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Design and Analysis of Portable Floor Cleaning Machine - A Research Paper

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Abstract: - In today's world, it is very important to maintain hygiene at public places, especially at hospitals, market place, school and colleges. In the given paper, we proposed a cleaning machine that runs on the renewable energy gained by the solar panel from the sun. Proposed machine is efficient to do work in highly populated places and it is affordable too
Keyword: - portable floor cleaner, solar equipped cleaner, semi-automatic cleaner.

I. INTRODUCTION

Portable cleaner is a type of vehicle that runs along the street manually. It has a wide area of application like office, hospital, railways and airport and in manufacturing industries. In today's world where hygiene has become the most important aspect of life our portable floor cleaner will be reliable and efficient enough for cleaning process. Our objective was to make a cleaner, which should be affordable to make in abundant as it is for public places only, it is very easy to use because it does not contain any complex mechanism or any program orientation to control it.

A. Working

It is a trolley like structure vehicle equipped with solar panel that helps to supply renewable energy from the sun, and this what makes it efficient and less costly. Our portable floor cleaner contain mopping and water spray mechanism, which increases its productivity, it has a nozzle through which water is sprayed. Motor runs on a separate battery and other components on solar power charged battery. The base of the system is relied on ABS plastic wheels, which give it frictionless mobility and handle has grip, easy to hold and drive the system forward. The mopping mechanism in cleaner contain is done by the motor which revolves at the rate of 3000 rpm. Hose pipe is use to collect all the dust through vacuum. The main body of the system has two tanks on it one is dust collector and other one is water storage all the through hose pipe is collected in dust tank and water function's start from the water tank.

II. COMPONENTS AND CALCULATION

Components	Photograph	Dimensions
Vacuum Cleaner		Vacuum rating :- 12V 100 Watt Motor 3000 RPM Vacuum Suction of 45 kpa
Solar Panel		It is 50 Watt Dimensions :- 435x670x34 mm Wattage (Wp) :- 4.96 kg Voltage at max :- 12volts Current at max power:-2.23amp

Battery		Battery used :-2 Dim (LxWxH):- 5.94x2.56x3.94 Actual Weight :- 5 kg Amp Hour:-7.5
Spray Pump		It is 12 Volt 2 Amp Capacity : 4 to 5 lit/day
Water Nozzle		It is 80 to 100 PSI
Wheels		Material used :- abs Plastic and Rubber
Roller Mop		Dia :- 10 cm Motor speed:- 150 RPM Material used:- Cotton/Wick

Water Storage & Dust Collecting Tanks		Dimensions :- 40x30x25 cm Area of Tank:- 0.59m^2 Volume capacity:- 0.03 m^3
Brusher		Dimensions:- l=122cm Dia of brusher wheel:-10cm Material used:- Plastic & Fibber Wires

Battery = 12 x 7.5 (discharge 50%)
= 90 watts x 2
= 180 watt

Vacuum motor = 12 x 10
= 120 watt

Mop rotor = 12 v , 14 watt
Water sprinkle pump = 12 x 2 = 24 watt

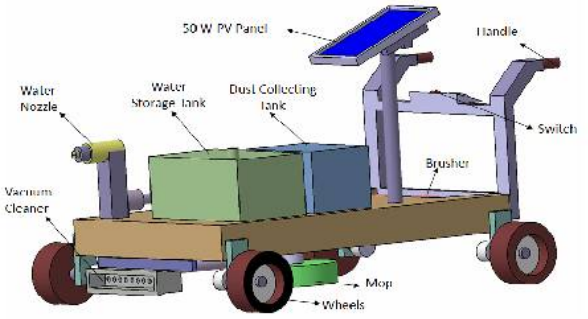
Total load = 120+24+14
= 158 watt
Time consumption of solar panel to charge battery the maximum charge current output by solar charge controller

$$= \frac{50 \text{ watt}}{12 \text{ v}} = 4.16 \text{ A}$$

multiplying current by rule of thumb system losses(20%) and charge controller efficiency (MPPT=95%),
4.16 x (1-20%) x 95% = 1.98 A
multiply battery capacity by 1 divided by rule of thumb battery charge efficiency (lead acid 95%)

$$15\text{Ah} \times \frac{1}{95\%} = 15.75 \text{ Ah}$$

Time it will take to charge battery
= 15.75/ 1.98
= 7.95 hrs
Multiplying charge time by the battery's depth of discharge
To estimate the time,
= 7.95 x 50% = 3.97 hrs
So, from above we conclude that it will 3.97 hrs to charge 12 v batteries with 50 w solar panel



III. CONCLUSION

We have successfully design and analyzed automatic floor cleaner , which is very beneficial especially for crowded outdoor places. By the use of this Proposed System we can save electricity and maintain hygiene, we have done calculation of materials and selected cast iron because of good properties.

