BAHRIA UNIVERSITY OF ENGINEERING AND MANAGEMENT ISLAMABAD

Design, Manufacturing of Electro Kinetic Energy Ramp

Graduate studies & Applied Sciences Department
Year 2008-2012

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A REPORT

Submitted in partial fulfillment of the

Requirements for the degree

CERTIFICATE OF APPROVAL

It is certified that the work presented in this project report, entitled "**Electro kinetic Energy Ramp"** was conducted by students of Bahria University under the supervision of Sir Usman Akram by Ehsan Yousaf, Usman Idrees, and Qamar Rasheed.

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Project Coordinator

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Head of Department

ABSTRACT

The aim of the project is to develop a ramp which produces energy when it is compressed by weight. The mechanics of ramp are unique in the sense that it does not require a natural fuel to produce electricity; the Ramp just requires the flow of road traffic (vehicles). The major problem which we are faced with, is the movement of the vertical bar and adjustment of helical gear to produce sufficient output. The energy ramp also powers a camera which has been installed under the movable bar. On every push the camera takes a picture of desired focused object. All the design has been done using geometric similarity principle and modeling has been performed on Pro-Engineer Wild-fire 4.

ACKNOWLEDGEMENT

In the start we thank the ALLAH Almighty that we are able to accomplish our task successfully. We would like to thank our esteemed teaching staff and the faculty of our electrical engineering Department for providing us with the guideline to complete this project. Special thanks to our project supervisor Mr. Usman Akram for his collaborative support, encouragement and his belief on us. Also, we express our deepest gratitude to Mr. Jahanzed Ahmed (HOD electrical Engineering department) and Mr. Muneeb Yaqoob for the heartiest support and interest in our project.

We would like to thank Mr. Shaftab Ahmed and Mr. Junaid imtiaz for his in valuable contribution in suggesting a model for the optimum values of concept and power. We would like to thank our friends, who we troubled a lot during last year. But with their support and understanding, we could not have accomplished it successfully.

In the end, it is all because of our parent's prayers that helped us throughout the whole project.

Regards:

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Chapter 01

1.1 BACKGROUND

We started to work on a project which was previously developed by Mr. Dorset. Following the traffic on road we have come up with an idea that the energy can be produced by speed breakers. Previous Research made a clear breakthrough for considering this idea as a source of producing usable energy using ac ramp .In early 2009, an experiment was made by installing a ramp in parking lot where it provided enough electricity to run street light.

1.2 OVERVIEW of project

1.2.1 PROJECT IMPORTANCE

The ramp provides comfort ability and safety to the vehicles .this concept is not only providing electricity but it also provides security of the vehicles and it also makes the traffic system intelligent future more it is friendlier than the other related projects.

This concept is a new industry of its own because it is the combination of the mechanical and electrical engineering fields. The amount of energy produces is less as compare to turbine or wind mill projects. The cost of the project is relatively lesser than other alternative power energy projects

1.2.2 DESCRIPTION OF PROJECT

This ramp is not similar to the ordinary speed breaker found on road. This is unique idea of making a ramp which provides no damage to your car and you don't need any extra energy to drive this ramp vertically. It is just so simple that requires a flow of traffic.

Electro kinetic energy ramp can be described in a set of simple methods.

Whenever a car passes over a ramp. It gets pressed by the weight of the car which moves the vertical rod in vertical motion. This Rod is further welded with the handle of the worm gear. Whenever the ramp drives the vertical rod it causes the worm gear to produce an output in rotatory motion. This rotatory motion is multiplied by 15times using a gearing technique of a compound gears which is discussed in detailed in the further report. A Fly wheel has also been attached to keep the balance and provide a maximum output to the alternator. A generator is attached with one of the ring of the compound gear which provides efficient output on the Volt meter.

We have high hopes with our project because this idea of generating electricity will be effectively by practical standards in those countries where the traffic is increasing day by day. Further this concept held's us to overcome energy crisis in our country like PAKISTAN where it is the major collapse of our economy. Hence the project means us a lot towards our contribution in bringing active step towards the development.

1.3 OBJECTIVES

The project is a sort of dynamo that is able to exploit cars' passage to generate electric energy. The main object of this ramp is to convert the kinetic energy into electrical energy. The other main objective of this project is that in cities there are many speed bumps and also has one of the busiest street systems. Just imagine if all these speed bumps are replaced by the new ones, and then imagine to what extent the problem of energy can be solved. The device is formed by a steel platform positioned on the street at the soil's height, divided into 3 moving parts. The ramp geometry is so simple that it is easily pressed by the weight of the car causing the gear system to operate in a way that it provide no harm to the vehicles and as a result it gives us an electrical energy which is our need. The current produced by ramp is AC so to convert it from AC to DC we have a

circuitry which gives us an output as DC. Moreover a camera feature provides an intelligent security system to the transportation industry.

1.4 KEY FEATURES

- The best feature of "Electro-Kinetic Energy Ramp" is that it generates electricity by dragging it from the kinetic energy produced by vehicles.
- The "Electro-Kinetic Energy Ramp" works safe peak for the cars by giving them a slight (Negligible small bump) when passing over it.
- The "Electro-Kinetic Energy Ramp" is a onetime investment project which causes low maintenance cost and works perfectly for long time.
- One of the key feature of the project is that is works in every possible weather conditions
- The "Electro-Kinetic Energy Ramp" also reduces pollution and is environment friendly
- The "Electro-Kinetic Energy Ramp" is a nice way to generate the electricity.

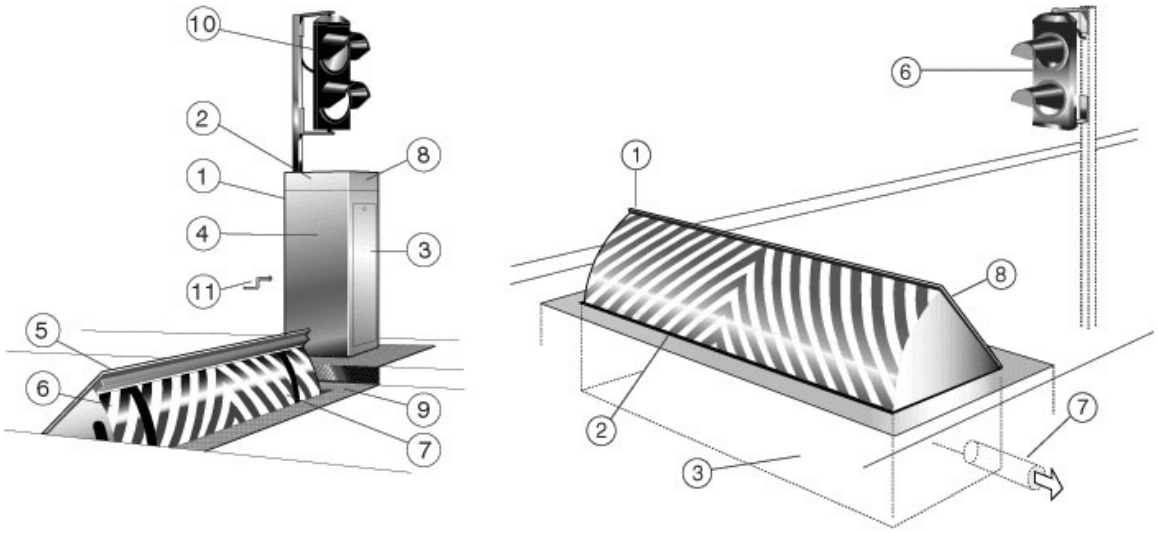

Figure 1.1 3D Image of project

Chapter 02

2.1 INTRODUCTION TO ENERGY RAMP

The electro-kinetic project is a technique for generating electricity by digging the kinetic energy to get the other useful power.

The project is a generator of free energy, friendly to the environment and is easily acceptable by the society because it has no noise or air pollution.

On increasing the number of products we can replace the other methods of generating electrical energy which cause create air/noise pollution and require lot of resources. This product is new in the transportation industry as well as in the power sector where both of them are facing a real big issue. Our product is solution to both of the sectors.

Looking at the growing demand of the electricity and traffic issue this project provides an enough guide to take them out of the thinking over this problem.

