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# ANALYSIS OF UTILITY CART POWERED WITH SOLAR ENERGY

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## ABSTRACT

The goal of this project is to create a solar-powered vehicle that will address issues with pollution and fuel scarcity. For the modern world, renewable energy is crucial since the non-renewable resources we currently rely on will soon run out. The solar car could be a step towards preserving these non-renewable energy sources. The fundamental idea behind a solar vehicle is to make use of the energy that is stored in the battery both during and after it has been charged by a solar panel. The motor, which in this case acts as the engine and propels the vehicle either forward or backward, is typically driven by the charged batteries. To control the motor speed, an electrical controller is offered. Thus, excess flow is prevented.

Key Words: The use of non-conventional energy to power environmentally friendly Vehicle

## 1.INTRODUCTION

One of the most important need for human life on planet is energy. To meet our requirements, we are tethered to one form of energy or the other. Fossil fuel energy is one example of this type of energy. We utilise the energy from these sources to operate our cars and generate electricity, among other things. But those FOSSIL FUELS' greatest drawbacks are that they are exhaustible and unfriendly to the environment. In order to address these issues with fossil fuels, we need look at alternative sources of energy. In light of this concept, we created a utility car that is powered by solar energy. The planned vehicle may have a two-wheel drive and be utilised for shuttle services and short trips. Like these We'd want to think about making cars more affordable and better designed for the long future of the automotive industry. This car represents a move in that direction. 'Sun' is the primary energy source for this vehicle. Solar panels collect solar energy, which is subsequently transformed into electricity. The resulting electricity is delivered to the batteries, which are then charged, and is used to power a BLDC (brushless direct current) series motor. The motor shaft is linked to the vehicle's rear wheel via a connecting axle and a crown. The batteries are initially completely charged, and then solar panels continue to charge them. This aids in completing the battery's charging-discharging cycle, which is crucial to the battery's proper operation. People may benefit from this project by saving money, time, and energy. There won't be any pollution because this project employs solar electricity, therefore there is no need to be concerned. By doing this, fossil fuel waste will be reduced. the automobile Vehicles powered by mono-crystalline solar panels use the sun's energy for propulsion.

## 2.NEED FOR ALTERNATIVE FUEL

Non-renewable resources include fossil fuels. In millions of years, they began to develop. Plants and animals were broken down by the heat, pressure, and movement of the Earth's strata into petroleum, oil, coal, and natural gas. The likelihood of discovering natural gas and oil deposits increases with

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depth. The pinnacle of the world's demand has not yet been achieved. The usage of fossil fuels also increases year over year as a result of rising global energy demand. Simply put, we lack sufficient renewable energy to meet the demands of our industry and people. As of 2016, the world's proven oil reserves were 1.65 trillion barrels. The global stock of proved reserves is 46.6 times that of yearly usage. It signifies that (At current consumption rates and ignoring untested reserves) has around 47 years' worth of oil left. It is necessary to identify what emissions are and where they come from. Exhaust gas or flue gas is emitted as a result of the combustion of fuels such as natural gas, gasoline, petrol, biodiesel blends, diesel fuel, fuel oil, or coal. According to the type of engine, it is discharged into the atmosphere through an exhaust pipe, flue gas stack, or propelling nozzle. Another important objective is to recognize the importance of alternative fuel sources. One day, our sources for traditional fuels including petroleum would be depleted. Owing to the fact that these fuels are typically not renewable, a lot of people are worried that a day would come when the demand for these fuels would be more than the supply, triggering a considerable world crisis. Alternative fuels, known as nonconventional and advanced fuels, are any materials or substances that can be used as fuels, other than conventional fuels like; fossil fuels, as well as nuclear materials such as uranium and thorium, as well as artificial radioisotope fuels that are made in nuclear reactors. Some well-known alternative fuels include biodiesel, bio alcohol, refuse-derived fuel, chemically stored electricity, hydrogen, non-fossil methane, non-fossil natural gas, vegetable oil, propane and other biomass sources. It is necessary to investigate the advantages and disadvantages of using alternative fuel sources. Alternative fuels such as methanol, ethanol and biodiesel have numerous advantages and disadvantages regarding environmental and societal impacts. In developing countries, the expansion of the alternative fuel industry could increase deforestation, decreasing the removal of CO2 from the atmosphere through photosynthesis. The view that vehicles contribute the most to air pollution and climate change in the metropolis because they emit carbon dioxide heavily has made the government put top priority to four alternative fuels with potential use in the transport sector. These are compressed natural gas (CNG), liquefied petroleum gas (LPG), biodiesel and Alco gas. Biodiesel produced from Jatropha plant, a promising substitute as an alternative fuel has gained significant attention due to the predicted shortness of conventional fuels and environmental concern. The utilization of liquid fuels such as biodiesel produced from Jatropha oil by transesterification process represents one of the most promising options for the use of conventional fossil fuels.

