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Perspectives on Pollution free technologies for vehicles

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Abstract.

This article mainly focuses on innovative methods of producing energy (electricity) using renewable energy sources such as solar and wind energy in cars and railways. The rail and road sectors are the largest passenger and freight transport systems. It uses current for lighting, fans, and air conditioning of passenger trains, AC buses, cars, etc. The current maximum number of cars and railways use diesel or electricity supplied through the network. Fuel (diesel and petrol) may run out over some time. An innovative way to generate electricity in moving cars and trains is the technology of renewable energy sources. The surface design of heavy cars and trains must be modified to accommodate solar panels to generate electricity, and another innovative method is to use the wind blowing against the cars and the train's torque. generate electricity. These innovative methods reduce the costs that cars and railways use for current consumption.

Keywords: Solar energy, wind energy, alternator, transport system

1. Introduction

Solar panels convert solar energy into electricity. Solar panels are arrays of solar cells that transform solar energy into electrical energy. The conversion of electrical energy is

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possible due to the basic properties of matter. Solar panels collect sunlight and actively convert it into electricity. Solar cells are arranged in a grid on the surface of the solar panel and convert solar energy into electricit

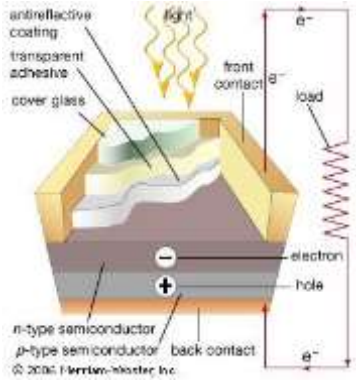

Fig.1: Processing electrical energy from solar energy

Fig.1 shows the details of the solar energy conversion process. Solar panels must be placed on the train so that as much sunlight as possible hits the panel's surface. Such panels should be placed on the outer surface of the wagon whenever there is more sunlight. Wind energy is one of the natural energy sources. Small wind turbines can be placed where wind speed is high. A wind turbine [6] or generators help produce electricity. The material used to make the loaders is light [1] and the frame of the wagon must also be made of light materials to reduce the total weight.

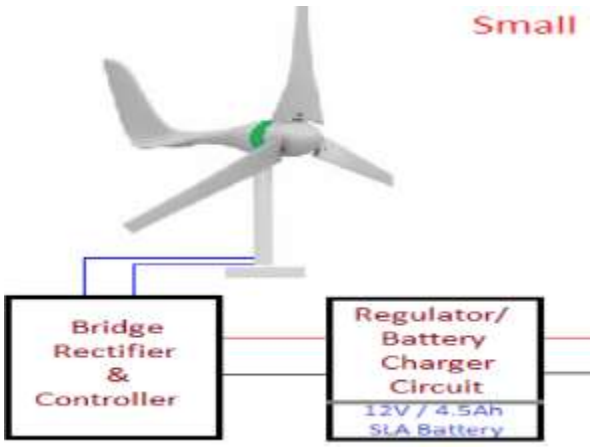

Fig.2: Power generation circuit diagram with wind turbine

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A wind turbine is a device that helps generate electricity. Small wind turbines are attached to the bodywork of cars and trains in such a way that the air moves as much as possible through the direction of the airflow [1]. The generated power is stored in the battery and from there the circuit is connected to the engine or the device in the vehicle [3]. A diagram of wind turbine power generation is shown in Fig.2.

2. Methodology

The process of electricity flow through the wind turbine system is shown in Fig.3. Solar panels are placed on top of cars and these panels convert solar energy into electricity. The generated current is stored in the battery bank. The power stored in batteries is used in various applications, such as drive motors, lights, fans, and air conditioning in cars and passenger trains.

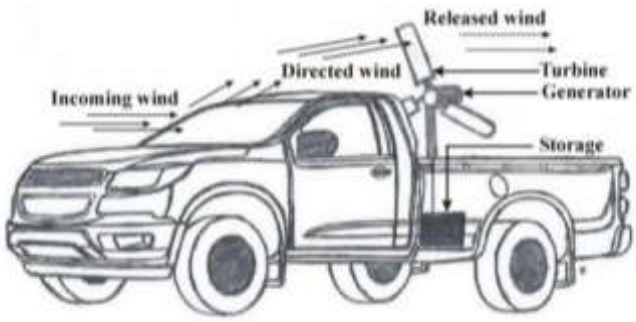

Fig.3: Model layout of a system

The method of flow process of current by wind energy system is shown in Fig.3 [10]. The automobile body and train body must be redesigned in such a way that the wind turbine is placed in front of automobile vehicles and train body frame and at the window areas with an angle to wind direction. These wind turbines are connected to alternators which generate electrical energy. The generated current by alternators is stored in the battery bank.