2.2 PHYSICAL SYSTEM

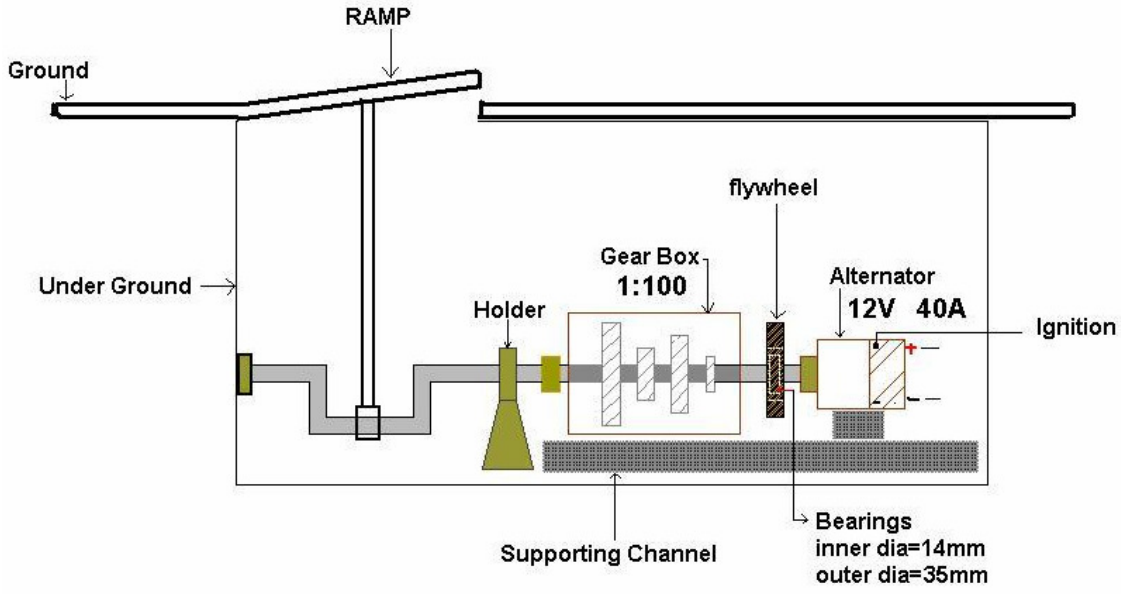

Figure 2.1 System Overview

When vehicle passes it pushes the ramp which rotate the crank, rotation is restricted in one direction by clutch bearings which is supported by holders. Ramp is pushes twice by a single car.

The motion of crank rotate the gearbox shaft which increase it rotation by 15 times (1:15) then its motion is smoothen by the help of flywheel which temporary store the motion, which is deliver to the alternator (it produces 12V 40 Amp at 1000 Rpm) , We use three wire alternator which need to be excited for the generation of electricity.

Whole system is placed on the iron bars called channels which not only provide a support but also prevent system from being misalign.

2.3 BLOCK DIAGRAM

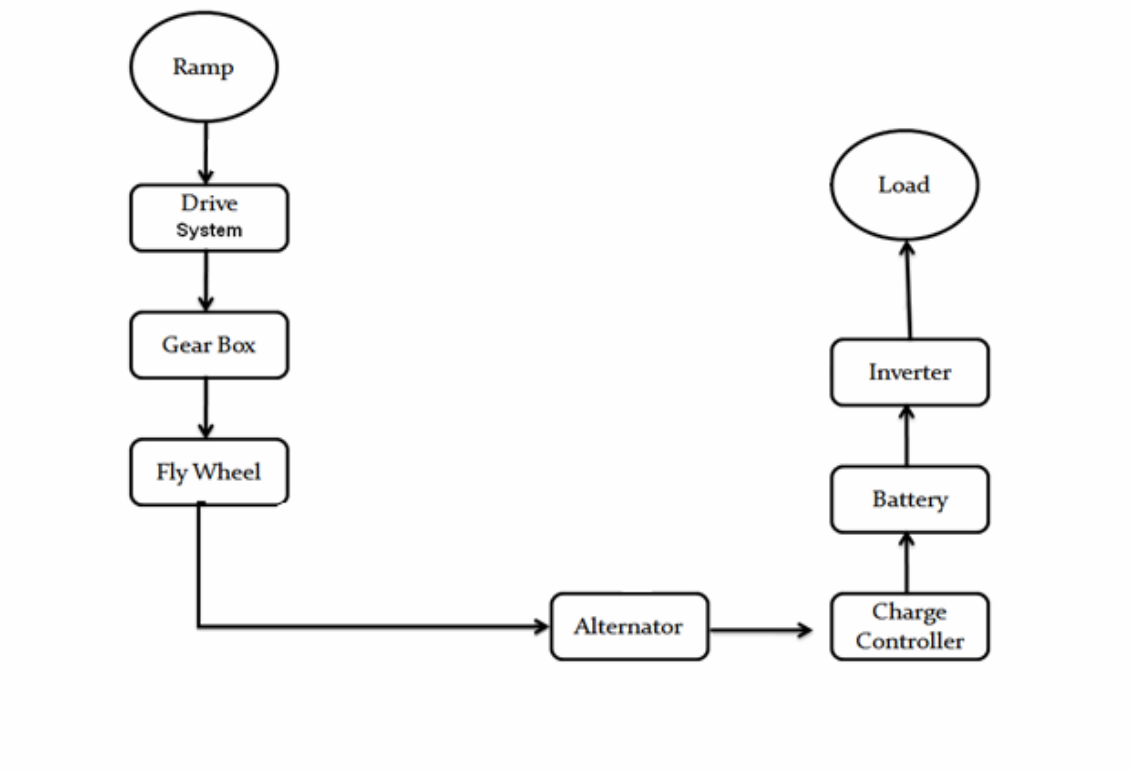

Figure 2.2 Block Diagram

- As the traffic passes over it, the ramp generates vertical motion which is further converted into rotation using a worm gear and this rotation is then multiplied 15times
- A Fly-Wheel is connected before alternator; it smooth's the rpm coming from the Gear Box. The fly wheel also helps in keeping the alignment of the gear straight to move around in a perfect manner
- This mechanical energy drives the alternator.
- The weight of the car does not matter because our deign follows the geometric principles, according to which it can also be pressed by extensive force using hand or feet.

2.4 SYSTEM FLOW DIAGRAM

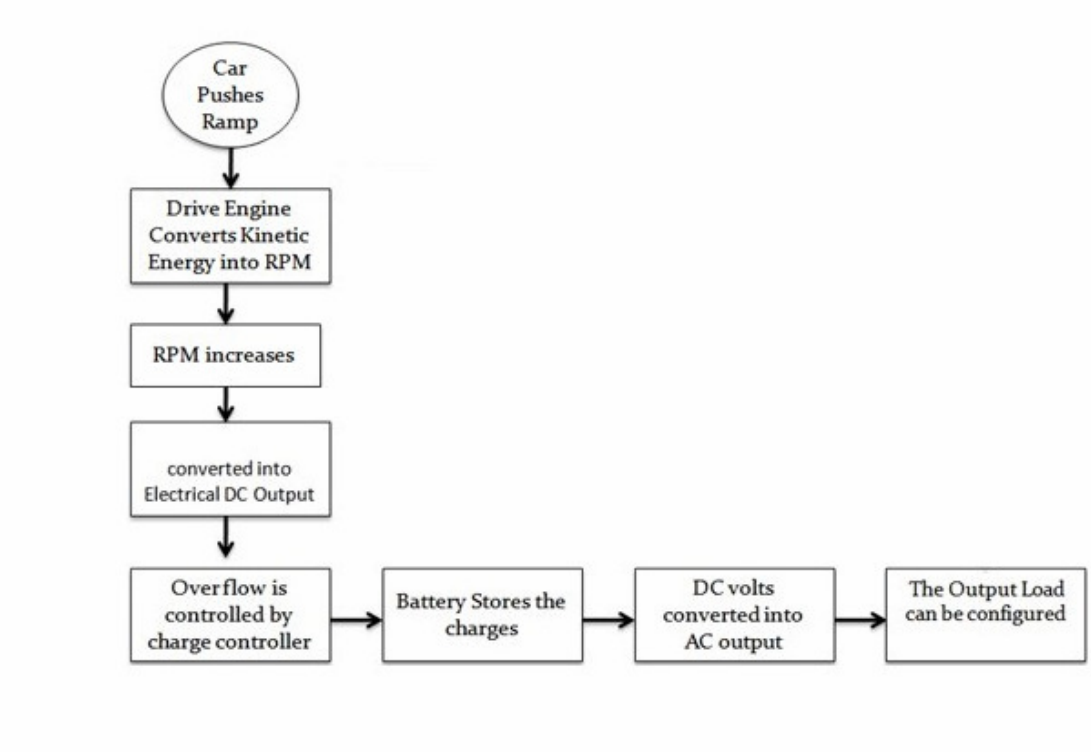

Figure 2.3 Flow Graph

Chapter 03

3.1 LIST OF COMPONENTS

- Worm gear.
- Gearbox.
- Flywheel.
- Bearings.
- Alternator.
- Charge controller.
- Battery.
- Inverter.
- Camera.
- Street light.