## 2.1Pollution Caused By Fuels

Vehicular pollution is the introduction of harmful material into the environment by motor vehicles. These materials, known as pollutants, have several bad effects on human health and the ecosystem. Transportation is a major source of air pollution in many countries around the world due to the high number of vehicles that are available on the roads today. An increase in purchasing power means that more people can now afford cars and this is bad for the environment. Vehicular pollution has grown at an alarming rate due to growing urbanisation in India. The air pollution from vehicles in urban areas, particularly in big cities, has become a serious problem. The pollution from vehicles has begun to tell through symptoms like

1. Particulate matter- These particles of soot, metals cough, headache, nausea, irritation of eyes, various bronchial and visibility problems. The following are the major pollutants associated with motor vehicles.

2. Ozone- The primary ingredient in urban smog, ozone is created when hydrocarbons and nitrogen oxides—both of which are chemicals released by automobile fuel combustion—react with sunlight. Though beneficial in the upper atmosphere, at the ground level ozone can irritate the respiratory system, causing coughing, choking, and reduced lung capacity pollen give smog its murky colour. Among vehicular pollution, fine particles pose the most serious threat to human health by penetrating deep into lungs.

3. Nitrogen oxides- These vehicular pollutants can cause lung irritation and weaken the body's defences against respiratory infections such as pneumonia and influenza. In addition, they assist in the formation of ozone and particulate matter.

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4. Carbon monoxide- This odourless, colourless gas is formed by the combustion of fossil fuels such as gasoline. Cars and trucks are the source of nearly two-thirds of this pollutant. When inhaled, CO blocks the transport of oxygen to the brain, heart, and other vital organs in the human body. Newborn children and people with chronic illnesses are especially susceptible to the effects of CO.

5. Sulphur dioxide- Motor vehicles create this pollutant by burning sulphur-containing fuels, especially diesel. It can react in the atmosphere to form fine particles and can pose a health risk to young children and asthmatics. 6. Hazardous air pollutants- These chemical compounds, which are emitted by cars, trucks, refineries, gas pumps, and related sources.

# 2.2Effects Of Vehicular Pollution

These are some of the consequences of pollution:

- 1. Global warming
- 2. Poor quality of air
- 3. International reputation
- 4. Health
- 5. Tourism

Emission of greenhouse gases into the atmosphere leads to depletion of the ozone layer and this causes global warming. The result of this is adverse weather that often results in loss of life and property. Global warming is a concern for many major world governments and deliberate efforts have been made to reduce it. With the ozone layer depleted, the harmful ultraviolet rays of the sun can reach the lower 7 surface of the earth and harm humansand other living organisms on the planet. Greenhouse Gas Emissions: Vehicles emit a significant amount of greenhouse gases, particularly carbon dioxide (CO2), which is a major contributor to global warming. When fossil fuels, such as gasoline and diesel, are burned in vehicle engines, they release CO2 into the atmosphere. CO2 is a greenhouse gas that traps heat in the Earth's atmosphere, leading to the greenhouse effect and subsequent global warming. Other Pollutants: Vehicles also release other pollutants, as such as nitrogen oxides (NOx), volatile organic compounds (VOCs), and particulate matter (PM), which can have a warming effect on the planet. For example, NOx and VOCs can combine in the atmosphere to form ground-level ozone, which is the potent greenhouse gas. PM, on the other hand, can directly absorb and scatter sunlight, leading to increased warming. Urban Heat Island Effect: Vehicular pollution can also contribute in to the urban heat island effect, which is the phenomenon where urban areas experience higher temperatures compared to surrounding rural areas. Vehicles release heat during combustion, and the concentration of vehicles in urban areas can result in increased heat absorption by buildings and pavement, leading to higher temperatures. This can exacerbate the overall warming of the planet. Deforestation for Transportation Infrastructure: The construction of roads and highways to support vehicular transportation often involves deforestation, which further contributes to global warming. Deforestation leads to the release of stored carbon in trees, plants and soils, reducing the planet's ability to naturally absorb and store carbon dioxide, thereby exacerbating the greenhouse effect.

