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HYBRID HUMAN POWERED ELECTRIC VEHICLE

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Abstract

The Team aims towards designing, validating and fabricating a three wheeled hybrid human powered electric vehicle driven by two drivers, which has a capability to act as a good viable option for city local transportation. The vehicle would be capable of being driven electrically as well as by a single driver and alternatively by two drivers. Team designed the vehicle keeping ergonomics and value engineering in mind. The vehicle is designed to give high performance at a lower rate. The vehicle thus design is capable of carrying two riders, of 5'7" height and weighing 75 kg. Our Vehicle further is designed keeping in view the future aspect by using bio filters for rural Indian population and innovative battery charging assist for city conditions. The design is validated using six different analysis tests for driver safety.

KEYWORDS - ELECTRIC MOTOR, SHM GENERATOR, GEARS, GREEN WATER FILTRATION, DELTA AND TADPOLE, PUGH'S APPROACH, FRAME, FEA, FOS, DOF

I. INTRODUCTION

Most of the cities and towns in India are highly polluted. The main reason is the air and noise pollution caused by transport vehicles, especially petrol and diesel-powered two and three-wheelers. In India there are presently close to 19 million petrol-powered two wheelers and about 1.7 million petrol and diesel-powered three-wheelers and their population is growing at rate of about 15% per annum. Besides being a major hazard to people's health, these machines are guzzling huge amounts of petrol and diesel for which the country has to pay dearly in foreign exchange outflow. It is a common sight in India and in other developing countries that during traffic jams in congested areas of cities these vehicles produces tremendous air pollution. For example three wheeler diesel tempos in Noida city (Uttar Pradesh) produce close to 70-80 decibel noise at a distance of 1-2 m, besides belching out huge amounts of particulates into the air. These diesel tempos have been recently banned in certain parts of India but still they seek replacement in many other parts. Similar data exist for almost all major towns where diesel/petrol three wheelers are being introduced. Recent incident of banning of six seater diesel tempos in Pune attests to this pollution problem. There is therefore an urgent need to introduce in cities and towns of India an environmentally sound transport system which is cost effective and which provides large scale employment for urban and rural poor. An electric cycle rickshaw can provide a non-polluting, point-to-point and a very silent transport system for urban and rural areas of India. Besides it is a very energy

efficient and cost effective vehicle. Work done at our Institute has shown that improved cycle rickshaw powered by an electric motor and batteries has a potential to provide an attractive alternative to petrol and diesel-powered three-wheelers. They can also provide large-scale employment and extra income to the rickshaw puller.

While access to drinking water in India has increased over the past decade, the tremendous adverse impact of unsafe water on health continues. The World Bank estimates 21% of communicable diseases in India are water related. Of these diseases, diarrhoea alone killed over 700,000 Indians in 1999 (estimated) – over 1,600 deaths each day. The highest mortality from diarrhoea is in children under the age of five, highlighting an urgent need for focused interventions to prevent diarrhoeal disease in this age group.

Our design of rickshaw can solve this problem too since it includes a carbon filter thus from where ever a rickshaw puller fills water in a tank provided by pedalling only he will get enough power to drive a pump that can ultimately drive water through the filter to a tank receiving clean water.

The existing cycle rickshaw has hardly changed since it was introduced in India in the early 1920's from Far East (rickshaw is derived from the Japanese word *jinrikisha*, which means hand drawn cart).OUR IDEA is firstly to redesign the existing framework of rickshaw by lower the CENTRE OF GRAVITY, by making the front wheel bit smaller so that handling becomes easy and even the stability increases also the turning becomes better and also we provide high , medium and low gears for plane , rough and slopes respectively , and also by improving brakes.

Other advancement is by utilizing all types of vibrations and incident energy being received by a rickshaw during run that is –

Weutilize the centrifugal energy produced by reciprocating motion of a permanent magnet inside of coils to produce induced emf.

All theproduced energy is utilized to charge a mobile which becomes our necessity sometimes.

And our last idea is to use the small fraction of rotational energy from the shaft of the rickshaw to run a pedal pump which is placed inside a tank. Rickshaw puller can fill water from any tape or hand pump or from any where in that tank and the pedal pump will pull that water to a carbon filter and then that water will be sent to a small tank fitted in front of the rickshaw which not only balances the weight but also stores the clean water which a rickshaw puller can utilize to drink and remaining water can be taken to home. Further a clutch is provided in the rickshaw for the purpose of cleaning water for home. If the family of puller requires water they just simply engages the pump by simple push button and starts pedalling and in few minutes they can have tank filled of clean water thus eradicating water problem.

It can replace auto rickshaw and other polluting vehicles with just zero maintenance and with a small estimated manufacturing cost of Rs.29761 which is way too less compared to any other vehicles like Auto which costs Rs.2,50,000 on road.