3.2 WORM GEAR

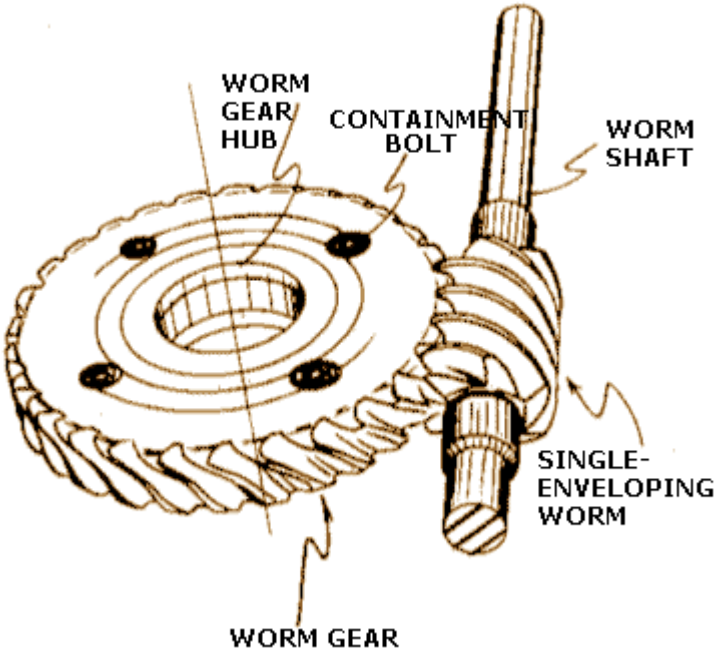

Figure 3.1 WORM GEARS

3.3 GEARBOX

Gearbox is adjustment of different gear in particular way to achieve the maximum advantage out at the next stage.

In our project 1:15 ratio Gearbox is used that is it converts one rotation of shaft into 15 rotations.

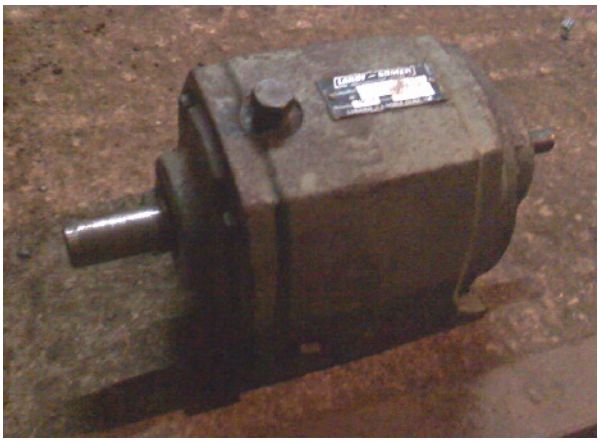

Figure 3.2 Gearbox

Figure 3.3 Gearbox Internal

3.4 FLYWHEEL

A flywheel is a weight which is equally distributed over an entire plate (disc). Whose main function is to provide addition rotations to the motor? In our project we studied a new behavior of the flywheels that it made t alignment work better. [1]

In our project 2 plate of 5kg weight each flywheel is used in our project.

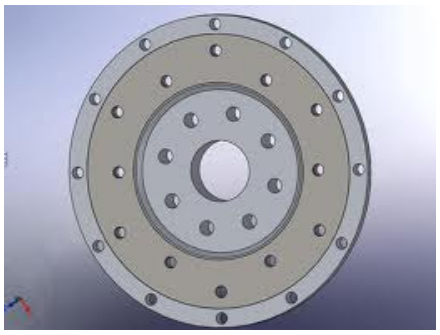

Figure 3.4 Flywheel

3.5 BEARINGS

A bearing is a pure mechanical modernism device which rotates two or more parts freely. It is inner greased with high quality lubricant dripping.

Inner diameter 12mm.	Inner diameter 25mm.
Outer diameter 33mm.	Outer diameter 52mm.

Figure 3.5 Clutch Bearing

3.6 ALTERNATOR

An alternator is a generator or a dynamo which converts mechanical energy into electrical energy using the principle of EMF (induced EMF)

In our project we used 12V 40A alternator which gives maximum output at 1000RPM.

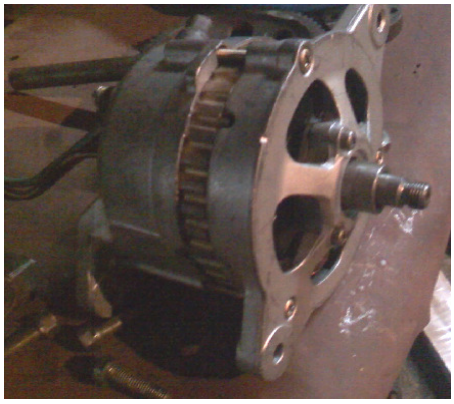

Figure 3.6 Alternator

3.7 CHANNEL

Channels are the long iron or steel bars used for supporting the structure. We use channels for the alignment of the whole system and framing the ramp with high quality angle iron was made successful using channel.

Figure 3.7 Iron Channel

3.8 AVR (Automatic Voltage Regulator)

AVR also known as power stabilizer whose main function in our project is to control the output voltage at a constant level for a certain time period. In fluctuating voltage periods the losses are very high which can cause in halting (burning) the devices attached with it. [2]

3.9 BATTERY

A 12 volt battery is a component which stores electricity and is used widely in almost all the appliances in 21st century.

In our project 12V 43A "AGS" battery is used.

Figure 3.8 AGS Battery

3.10 INVERTER

An inverter is a simple circuitry which converts alternating current into direct current. Inverter has been used in our project to convert the directs of current.

We construct an inverter of 500W.

Chapter 04

4.1 GEARBOX

Assembling the different parts of cylindrical rods having teethes at their outer edges, worked as gear in our project. The formation of the rings and adjusting them in a particular way was a big challenge to make out work into our project. The formation of the gear adjustment was made on geometric principle causing many failures during the entire tenure.

4.2 REVIEW AND HISTORY

For years gears have played an important role, for about more than 1500years age two wooden shafts were meshed with each other to get the rotation double as compared to previously produced. In forth century great scientists Aristotle discussed about the teethes, engaging pins, smoothness and friction of the wooden bars.

In 19th century wooden gears came into consideration and the idea was highly appreciated by the scientists. After that the wooden gears were widely used in steel mills and textile mills. This was the biggest industrial revolution in the history of development phase which has replaced the human problem with an ease of the work. Working on gearing technology later on was considered as a profession and still it is a specialized course in the field of mechanical engineering.

In 21st century almost every appliance uses a gear system. From toy car to real aero planes the gears play a vital concept of running a machine at the age the gears are the initiate of the working principle for almost every mechanical product. gears are basically used for the smoothness and are the multipliers in case of using a compound gear and are axis convertors in case of worm gear similarly other gears have their own importance according to their geometry and physical behaviors.[3]

4.3 FOR PROJECT CONSIDERATION

We use gearbox for increasing the RPM

Gearbox relation

N1*T1=N2*T2

Where,

N1=rpm of prime mover N2=rpm of secondary mover

T1=Teeth of prime mover T2= Teeth of secondary mover

4.4 PRINCIPLE

For providing angular velocities at the output the main head is to align the gear in a particular way so that it completely contacts with the other gear .In project we used a gear whose main principle was to provide an enough rotation which could drive the motor. The principle clears the point of rotation but how much rotation is to produce was a big faced issue. Then a solution to align and adjust the gear position was a shaft which was being made of a calculated reading. Shafts of particular size, shape to keep the gear moving and aligned at its perspective axis was made at the end successfully.

4.5 GEAR GEOMETRY

The features of gear box geometry are.

