Department of Mechanical Engineering

List of PBL Project

Academic Year	Group No.	Name of Student	Name of Guide/Mentor	Project Title
2021-22	Group No. 1	KALE ARPITA SUNIL	Prof. J. R. Mahajan	Robotic Arm for Material Handling
		VEER NILESH		
		SHAIKH SOHEB ISMILE		
		ACHARYA OMKAR SURESH		
		ACHAT SIDDESH DATTATRAY		
	Group No. 2	AHIRE ABHISHEK BABULAL	Prof. P. S. Talmale	Manufacturing of tool
		AHIRE TUSHAR SUDHAKAR		
		AVHAD CHAITANYA SAMPAT		
		BARGAT SIDDHESH DIPAK		
		BHADAGE MAHESH RAMESH		
	Group No. 3	BHADANE HIMANSHU SHARAD	Prof. C. P. Shinde	Green Building HVAC System
		BHADANE HIMANSHU YASHVANT		
		BHADANE MILIND ASHOK		
		BHALERAO TEJAS DEVIDAS		
		BHAMARE DHEERAJ RAJU		
	Group No. 4	BHANDIRGE AAKASH SHANKAR	Prof. P. D. Jadhav	Cool pack machine
		BORSE DIPAK RAMESH		
		BORSE KARAN JITENDRA		
		BORSE SHUBHAM BHAUSAHEB		
		BURAD RAHUL AJIT		
	Group No. 5	CHAUDHARI AKSHAY DHANRAJ	Prof. K. W. Kale	Advanced Suspension System for Off-Road Vehicles
		CHAVAN LOKESH GIRISHKUMAR		
		CHAVAN NIKHIL SANJAY		
		CHAVAN SHIVAM VILAS		
		CHOUK ANAND VINOD		
	Group No. 6	DALVI SHUBHAM SUDHIR	Prof. R. B. Hagote	Die moulding of rubber sealing
		DASPUTE PRASAD BHASKAR		
		DAUND HRUSHIKESH DIPAK		
		DEORE GAYATRI MANIK		
		DESALE LOKESH MURLIDHAR		
	Group No. 7	DESHMUKH GIRISH RAJENDRA	Prof. M. V. Jadhav	Electric scooter
		DESHMUKH PRASHANT SANTOSH		

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		DESHMUKH SUKANYA ASHOK		
		DEVKAR CHANDRAKANT RAMESHWAR		
		DHAKRAO KISHOR BALU		
	Group No. 8	DHAMALE ADITYA VIJAY	Prof. R. R. Chaudhari	WAVE ENERGY CONVERTER
		DHIKALE DHANANJAY RATAN		
		DIGHE SANKET CHANDRASHEKHAR		
		GAIKWAD SHUBHAM VINAYAK		
		GARGATE PRATHAMESH VIJAY		
	Group No. 9	GARUD HARSHWARDHAN MADHUKAR	Prof. F. U. Pathan	6 DOF Robotic arm
		GAVALI ROHAN MADHAV		
		GAVHANE HRUSHIKESH BALASAHEB		
		GHODAKE AASHUTOSH ASHOK		
		GHUGE AMIT GAJANAN		
	Group No. 10	GOSAVI SWAPNIL RATAN	Prof. S. S. Kushare	Band Bulding letoff to be modified
		HADEKAR JAYESH ANIL		
		INGALE DHIRAJ RAMESH		
		JADHAV GHANSHYAM PRAKASH		
	Group No. 11	JAGZAP KAUSTUBH KISHAN	Prof. P. S. Talmale	Mini windmill power generation
		KADAM AKSHAY SHRIRAM		
		KADAM AMIT PUNDLIK		
		KAJALE GAURAV CHANDRAPAL		
		KALE KUNAL MUKESH		
	Group No. 12	KARDAK SAGAR BABAN	Prof. C. P. Shinde	Hoverbike
		KASTURE NIKHIL NANDKUMAR		
		KHAIRNAR HARSHAD KIRAN		
		KHAIRNAR SAURABH UTTAM		
		KHANDAGALE SHAMMUWEL IMMANUEL		
	Group No. 13	KHARAT MAHESH RAMDAS	Prof. P. D. Jadhav	Solar coolar
		KHARE BUDDHBHUSHAN SUNIL		
		KHATIK TAHIR ZAMA Md. YUSUF		
		KHIRKADE SANKET SUDAM		
		KHULE ABHISHEK DINKAR		
	Group No. 14	KOTME DARSHAN MAHINDRA	Prof. K. W. Kale	3D Printing of Composite Materials
		KULKARNI AKSHAY PRAKASH		