Our Design of Rickshaw is

- Extremely reliable
- Highly maneuverable
- Comfortable easy ride
- Very economical to run
- Simple to maintain
- Zero pollution

II. EXISTING CYCLE RICKSHAW SCENE

It is estimated that close to 2 million cycle rickshaws ply on the Indian roads carrying about 6-8 billion passenger- kms/year. The exact number could be even greater since there are no reliable records available. In some cities and small towns they are the major means of transport. They provide employment to more than 2 million rickshaw pullers, are very maneuverable, completely non-polluting and hence environmentally friendly means of transport. In the narrow lanes of towns and cities probably they are the only transport system to provide point to point travel. It is however very unfortunate that deliberate policies in most of the urban towns of developing countries have been made by the concerned authorities to phase out these rickshaws.

These non-polluting vehicles are being replaced by polluting (both air and noise wise) petrol and diesel-powered three-wheelers. However, the existing rickshaws are so poorly designed that running them takes a heavy toll on the health of a rickshaw puller. The existing cycle rickshaw has hardly changed since it was introduced in India in the early 1920's from Far East (rickshaw is derived from the Japanese word jinrikisha, which means hand drawn cart). Apparently in early 20's a Jesuit priest in India put a cycle wheel and pedals in front of the original rickshaw and this are the design which has been used since then. The gearing and the mechanical advantage of the pedal is very poor. Hence the rickshaw puller has to work very hard while climbing even a slight slope.

A common sight is of the rickshaw puller getting down and pulling on foot the rickshaw with passengers. The braking system is also very poor with only front brakes on the rickshaw. Thus when going downhill at high speeds sudden braking produces a catapult affects which results in overturning of the rickshaw. Similarly the seating arrangement is very uncomfortable and the aerodynamic drag of the system is very high. It is therefore humanly degrading to pull the existing inefficient cycle rickshaw. Yet because of poverty and no other source of income, migrant laborers do become rickshaw pullers and suffer adverse consequences to their health. There are estimates that rickshaw pulling is far more stressful than even hard labor. The rickshaw manufacturing presently is an unorganized footpath industry with no quality

control and there are as many rickshaw designs as cities in which they ply. These rickshaws are so poorly made that they have to be replaced completely in about two years. Thus there is a need to improve the existing rickshaw to make it user friendly and bring quality control in its manufacture.

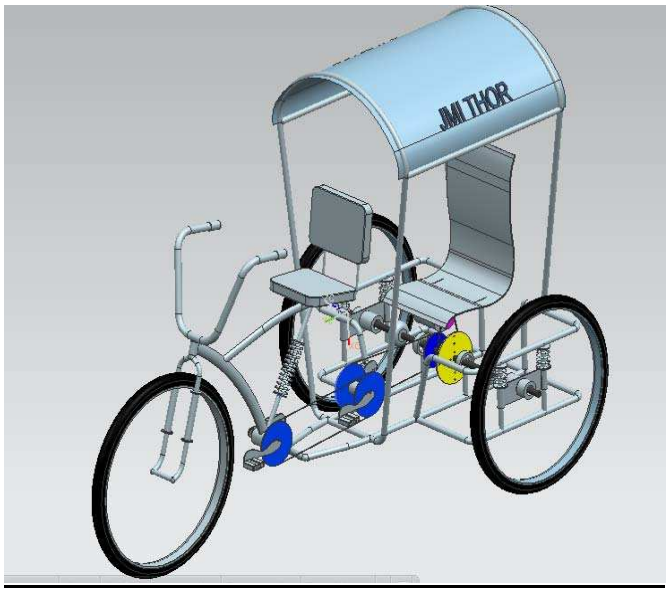
Thus a rickshaw requires a highly Developed design that should be adopted which can together reduce the health problems of pullers, comfort ability of passengers, other problems in society and also should be attractive enough to attract people and tourists

III. HYBRID HUMAN POWERED ELECTRIC VEHICLE

Technical Specifications

Vehicle Design	Recumbent Delta
Frame Material	ASTM 106a Grade B
Vehicle Dimensions	Track width- 40” Vehicle length- 82” Vehicle width- 42”
Expected Vehicle Weight	90kg
Load Carrying Capacity	4500 Newton /458Kgs
Wheel Configuration	2 Rear 1 Front
Wheel Size	Rear 26.5” * 2“ * 20“ Front 22 “ * 1.5“ * 20”
Steering	
Steering Type	Direct Linkage
Turning Radius	2.032 m
Brakes	
Braking	6 “ Disc Rear (Hyd. Operated) Shoe Brakes Front (Mech. Operated)
Ground Clearance	6”
Suspension	
Suspension Type	Front : Fork Gas Dampers Rear : Innovative New Design

Suspension Travel	Rear : 4 “ Front : 3.5 “
Electrical System	
Motor	48 Volt ,0.5hp(350W) , PMDC
Battery Type	SLA (4in No.)



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