DESIGN OF ELECTRICAL WIRING HARNESS FOR EV AND CHARGING OF BATTERY BY WIND ENERGY

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ABSTRACT

A wire harness is an assembly of cables or wires which transmit signals or electrical power. Basically, the Electric vehicles with motors and some kind of control panel tend to have systematic wire harnesses design. The harness designing in any vehicle is very important aspect. If it is not properly arranged, environment threats and electronics damages can occur. Therefore Wire harness and wire cable industries play crucial role for design the wiring. A wiring harness in the engine is a set of wires, connectors, and terminals which run all over the vehicle for relaying electric power and information. The harness plays an integral role in connecting a number of important components of a vehicle.In addition to design of electrical harness design ,work will be focus towards the charging of battery through wind energy.

Keyword : - *Design of Electrical wiring harness , wind energy and Electric Vehicle.*

1. INTRODUCTION

Wire harness and wire cable industries have a passion for design. The designs for wire harnesses tend to focus on the reliability, function, and efficiency of the product. In harness designing number of components are used such as battery, switches, wires, relay, diode, connectors, taping. The battery can be used for the power supplying purpose. The electric vehicle harness is specially designed so that the energy limitation can be easily overcome using wire harness technology with the use of wind energy system. A wind turbine is a device that converts kinetic energy from the wind into mechanical energy. If the mechanical energy is used to produce electricity, the device is called a wind generator. The smallest turbines are used for applications such as battery charging or auxiliary power on sailing boats, while large grid-connected turbines are becoming large sources of commercial electric power. Wind turbines can be put into two basic categories: namely, vertical axis and horizontal axis wind turbines.

2. METHODOLOGY

Hardware Used: EV Controller, Brushless DC motor, switches and relays, alternator, charger, Two batteries 12V ,Wind turbine,LED light, Indicators, Temperature sensor of motor, Battery indicator, electric wires,etc.

Software Used: AutoCAD, Ecad tool .

System Architecture: We can consider a vehicle which is redesigned to allow airflow and wind turbine can be set up to extract energy. Wind turbines are set in parallel with the flow of air. This set up will not create any additional

thrust at the direction of propulsion. Two basic equations will be needed to explain the air flow and power extraction. The air flow through the vehicle is given by, [2] Q = Cv A v (1) Where, Q = flow rate in cubic meter per second. Cv = opening effectiveness [Value for Cv is 0.5 - 0.6 for perpendicular flow and 0.25 – 0.35 for skewed flow] [2] A = Area in square meter v = air velocity in m/s This equation (1) will determine the amount of air flow through the vehicle inlet area. Output power from a wind turbine is given by [4], PT = 0.5 CP ρ Q v2 (2) Where, PT = Power output from the turbine in watt. Cp = Power co-efficient (Assuming, Cp = 0.4 for the design) [4] ρ = air density; 1.225 kg/m3 . Q = air flow in m3 /s. v = air velocity in m/s. In conventional vehicle air cannot go to rear side of the vehicle due to presence of boundary layers and vortex shedding. If a high-pressure and a low-pressure region can be connected via a neutral zone, then air can flow in between these pressure regions. Our design will allow the air to flow in this manner D.C battery to supply power to the motor. The vehicle has to move at a velocity of 54 km/h i.e.15 m/s. The design of the vehicle is shown here with all dimensions. In this design the wind turbines are set in such a way so that the axial thrusts on the turbines are 180° apart to each other which results in the cancellation of two thrusts. In this way this symmetrical positioning of the turbines will create no additional drag component over the vehicle. Placing the turbines on the top will increase the frontal area as well as the drag acting on the vehicle. So that approach is not scientific. Rather some solar panels can be placed on the top to aid the recharging of the vehicle, both in motion and parked position. In addition if the vehicle is parked in a place where the wind velocity is above cut in speed then it is possible to charge the vehicle and thus it could aid the total charging system and hence charging time can be reduced.