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		KUWAR DURGESH RAOSAHEB		
		KUWAR RUSHIKESH SANTOSH		
		LANDGE KRUSHNA NIVRUTTI		
	Group No. 15	MAHAJAN AKASH CHANDRASHEKHAR	Prof. R. B. Hagote	Special Purpose Machine
		MAHALE ABHIJEET MURLIDHAR		
		MODHE ATUL ARUN		
		MORE KUNAL VISHWAS		
		MORE RUCHIKA CHOTULAL		
	Group No. 16	MORE SHUBHAM VISHAL	Prof. M. V. Jadhav	Design Analysis and Manufacturing of Rollcage
		MUNGASE PRAKASH VITTHAL		
		NEHE SHUBHNIL KISHOR		
		NERE DHIRAJ TATYABHAU		
		NERKAR BHAVESH JAGDISH		
	Group No. 17	NERKAR MAYUR BHARAT	Prof. R. R. Chaudhari	Welding Rotater with proximity Sensor
		PABALKAR PRANAV MADHUKAR		
		PAGARE BHUSHAN BAJIRAO		
		PARADHI RAHUL ARUN		
		PARDHE DEVENDRA GAUTAM		
	Group No. 18	PARDHI AMARNATH EKNATH	Prof. F. U. Pathan	Thermoelectric Heating and Cooling
		PATIL ANIL PITAMBER		
		PATIL CHETAN AANANDRAO		
		PATIL DARSHAN HIMMATRAO		
		PATIL DINESH GOVIND		
	Group No. 19	PATIL KALPESH DIPAK	Prof. S. S. Kushare	Design and analysis of a braking system for a UTV
		PATIL KAUSHAL MANOHAR		
		PATIL KESHAV BHAUSAHEB		
		PATIL LALIT HIRAMAN		
		PATIL MANOJ CHUDAMAN		
	Group No. 20	PATIL NARENDRA BHAUSAHEB	Prof. S. S. Kushare	conveyor
		PATIL NILESH CHHABULAL		
		PATIL VASUDEV RAMESH		
		PAWAR DEVENDRA CHAITRAM		
		PAWAR JEEVAN RAJU		
	Group No. 21	PAWAR NILESH ASHOK	Prof. P. D. Jadhav	Polycarbonate luggage
		PAWAR PRATHMESH SAMADHAN		
		PAWAR RAJENDRA SHIVAJI		
		PAWAR RAKESH PANDIT		

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		PAYMODE SHUBHAM KAILAS		
	Group No. 22	QURAISHI TASAVVAR SADIQUE	Prof. K. W. Kale	Manufacturing of Die Mould
		RAO SHUBHAM SUNIL		
		SANDANSHIV SAURABH SATYEN		
		SARDA SHREYASH PRAVIN		
		SARODE LOBHAS VIJAY		
	Group No. 23	SASWADE OMKAR DNYNESHWAR	Prof. K. W. Kale	Automation in industry
		SAWALE MAHENDRA SURESH		
		SHAIKH MOIN MEHMOOD		
		SHINDE ABHISHEK SANJAY		
		SHINDE ROHAN SHALIGRAM		
	Group No. 24	SHIRSAT VISHAL GOTIRAM	Prof. R. B. Hagote	HOT STAMPING MACHINE
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	Group No. 25	TAMBE HARSHAL BAPURAO	Prof. M. V. Jadhav	DESIGN AND Manufacturering of gear mould mechhanism
		TARLE DIVYA DILIP		
		UPASANI MANJIRI SUNIL		
		USHIR SHRADDHA RAJENDRA		
		VARMA PUNEET MADAN		
	Group No. 26	VARPE SANTOSH ANNASAHEB	Prof. R. R. Chaudhari	Seat Belt Controled Hand break
		WADEKAR HARSHAD SURESH		
		WAGH KALPESH NARENDRA		
		WAGHALE SARTHAK SANJAY		
		WAGHCHAURE SURAJ RAJENDRA		
	Group No. 27	WALUNJ AKSHAY BHAUSAHEB	Prof. F. U. Pathan	Solar Seed robot
		WARE SOMESH RAVIKANT		
		YADAV OM SARJERAO		
		YEOLE ROHIT RAJENDRA		
2022-23	Group No. 1	GAIKWAD SANKET KAILAS	Prof. M. V. Jadhav	Automated Manufacturing Cell
		GORE PRATIK ASHOK		
		KAMBALE NIKHIL RAJENDRA		
		RATHOD ATUL SAINATH		
		SHINDE JAYESH PRALHAD		
	Group No.	SONAWANE SAHIL PRAKASH	Prof. R. R. Chaudhari	Solar-Powered Water