Pollution-free technologies for transport system

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An innovative design model for the exterior of the train is shown in Fig.4. Solar panels are installed on the upper surface of the train, and a wind turbine can be installed on each window so that the wind flows through the turbine blades. A similar arrangement was made for the entire train.

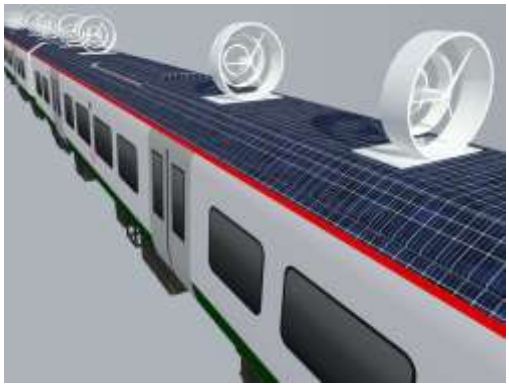

Fig.4: Model design of Innovative train setup

An innovative method to generate electricity on the train for lights, fans, AC, and to some extent the grid to power the train using a renewable energy source as shown in Fig.4. The structure of the top of the train must be modified to accommodate. the solar panels that generate energy, and another innovative design is to use the train to take advantage of the wind blowing in the opposite direction to generate electricity by placing alternators on both sides of the train. wall [6]. These innovative methods reduce environmental pollution, the cost of which Indian railways currently use for consumption.

A model for connecting solar and wind energy to the body of the car is shown in Fig.5. A specially designed turbine is connected to the upper part of the body; every time the brake is applied, the turbine rotates and generates electricity [10]. The solar panels are placed above and behind the body of the car. These panels help generate electricity using solar energy. These two types of electricity are connected to the battery when battery power goes to the engine.

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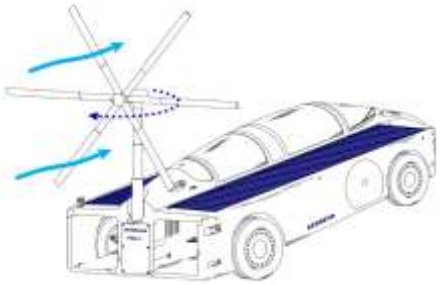

Fig.5: Solar and wind turbine connection on the car model

The model of connected solar and wind energies to an Auto body as shown in Fig.6. A specially designed turbine is connected on the top of the Auto body, whenever brakes applied the turbine rotates and generate electricity. The solar panels are placed in the top surface and back side of the auto body. These panels will help to generate electricity with sun energy [10]. These two kinds of electricity are connected to the battery from battery power goes to motor.

Fig.6: Wind and solar power connection on the Auto model

The model of connected wind and solar power to a Lorry body is shown in Fig.7. A specially designed turbine is connected to the top of the lorry body's top surface; whenever brakes are applied the turbine rotates and generates electricity [10]. The solar panels are placed in the top surface and back side of the lorry body's outer surface. These panels will

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help to generate electricity with sun energy. These two kinds of electricity are connected to the battery from the battery power goes to the motor.

Fig.7: Wind and solar power connection on the Lorry model

Fig.8: Solar connection on the car model.

The model of connected solar energies to a car body is shown in Fig.8. A specially designed turbine is connected to the front side of the car body; whenever moving at a certain speed the turbine rotates and generates electricity. The solar panels are placed on the top surface and front side of the car body's outer surface [6]. These panels will help to generate electricity with sun energy. These two kinds of electricity are connected to the battery from the battery power goes to the motor.

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CO_2 emissions

Emissions from the transport system are one of the major problems of human health and environmental pollution. Fig.9 shows the level of emissions from different modes of transport systems. 71.0% of CO_2 emissions are released by road transport as per the analysis done by IEA (International Energy Agency) [8]. 1.8 percent of CO_2 emitted by the railways as per the studies done by IEA. Renewable energy resource technology for movable items reduces these harmful CO_2 gases and minimizes the maintenance cost [4]. The utilization of electricity as per the studies is 37.8 percent; with this Increasing the usage of solar and wind energies minimizes the coal base thermal power plans so that harmful emissions can be minimized. Road transport CO_2 emissions can be reduced by up to 90 percent by using natural resources of energy generation technology.