Working principle: It is assumed that the vehicle is moving in a calm and steady wind stream with zero wind velocity. If the vehicle is moving at a constant speed of 15 m/s (54 km/h), then we can think a wind stream with15 m/s is flowing around the vehicle. Normally this wind will cause a drag force which is opposite to the direction of the propulsion of the vehicle. At constant speed (zero acceleration) the energy requirements to move the vehicle forward are –To overcome the frictional force (rolling resistance of road) and to overcome wind resistance [1]. At this Condition, if the air stream flowing around the vehicle (which was not interacting with the vehicle previously) is allowed to enter inside and let it flow down to the rear side; then it may be possible to use these air streams to generate power. The vehicle has already interacted with this wind and it deflects the stream of wind at the two sides of it by stagnation at the front. This is the energy that had been lost from the vehicle to overcome the aerodynamic resistant. Now if these stream generated by the interaction of the wind and vehicle is captured within the vehicle in such a way that it would not impose an additional drag at the direction of propulsion of the vehicle, some of the energy can be recovered and fed back to the battery by means of conventional energy conversion processes. Placing a wind turbine can serve the purpose. At the same time it will help to increase the pressure at the back side (according to Bernoulii's equation pressure will be increased if velocity is decreased and velocity will be reduced at the back side of the turbine after energy extraction) which will reduce the drag force that existed before with the conventional design of the vehicle. So, vortex shedding will be reduced at the rear side. For this it is necessary to modify the design of a vehicle which gives provision of air flow through the vehicle. On the other hand positioning of the turbines will also be important because they must be placed in such a way that they do not impose or create any additional drag on the vehicle. Symmetrical positioning of the turbine can do the trick as the thrust acting on the turbines will cancel each other.

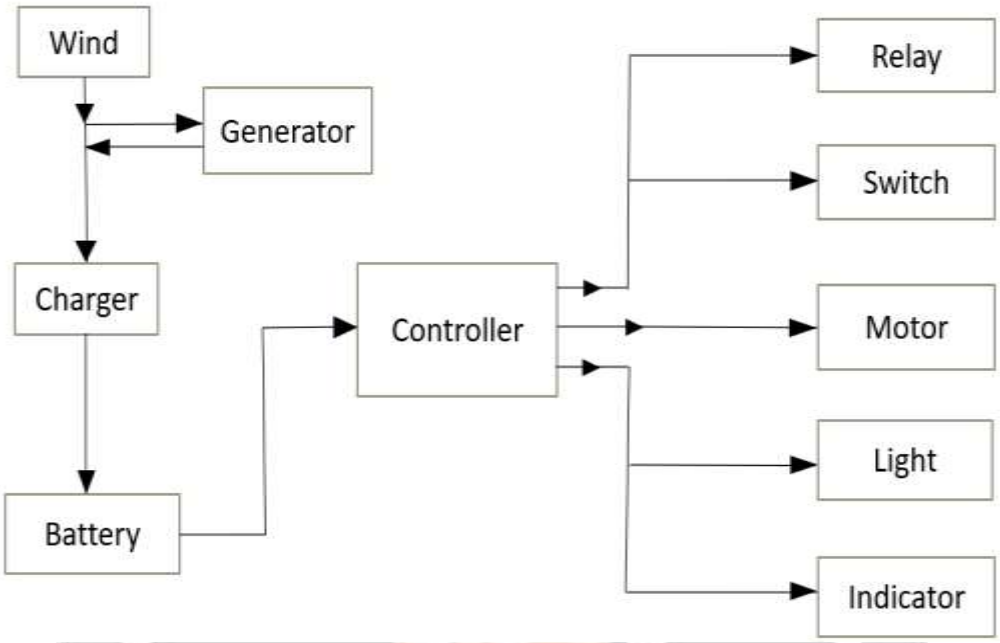
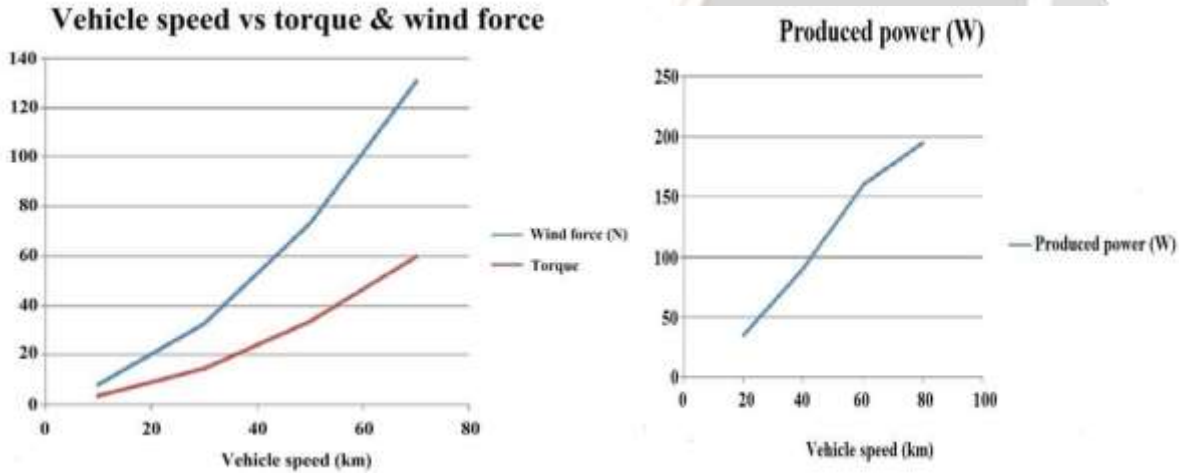