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	2	WAGH HEMRAJ VASANT		Desalination System
		AHIRE KHUSHAL SANTOSH		
		AHIRE PARTH PARAG		
		ATTAR FARHAN RAFIK		
	Group No. 3	BARVE VEDIKA SUNIL	Prof. R. B. Hagote	Smart Agriculture Equipment
		BAVISKAR SHUBHAM JALINDAR		
		BHAGWAT NIKHIL SANJAY		
		BHAMARE VAISHNAV BAPU		
		BORADE SAURABH DASHRATH		
	Group No. 4	CHAUDHARI BHUSHAN DILIP	Prof. M. V. Jadhav	Electric Vehicle Conversion Kit
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		GADE OMKAR JALINDAR		
		GAIKWAD MANAS ANAND		
		GANGODE VAIBHAV KAILAS		
	Group No. 5	GAVIT RAVIRAJ KARAMSINGH	Prof. C. P. Shinde	Waste Heat Recovery System
		GODGE SHUBHANGI RAVINDRA		
		HIRE PRATIK VASANT		
		IRNALE ASHISH SACHIN		
		JADHAV AAKASH BHAUSAHEB		
	Group No. 6	JADHAV MOHIT KHEMRAJ	Prof. P. D. Jadhav	Biomechanical Prosthetic Limb
		JEUGHALE OM PRAVIN		
		KAPSE KALYANI MAHENDRA		
		KHAIRNAR DIPESH GAUTAM		
		KHAN SARIK SHAMSHAD		
	Group No. 7	KUMAVAT ASHISH GORAKH	Prof. R. R. Chaudhari	UAV for Agricultural Surveillance
		MAINKAR PAURAS NILESH		
		MOHITE AJIT DILIP		
		NAWALE ADITYA RAJENDRA		
		PADMAKAR HARI SHINKAR		
	Group No. 8	PAGAR CHETAN BHAUSAHEB	Prof. M. V. Jadhav	Smart Home Automation System
		PAGARE HEMANT SOPAN		
		PAIKRAO VISHAL NAGESH		
		PANGAVHANE DHANANJAY PANDITRAO		
		PATEL MOHAMMAD GAUS SAMEER		
	Group No. 9	PAWAR AVISHKAR NARAYAN	Prof. R. R. Chaudhari	Wind Turbine Blade Optimization
		SALUNKHE MANISH KISHOR		
		SHAIKH AFNAN ARSHAD		
		SHINGADE PRADIP BHAUSAHEB		

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		SOHAIL SALIM MANIYAR		
	Group No. 10	SONAWANE MAYUR ABAJI	Prof. K. W. Kale	Hydraulic Hybrid Vehicle
		TAMBDE MAHESH SANJAY		
		TORANE AKASH REVNNATH		
		TUSHAR EKNATH UNDE		

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A Project Based Learning – II Report on

Hybrid Electric Vehicle Model

By

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[2022-2023]

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CERTIFICATE

This is to certify that,

Mr. Avishkar Narayan Pawar
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M. Nikhil Sanjay Bhagwat.
Mr. Dhananjay Panditrao Pangavhane

has successfully completed the Project Based Learning –II entitled "**Hybrid Electric Vehicle Model**" under my supervision, in the partial fulfillment of Second Year of Engineering - Mechanical Engineering of University of Pune.