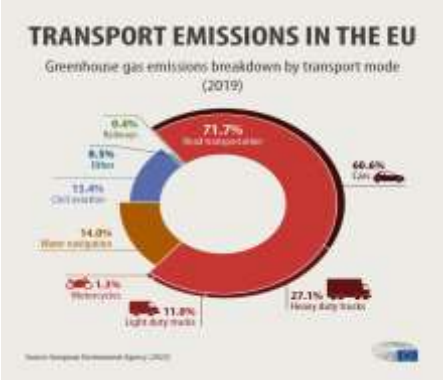

Fig.9: 2019 - CO_2 Emissions from fuel combustion by sector.

The data presented reveals that road transport is a major contributor to CO_2 emissions, with a high energy requirement, while coal usage decreased from 1990 to 1997 due to its environmental impact. Electric mobility gradually gained traction from 1998 to 2009, utilizing cleaner energy sources such as solar and wind. CO_2 emissions increased in both developed and developing countries, highlighting the need for new electricity generation technologies. Notably, the USA experienced a decrease in emissions from 2008 onwards, attributed to the adoption of E-mobility and natural energy resources. In India and China, CO_2 emissions from the transport sector continue to rise. These findings underscore the urgency for sustainable solutions to address the growing emissions from transportation systems.

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Carbon dioxide emissions from 1998-2009 caused by various modes of transport in developed and developing countries are increasing daily. It must require new energy production technology, such as solar and wind energy for transportation. The current trailing situations gives the details that CO_2 emissions from transport systems are increasing every year in India.

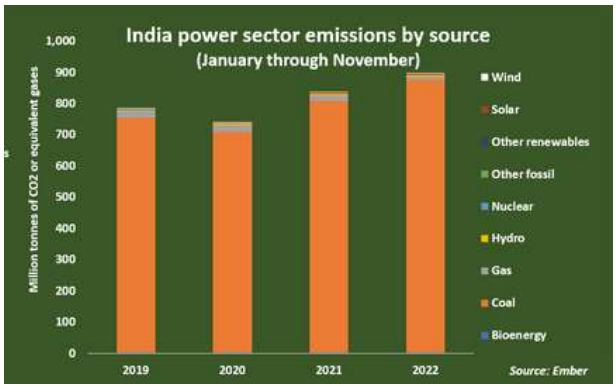

Fig.10: 2022 - CO2 Emissions from fuel combustion by sector.

Global energy-related from 2019-2022, CO_2 emissions increased again in 2022, 2.5% slower than in 2021 (+6%), but more than twice as fast as in 2010-2019 (+1% per year). Emissions hit a record high of more than 33.8 GtCO2 despite a global economic slowdown. CO2 emissions increased slightly in the two largest emitters, namely China (+1% as growth in energy consumption in the industrial sector slowed and the share of wind and solar in China's energy mix continued to grow) and the United States (+1.2 % as the decline in coal-related CO2 emissions was more than offset by higher gas-related emissions) .

3. Results and Discussion

These study results show that road transport significantly contributes to CO_2 emissions, surpassing other modes like rail, navigation, and aviation. Moreover, road transport has the highest energy consumption, but there is promise in generating electrical energy to cover a substantial portion of its needs. Over time, there has been a positive shift from coal usage to cleaner energy sources, particularly for mobility, with electric vehicles gaining popularity. However, a global trend reveals a steady increase in CO_2 emissions from the transportation sector, highlighting the urgent need for pollution-free technologies. To address this issue, action is required to reduce the environmental impact of road transport, promote electric mobility, and leverage renewable energy sources. The USA's successful emission reduction

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through E-mobility serves as an inspiring example, emphasizing the necessity for ongoing research and development in pollution-free technologies on a global scale.

4. Conclusions

The Innovative models of pollution-free technologies which are described in this paper are good for reducing the maintenance cost of transport systems in comparison with existing practices. The current generated by natural resources may save up to 60% of current used from the grid for lights, fans, and AC for railways and 90% for road transport systems. The only drawback with this system is the high initial investment. It is one of the best technologies to overcome the present stage of air pollution levels due to road and rail transport systems existed CO_2 emission levels. World transportation research must work on this line to reduce pollution levels and save human health. When the time comes, there would no oil-based products, then pollution-free technologies help the world e- mobility.

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