

# Technological Development and fabrication of Cargo bike

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## ABSTRACT

This research paper is about study related to Technological Development and fabrication of cargo bike. A portable bike, which can be folded or unfolded easily. It can be handled by both the sexes with equal ease. Power economy, ease and comfort of riding and low maintenance cost from additional features. Our project being the special purpose , environmentally friendly specially meant for inside city personal handling to the target destination. Our design has maximum range and vehicle can range of 15 km on single charge. The running cost is 40 paise per kilometer

## INTRODUCTION

For a human being, travelling has become an important part of life. In order to sustain in this world, he must travel from one place to another. It is very essential that his journey take as less time as possible. Also it should be economical and available easily.

To comfort all these problems, 20th century saw many important inventions such as Bicycle, Mopeds, Scooters, Cars, and Trucks etc.

But it is only the two wheels driven vehicle that our project is concerned with because it is a vehicle where enormous modification and development can be done. Excluding bicycle, which is the simplest of all moving machine, all others are fairly complex, heavy and unportable.

Imagine if someone is to invent a bike that is foldable and light so that we can carry it around as and when he wants.

Imagine being able to carry around your motorcycle in a haversack! Yes it is possible. An improved version of the bicycle, the motorcycle is equipped with a dc motor driven It can be folded easily and weighs only 20 kg goes to show that there is no dearth of ingenuity and innovation ability in the young generation of today. Especially taking into consideration the meagre resources and facilities at their disposal.

Generally all 2 - wheelers are above 50cc capacity, bulky, costly to design for high speeds. Transporting these vehicles is a problem one has to make use of conventional means such as trains and HCV's - a time consuming process. That's why we, decided to design something which is a very new concept to India.

A portable bike, which can be folded or unfolded easily. It can be handled by both the sexes with equal ease. Power economy, ease and comfort of riding and low maintenance cost from additional features.

Though the turn of the country may still be a few years away, the world's leading car and bike manufacturers are already into advanced stages, to design which will completely alter the shape of cars and bikes as we see them today.

Drawn by a list of priorities like fast depleting oil resources, over increasing traffic. Snags problems of parking and the need to make the automobile a more environmental friendly vehicle designers are back in this board room trying to hit upon novel concept that completely alter conventional design.

Japan has taken the lead in conceptualising the car of the future. Auto giants are asking designers and engineers to device technological marvels by giving free run to their importable dreams.

To solve the problem of parking, the engineers have hit upon some of the beautiful ideas. They have designed the STAND - UP car, SPLIT car that splits into two to facilitate parking and we are going to event a CARGO BIKE..

## LITERATURE REVIEW

1. B L.Minner, Braun, L. Mongeau 1996  
-Conclusion: Cu alloy exchanger used He & Xe mixture results in shorter device a lower operating frequency as compared to pure helium and results were nearly optimal
2. Gregory Swift,1997- Conclusion: Thermo acoustic skill successfully implemented to liquefy natural gas.
3. J.C.H.Zeegers,Nov2001 – Conclusion: Even after reducing the parameters results obtained were 95% accurate as that of the original one
4. Garrett, Jan2004- Conclusion : It does not matter if wave is travelling or standing the heat that is pumped matters
5. Bhansali.P.S,JUNE2015 – Conclusion: Stack spacing affects stack performance too low spacing leads to higher viscous losses and too larger spacing results in only a small volume of gas involved in thermal interaction

## EXPERIMENTAL SET UP :

### Components: -

“CARGO BIKE” is the electrically operated consisting of the following different sub-components:-

- 1) D.C. Motor
- 2) Frame
- 3) Charger
- 4) Battery
- 5) Wheels
- 6) Drive
- 7) Tricycle

### 1) D.C. Motor: -

The motor is having 250 watt. capacity with maximum 800 rpm with torque capacity of 50 Nm. It's specifications are as per the following:-

Current rating -- 15 Amp

Voltage rating – 12 Volt D.C.

Cooling --- air cooled

Bearing — single row ball

**2) Frame: -** It is made from the mild steel body along with some of the light weight components. Welded in suitcase shape which serves as the base to hold all the accessories such as motor, weight of the load to be conveyed and the weight of the person driving the unit. Also it should be able to overcome the stresses, which

are coming due to different driving and braking torques and impact loading across the obstacles in the traveling ways. It is with the linkage and wheels to propel it and the platform plates. It is drilled and tapped enough to hold the support plates.

