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Design of Eco Friendly Vehicle

S. Krishnaa

Mechanical Department Anna University - Jeppiaar Engineering College

Abstract: ***Modern technologies have influenced many development in automobile field which been trended with attractive designs and shapes for regulating the performance and plausibility's of emerging dynamic method. Various methodologies have leashed to work on the driving system of electronic drives of the system to increase the speed in vice to performance. New range of finding in consideration of various parameters such as potential design, practicable aerodynamic structures, enduring driving system & aesthetic aerodynamic system with feasible range of cost may lead to rapid development in favor of ecological system enables the growth, such kind of new trending environmental friendly vehicle has been fabricated with electrical and mechanical way of driving system for fortitude. This can be used for application of short drive at viable cost without the use of fossil fuels.***

Keywords: Driving system, speed, design, aerodynamics, endurance.

1. Introduction

Product development and processing them in a real time model ceases to various solutions in case of various modifications in the designs, hence every component is to be designed as per the norms which must be satisfied in case of various speculations as per the vehicle design [1]. Dynamic system of vehicle mainly depends upon usage of stimulated power train system inclusive utilization of motor drive system with supporting battery system which enhances the driving factor. Former system deals with electrical and mechanical system of operations which would enhance the ease of drive to the companions. System conversion of mechanical energy in to electrical energy is used in this process for recharging purpose of battery by means of energy converting devices [2].

Figure 1: represents the vehicle description.

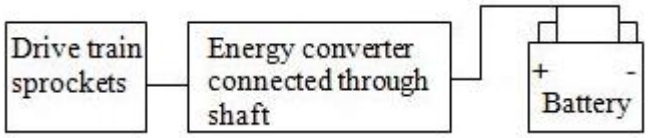

Figure 2: representing electronic system.

The conceptual design was derived from the structure of eagle head and fish frame structure providing aerodynamic effect and strong basement for the tricycle, former mechanisation is controlled by means of accleration through the alternator and by means of gradual pedalling action. Fig 3 represents the evolution of variopus stages from the basic frame to well build cycle, this case is designed for the model 2F & 1R model which is differnt from [3]. In order to enhance the battery charge additionally wind fans are made to be installed in the aerodynamic region which would enhance the rotation of fans to generate power and can be stored in battery for additional power [4], usage of these kind of hybrid tricycle would reduce the consumption in rate of fuels used which would be demand full in case of over use in the current generation hence the former would be a greater replacement for such case. As the rising demand for new range of vehicles the former would replace them with rising demand due to its appearance and features. Various components such as shock absorbers, batteries, alternator circuits, disk brakes and steering substrates have been utilized as subsidiaries for the tricycle [5].

2. Processing

2.1 Frame cage

Preliminary modelling was carried out in pro-e which was then designed in Solid works with the features of protrusion (choosing the sweep command) solid weld mends joining the structure of pipes. Roll cage design is derived from the structure of eagles head & fish frame design considered was drafted according to assigned Dimension of 970 mm from base and the top frame extending to about 2400 mm in length, the base width was assigned to be about 1370 mm with corresponding track width to be about 1200 mm providing sufficient turning effect for the wheel base.

Figure 3: representing the evolution

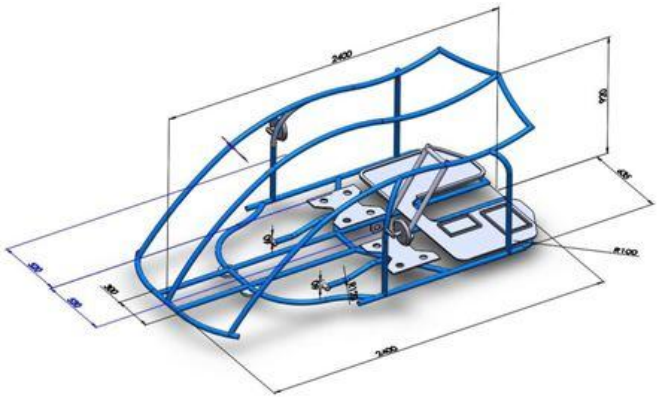

Figure 4: represents roll cage.

This frame assumption was made for betterment of aerodynamics and also for providing comfortable base for the riders, Additional aspects of battery mounting and seating arrangements were also designed as per the speculations [6], along with this arrangement for top covering is also been designed for shelter of riders.

The fish frame structure enabled to withstand a load of 150 KN from the analysis results, also this is due to the reason of the additional cross members that have been connected by means of the main frame for additional support, in case of top frame due to its eagle shaped spectrum lead to provide minimum drag by increasing the speed due to friction between wheel base and road.