Date: 29/04/2023

Place: L.G.N.S.COE

Prof. F. U. Pathan
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Prof. (Dr.) T. Y. Badgujar
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Seal

ABSTRACT

Across the globe, governments have been tackling the concerning problem of air-polluting emission by committing significant resources to improving air quality. Achieving the goal of air purification will require that both the private and public sector invest in clean energy technology. It will also need a transition from conventional hoses to smart houses and from conventional vehicles to the Electric Vehicle, Hydrogen Fuel Vehicles. It will be necessary to integrate renewable energy sources (RESs) such as Solar Photovoltaics, wind energy and diverse varieties of bio energies. In addition, there are opportunities for de-carbonization within the transportation sector itself. Paradoxically, it appears that the same transportation sector transportation is responsible for 14% of global greenhouse gas (GHG) emissions. However, there are numerous options for viable clean technology, including the plug-in electric vehicles (PEVs). There are indeed many technologies and strategies, which reduce transportation emission such as public transportation, vehicle light weighing, start-stop trains, improved engine technology, fuel substitution and production improvement, hydrogen, power-to-gas, and natural gas heavy fleets. This work concentrates on EV adoption integrated with RES. Specifically, the present work focuses on development of Battery Electric Vehicle Model for demonstration purpose.

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1. INTRODUCTION

Change is highly possible especially if way for it. Notice how plants wither and die for new plants to grow and benefit our lives The same way goes for development in different parts of globe. There must be some limits to the ability of the earth to sustain a growing population. Fortunately, population models suggest that the world's population will probably level out at about two or three times the present numbers over the next hundred years. The question is whether the earth's resources are sufficient to sustain that population at a high standard of living for all. In this the key issue is energy.

Solar energy is radiant energy that is produced by sun. Every day the sun radiates, or send out, an enormous amount of energy. The sun radiates more energy in one second than people have used since the beginning of time! Solar energy refers primarily to the use of solar radiation for practical ends. However, all renewable energies, other than geo-thermal and tidal derive their energy from the sun.

Now-a-days, dealers of natural resources like fuel, coal etc are facing a hard time to keep peace with the increasing demand. At one hand, there are more cars or motor cars or motor vehicles are dominating the transport medium, on the other hand these cars are being dominated by the fuel. As a result, the limited us to an uncertain future with having the scarcity of fuel and minerals. So, it is clear that present trends in energy consumption, especially oil, cannot be sustained much longer. Again, in view of the possibility of global warming, these resources are playing a negative role. Therefore, under this circumstances it is quite necessary to make a new exploration of natural resource of energy and power. But why exploration when the resource is in front of our eye. It is effective, less expensive and above all, it is an endless sources of energy. With greatly improved energy efficiency, a transition to this energy-based economy capable of sustaining the anticipated growth in the world economy, is possible. This effective sources is "Solar and Wind Energy".

1.1 Background

Anyos Istvan Jedlik designed a prototype of the electric car in 1828; however, it was an American Inventor, Scotsman Robert Anderson, who developed the first working electric car in the 1830s.

William Morrison created the first electric automobile in the United States in 1891. Battery-electric cars don't use any gasoline, but instead run solely on electricity stored in a battery pack that energizes one or more electric motors and produces zero tailpipe emissions. These cars can be charged most anywhere, anytime and usually at a much lower cost than fueling with gasoline. The concept of battery electric vehicles is to use charged batteries on board vehicles for propulsion. Battery electric cars are becoming more and more attractive with the higher oil prices and the advancement of new battery technology (lithium-ion) that have higher power and energy density.

1.2 Motivation

Driving an electric vehicle can help you reduce your carbon footprint because there will be zero tailpipe emissions. It can reduce the environmental impact of charging your vehicle further by choosing renewable energy options for home electricity. The Government wants India to be a 100%, electric vehicle nation by the year 2030.

- Electric vehicles now include cars, transit buses, trucks of all sizes, and even big-rig tractor trailers that are at least partially powered by electricity.
- Electric vehicles are saving the climate and our lives.
- Electric vehicles have a smaller carbon footprint than gasoline-powered cars.

1.3 Problem Statement

Solar and Wind is now-a-days considered to be a source of energy which is implemented in various day to day applications. Solar energy is being used to produce electricity through sunlight and wind energy is being used to produce electricity through wind. With the help of these Technology we aim to make renewable energy powered vehicle.