4.5.1 CENTER DISTANCE

Centre distance is a distance between the two placed outer circles of the area.

4.5.2 PITCH

Pitch is the play area of the teeth where the teeth coincides with the another teeth gear, the coinciding point of the two different teeth gears is called a pitch of a gear. This calculation is depended on the number of teethes a particular gear is having. Teethes of the gears are distributed over an entire outer diameter of the gear which develops the category of the teeth gears like crossed or straight teething. [4]

4.5.3 PRESSURE ANGLE

Pressure angle is the areas of the gear where its asserts a particular amount of pressure by another teeth gears which is meshed with it

4.5.4 GEAR TRAIN

To achieve maximum output, combination of different gear is used which results in making a gear train. Gear train increases or multiplies the input with certain ratio to get the output. In our project the ratio has been engaged up to 1:15 which means one rotation at the first disc (teeth gear) multiplies it with 15 giving 15 rotations at the output.

4.5.5 GEAR BOX

Gearbox is the combination of different teeth gears to rationalize the output to certain ratio to get the maximum output at the end.

4.5.6 SHAFTS

Shafts are the metals rods which are round/cylindrical in shape which has been used at the centre of the compound gears to move it around it axis ,further more the shafts were indulged by the bearing which helps it to move freely around it axis without making loses.

4.6 KINETICS OF GEAR

On connecting different gears for a particular purpose or to rotate them one considerable direction a driven gearing subject was involved into the project, that was once a gear is driven is one direction at certain speed it is tough charge to get the direction back into other direction as teethes of one gear are properly fixed with another. Drive gear started producing rotations in both directions which was a major concerned problem with the related project.

Installing a planetary gear provided the solution to the problem. Placing it after the worm gear followed by a shaft and bearings made the rotations work even better in one direction without any friction losses. The planetary gear is widely used in bicycle and sulf/starter generator, cars and other appliances to give the sufficient results. Similarly in our project it worked out the same and provided the direction in required form.

4.7 CLASSIFICATION OF GEARBOX AND ITS USES

Different types of gearboxes including planetary, worm. Rack and pinion, compound gear, helical gear, spurs gear etc. Gears are classified on the basis of physical properties, geometry and output reception.

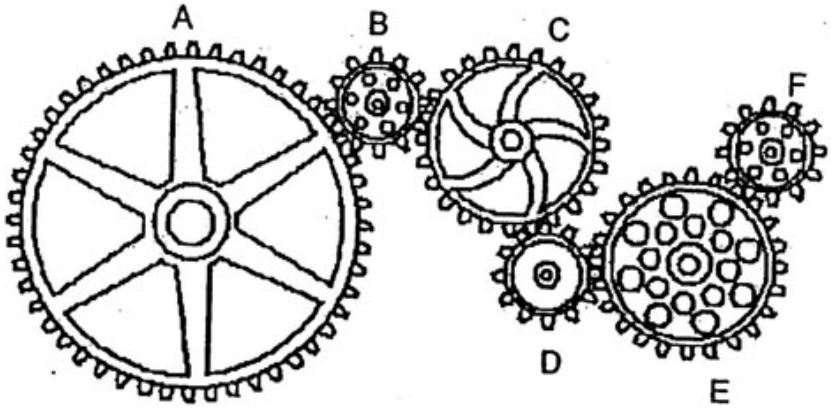

Figure 4.1 Gearbox

4.7.1 PLANETARY GEARBOX

Planetary gear is widely used in cars, machines, generators and wind mills, this type of can also be called as a directional coupler because it changes the direction in a single direction. Similarly in our project it worked out the same and provided the direction in required form. [5]

4.7.1.1 USES OF PLANETARY GEARBOX

- Wind machines
- Power sector
- Automobiles
- Medical/surgical equipment
- Robotics arms
- Military equipments

Figure 4.2 Planetary Gearbox

4.7.2 WORM GEARBOX

A simple car steering is an example of worm gear .it has a vertical bar sliding over a cylindrical disc. Whenever the bar moves on a horizontal disc it produces rotation causing vertical motion to change into rotations. The working principle is similar to the rack and pinion gear.

Figure 4.3 Worm Gearbox

4.7.2.1 FEATURES OF WORM GEARBOX

- Good grip over the other bar.
- Easily adjustable.
- Many sizes and varieties available.
- Fabricated with high quality for long life use.
- High efficiency and safe operation.
- Easy maintenance

4.7.2.2 USES OF WORM GEARBOX

- Machinery
- Industrial sector

- Automobiles
- Manufacturing industry
- Handling arms

4.8 ADVANTAGES OF GEARBOX

- Gearbox improves your working efficiency by 25% to 30%.
- There are very less loss of frictional and other losses like heat temperature in gearing technique because its properties are environment friendly...
- When a gear is working is operation at its highest operational rate it does not gather any kind of harm to human neither is produces noise to disturb to living beings.
- As they are highly fabricated with quality materials so they have a long life and an easy maintenance edge as compared to other products that are designed at the opponent place for gear box.

4.9 DISADVANTAGES OF GEARBOX

- The maintenance is quite difficult at the stage when it is roughly used because some time the problem is untraceable and we have to dispose this gear off.
- It usually works with lubricants which make it a cost reluctant. Gear box are usually expensive in spite of their advantages cannot be resubjected.
- Gear box is mainly involved in the manufacturing industry so the production of the gear box needs a lot of resources to get into use.
- A type of machinery to produce or to repair a gear box or parts of gear box is very rare.

4.10 FLYWHEEL

Mechanical devices which can store rotation energy. It works or the principle of moment of inertia in simple terms it is also known as weight. The main feature of the fly wheel is to store the spinning or rotatory motion. For deriving load flywheel plays a vital role. One physical behavior that we saw during the project that it can also provide alignment to the gears and allows the shafts to move around it axis. Using a fly wheel is considered as a most promising way to store the energy.

Once a wheels comes into rotation it can produces the spinning storage to the flywheel and stores an amount of kinetic energy as it is the true potential of the flywheels. This stores energy can easily be stored back at the instance

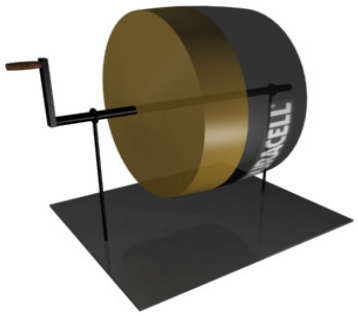

Figure 4.4 Flywheels on an Axle

4.11 USE OF A FLYWHEEL AS CENTURIES AGO

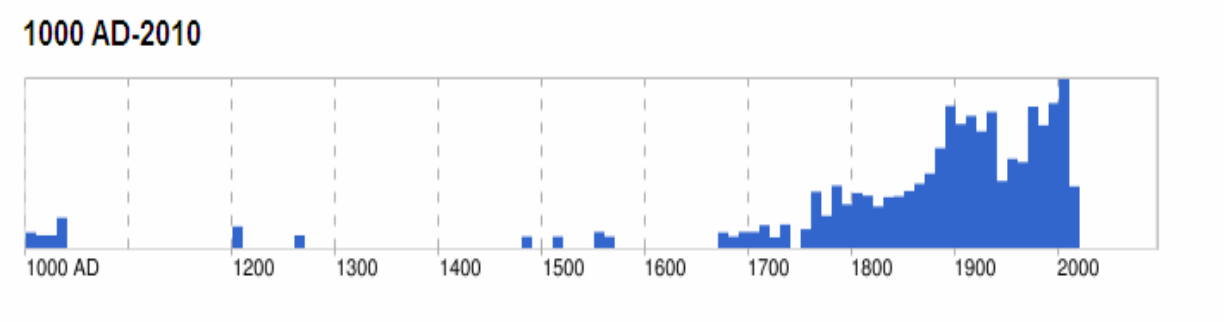

Figure 4.5 Flywheel Usage

4.12 FOR PROJECT CONSIDERATION

- In our project flywheel is used to control and maintain the direction of the motion.
- Flywheels are attached with both the rings of the gear box for the smooth rotation.
- 2 fly wheels of 5kg each are used in our project.
- Fly wheels also provided alignment and balance to the cylindrical shafts.
- Flywheels are fixed using a shaft and followed by purely aluminum fabricated bearing to keep its rotating smoothly for a seconds
- Flywheels of Suzuki Alto 1000cc were matched with our gear box so confirmed availability of resources dialed us into use this type.

