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Design and Develpment of Hybrid Vehicle for Physically Challanged People

M Gunasekhar Reddy
Asst Professor
Dept. of Mechanical Engineering
MITS, Madanapalli
Chittoor, India

Dr. G. Harinath Gowd
Professor
Dept. of Mechanical Engineering
MITS, Madanapalli
Chittoor, India

***Abstract*— In day to day life, mobility of physically disabled people who are partially or fully dependent on others is a difficult task. This project has been an attempt to change the lives of the people those who are basically amputees i.e., lost their legs. With a disability, it can be very difficult to drive. The problem is overcome by a three wheeler which include a handle with brake and accelerator in order to reduce the difficulty faced by them compared with normal people. Hand controls can make this much easier with more control and quick response times. Vehicle hand controls are suitable for almost any make and model car on the road today. The proposed three wheeler is designed in order to meet the comfortless of the amputees by increased suspension and the power source by hybrid system which includes engine, solar, dynamo and electrical type.**

***Keywords*— Solar Sheet.Component; Introduction**

1. INTRODUCTION

In the present trends automobile sector is developing a lot in order to satisfy the needs of people in stability, ergonomics and aesthetic features. But they are only for the people who are physically good. Our project deals with the people who are basically amputees ie., those who don't have legs. In this context we care for the comfort of the seating arrangement of the person and the different principles for obtaining power in order to run the vehicle. The energy sources are depleting continuously, so there should be a need to change in to non-conventional energy sources which are available in plenty in nature. Solar energy which is available at vast now a day can be converted in to electrical energy. The energy which is wasted normally unnecessarily from the wheels will be converted in to electrical energy by using dynamo which recharges the battery on running. The reverse current from the motor is used to recharge the batteries when engine is working.

A. PHYSICAL CHALLENGE -- PROBLEM

The People with disability has a problem of body function or has a difficulty in executing any task or action or participation restriction which is nothing but problem experience by him in live situations involvement

The impairments is broadly classified into categories they are physical disability, mobility impairment. Physical disability is impairment which restricts physical functions of legs or damage of limbs mobility impairment is another type of disability which *includes various types of disabilities like upper limb disability, disability in coordination of different organs, manual dexterity. The mobility impairment can be either by accidents, congenital or with age and because of any disease i.e. paralysis. The physically challenged people faces many problems while moving from one place to another they are restricted by the social cultural and physical barriers which stops their access to different systems in present scenario which are available for normal people. The physically challenged people who are interested in studying, doing jobs are facing major problem of transportation*

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Fig:1

According to the census nearly 2-3% of Indian calculation are suffering from different kinds of disabilities among them the maximum portion are males in that the number of disabled are more in rural compare to urban areas in that maximum people have lower limb disability it restricts the access of moving in public areas like city streets.

B. ENERGY EXCHANGE

Our mother earth is a precious gift of the universe the sustenance of nature is the key for the development of future mankind. It is the duty of every person to protect nature the degradation of environment is directly proportional to the development because of the people ignorance about ecological balance retainment. As the earth's natural resources rapidly decreasing and environment is increasingly degraded by human activities we often feel that managing all this is the issue of government only the government cannot do anything. Individually we can play important role in management of environment for that we need to decrease the usage of natural resources and use renewable energy resources

These sources are used in the production of energy. Energy is nothing but capacity to do work. It is found in variety of forms in which some can be immediately useful while others are process of transformation the need of energy is linked with the man's economic growth and development. Every decade the world's energy needs are fore folded

The process of oil and natural gas drilling, processing, transport and utilization have serious impact on environment such as leaks in which both the water air are being polluted oil powered

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vehicles release various harmful gases like sulphur dioxide carbon monoxide carbon dioxide and particulate matter that causes air pollution in heavy traffic density constituted cities the attention spans are reduced and also sometimes lead to neurological damage.

Air pollution start to increase in the starting of 20th century with the increased development of transportation system and maximum consumption of diesel and petrol the air quality problems are due to the petro chemical smog of combustion residues of petrol and diesel engine. The auto exhaust is a serious environment pollution issue for both developed and developing countries including India. The air pollution effects plants, human being and materials in human beings causes headaches nausea and dizziness. In plants it causes the leaves to turn yellow, brown or drop off all together, prolonged exposure will even cause the damage of trees and plants.

For this we need to control the air pollution by fundamental approaches like preventive techniques and effluent control. WHO rated delhi as the fourth most polluted city in world. the central pollution control board has restricted and maintained the standard of 60 microgram per cubic meter. The levels of nitrogen dioxide are increasing in the major cities because of the pollution caused by heavy vehicular traffic so in order to decrease this we need to exchange the source of energy to renewable energy like solar which is available in maximum extent of day and also the temperatures are increasing widely which should be stored or converted in order to use.

