designed, Fabricated successfully and also tested. It works Satisfactorily. We hope that this will be done among the most versatile and interchangeable one even in future.

8 ACKNOWLEDGMENT

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