4.13 WORKING OF FLYWHEEL

As discussed earlier in the report that fly wheel works as an energy storing device. We have used frequently 2 flywheels to store rotational energy to boost the rotation according to our need.fly wheels are the perfect match for driving motors without any external forces. . For example, certain devices uses electrical energy to spin a flywheel to high speed which is lot of loss for the electrical energy so considering this draw back we have used simple pressure and weight concept to power up flywheels rotation.

As seen in the hardware the Fly wheels also gives the alignment to the gear box because the gear box we have chosen for the project is manually made by man. Then setting up with the bearing and equally sized shafts over which it makes its rotation. According to the objective a fly wheel location is placed relatively ideal to provide us a sufficient amount of output.

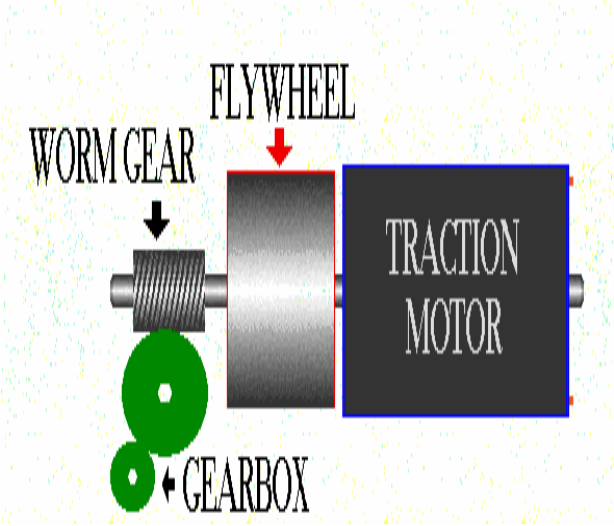

Figure 4.6 Flywheel Work

4.14 PHYSICAL CHARACTERISTICS

- Fly wheels are long lasting devices that can work for decades with just a tiny amount of mainatainence.
- Physical characteristics of the wheel are like an ordinarily wheel it's just filed with a thick metal and furnished in a way that its weight is equally distributed over the entire area.
- On buying the fly wheel a long time warranty is given which clearly defines the quality and effective results of using a product.
- The installation of fly was easy to implement by welding it with the gear because following the geometric similarities it was found to be the best place for adjusting it here
- They are up to about 80% efficient in consecrating energy. Capacities range from 3 kg to 50kg flywheel plates.
- It physical appearance is just like a round disc with heavily filled metal. If used as violent it can harmful to anyone.

Figure 4.7 ordinary shape of flywheel

4.15 FEATURES

- New features that comprises of strengthen materials like tensile, iron, knuckle etc. which is used in high efficiency motors.
- Energy storage in flywheel is distributed over per kilogram and meets the demand of power that is required. The energy stored in them cannot be compared with the batteries or any other energy conserving device/instrument.
- The calculations of storing the energy on a flywheel is calculated by the mathematical equations by use of angular velocity technique
- The installation of fly was easy to implement by welding it with the gear because following the geometric similarities it was found to be the best place for adjusting it here.

4.16 ADVANTAGES

- Fly wheels also provided alignment and balance to the cylindrical shafts.
- Fly wheels are less damaging if we consider them in case of potentially use .using it as tool to hit someone can cause a serious injury.
- Another advantage that it was build for it conserves energy for certain seconds and we can easily draw it back.
- Keeping objectives in mind a fly wheel location is placed relatively ideal to provide us a sufficient amount of output.

4.17 TECHINICAL SPECIFICATIONS

Table 4.1 Flywheel Technical Specification

Powerware Flywheel Technical Specifications:	
Input Specifications	
Float voltage range	400 to 600 volts DC
Minimum charging current required	15 ADC (250 kW) 30 ADC (500 kW)
Output Specifications	
Adjustable nominal discharge voltage range	360 to 550 volts DC
Maximum rated power	between 480 VDC and 550 VDC
DC voltage regulation	±1% steady state
DC ripple	<2%
Environmental Specifications	
Operating temperature	-20°C to 40°C
Non-operating temperature	0°C to 70°C
Relative humidity	<95% non-condensing
Altitude	Up to 4,000ft (1220 meters) with no derating
Audible noise	72 dBA at 1 meter; in accordance with ISO 7779
Typical heat dissipation	<3 kW or 10,250 BTU (250 kW) or <5 kW or 17,050 BTU (500 kW)
System Dimensions	42"W x 34"D x 78"H (107 cm. W x 86 cm. D x 198 cm. H)
Cabinet Footprint	10 sq.ft. (.93 sq. m.) (no rear or side access required)
Weight	250 kW - 3,800 lbs. (1724 kgs.) 500 kW - 6,000 lbs. (2727 kgs.)

Chapter 05

5.1 ALTERNATOR

An alternator also known as DC generator is a mechanical device which converts mechanical energy in to other form of usable energy known as electrical energy. Mostly alternators used for rotating the armature of the motor to induce magnetic current at the coils. Any electrical generator can be called an alternator. Moreover alternators or generators are the breakthrough to different alternate power energy projects.

Alternators have a second name as DC generators which have a large variety of being used in different vehicles. The type and variety of generator are huge according to the output requirement for example for 800cc cars the generators is usually smaller than the 1800cc cars as per accordance. [6]

In our project the selection of the generator was a tough phase in the sense we have no idea about the amount of rpm our system or gearbox could generate, so a DC generator was selected by mutual funding and focusing on the amount of energy to be driven was made affirmative. Thus we targeted a Magni-tek DC Generator of Maximum RPM of 1750 giving 90 Volts Maximum at the rate of Producing Current of 2.8amperes.after selection of the particular generator the adjustment solutions and designing a place to fit the generator was made sure.

Figure 5.1 Alternator

5.2 PRINCIPLE OF OPERATION

As discussed in earlier paragraph, Alternators produce electricity by the same principle on which DC generators behavior normally works on. Dc motor works in a way that the armature of the motor was made to be rotating using different gearing techniques. Whenever armature of the generator moves the EMF is induces around its magnetic plates causing electromagnetic field to produce on the output. Output can be collected using multimeter or adding some weight on the other end. This brief description will be explained in detail in the next couple of pages.

5.2.1 CLASSIFICATION AND OPERATING PRINCIPLES

In DC generators, the magnetic or the poles of the magnetic are stationery. So the current is produces only by rotating the armature whereas other generators have their field gets moving. There is slightly difference between both of the types of alternator. Alternating current is produced whenever the motor gets rotated that is why it is called an alternator.

Alternator supplies a regulating voltage as the speed of the motor is varying so the amount of power generated in volts also varies accordingly. When the rotor rotates, the armature of the motor cuts the magnetic flux causing magnetic field to occur at the other end and have induced EMF around it magnet. The flow of current and generation of electricity follows Fleming's left hand rule. [7]

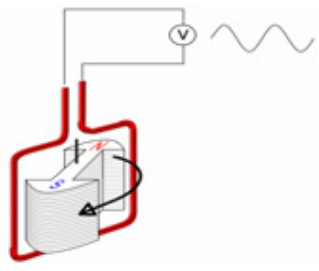

Figure 5.2 Principle of Generation

5.3 CONSTANT SPEED

DC generator depends on the number rotations made by a motor and amount of induced EMF. In our project the RPM of generator was driven up to 800RPM which produced about 90 Watt power per push.

Table 5.1 Synchronous Speeds

Poles	RPM at 50 Hz	RPM at 60 Hz
2	3,000	3,600
4	1,500	1,800
6	1,000	1,200
8	750	900
10	600	720
12	500	600
14	428.6	514.3
16	375	450
18	333.3	400
20	300	360

Moreover, one cycle of alternating current is produced each time a north South Pole of the field passes over a point onto winding causing EMF to induce on its plates...

