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Design And Fabrication Of An Electronic Bike: A Sustainable And Efficient Transportation Solution

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ABSTRACT

With the increasing concern for environmental sustainability and the need for efficient transportation alternatives, the design and fabrication of electronic bikes (e-bikes) has gained significant attention. This paper presents a comprehensive study on the design and fabrication process of an e-bike, focusing on key aspects such as the selection of components, system integration, power management, and overall performance optimization. By combining advanced electronics, battery technology, and lightweight materials, the fabricated e-bike provides a sustainable and practical solution for urban commuting. Experimental results demonstrate the feasibility and efficiency of the proposed design, highlighting its potential for widespread adoption and positive impact on the environment.

Keywords: Electronic bike, e-bike, design, fabrication, sustainable transportation, efficiency, power management.

I. INTRODUCTION

Energy crisis is one of the major concerns in today's world due to fast depleting resources of petrol, diesel and natural gas. The issue of the pollution because of vehicles in metro towns & urban zones is swelling uninterruptedly and the growth in consumption of oil and natural gas has been highly increasing for every decade. This trend is likely to continue and will lead to complete depletion of natural resources in next coming years. So, combining both issues, environmental progress supporting and economical affordable alternative would be the best solution. Ecological and increasingly economic aspects contribute to the increase of interest in alternative (unconventional) methods of powering vehicles. One of the interesting solutions is the use of electric driven motorcycles. The main advantages of using an electric bike include emission-free, ease of parking, relatively low purchase cost, lower travel costs than in the case of combustion vehicles.

Our solution to the above problem is the E-bike as it is environmentally friendly and cuts back expenses. An electric bike is a type of electric vehicle based on a traditional motorcycle to which an electric motor in place of I engine has been added to help propel it. Electric vehicles gave a breakthrough solution to satisfy the needs required thereby it started to flourish, by overcoming the hindrance. One of the most appealing features of electric motorcycles is that it has no harmful emissions with zero chances of Earth pollution. One of the interesting solutions is the use of electric driven motorcycles. The main advantages of using an electric bike include emission-free work, speed of travel, relatively low purchase cost, lower travel costs than in the case of combustion vehicles. An additional argument in favour of the electric bike is the reduction of noise emissions. It works on the principle that the electromotive force of an D.C. motor which receives electrical energy stored in D.C. battery. The E-bike will be running on battery, the power is supplied by the motor, thereby supplying this power to drive the other gear components. It is possible to convert a classic motorcycle to an electric bicycle, thus reducing construction costs. A bike with a suitable construction is required, i.e., allowing the assembly of the motor, battery, controller and additional equipment. The main purpose of using this E-bike is that it is user friendly, economical and relatively cheap. The efficiency of this system undeniable compared to conventional modes of transport.

II. METHODOLOGY

The invention of electric vehicles was dependent on two technical advances in the 1800s: the battery and the electric motor. The term 'battery' was coined by Benjamin Franklin, to describe an array of interconnected, charged glass plates. The term was adopted to cover electricity generated through a chemical reaction (what we now think of as a battery): it was chemists who first developed a practical method of electrical generation. Various types of batteries were developed in the early 1800s, and were usually messy affairs: open containers of acid with metals suspended in them to create stable chemical reactions and generate electricity. The rechargeable lead-acid battery, as used in just about every car and motorcycle until the 2000s, was invented in 1859 by Gustave Plante, while the first 'dry cell' batteries, as we use in portable electric tools, flashlights, and now vehicles, were invented in 1886 by Carl Gassner. Of course, invention and application are very different things, and it took yet more time to develop practical batteries of all types, and commercialize them. A battery small enough and strong enough to power a vehicle was not developed until the 1880s.

Pollution survey:

Bikes, cars, trucks, and buses powered by fossil fuels are major contributors to air pollution. In fact, transportation emits more than half of nitrogen oxides in our air, and is a major source of global warming emissions. Poor air quality affects both physical and mental state of a person, the survey found. Majority of the respondents (87 percent) revealed they were personally affected by rising pollution levels. Sixty four percent of the people reported irritation in their eyes, nose and throat as the most visible impact of air pollution, more so among Delhi residents compared to other states. Breathlessness (57 percent) and skin allergies (52 percent) are some of the other issues faced by people. The health impacts are immense but unevenly distributed, both geographically and among various segments of the transportation sector, such as light-duty and heavy-duty vehicles, shipping, and off-road machinery.

In India, the number of vehicles increased from 0.3 million in 1951 to 58.3 million in 2001-02. About half the vehicles are concentrated in 39 metropolitan cities (cities with population of over one million). The two wheelers are the major contributors of vehicular air pollution followed by four-wheeler (e.g., car, jeep, taxi etc.), trucks and buses in decreasing order of magnitude.