**3) Platform:-** It is the robust base for holding the uniformly or concentrated load along with the weight of the driving person. It is manufactured from the mild steel angle of 40x40x5mm c.s. size welded in suitcase shape with top sheet of 3 mm thickness. Platform is directly bolted and welded to the framed platform, the alignment of the platform is always kept perfectly horizontal while it is loaded or un-loaded.

4) **Battery:-** it is the accumulator of electric charge. It must store the electrical energy produced by the generator by the electrochemical transformation and give it back again on demand. e.g. while starting.

#### **Construction: -**

The basic element of battery is the cell. It contains the plate block which consists of a set of positive plates and a set of negative plates. The individual plates are separated from one another by separators placed in between. The cell is filled with the mild sulphuric acid.

The block cases e.g. of a 12V battery, is divided in to six cells that are mutually sealed and are tightly closed at the top by the block case cover. The individual cells are connected in series by the cell connector. At the first and the last set of plates, the end poles are welded.

Following are the different components of battery:-

#### **Block case, block cover:-**

It is manufactured from acid resistant insulation material, partly from the hard rubber, mostly from plastic. E.g. polypropylene.

#### **Plates:-**

These are manufactured from lead grid with embedded highly porous effective mass from very small lead particles (positive plates). The effective mass is chemically transformed while charging and discharging.

#### **Separators:-**

Micro porous insulation plates from acid-resistant plastic. They prevent contact between positive and negative plates, but must allow the electrolyte to pass through.

#### **Electrolyte :-**

Mixture from chemically pure sulphuric acid ( $H_2SO_4$ ) and desalinated or distilled water. The electrolyte should not be made impure by the mineral salts of water.

#### **Electrolytic processes:-**

The sulphuric acid is separated into columns of positive H ions and negative  $SO_4$  ions by mixing with water. If the poles of the cell are connected by a load (incandescent lamp), electrons flow from the negative pole to the positive pole. Due to the scarcity of electrons at the negative pole, bivalent positive lead is produced from the neutral lead which combines with the bivalent negative  $SO_4$  group to form lead sulphate  $PbSO_4$ .

At the positive pole, bivalent positive lead is produced from the quadrivalent positive lead of the oxide through the electron supply. The combination with  $O_2$  is therefore ruled out and a combination with  $SO_4$  is introduced, lead sulphate  $PbSO_4$ , is likewise produced. The oxygen atoms released combine with the hydrogen atoms of the electrolyte to form water. The density of the battery acid decreases.

#### **Discharged condition:-**

Positive plates, effective mass lead sulphate  $PbSO_4$  negative plates, effective mass lead sulphate  $PbSO_4$