5.4 ALTERNATOR COMPONENTS

The alternator has coil of wire wrapped around an iron core metallic rod also known as the armature of the motor. Current through wire travels causing field current to occur at the point .magnetic field across the plates is the strength of the field current and levels determines the amount of power being generated at the output. The field current is D/C, or direct current. In our project the current flows in one direction only, because we have attached the bridge circuit at the output. And is supplied by the wire coil from a slip rings and brushes. The magnetic field has a magnet having two poles south and north, a north and a south pole. The rotor is derived or rotated by adjusting different gear at the input stage. [8]

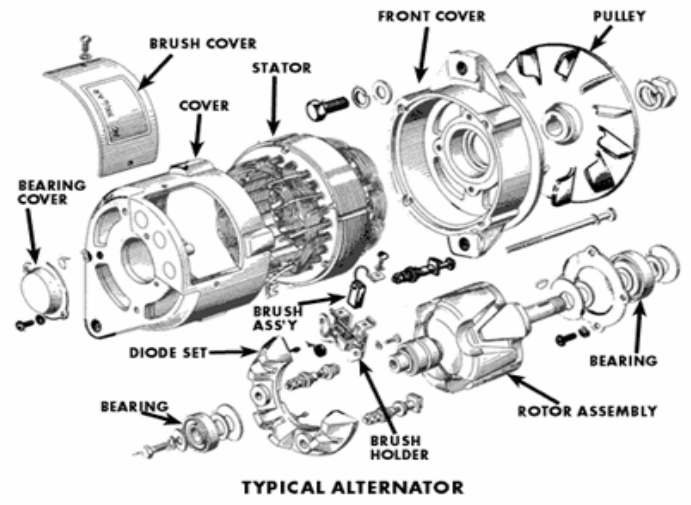

Figure 5.3 Components of Alternator

5.4.1 SLIP RING

A slip ring is adjusted with the metallic shaft to hold it at its place. Slip ring are t molded by pure metallic shape is in cylinder form that has an outer surface as round It has a generally cylindrical body which includes two slip rings at its outer surface, slip rings are connected to the slip ring unit by a conducting wire. Slip ring moves with the movement of the motor or the armature replacing the contact with the bushes on every rotation. On other side's the slip rings are rotated in a way that they cut the poles of the magnet to induce the additional EMF at the output or the magnetic field place on every rotation slip rings at least cuts the poles once or twice to provide sufficient amount of induced EMF at the output.

5.4.2 BRUSH

A brush is a plate of small conducting metals that are in contact with armature and the poles of the magnetic causing current to be induced.

5.4.2.1 TYPE OF CARBON BRUSHES

There are basically 3 types of carbon brushes

- Industrial motors: both AC and DC current,
- Household appliances: AC current, 110 / 220 V.
- Automotive applications: DC current, voltage 12-24 V.

5.5 ADVANTAGES OF ROTATING FIELD SYSTEM

- This alternator has a rotating armature whose winding is fixed with the armature and magnet over which it slides is also fixed...
- Armature winding is fixed in our Dc generator which helps in placing a direct load to the output... it only requires a slip ring and brushes to conduct electricity or magnetic field current.
- To get the high voltage on the same type of alternator we require a non adjustable armature which moves with the magnetic field so high voltage can be achieved without making the motor heavier.
- The rotating armature cuts the magnetic field causing magnetic flux to occur at the other end which is our required output after all.

5.6 ALTERNATOR CHECKING

To check the alternators connect the multimeter with the wire and set DC volt function at the meter. Using hand rotate the fan of the generator. You will see a very small amount of reading that can be seen on the meter. If you are unable to see the reading scale the multimeter to low value it will clearly show up some volts onto the meter screen. Make sure you have connected the positive and negatives ends of the wire with proper terminal otherwise wrong reading will be displayed.

Another method to see the flow of current is that you drive a motor with any machine e.g. drill machine the RPM will reach at its maximum giving you a very huge current at the output. This current can be dangerous and you can feel a real shock at the output and may cause a death if the severity is extremely high.

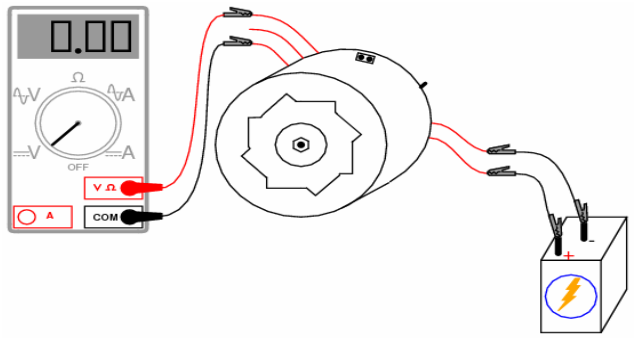

Figure 5.4 Alternator Checking

A simple and basic method that can be checked without the multimeter is that you rotate the fan of the motor with hand and touch the ground and hot wire with each other if the sparks are being produced that means the generator is working fine otherwise you generator is not in working condition.

5.7 CONNECTIONS

The connection is simply made through the copper wire which has been directly converted with the battery followed by an AVR. The diagram shown below clearly helps in understanding the connections.

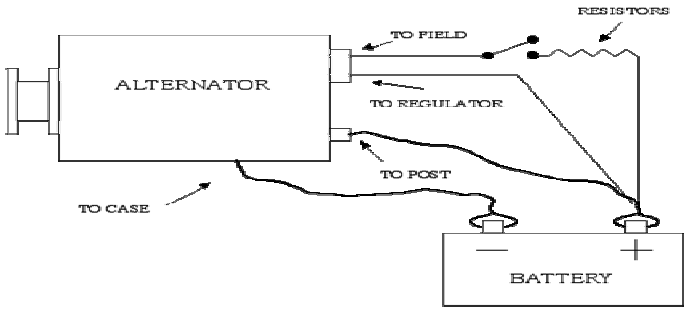

Figure 5.5 Alternator Connection

5.8 ADVANTAGES

- Dc generators are high efficient and a usable device for generating electricity.
- The current that is induced by the stator or the armature is directly available for use because rotating armature with the fixed magnet is the direct current generator.
- The increase of current or voltage depends on directly how fast you are motor is rotating. Simply it follows a rule more the rotation more the power at the output.
- The other advantage that a motor it produces the voltage in both the directions.
- To get the only positive values we have made a circuitry of a bridge circuit which gives us an output in only positive numbers.

5.9 DISADVANTAGES

- Disadvantage of the alternators are you need a large amount of power to rotate them.
- The other issue with the alternator is that once the motor catches the speed the magnetic flux opposes it to move and alternator gets heavier as current is induced on it. .
- The power to derive the motor is much larger which causes much larger loops in at the output.
- According to our plan readings must have been around 300waats .due to certain looses it has decreased to 200 one of the main loss we found is at the alternator stage.

- Alternator is reluctant on diodes to produce the current in both rotatory motions.
- Another big advantage of the alternator is that they are extremely high priced.se faced the same issue so we found a used alternator to apply an experiment into our project and it worked perfectly as we thought off.

5.10 SAFETY ISSUES

Alternator is the electricity generator so we have to be aware of its characteristics. Some safety measures that must be kept in mind while working on the alternator are as follows. [9]

- Do not disconnect it from battery directly
- Do not use your hand to make the wiring until it's properly grounded.
- Use a sticking tape to make the wiring safe because open wiring can be injurious to health and may course serious health hazards.
- When connecting meter use safety gloves.
- Points should be properly grounded while taking readings.
- Alternator directly relay on the current so properly read the guide book before using alternators.

Chapter 06

6.1 CHARGE CONTROLLER

This device Controller, charge regulator or battery regulator is lemmatize the electric current which is produced by the DC generator and add this produced voltage into battery.

This Charge controllers device also prevent the overall system from overcharging of batteries and also provide safety to batteries from drying and give maximum life to batteries as well as provide greater life to the system.

"Charge controller" or "charge regulator" referenda are a stand-alone device, or to control circuitry integrated within a battery pack and powered battery device, or rechargeable battery. [10]

Figure 6-1 Charge Controller

6.1.1 STAND-ALONE CHARGE CONTROLLERS

A charge controller or regulator disables excess current flow into batteries when they are fully charged. A shunt controller is an additional device which acts as switch for preventing from reverse current to flow in the circuit.

6.1.2 CHARGE CONTROLLER CIRCUITRY

Circuit which functions on a principle in which charge regulator controller is may be consist of many other electronic components, which may be integrated in a microchip, and that integrated circuit is commonly known as IC.

So by bow importance of Controller is getting high because it is also used for rechargeable devices such as mobile phones, notebooks, PC, MP3 Players, and UPS,and more importantly device provide benefit in larger battery's used in e high bird cars, and giving commands and show way the way to satellite as well .