Preliminarily our objective would be to implement our idea on a small prototype and afterwards with help of this prototype we can extend our future work on building an actual car powered by the solar energy which is both cost effective and of course environment friendly. We also intend to solve the problem of voltage fluctuation due to the fact of cloud, earth movement, sun movement etc.

1.4 Objective of Work

The main objectives of project are

- To study and understand the working of hybrid electric vehicle.
- To construct hybrid electric vehicle model for demonstration purpose.

2. LITERATURE REVIEW

2.1 Introduction

The project emphasis on use of wind energy as fuel to generate electricity using it. In wind-electric turbine, the turbine blades are designed to capture the kinetic energy in wind. The rest is nearly identical to a hydroelectric setup, when the turbine blades capture wind energy and start moving, they spin a shaft that leads from the hub of rotor to a generator. The generator turns that rotational energy into electricity. At its essence, generating electricity from the wind is all about transferring energy from one medium to another.

2.2 Literature Review

Singh and Gupta [1] developed Solar Energy Hybrid Vehicle, they found that, India is densely populated and has high solar insolation, which varies from 4 to 7 kWh/(m2.day) with about 1500-2000 sunshine hours per year. Transportation sector is a major source for global Carbone mission and also contributes to air quality concerns, particularly in urban areas, in view of above, development of a passenger solar electric hybrid vehicle program has been initiated.

Palencia and Milazzo [2] have designed the chassis of Electric Vehicle and they found that the aerodynamic study of a high efficiency chassis of a solar propulsion vehicle. Experimental and Numerical methodologies are used. The experimental methodology was based on profile studies in a subsonic wind tunnel a 1:2 scale model and velocities until 35m/s.

Hrnjak [3] has developed the vehicle with Wind Powered Generator. Some vehicle included a regenerative braking system such as the electric motor generator that converts the vehicle kinetic energy into electrical energy to recharge one or more. The idea is to use air flow to produce additional electrical energy in response to deceleration of the vehicle.
With the Wind Power Generator System (WPGS) as a green system, a vehicle can produce extra energy, reduce gasoline usage and reduce air pollution.

Shaik and Rao [4] have developed the extended-Solar Power Assisted Electric Vehicle.
Economy and Emissions are the main Concerns for Success of any commercial vehicle in the present day. Automotive market. Electric are attracting more attention due to their advantages in these two points of view as compared to conventional fuel base vehicles. However, an important drawback for electric vehicles to be noticed is its range per a single charge.

Dawidwicz [5] has found the Wind Energy Harvesting for low Power Application to determine the effectiveness of low power wind energy harvesting for mobile applications. Experimental and Simulated data has shown that harvesting of alternative energy resource is viable for potential mobile applications. The study has demonstrated an improvement in overall efficiency of the power generating system.

Garling and Thogersen [6] have marketed the Electric Vehicles. Electric vehicles for traditional use. It reduces local pollutants and greenhouse emissions from the transportation system. They contend that the user of an electric vehicle pays a hefty price for these societal benefits in terms of pricing, availability, speed, and acceleration.

3. SYSTEM IMPLEMENTATION

3.1 Methodology

A. First of all, we did the survey of various research papers and reference books regarding our topic. After doing survey and gathering knowledge about the topic and having discussion with the group members we started preparing our model.

B. First we prepared the chassis frame of our vehicle model then we started mounting the other parts like front wheels, rear wheels, Prime mover (DC Motor)
Alternator, Wind Turbine at front side of the vehicle, and Solar Photovoltaic Panel, Pulley and V-belt for transmitting the power.