Acid density 1.12 kg/dm<sup>3</sup>

Acid density in degree

Baume 16°

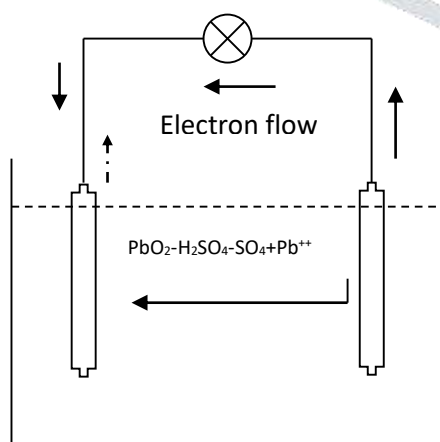
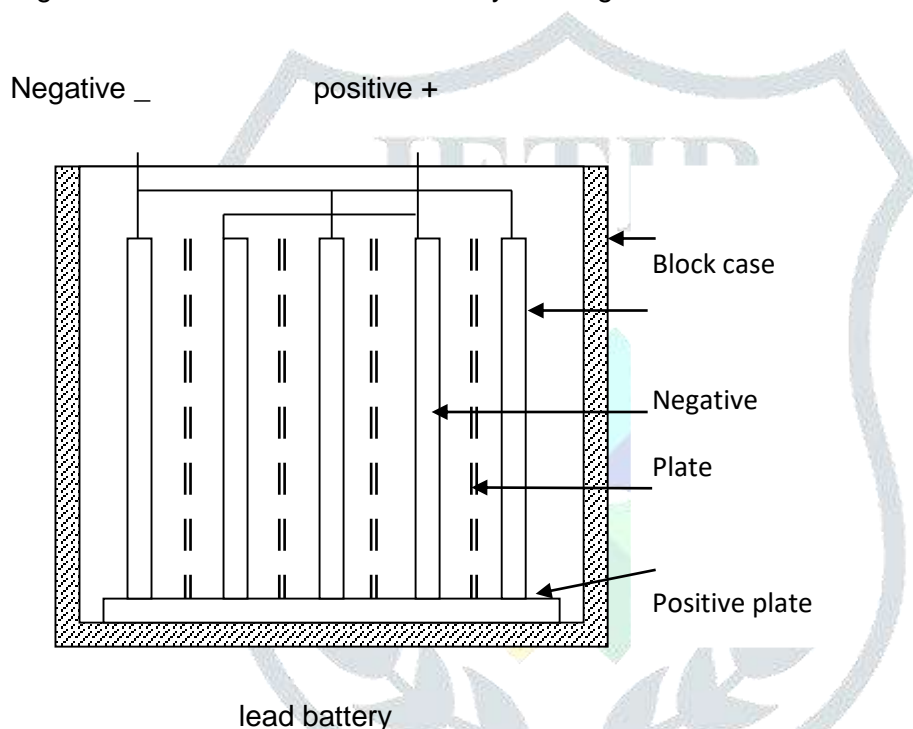
Cell voltage, unloaded 1.75 V

High current discharge while discharging with high currents, e.g. while starting, it is to be noted that the water formed in the inside of the plates must mix with the remaining acid. The battery therefore needs relaxation pauses during high current discharges.

**Deep discharge:-**

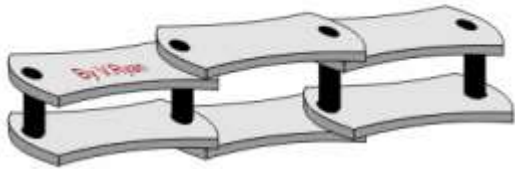
Complete discharge of a battery must be avoided since the resulting lead sulphate has a larger volume and therefore there is the danger of breakage of the effective mass from the plate grid.

Deep discharged batteries should be immediately recharged.



Discharging

**5) Chain Drive:-** A chain is made up of a series of links with the links held together with steel pins. This arrange makes a chain a strong, long lasting way of transmitting rotary motion from one gear wheel to another.

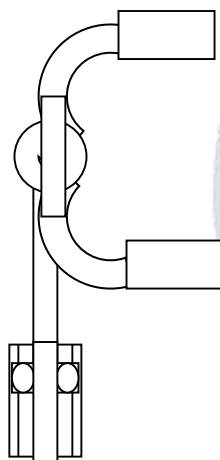


Chain drive has one main advantage over a traditional gear train. Only two gear wheels and a chain are needed to transmit rotary motion over a distance. With a traditional gear train, many gears must be arranged meshing with each other in order to transmit motion.

### FIG:- WHEEL SPROCKET & MOTOR SPROCKET ASSEMBLY

#### **STEERING:**

We are going to use the steering similar to that of swiveling rod. This system gives nearly perfect steering. Its working is purely on the movements of linkages. Ball joints to have accurate motion in one plane connect linkages. This type of steering system is a simple mechanism thereby easy to design as well as maintenance will become very easy. This system does not consist of any gears. It is light in weight. So it serves our purpose reducing the total weight thus helps in propelling.