Conservation of fuel resources:

We all know that our bikes and cars run on petrol and diesel, types of non-renewable fuel. And you also know that all governments around the world are making a big push for electric bikes and cars in an attempt to save precious fossil fuel. Natural resources are very important for us. That is why it is necessary to take care of our natural wealth and use it judiciously. Ways and efforts for conservation mean protection. To live comfortably in the coming year, conservation of natural resources is extremely essential. We must preserve the greatest treasure of the earth, nature. The conservation of fuel through more energy-efficient technologies and practices may help extend the current reserves of petroleum, coal and gas for a few more years. Unless world economies begin to rely more on renewable resources, though, the supply will surely run out. However, there is a more important reason to conserve fossil fuels, and that's to help heal the environment.

Environmental Impact of Electrical Vehicles:

Due to efficiency of electric engines as compared to combustion engines, even when the electricity used to charge electric vehicles comes from a CO2-emitting source, such as a coal- or gas fired power plant, the net CO2 production from an electric bike is typically one-half to one- third of that from a comparable combustion vehicle. Electric bikes release almost no air pollutants at the place where they are operated. In Addition, it is generally easier to build pollution-control systems into centralized power stations. Electric bikes typically have less noise pollution than an internal combustion engine vehicle, whether it is at rest or in motion. Electric bikes emit no exhaust pipe CO2 or pollutants such as NOx , NMHC, CO and PM at the point of use. Electric motors don't require oxygen, unlike internal combustion engines; this is useful for submarines.

III. MODELING AND ANALYSIS

Design and Analysis:

The process involves preparation of a CAD model of existing component with help of 3D modelling software like CATIA V5, Pro-E. Analysis is done on this model with the help of analysis software like ANSYS which helps in determining the maximum stress, and displacement values of existing model. Further the analysis is done with alternate materials to verify the best material. We made the schematic sketch from the requirements and continued into CAD designs like Catia V5 and proceeded for analysis with ANSYS 19.1 chosen for stress and deformation test, factor of safety. Aiming for work with elegance by the inclusion of team work, plan, strategy.

Components of Electronic Bike:

1. **Dc motor:**

A brushless DC motor (also known as a BLDC motor or BL motor) is an electronically commuted DC motor which does not have brushes. The controller provides pulses of current to the motor windings which control the speed and torque of the synchronous motor. These types of motors are highly efficient in producing a large amount of torque over a vast speed range. In brushless motors, permanent magnets rotate around a fixed armature and overcome the problem of connecting current to the armature. Commutation with electronics has a large scope of capabilities and flexibility. They are known for smooth operation and holding torque when stationary.

Fig:1 Brushless Dc Motor

Calculations:

Angular velocity =2πN/60

ω = 2×3.14×3500/60 366.33 rad/sec Power = T×ω P = 2.7×366.33= 989.091W

Sprocket:

T2 = 42 teeth, T1 = 15 teeth Gear Ratio = T2/T1 = 42/15 = 3:1

Wheel Radius = 8.5inch= 0.2159 m

F = T/r = 2.7×3/0.2159=12.50N

T1/T2 =1/3 , ω1/ ω2 = 1/3

ω2 = 3× ω1 = 3×366.33= 1099rad/sec Velocity = r×ω = 0.2159*1099

= 237.27m/s

= 237.27× 5/18=65.90 km/hr

Acceleration:

F = m×a

Where F = net force on the vehicle (N) m = mass of the vehicle (Kg)

a = acceleration of the vehicle (m/s^2) Time taken to attain the top speed:

T = (V2-V1)/a

Where V2 = final velocity of the vehicle (m/s)

V1 = initial velocity of the vehicle (m/s) mass of bike = 80 kg

a = F/m =12.50/80= 0.150 m/s^2 Time taken to reach the speed of

56.16 km/hr or 202 m/s

t = (V2-V1/a) = (237.27– 0)/0.150

= 1581.8 sec

2. Battery:

A Battery is a device that stores chemical energy and converts it to electrical energy. A battery consists of two or more electric cells joined together. The cells convert chemical energy to electrical energy. The cells consist of positive and negative electrodes joined by an electrolyte. It is the chemical reaction between the electrodes and the electrolyte which generates DC electricity. In the case of secondary or rechargeable batteries, the chemical reaction can be reversed by reversing the current and the battery returned to a charged state.

Different types of batteries

- The Nickel Cadmium (NiCad) battery.
- The Nickel-Metal Hydride (NiMH) battery.
- The Lead Acid battery.
- The Lithium Ion battery

Memory effect in Ni-Cd batteries refers to a decrease in energy capacity after the battery has been discharged shallowly. The battery remembers the smaller capacity and thereafter can no longer charge fully. Lithium-ion batteries do not have this memory effect, so this battery has been used as it can always be recharged even before its stored energy has been depleted.