6.2 FUNCTION OF CHARGE CONTROLLER

This controller is basic component of almost used in all systems that give power to the batteries, no matter if the source is Turbine, wind mill , air project, oil, or any equipment or similar of this. Purpose is to keep the battery in proper and safe manner so its life would be enhanced.

The main principle of a controller is very easy to understand. Controllers provide no entrance to reverse current and neither give a chance to batteries to be overcharged. In the same way controller kept checking that batteries cannot be discharged, prevent from overload of current, and show current state of the battery flow of power.

6.2.1 BLOCKING REVERSE CURRENT

In all most every controllers, current flow from semiconductor acts like a button for controlling the current. Which known as a "semiconductor" due its property to pass charges in one way only. These things provide safety against reverse current without putting any additional work.

6.2.2 PREVENTING OVERCHARGING

When battery shows its full charging, so than system is so intelligent that automatically does not store any energy further. If energy still to be applied at the full rate, the

battery voltage goes on to the highest value of its own. The battery also discharged quickly and prevent from heating. More voltage also putts up the load on to your sources and than your inverter are to turn off automatically.

6.2.3 BATTERY TYPE VS Controlled set Point

The set points for controlling the battery strictly depend upon design of the battery. Many of the systems go for deep-cycle as well for lead-acid batteries of either the flooded type or perhaps sealed type some time preferred. This liquid batteries than called as flooded batteries.

Sealed batteries use saturated pads plates. To overcome this issue they need to be controlled on lower voltage. Controller is selected according to your battery specification .so after all that you must know you do not use such controller which does not suite your battery system.

6.2.4 LOW VOLTAGE DISCONNECT

For renewable energy deep cycle batteries are used as sources which are designed to be discharged by about 70%. If they in case discharged occurred to its maximum, then batteries are expired.

To overcome this problem is to discharge when every cell fills with liquid, is to disconnect loads and then to connection made again only when the voltage is fully on its peak.

A low voltage system will disconnect all appliances to reset point. It will reconnect the appliances in one condition if the battery voltage recovered power due to gain of charge.

6.3 12V CAR BATTERY

12 volt battery is variable battery for start the home appliances.

From most of the battery types, the 12 volt battery is unique in its working. It can be huge or tiny, bulky or light.

The sizes of battery are purely on the basis of power which they are design to deliver. It can be big, such as which we uses in our personal cars. They also be tinny which were presenting electrical children' toys.

A car battery is rechargeable which can provide power to the engine as well.

In those cases a 12 volt portable battery is very handy replacement of already present 12 volt battery.

The acid battery is mostly used. It is a dc battery with lead terminals courted with acid, mostly used in batteries. To make this type of battery we used plates, and lead oxide (some other ingredients used to change density, rockiness, shininess, etc with a 39% acid named as sulfuric and 57% liquid. This fluid is known as electrolyte, which causes a chemical reaction produce in agitation in electrons. When you take test of a battery actually you measure the amount of sulfuric acid left in it. If fluid is lower than your expected level, means the reaction between electrons is not proper. [11]

Figure 6.2 12V Car Battery

6.4 TYPES OF LEAD ACID BATTERY

There are two most common types of acid led batteries one is known as Starting, and the other one is Deep Cycle.

6.4.1 STARTING

This type of battery is particularly used for start the engine which requires more power, to start an engine. Once the engine is in working order, then the batteries are charged by themselves.

These Starting batteries are lighter in weight than deep cycle batteries because the cell plates in these batteries does not exceeded so much that can reach any way near to the bottom of the battery case.

6.4.2 DEEP CYCLE

These types of batteries are used to deliver power for long hours or you can say work on continuously. The surprising thing about them is they are also used for storing energy from small wind energy system. They have heavier plates for a large capacity and works on greater number of charge/discharge cycles. The specific energy is between 28-39watt-hours per kilogram.

Deep-cycle cells less exposed to degradation due to its unique cycling thing, High bird vehicles and UPS. These heavier plates that give less peak current, but can deliver occasional discharging.

6.5 BATTERY CONSTRUCTION

Car battery contains dilute sulfuric acid electrolyte and negative and positive electrodes, present in plate forms. While the plates are made of lead this type of battery known as led acid battery. Battery is divided into several cells and in every cell there are some battery elements present.

Every 12 volt acid battery has hydrochloric which is used for electrolyte in these types of batteries. Battery casing is made up of plastic, rubber or some other rock element in order to avoid the acid housed inside.

Metals used for anode and cathodes for the led acid Battery. 12 volt lead acid battery is used in truck, car, tanks, ups and in. such type of batteries used to made battery banks and systems which provide backup at power sensitive systems.

The figure is 12v dc battery but this is not used for mobile battery or any other device which is rechargeable. [12]

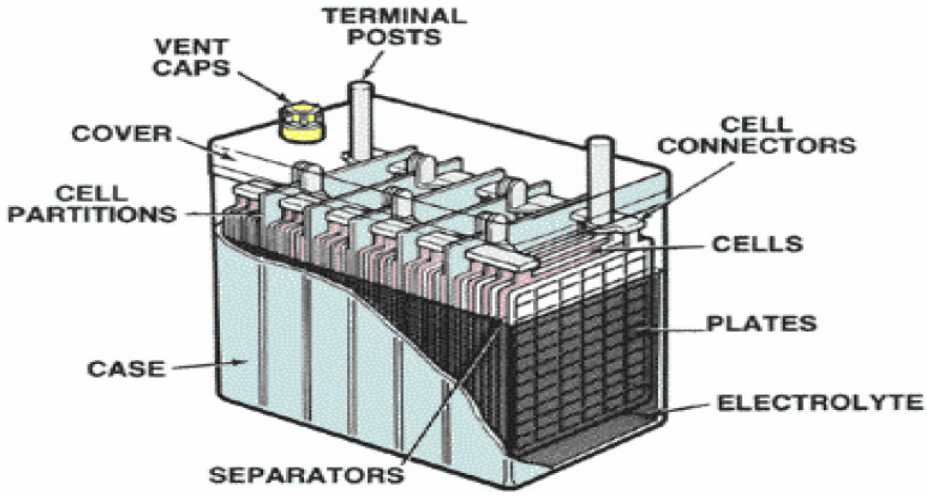

Figure 6.3 Lead Acid Battery

6.5.1 CELL OPERATION

Two different metals placed bath capable of producing electrical potential to the left right poles. Cell generates voltage due to a chemical reaction. The positive plate is

Reddish-brown material which is also used in Lead Dioxide while the negative plate is made up of grayish material known Sponge Lead. Acid bath is a mixture of water cell and sulfuric acid. And if they both are together than they made cell element formed.

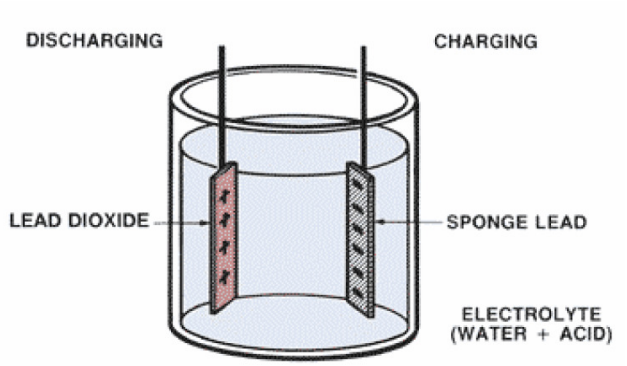

Figure 6.4 Lead-Acid Cells

6.6CAPACITY OF BATTERY STORAGE

Amp-hour Capacity is such type of a battery which works to measure the amount of usable energy nominal voltage. So according to this principle greater the physical volume of a battery, the greater its total storage capability. Storage capacity can be enhanced when batteries are joined in parallel but not if they are connected in series.

When two 5V, 100Ah batteries are joined in Series, the voltage is doubled but the amp-hour capacity remains 100Ah (Total Power = 1000 Watt-hours).

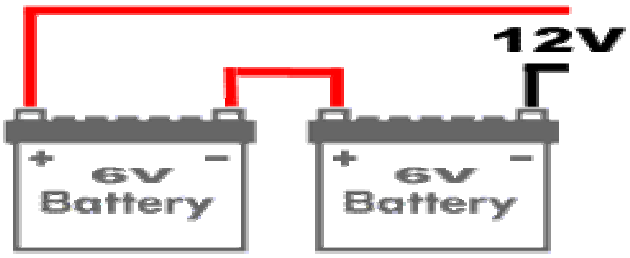

Figure 6.5 Two 6V, 100Ah Batteries

You may find easy to joined batteries in series in single 12V battery pattern simply too heavy to lift into one place. Batteries Equipped with lesser cells give us the same storage capacity at the same time they are mobile. It is not compulsory to watch solar power installations made of battery bank consists of an only sea of 2V batteries have been joined in series.