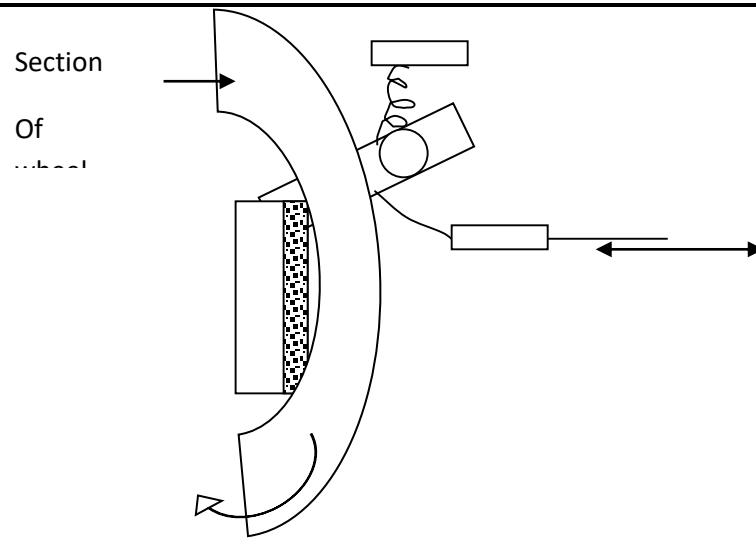
We also have another option of utilizing the Ackerman and Power steering mechanism. But this will become costly and bulky.

#### **CHASSIS DESIGN:**

We will design the chassis according to the layout of the mechanisms and other parts. We may use any one of carbon fiber material or M.S frames.

#### **BRAKING SYSTEM:**

For the braking system we shall be using the braking system used in band brake system consisting of spring loaded friction- shoe mechanism, which is actuated with the help of hand lever.



## SEAT

A great looking carbon fiber bucket seat shell provides excellent lateral support while allowing the upper body freedom to lean into corners. The raised front portion of the bucket seat shell prevents the rider from sliding down in the seat in rough terrain. A built in relief rib eliminates uncomfortable pressure on the tailbone region. The reversible seat cushion is made from practically indestructible material and is removable for washing. The adjustable lumbar cushion offers added comfort on those long rides. The seat uses quick nuts for easy removal and is mounted to the frame using rubber isolators to help soak up the bumps.

**SPROCKETS :-** The chain converts rotational power to pulling power, or pulling power to rotational power, by engaging with the sprocket. The sprocket looks like a gear but differs in three important ways:

1. Sprockets have many engaging teeth; gears usually have only one or two.
2. The teeth of a gear touch and slip against each other; there is basically no slippage in a sprocket.
3. The shape of the teeth are different in gears and sprockets.



Types of Sprockets

## **WORKING:**

**Principle:-** The machine entitled “ Battery operated – tri scoor” Works on the principle that the motive force of an A.C. motor which receives the electricity energy stored in the d.c. battery converted with the help of D.C. to A.C. converter circuit.

**Operating procedure:-** here prior to start the two wheeler starting switch, it ensured that whether the battery is fully charged. Unless it is charged using the inverter circuit, consisting transistorized integrated circuit.

**Working medium:-** Here the chemical reaction which is taking place, evolves the energizing current which is responsible for motivation of the prime mover. This chemical reaction takes place while discharging of the battery.

The sulphuric acid, being the working medium is separated into columns of positive H ions and negative SO<sub>4</sub> ions by mixing with water. If the poles of the cell are connected by a load (incandescent lamp), electrons flow from the negative pole to the positive pole. Due to the scarcity of electrons at the negative pole, bivalent positive lead is produced from the neutral lead which combines with the bivalent negative SO<sub>4</sub> group to form lead sulphate PbSO<sub>4</sub>.

At the positive pole, bivalent positive lead is produced from the quadrivalent positive lead of the oxide through the electron supply. The combination with O<sub>2</sub> is therefore ruled out and a combination with SO<sub>4</sub> is introduced, lead sulphate PbSO<sub>4</sub>, is likewise produced. The oxygen atoms released combine with the hydrogen atoms of the electrolyte to form water. The density of the battery acid decreases.

**Operation:-** The switch is put on the electric energy in the form of electric current flows from the battery to the d.c. to a.c. converter circuit where the direct current waveform is made sinusoidal due to the operational transistorized d.c. to a.c. amplifying circuit. The small intensity a.c. current across the out put is again amplified using the amplifier circuit. This amplified current is fed to the stator winding of the a.c. motor, which drives the circuit through the condenser. Condenser is the device which acts as a storing the electrical energy and delivering it at the time of requirement type of device .

The motive power of the electric drives the sprocket wheel installed on the motor shaft. The sprocket wheel being coupled to the another sprocket wheel installed on the rear wheel through the chain drive, rotates the rear sprocket wheel. The rear sprocket wheel being installed on the rear wheel drives the wheel. Thus the two-wheeler is mobiled using the electric power.