# **3.NEED OF A PROJECT**

The need for alternative propulsion technologies that are more efficient and emit less pollutants is developing as environmental pollution, climate change, and the depletion of fossil fuel supplies are becoming more and more of a problem. The main reason why electric cars are being created is because they don't produce any pollution when being driven. Electric motors driven by batteries are what move an electric car forward. There is no fuel burning. An exhaust system is absent from an electric car. At a time when global CO2 emissions and air pollution must be dramatically reduced, it is the greatest option for road travel. LEZs are being used in more cities, but they are also expanding in size and becoming stricter with time. Having an electric vehicle, you access to low-emission areas whenever and wherever you choose, both now and in the future.

o Fuel and petrol are more expensive than electricity. An electric car is less costly than a car with a combustion engine in this aspect. Charging at home is the most economical choice.

o An electric motor makes a lot less noise than a combustion engine. Because of this, it's easy to tell whether an electric car is silent. A combustion engine produces resonance and vibrations, but an electric motor does not. The serene drivetrain contributes to the tranquilly.

o Another significant difference between an electric car and one powered by a combustion engine is that the former lacks a conventional transmission. A automobile with an automatic gearbox always functions like an electric vehicle, which removes the

the need to change gears. Additionally, you won't have to spend extra. Thanks to the silence of an electric motor, driving in city traffic or in heavy traffic has never been more enjoyable.

o An electric motor's astronomically high torque is a distinguishing characteristic. superior to a standard internal combustion engine in terms of power. Additionally, an electric motor may produce its maximum torque straight away from a stop and responds quickly to throttle adjustments. Internal combustion engines can only produce their maximum torque in a narrow speed range and have an inevitable reaction time. All of this guarantees appealing performance due to the strong and smooth acceleration, as well as a lot of driving enjoyment.

o Currently, combustion engines with the highest efficiency hover around 40%. In other words, they only used 40% of the fuel's energy to move the vehicle. The remaining 60% is made up of heat and friction.

# 4.OBJECTIVES

□ In this proposing system we will going to make the vehicle that will help full for transportation.

 $\Box$  In this vehicle solar panel is used to consume solar energy and this energy is converted into electrical energy. The electrical energy stored inside a 48 v battery which then gives the necessary power to a DC motor.

Mono-Crystalline Solar Panel is used and this panel collects peak energy from sun.

The stored Solar energy in form of Electrical energy in battery is used drive the motor of the vehicle, We are improving the efficiency of the solar vehicle by using monocrystalline solar panel which is very much efficient than the other solar panels , so the number of solar panels used in our project is less so its weight also become less. The vehicle is used for short-distance transport solutions in ranches, hotels, resorts, multifamily housing properties, and industrial sites, among others. This, in turn, has substantially broadened the application scope of the golf cart industry across commercial applications.



Fig 4.1 Block Diagram

# 5.ANALYSIS AND RESULT

Results were obtained in a cautious manner. This part contains parametric analysis, purchase data, and FEA.

Chassis: The chassis's low centre of gravity, light weight, compatibility with the standard suspension system, and compliance with the competition standards were crucial as a starting point. Before a final design for the frame was chosen, several designs were created (Fig. 5.1).

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Fig 5.1 Chassis

The maximum stress can be calculated by analysing the tension-related findings (Figs. 5.2 and 5.3). The obtained pressure of 2000N is not more than the yield strength of 2000N for iron. It follows that the frame only experiences elastic deformation.



The maximum stress can be calculated by examining the findings for displacement (Figs. 5.4 and 5.5). The obtained displacement of 1200N is not greater than the yield strength of iron, which is 2200N. It follows that the frame only experiences elastic deformation.



Fig 5.4





**Solar Pannel :** PV solar panel The results of several solar panel trials may be extracted from the programme andentered into MATLAB to produce the system estimation parameters. These estimates may be used to produce visually appealing graphs that clearly illustrate the solar panel's potential. The graph below (Fig. 5.6) shows the current-voltage and current-power curves that were created in Microsoft Excel using the information from the scan produced by the solar analyzer when the panel was put to the test outside in full sunshine. The graph's most significant data are displayed below and were produced straight from the solar analyzer (Table 1). The panel was tested five times, and the average results (Appendix F) are based on these tests.



|         | V_open (V) | I_short (A) | V_maxp (V) | I_maxp (A) | P_max (W) | Efficiency % |
|---------|------------|-------------|------------|------------|-----------|--------------|
| Test 1  | 21.86      | 4.827       | 4.052      | 16.13      | 65.39     | 26.56        |
| Test 2  | 21,84      | 4.877       | 4.039      | 16.24      | 65.61     | 26.66        |
| Test 3  | 21.78      | 4.781       | 3.92       | 16.23      | 63.65     | 25.87        |
| Test 4  | 21.5       | 3.857       | 3.236      | 16.03      | 51.9      | 21.08        |
| Test 5  | 21.58      | 4.33        | 3.577      | 16.16      | 57.81     | 23.46        |
| Average | 21.712     | 4.534       | 3.765      | 16.158     | 60.872    | 24.726       |

Table 5.1





## **Photographs**

#### **6.CONCLUSION**

In order to address the rising fuel demands and the ensuing catastrophic environmental pollutioncaused by operating carbon-based vehicles, it is imperative to switch to a different energy source, such as solar energy, which is a cheap, efficient, limitless, and actually environmentally friendly alternative. Solar automobiles are safe since they lack flammable gasoline or hot exhaust systems.

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