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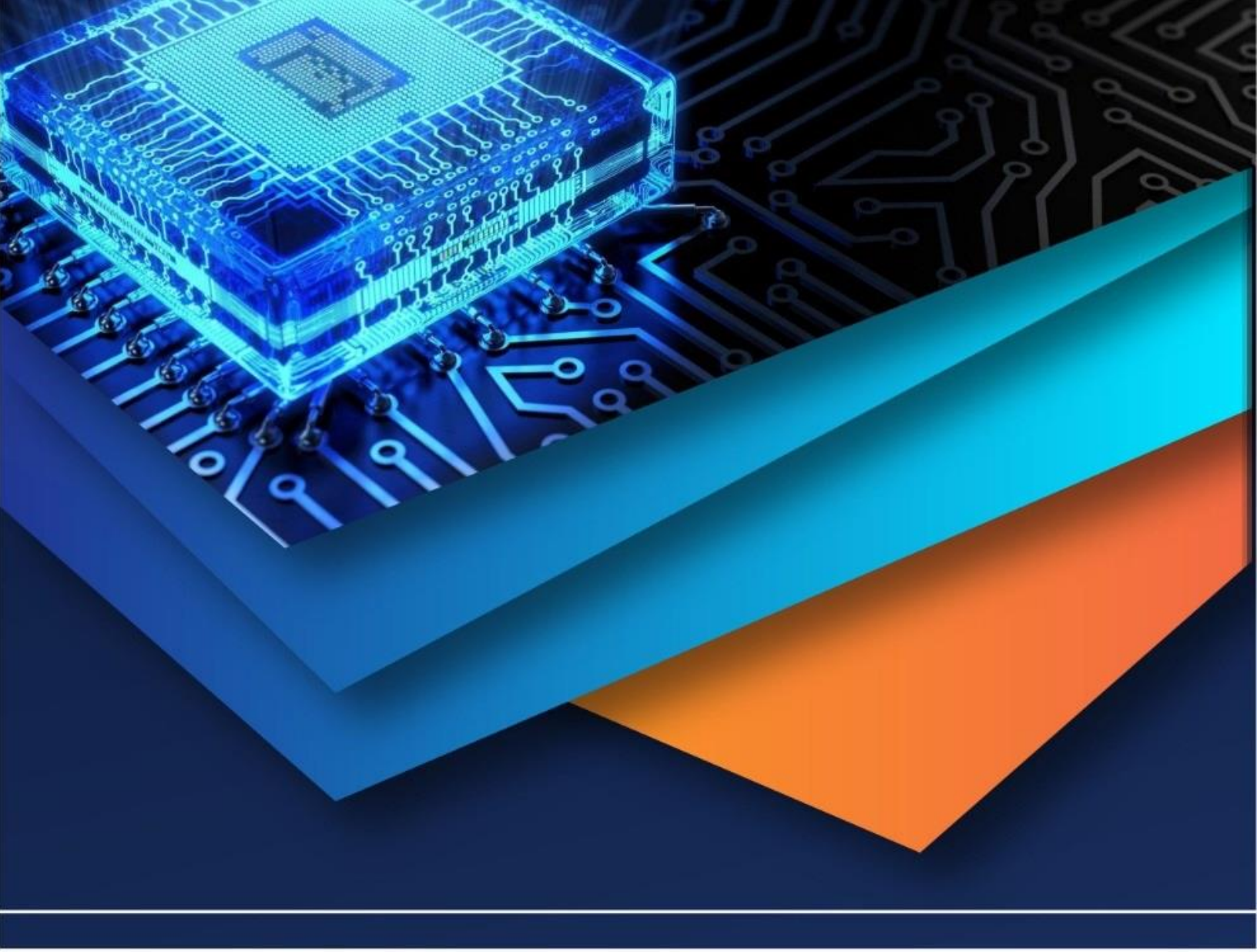

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