3. Other Accessories

Tires: Tire of dimension 26" were used for better traction between surface of tires and the wheel base, the width of the tire was selected wider in order to reduce the skidding effect which would reduce the speed by reducing the friction factor, also corresponding tire also increases the speed, thicker spokes were in turn chosen in order to remit the bending of wheel assembly due to over loading. Hubs of the wheels have been given the arrangement of various slots sprocket zones for the disc brake allotment which has been connected in x type arrangement in order to enhance break efficiency, on the other side slot is provided for connecting the motor sprockets which would Provide force to propel the vehicle in forward motion.

Figure 5: representing the spokes.

3.1 Battery

Batteries are connected in series with one terminal connected with alternator circuit and other terminal connected to BLDC motor; the batteries are selected for a capacity of 30 amps, 12 V capacity.

Figure 6: battery used.

3.2 Steering

Ackerman steering is been utilized for the ease of driver access and in order to get larger turn radius in return during a ride in circular boundary the maximum turning radius achieved from the former model is 6.1 m, which can be steered for the figure of eight test with faster time.

Figure 7: Ackerman steering.

Figure 8 represents the assembled veiw of steering with an universal joint which controlled by a joystick steering model which has the maximum turning radius of 180^0 at turn, also for three and half reveloution of the steering wheel gives the complete turn for the wheel base in turn.

Figure 8: Ackerman steering assembly.

3.3 Suspension

Since the vehicle is designed for the two seaters the suspension mounting was preferred in the center eye of the vehicle which would rather manage the dynamic loading condition in rugged road condition a pivot like setup was welded to the main frame for the attachment of the suspension spring on one side and other end was connected to the wheel guard at 53^0, hence receiving the loads from road so that the compression in spring occurs that absorbs the shock and driver can ride a comfortable drive. Additionally two compressive springs have been provided at the front in support with steering for reducing the dynamic impact to the drivers in handling the steering wheel.

Figure 9: represents the front suspension

3.4 Vehicle Covering

Solar panels can installed in future for obtaining solar energy which can be converted in to electricity for future scope, here acrylic sheets were used for covering the top part of vehicle in consideration of vehicle Aesthetics & Ergonomics. Advantage of acrylic sheet gives the driver for easy access of vision during the drive and they are useful to resolve any defect in vehicle through naked eyes due to their transparency.

Figure 10: represents covering region.

3.5 Wind fans

In order to get additional power source a wind fan was installed for generating the necessary energy for the battery which can be converted by the ease of energy converter enables the storage of required power in the battery.

4. Aerodynamics & Aesthtics

The vehicle is mainly designed for the consideration of aerodynamics which resolves the area of 3.29 square meters for eagle head structure which provides the path of reduction of air drag and inducing to increase friction of vehicle to increase the speed.

4.1 Drag force involved

F_D – Drag force, ρ – density, C_D – drag coefficient, A – area

$F_D = 0.5 \times \rho \times C_D \times A$
$= 0.5 \times 1.22 \times 1.05 \times 3.29$
$= 0.51$ N.

Aesthetics plays a major role in designing here various modification of joystick model of steering, usage of various acrylic sheets gives good view for the vehicle that would enhance structural value, and also the usage of wind fan for power generation is an additional feature for the vehicle. The following observations are made from the power generated by mechanical means of sources to battery storage via energy converter.

4.2 Battery back-up calculation

Battery Backup = Battery Ah *(Volts/Load) *(1/Power factor)

Load = 350 W
Power factor = 1.4
Voltage = 12 V
Battery = 30 AH
The battery backup
= 30*(12/350)*(1/1.4)
= 30*0.03*0.7
= approximately 50 min.

When the vehicle runs normally in pedalling action the battery backup can run till 50 min of acceleration at constant speed. Observation under non usage of wind fans during cycle time.

Table 1: representing normal cycle time & efficiency

Sno	Cycle time in min	Energy stored at battery in V	Normal battery efficiency in %
1	5	1	94
2	10	1.8	83
3	15	2.4	78
4	20	3.2	87
5	25	4.1	90

This observation was made under the usage of wind fans during the cycle time.

Table 2: representing cycle time & efficiency in usage of wind fans.

Sno	Rotation time of fans in min	Energy stored at battery in V	Stimulated efficiency in %
1	5	2.3	98
2	10	4.2	90
3	15	4.8	88
4	20	5.3	96
5	25	6.2	99

5. Analysis Results

During analysis the components were finely meshed and the axial direction of the basement was fixed and the load was applied vertically for 150 KN which shows the deformation as shown in figure 11.

Figure 11: representing the deformation.