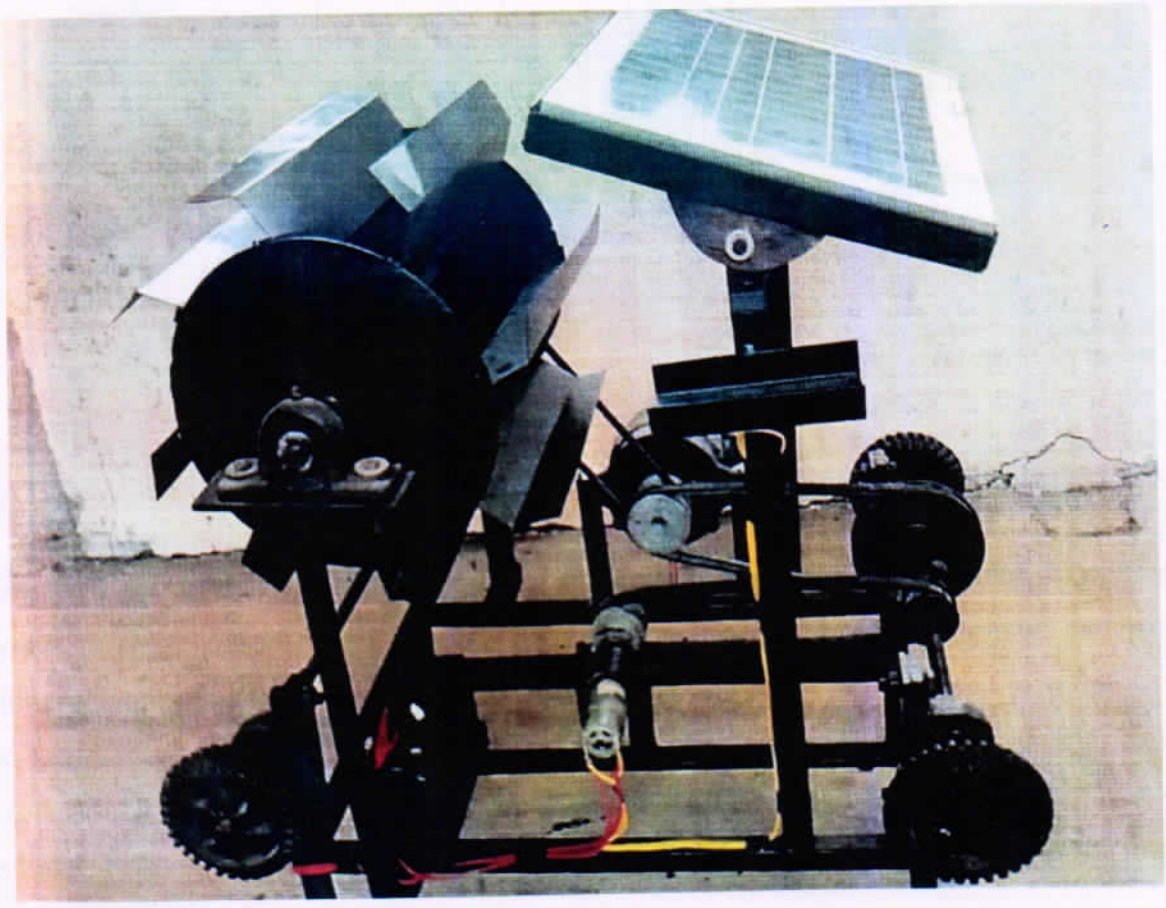

Figure.3.1. Model of Hybrid Electric Vehicle.