### Sprockets - Chains

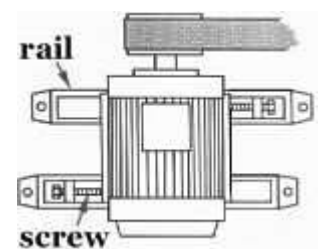
An important design consideration in rotating mechanical components is slippage between components. Pulleys and ropes/belts/cables are driven by friction, implying the possibility of slippage between the components. To help achieve no slip, the pulley can be replaced by a sprocket (a toothed wheel as opposed to a grooved wheel), and the belt or rope can be replaced by a chain (a loop of loosely pointed links).

Design relations for sprockets-chains are very similar to those desired for pulleys. Because the number of teeth that can be fabricated on a sprocket is dependent on the sprocket ratios, the velocity ratio becomes

$$V_r = \frac{\text{Number of teeth on driven sprocket}}{\text{Number of teeth on driver sprocket}} = \frac{N_d}{N_D}$$

Shaft alignment is important also when driving through belts. The plan view here shows a motor equipped with a belt pulley and mounted on **slide rails** which are fixed. During installation the motor can slide on the rails and is positioned by the two adjusting screws so that the belt is correctly tensioned and the motor axis is perpendicular to the belt length (if it isn't perpendicular then the belt might run off the pulley). When adjustment is complete the motor is secured to the rails.

The opposing orientation of the adjusting screws should be noted.



**APPLICATION :**

**Our project being the special purpose , environmentally friendly specially meant for inside city personal handling to the target destination.**

**Following are the different uses of the Battery-Bicycle:-**

- 1) It is used to convey the persons inside the city from one place to another place.
- 2) It is used to convey material from one place to another.

Advantages:-

**Following are the various advantages to make our**

**trolley, the popular one:**

- 1) The running cost is 40 paise per kilometer.
- 2) The vehicle can run 15 km on a single charge.
- 3) It is easy for the maintenance and service.
- 4) It requires very less skill for it's operation.
- 5) Emission is zero.
- 6) While running the vehicle does not produce noise.
- 7) As there are no gears and clutch in these vehicles, they are extremely reliable and safe and easy to drive and man-oeuvre.
- 8) They are ideal for 'start-stop' conditions.

**RESULT :** From above experimental set up we observed that

1. We get range 15 km on a single charge.
2. We get speed of 12 to 15 kmph.
3. It can sustain load upto 100 kg.
4. Maintenance is easy and running cost is 40 paise per kilometer.

Sr no.	Title of paper	Author name and date	Conclusions
1.			



2.	Optimizing the design of a TR	B L.Minner, Braun, L. Mongeau 1996	Cu alloy exchanger used He & Xe mixture results in shorter device a lower operating frequency as compared to pure helium and results were nearly optimal
3.	Thermo acoustic natural gas liquefier	Gregory Swift,1997	Thermo acoustic skill successfully implemented to liquefy natural gas
4.	Design of TR	J.C.H.Zeegers,Nov2001	Even after reducing the parameters results obtained were 95% accurate as that of the original one
5.	Resource letter on thermo acoustic engines and refrigerators	Garrett, Jan2004	It does not matter if wave is travelling or standing the heat that is pumped matters
6.	Development of low cost loudspeaker driven TR	2005	Loudspeaker of 250W was used for successful working with MYLAR stack
7.	An overview of stack design for TR	Bhansali.P.S,JUNE2015	Stack spacing affects stack performance too low spacing leads to higher viscous losses and too larger spacing results in only a small volume of gas involved in thermal interaction

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**BIBLIOGRAPHY:**

Following different references we have taken to make our project a successful creation. We have collected the literature from the following books:-

- 1) Hydraulic systems—S.R.Mujumdar
- 2) Machine design---- Pandya & Shah
- 3) Production technology \_\_\_\_\_ Hazra & choudhary
- 4) Machine design ----- R.S. Khurmi.
- 5) Work shop technology ----- R.K.Jain.
- 6) Industrial Herald -----Industry Association of new creation.
- 7) Production technology --- Banga & Sharma.
- 8) Machine design data book.