6.7Charging State of the Batteries

All those batteries which are charged hire are under the high voltage category. For long life, batteries should stay in the green zone. Not often dips into the yellow are not harmful, but continual discharges it will fall in to harmful category. [13]

Table 6.2 State of Charge

State of Charge	12 Volt battery	Volts per Cell
100%	12.7	2.12
90%	12.5	2.08
80%	12.42	2.07
70%	12.32	2.05
60%	12.20	2.03
50%	12.06	2.01
40%	11.9	1.98
30%	11.75	1.96
20%	11.58	1.93

10%	11.31	1.89
0	10.5	1.75

6.8 Practical Applications

Wet cell batteries manufactured in a way for deep discharge used in large supplies for telephone and centers in which computers are, and storage of energy in grid, electric power supply providershttp://en.wikipedia.org/wiki/Lead%E2%80%93acid_battery - cite_note-4. Lead-acid batteries also used for power.

Traction batteries used as golf and other system which are operated by the battery high bird vehicles. Motor vehicle starting, lighting and provide ignition current for starting engines.

Valve-regulated batteries can't provide their electrolyte. They are used in back-up power supplies, marine, and motorcycles too.

Lead-acid batteries also provide filament voltage in old vacuum tubes.

6.9 DISADVANTAGES OF 12V BATTERY

- One major Disadvantage 12volt lead it gives smallest energy to weight ratio. This means low volume ratio, which means that the size of the battery has to be big to incase of provide sufficient power.
- Fewer cells due to unsuccessful separation between two different polarity plates.
- Internal connection broken because of quarrel.
- Plants are broken by the vibration.

- Fewer electrolytes.
- Terminals which are broken.

6.10USES of 12volt battery

Mostly battery installed in transportation applications, such as in boats and cars. In these cases, battery recharged only due to current to start the vehicle. And then alternator takes control of all the electrical system, if it is functioning. The alternator provides current to led acid cells.

12v led acid provide many uses in our daily life too. From consumer electronics to robotics world, fro products used for health care to industries, almost every second device we use has equipped with battery. Batteries now days important part of our lives.

6.11INVERTER

Inverter is such electronic component which converts direct current to alternating current; the AC which is converted required voltage and frequency with the use of proper transformers, switching, and controlling systems. [14]

Figure 6.6 Two 6V, inverter

6.12APPLICATIONS

6.12.1 DC POWER SOURCE UTILIZATION

Inverter made to work in a way so it can provide 118 VAC from the 12 VDC provided in cars. The unit shown provides up to 1.2 ampere power.

An inverter is such device which changes the DC electricity from sources such as batteries, solar panels, or fuel cells to alternating power. The electricity at any required voltage; in such system operate equipment which work on ac designed for mains operation, or rectified to produce direct current at any given voltage level.

Micro-inverters change DC from single solar panels into AC for main Electric Grid.

6.12.2 UNINTERRUPTIBLE POWER SUPPLIES

UPS takes power of batteries and gives supply to inverter AC power when main power isn't available. When power is come back, bridge rectifier is used to supply DC power to batteries.

6.12.3 INDUCTION HEATING

Convert low frequency main AC power and make it to higher frequency for preventing from heating.

6.12.4VARIABLE-FREQUENCY DRIVES

A variable-frequency drive acts in such a way that the operating erumpent of an AC motor by worked in such manner the voltage and frequency of power supplied to the motor.

6.13 Wave forms of Inverters:

The property of the sine wave invertors can be seen in figure bellow mentioned with the necessary details

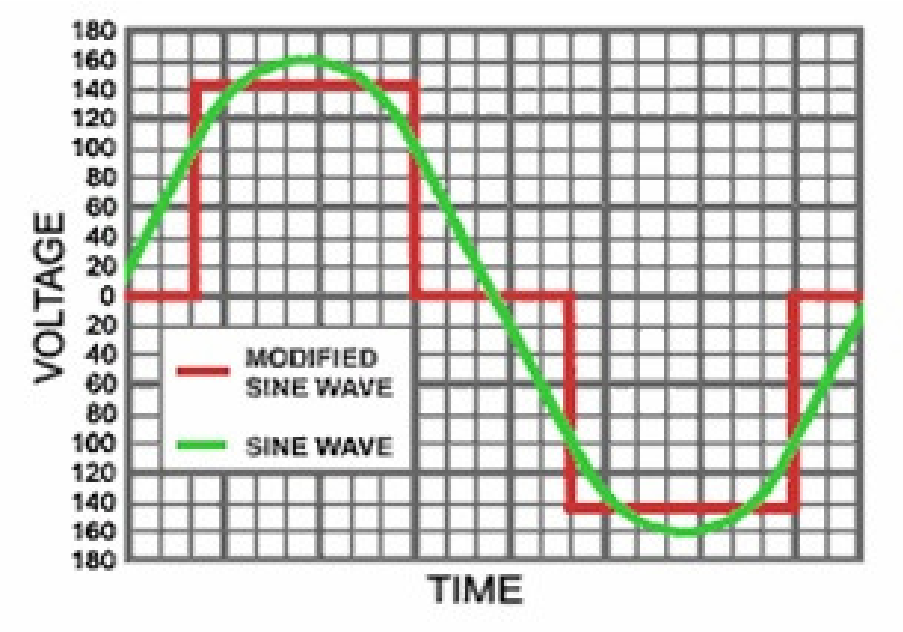

Figure 6.6 True Sine Wave Inverter

6.14 POWER RATINGS OF INVERTER

Power of invertors depend according to the need of user there is lot of variety which ranges from 100 watt to 100kilowatts.every inverter is unique in its sense because they

have different capacity rating altogether. The continuous rating of the invertors varies with the current drawn by the dc motor.

6.15 Uses and Advantages of Invertors

- DC power source utilization applications include use of DC in motor vehicles and from batteries to power AC loads and use of energy from solar cells to power AC loads.
- Use of inverters in uninterruptable power supplies (UPS) allows energy to be stored as DC in batteries and used as AC when needed.
- In industrial equipment such as AC motor speed controls and induction heating equipment once the alternating current is converted then is converted back to Dc for different instance of the frequency.
- Inverters are used in some battery powered electric vehicles and in hybrid vehicles to change DC to adjustable frequency AC to control AC motor speed.

7 CONCLUSIONS

As we already know that every country in this world is facing a major issue of power. Unfortunately our country is at the top of the list. We have an economy collapse due to this issue. If we intend to work on the first idea that comes in mind is to produce electricity using alternate recourses. Great researches have made plenty of research to overcome this problem and safeguard our future. Everyone is starting to utilize his skills to get the projects that require fewer resources, Environment friendly and acceptable work on Alternate Power Energy.

Following the work of the researchers and developers It is expected by great analyst that in near future more than 75% energy will be used which will be made by renewable energy techniques in fact it will replace the old methods of power generation old start thinking about the alternate methods in order to save the planet and entire life on this planet.

We have also followed them and made a research in making a project to cover up the major issues like Electricity and Security. We have face lots of problem while making this project. Working out into difficulties we have had the help of our teacher about the related issues.

If we continue the produce energy using coal, oil & gas, then by the year 3000 the temperature of this planet may increased by fifteen degrees Celsius and will cause some major life threatening diseases to human beings e.g. skin cancer, eye redness.

8 FUTURE RECOMMENDATIONS

Since the basic principle of power generation remains same therefore, we recommend the forthcoming engineers not to start their work from the beginning, by performing following changes they can achieve better results.

- This system is design for a track in which one car will pass at a time. If we use more than one ramp in system we can drive more alternators hence producing more energy.
- By using more effective alternator and inverter we can get less Power Losses.
- The same task can also be achieved by using Hydraulics or Pneumatic systems but it need more precision
- Redesigning a gear box with nylon material .they is bit expensive but the result at the output much better than our own designed gear box.
- Instead of using spring to get the ramp back to its position we can use hydraulics or the shocks to make it more friendly y and durable.
- This project also provides a way or a breakthrough towards making of electricity through that walking.

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