3.2 Working Principle

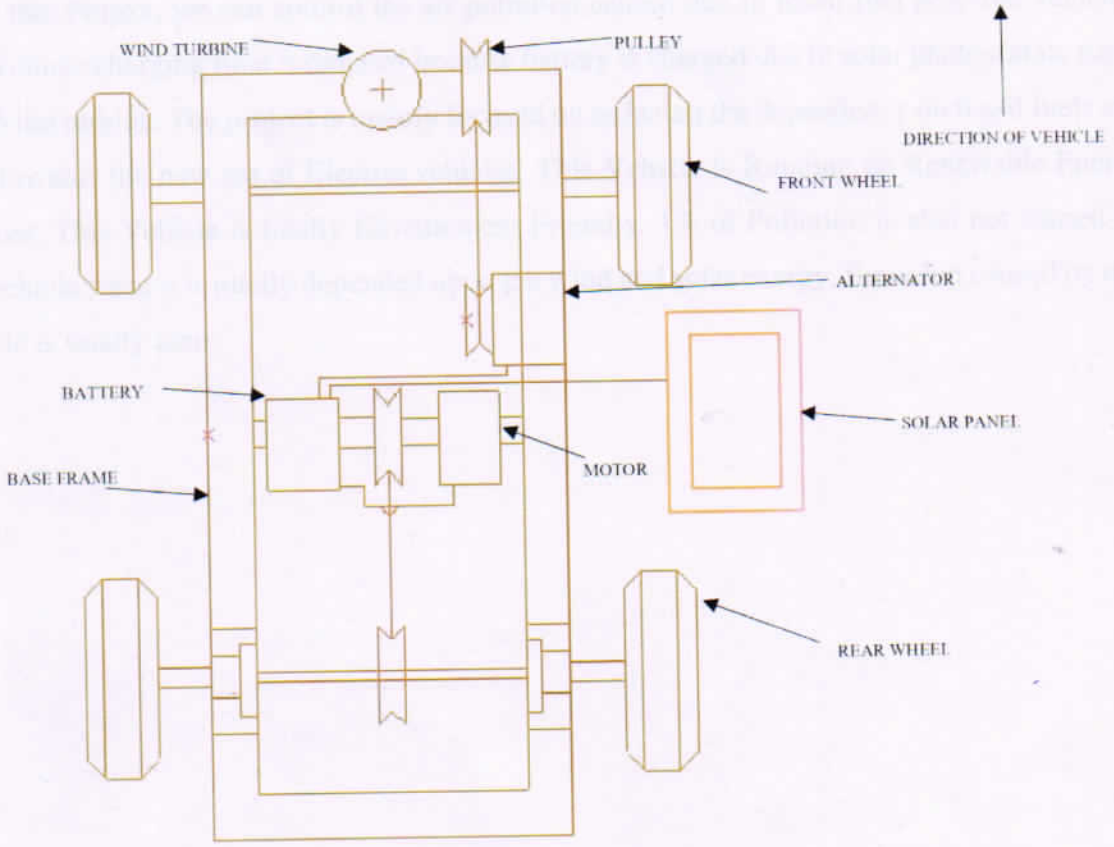

Figure.3.2. Block Diagram of Hybrid Electric Vehicle.

The Fig.3.2 shows the schematic diagram of the Hybrid Electric Vehicle Model. It consists of Various components such as base frame, front and rear wheels, battery, DC motor, pulley, wind turbine, solar panel, V-belt.

The Vehicle runs on DC motor. Motor runs on electricity stored in the battery. Battery is charged by solar panels and alternator is been provided to convert the rotational mechanical energy into the electrical energy to charge battery. Mechanical power produced by wind turbine converts into electrical power then it get stored in battery.

4. RESULT AND DISCUSSION

From this Project, we can control the air pollution caused due to fossil fuel powered vehicles. The Vehicle charging time is reduced because battery is charged due to solar photovoltaic panel and Wind turbine. The project is mainly focused on reducing the dependency on fossil fuels and shift towards the new era of Electric vehicles. This Vehicle is Running on Renewable Energy Sources. This Vehicle is totally Environment Friendly. 1% of Pollution is also not caused by this vehicle since it is totally depended upon the wind and solar energy. Emission caused by this vehicle is totally zero.

5. CONCLUSION

Our project is mainly about Battery Electric Vehicle Model. The Vehicle runs on the charge stored in battery. This Project is introduced to with modification done in battery vehicle in this model the vehicle run on DC Motor, the motor is powered by 12 V battery and it starts on battery but the battery is charged through solar photovoltaic panel and through wind turbine.

System Limitations:

1. Limited Battery Range.
2. Battery Lifespan Concerns.
3. Charging Infrastructure Worries.
4. Long Charging Times.
5. Low Top Speeds.
6. More Expensive to Buy.
7. High upfront material and installation expenses.
8. Because there is no solar power at night, a big battery bank is required.
9. Some people believe they are unattractive.
10. Devices that operate only on direct current are more costly.
11. The wind has limited speed which lessened the resultant kinetic energy of the wind energy.

5.1 Future Scope

- In Future, Battery of more Volts can be used in the vehicle.
- The more than one Solar Photovoltaic Panel can be used at the roof of the Vehicle.
- In addition to the Battery, Solar Photovoltaic panel and Wind Turbine, the Green Hydrogen Storage tank, so that the vehicle can run on Green Hydrogen also, in case of lack of Charging Infrastructure.

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