The amount of solar energy radiation received by earth is nearly 170000 terawatts of which 30-35% is reflected back to the space and remaining is absorbed by masses on earth most areas on earth have a insolation capacity level of 200-350 watts per square meter. The right utilization will meet the needs of the people on the earth the various ways of conversion of solar energy is like direct thermal storage, conversion into electrical energy by using photo voltaic cells

2. LITERATURE REVIEW

Many three-wheeler that exist in the form of motor cycle for lame are owner constructed vehicles. The first purpose of the three wheeler started earlier in 1885 by Carl Benz. Most of the three wheeler are constructed are having either one wheel at front and two wheels at rare or two wheels at front and one wheel at rare. The two wheeler are modified as changing the engine to rare side of the vehicle which makes the rider having comfort. The three wheelers that exist are constructed based on the economic conditions of the owner. In the villages most of the people who are lame are using bicycle which having thee wheels, this is bicycle which will ride by using hands. It has the chain arrangement from handle to rare wheels. The person who rides the vehicle must have to handle the steering also. It makes the ride to face difficulty to control.

The first electrical vehicle for lame is made by Morgan at Geneva shows. This vehicle having two wheels at rear and one wheel at front. This vehicle is not only looking thinner but it's looking very nice in appearance. He used 20kwh lithium battery 46 kwh electric motor .It will runs upto 150 miles with fully charged battery. It attains the 60mph in only 9 seconds. The speed of the vehicle is 90mph, and he makes the vehicle to less in weight.

The first solar vehicle is coming into existent in 1955 it is invent via G.Cobb of basic Motors. The sunlight auto used to be made up 12 selenium photovoltaic cells and a small Pooley electric motor turning a pulley which in turn rotated the rear wheel shaft. In 1962 the primary solar vehicle was demonstrated to the public. The worldwide Rectifier organization converted a antique mannequin 1912 Baker electrical car to run on photovoltaic vigor in 1958.

The first hybrid vehicle was made in 1901 Ferdinad-Porsche. The name of the vehicle is Lohner-Porsche which is gasoline and electric hybrid vehicle. The research and developed was held in 1990s by BMW 5 series. Over 10 million vehicles are sold as per the 2015 records.

The electric-car industry petered out during the Roaring 20s when owning a car became more of a convenience and less of a luxury. Rising fuel costs and the fear of exhausting fuel supplies gave rise to various electric vehicle prototypes in the 1960s and 1970s such as the Vanguard-Sebring Citi Car, which was a boxy, even more miniature version of its miniscule Indian predecessor, the REVA, one of the world's best-selling electric cars. One of the most important changes those cars exhibited was a reliance on fuel cells, which produce electricity from some form of fuel (hydrogen, hydrocarbons and alcohol have all been used) as an alternative to batteries. While this helped increase speeds, it didn't help sales take off and ultimately defeated the purpose of a more environmentally friendly, non-fuel reliant automobile. Better versions of electric cars arrived over the next two decades. GM's EV1 made it to production but proved too expensive to make in mass quantities; Toyota's Rav4 EV, which debuted in 2001, required a separate wall mount for charging. The Tesla Roadster, which first hit the streets in 2006, boasted a sticker price starting at $90,000 each — well out of reach for most consumers.

The latest entry, the Chevy Volt, is to be released by 2011; however, the Volt is actually a plug-in hybrid with a gas-powered engine that kicks in as a generator to recharge the car's batteries

3. BUILD GEOMETRY

Construct a 2 or 3 –D representation of the object to be modeled and tested using the work plane coordinates system in Ansys.

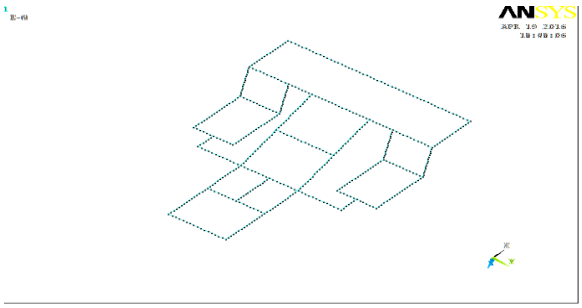

Fig:2

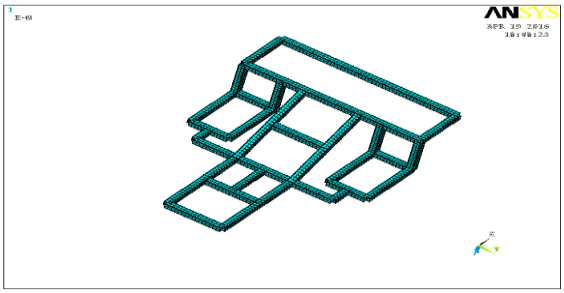

Fig:3

4. DEFINE MATERIAL PROPERTIES

Now that the part exists, define a library of necessary materials that composed an object (or project) being modelled. This includes thermal and mechanical properties.