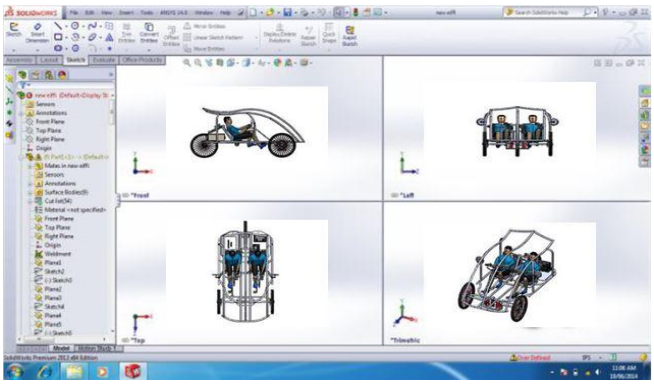

Figure 12: represents the various trimetric views.

The above figure represents the trimetric view results obtained from Solid works.

6. Conclusion

The green vehicle could achieve speed up to 40 Km/Hr by the usage of energy converter which converts the pedaling effect and the wind fans power generation up to 10 V during a cycle time that increases the battery efficiency by 20% during each phase of cycle riding as shown in the figure 11 & 12, also usage of such additional power generators may increase the life time due to repeated charging of battery at repeated cycle drives. The frame attains a deformation of about 3.8 mm due to applied load; the stress induced is 150 Mpa which is nominal for steel.

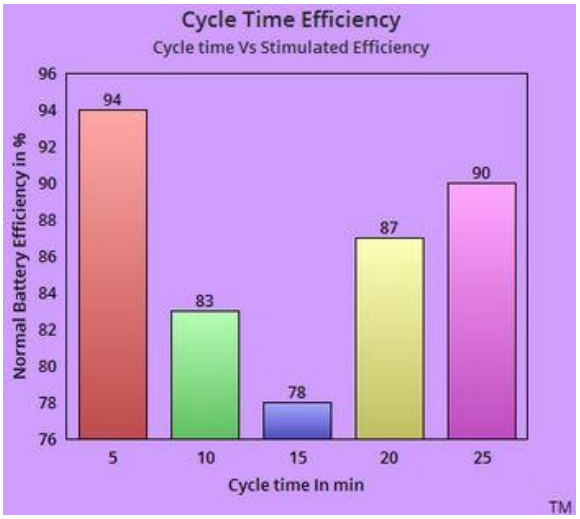

Figure 13: cycle time at normal drive.

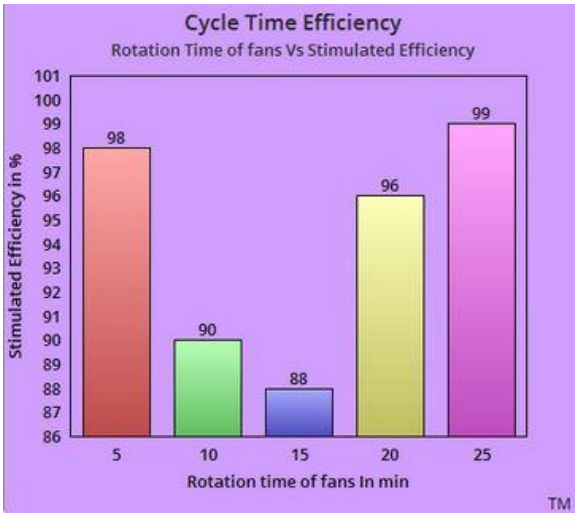

Figure 14: cycle time at wind fan drive.

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Author Profile

S. Krishnaa S/o N. Srinivasan, Graduated in Department of Mechanical Engineering Anna University, Jeppiaar Engineering College in the year 2015, during the year 2014 participated in the EFFI-CYCLE an all India level event (Fabrication of tricycle) as the Team Captain held at UIET Punjab university Chandigarh, Bagged 62 Position out of 81 Colleges. He presented a paper on IRF International Conference and have been Received Excellent paper Award Entitled on "Design and Experimental Analysis of an Impact Attenuator" 2014. He has published following papers

- Published a paper entitled on "**Design and Experimental analysis of an Impact Attenuator**" at International Conference on Computer Science and Mechanical Engineering on August 31st 2014. ID – IR-CSMECHNI-31084-007.
- Published a paper entitled on "**Power Generation through Grab Handles**" at International Journal of Innovative Science, Engineering & Technology, Volume 2, Issue 3 March 2015.ID – ISSN 2348 – 7968.
- Published article on topic "**Design of Hybrid Springs for Power Generation**" with International Organization of Scientific Research (IOSR) June 2015. Article id: C53088.
- Published paper work on topic "**Design and Fabrication of Hybrid Green Vehicle"** at International Journal of Science and Technology (IJST) June 2015. Article id: ST1506-020.
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