Fig.(a): Block Diagram



Fig(b): Calculation of speed vs Torque and production of power

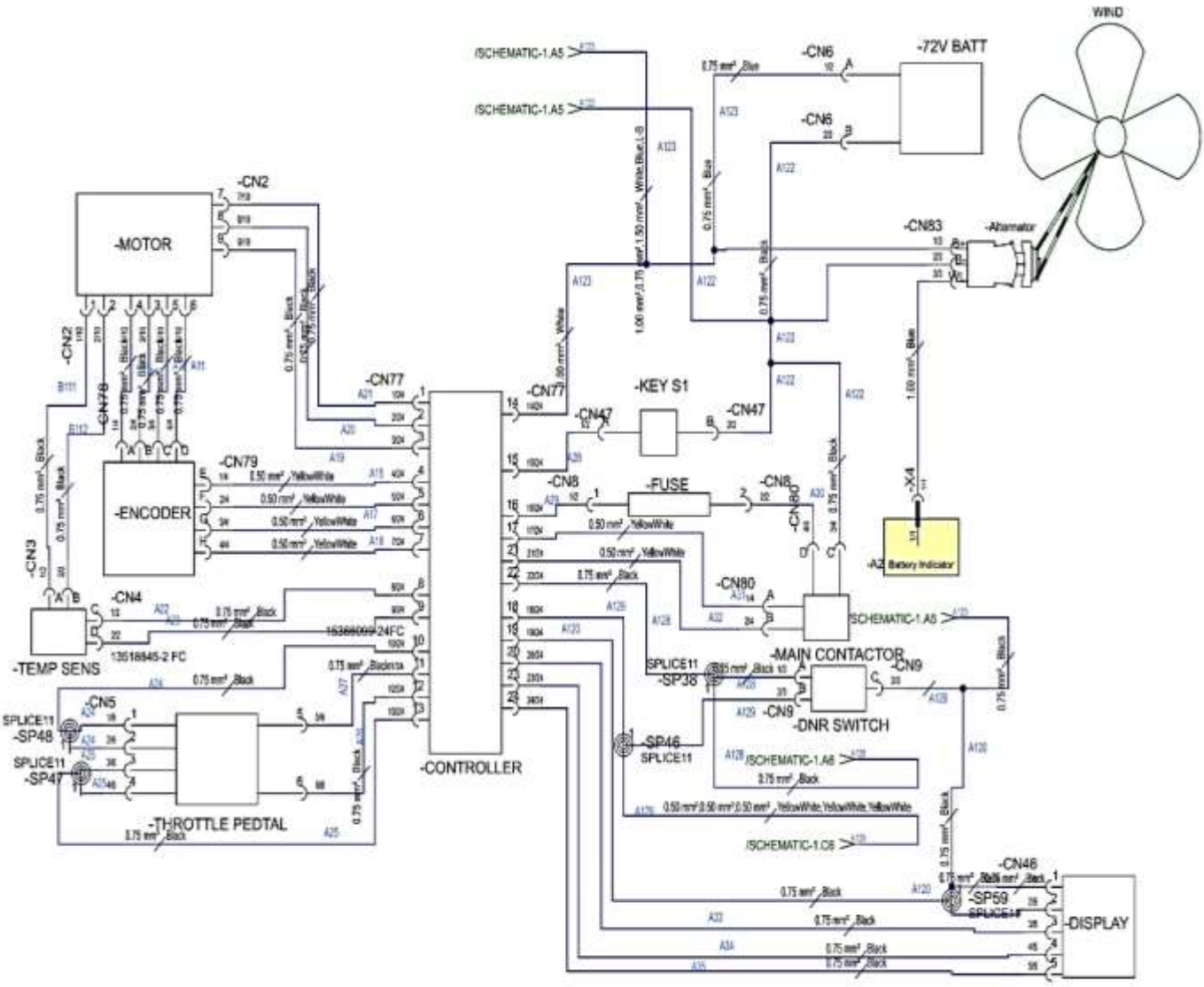


Fig.(c): Circuit Diagram of electric vehicle

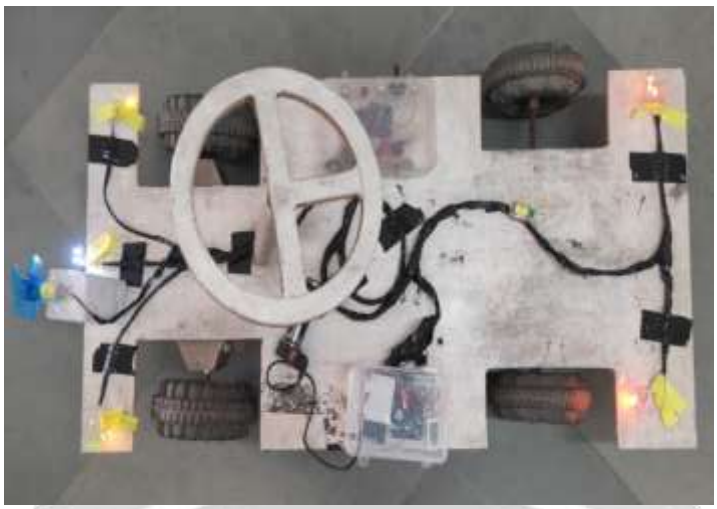


Fig (c): Implemented prototype of EV Battery management System

3. RESULT

The proposed Wind turbine system was tested on an electric vehicle prototype and the results showed that the wind system effectively generate electric energy and charges the battery which supply power to our electric vehicle. Controller smoothly controls all the components of vehicle like switching panels, speedometer, accelerator, braking, etc. The wiring harness which designed for EV work effectively and help in ensuring our vehicle run without any problem.

4. CONCLUSION

In this work, design and analytical experiments were performed for designing wiring Harness for EV and charging of battery by wind energy.. The battery can be used for the power supplying purpose. The electric vehicle harness is specially designed so that the energy limitation can be easily overcome using wire harness technology with the use of w. We accurately designed all the models for individual system and co-simulated in the end. We see that maximum efficiency of the system depends on the resonance and distance between coils to achieve an optimal power transmission. The prime concern with this model is that whether this design will create any additional resistive force components opposite to the direction of the propulsion. It has been found by the simulation that a drag will be induced due to addition of turbine. Overall simulation result along with graphs from Fig.3 will suggest that the overall effect will be same which means the modified design will experience almost same amount of drag compare to the conventional one. But the addition of turbines may give the provision of capturing some energy which will offer some benefits for the vehicle as discussed earlier. A physical structure of the design should be used to carry out wind tunnel tests which are yet to be done. At first the system may resembles with perpetual motion. But a careful observation may indicate that the system is trying to recover some of the energy spend to overcome the aerodynamic drag. The concept of placing symmetrical turbines is presented for the very first time by us. We believe it requires more research and elaborate analysis which we expect to continue in future.

6. REFERENCES

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