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Young's modulus=210gpa

Section area=38*38 mm

Thickness= 3mm

Poison's ratio=0.3

GENERATE MESH

At this point Ansys understands the makeup of the part. Now define how the model system should be broken down into finite pieces.

APPLY PRESSURE

Once the system is fully designed, the last task is to burden the system with constraints, such as physical loadings or boundary conditions.

OBTAIN SOLUTION

This is actually a step because Ansys need to understand within what state (steady state, transient… etc.) The problem must be solved.

PRESENT THE RESULTS

After the solution has been obtained there are many ways to present Ansys results, Choose from many options such as tables, graphs and contour lots

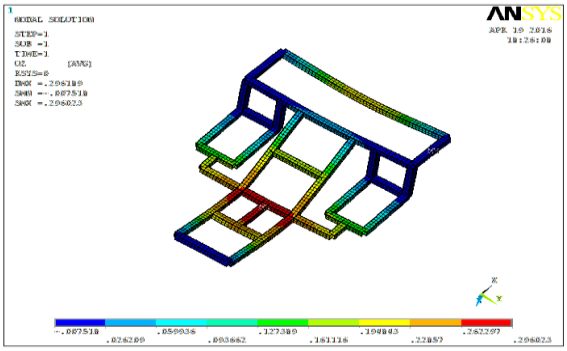

Fig:4

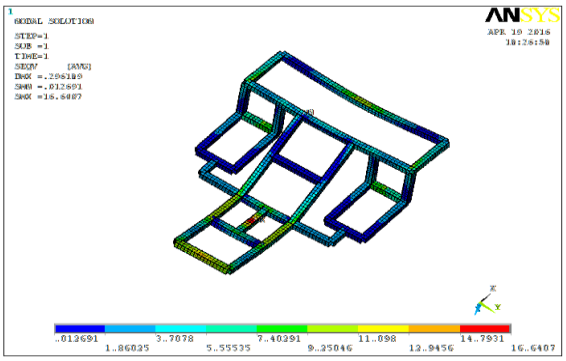

Fig: 5

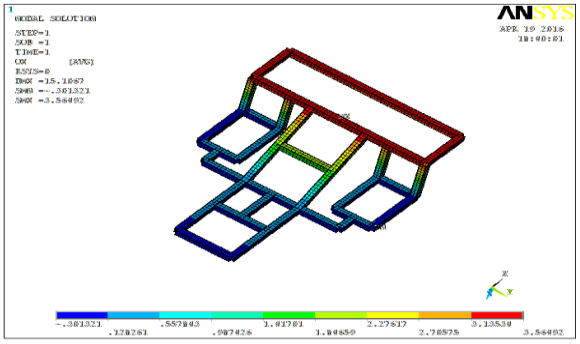

Fig: 6

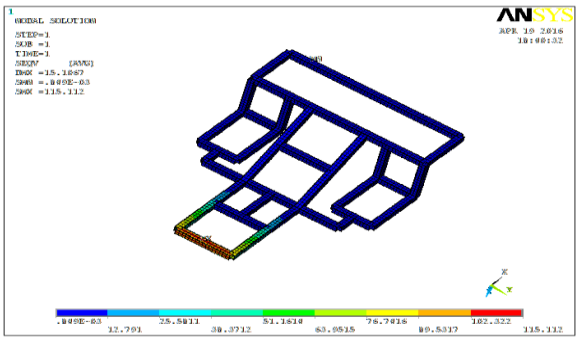

Fig: 7

5. SPECIFIC CAPABILITIES OF ANSYS:

Structural:

Structural analysis is probably the most common application of the finite element method is as it implies bridges and buildings, naval, aeronautical and mechanical structure such as ship halls, air craft's and machines housing as well as mechanical components such as pistons, machine parts and tools. Static analysis issued to determine displacement, stresses etc. under static loading conditions

ANSYS can compute both linear and non-linear static analysis. Non linearity can include plasticity, stress stiffening, large deflection, large strain, hyper elasticity, contact surface and creep.

6. STATIC ANALYSIS

A static analysis calculates the effects of steady loading conditions on a structure, while ignoring inertia and damping effects, such as those caused by time varying loads. A static analysis can however, include steady inertia loads (such as gravity and rotational velocity), and time varying loads that can be approximately as static equivalent loads (such as the static equivalent wind and seismic loads commonly defined in many building codes).

7. BATTERY POWER CALCULATIONS.

Assumed Gross weight of vehicle = 300 kg

Desired high pace = 30 Km/h

Favoured variety = a hundred Km

Coefficient of rolling friction (μr) = 0.015

Density of air at 20° C = 1.2 kg/m3

Acceleration because of gravity (g) = 9.8 m/s

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Voltage of the electrical method = 48V

Force of rolling friction Froll = μr n

= zero.015× 300× 9.8 = 44.1 N

Air resistance drive (at 30 Km/h) reasonable = ½ CdAρv^2

= ½ × 0.5×1.8 × 1.2× 8.34^2 = 37.Fifty six N

Power required to preserve the regular speed of 30 Km/h

= (Frill + fair) v = (forty four.1 + 37.56) × 8.34

= 681.0444 W

Time taken with the aid of the auto to cover the desired variety at 30 Km/h

= 100 / 30 = 3.34 hrs.

Current consumed to generate a steady vigor of 2152.22 W (IDC)

= 681.0444 / 48 = 14.1 Amps

Okay-component for 3.34 hours of back up = 4

Depth of discharge of batteries = 8%

Depth of discharge element = 1.25

Temperature deviation of battery performance = 10%

Temperature element = 1.1

Design Margin = 10%

Design element = 1.1

Ultimate Ah ranking = IDC× okay-component× Discharge component× T-component× Design Margin

= 14.18× 4×1.25 × 1.1 × 1.1 = 85.839 Ah

Power P = Voltage x Current

P = V*I

2417.5= 48*I

Current I = 50.4 A

Hence according to the above calculations, to drive a motor of 2417.5 W, 48 V capacities; we select 4batteries of 12V, 24AH. We connect these batteries in series to achieve a voltage of 48V as required by the motor.

8. ELECTRICAL CHARGING

Time required to fully charging the battery is calculated.

Power Supplied to Battery during AC Charging:

AC Adapter Specification: 48V, 6 A

Power P = V*I

P = 48 x 12

P = 576 W

The time required to charge the battery completely is

$$t = \frac{2417.5}{576}$$

t =4.2 hours

Hence, it is found that, the time required to charge the batteries completely is 4.2 hours.

9. MEASUREMENT OF CHARGING TIME

Date	Temperature ºC	Starting Time	Ending Time	Hours For Full Charge
08-04-2016	35	11AM	4 PM	5 hrs 4min
10-04-2016	36.5	9 AM	2PM	5 hrs 22 min
13-04-2016	34	12 AM	4:50 PM	4 hrs. 50 min
17-04-2016	37	11 AM	3:40 PM	4hrs 34 min

Observation of Battery charging with Solar panels

10. RESULTS & CONCLUSION

The entire chassis was simulated by using ANSYS APDL the simulation results are as follows

Bending Test:

Deflection result: 0.29mm

Stress result: Min: 0.0078N/mm^2

Max: 16.64N/mm^2

Collision Test:

Deflection result: 15mm

Stress result: Min: 0.0004N/mm^2

Max: 115.112N/mm^2

Sl.no	Source	load	Road condition	Mileage(km/ltr)
1	Petrol Engine	Single person	On road	30-36
2	Petrol Engine	Two people	On road	28-32
3	Petrol Engine	Single person	Off road	26-31
4	Petrol Engine	Two people	Off road	22-27

Sl.no	Source	load	Road condition	Mileage(km/ltr)
1	Motor	Single person	On road	26-30
2	Motor	Two people	On road	24-28
3	Motor	Single person	Off road	21-24
4	Motor	Two people	Off road	19-22

- The maximum stresses that are induced in the chassis when, the analysis are done is 115.12 Mpa, which is less than the yield strength of the material 351.57 Mpa.so, the design is safe.
- The maximum displacement induced in the chassis is 0.29mm, which is minimum and the design is safer.
- It consumed a power of 0.2 units at the time of charging.
- At one time charging it can travel a distance of 30km.
- So that the cost of travelling a distance of 1km is 0.3 rupees hence commercially the cost of consumption of 1unit costs rupees 7.
- It can run max speed of 30km/hr.

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