Fig:2 Lithium-ion Battery

Battery Discharge:

P=V*I

P=power of motor

V=voltage

I=discharge current 1500=48*I

I=30Amph

Our battery amperes =40 amph

Discharge time=40/3

3. Frame Material:

The selection of the material in design depends on various factors such as load, function, climatic condition, lifetime, and overall expenditure. Taking the above factors into consideration, material selection was done in order to design an efficient and economical type of frame. Steel Alloys, Aluminum and its alloys, Titanium, Carbon Fiber were preferred type of materials during selection. Comparatively, AISI 4130 Alloy Steel [2] was used in the present study as it is easily available, cost effective, and has improved mechanical properties.

Fig:3 Double Cradle Frame

4. Chassis:

Chassis is the foundation of a vehicle which is even termed as a skeleton for a vehicle that supports an artificial objective in its construction and protection for integrated parts in the vehicle. All the components of a motorcycle, like the suspension, wheels, fuel tank, seats, handlebars etc., are attached to this base structure which lends a motorcycle its strength and ability to handle well. Chassis frame forms the backbone of a heavy vehicle, its principle function is to safely carry the maximum load for all designed operating conditions. Our chassis is a double cradle type, which is highly stress compatible and ergonomically fit for all sizes of riders with various styles of riding. The chassis is assembled with multiple neck joints attached at the steering tube and some cross members, metallic plates to joint support single seat and mounted joints to integrate motors and innovations, metal mounts to support rear suspension. The motor is held by the frame which kind of encircles the motor while connecting the steering head to the swing arm in the convenient way. The wheelbase and tyre selection should be decided when finalizing the overall package of the vehicle. If the wheelbase is too short, the stability of the vehicle would be bad during bump loads, high speeds, braking or acceleration. The air flow from the front of the bike should be diverted such that there is adequate cooling for batteries and motor. The frame should be designed such that battery can be easily removable in case of replacement. In case of impact, there should be no deformation near battery because potentially, physically damage may occur.

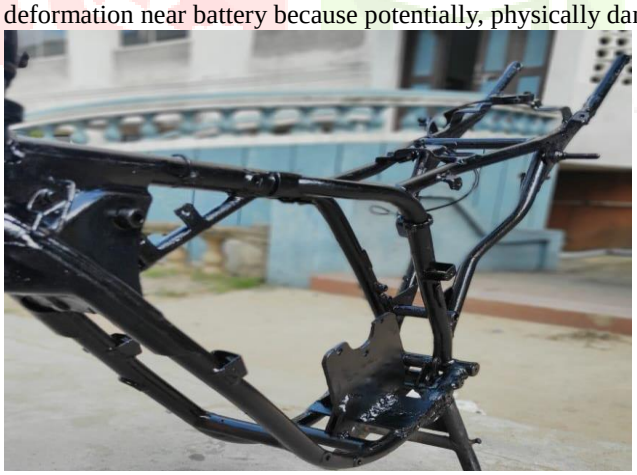

Fig:4 Electronic Bike Chassis

5. Steering:

Steering is the foremost and the most sensitivity wing of the vehicle of any class as this decides the direction of travel of vehicle and stability of both the rider and ride.

1. Motorcycle Rake angle :- An angle at which the headstock of the motorcycle is inclined when compared against a vertical line drawn perpendicular to the ground. It is also known as steering rake angle. It should vary between 17 degree to 25 degree

2. Motorcycle Trail :- The horizontal distance on the ground between a straight line drawn through the center of the front wheel spindle and a line drawn through the center of the headstock axis. It is also known as caster.

3. Motorcycle Offset :- The distance between a line drawn through the center of the steering stem/ headstock axis and the center line of the front fork tubes. It should be in between 55mm to 75mm. Trail increases as head angle decreases, as fork offset increases, or as wheel diameter decreases. The larger the trail when rake angle increases.

4. Fork Angle: - The angle of the fork is not necessarily the rake angle. Be aware of this. Some manufacturers and certain aftermarket forks offer an extra rake angle worked right into them. This is accomplished with the triple trees or the headstock bearings. This could be to your advantage as a simple way to modify and change the rake angle and trail if wants without changing the rake of the actual frame.

5. Fork Length: - Another way to change the angle of rake without modifying the frame is to change the fork length. Forks come in various lengths and are offered by many aftermarket manufactures. By lengthening the front end, you change the geometry and raise the height a little. This will have a direct effect on your rake angle and trail. In most cases, it will increase your trail length.

6. Suspension:

A suspension system is such a system that absorbs the bumps and suspense for giving the comfort of riders by absorbing the vibrations. The suspension system one of the most important components in the automobile, it is responsible for dissipating the kinetic energy and controlling the shock. A system in which the elements like tyres, air, springs, various linkages work collectively for helping in holding the road and braking so that safety can be increased and a better driving can be obtained and helps the motorcycle to roll smoothly at different roads.

- **Front Suspension**: Telescopic suspension is used in our front suspension. Telescopic fork is the part of the suspension system which is the damping device. Triple tree holds the telescopic for and used for the offset purpose. Motorcycles today use mainly use telescopic forks for the front suspension. The fork consists of large hydraulic shock absorbers with internal coil springs allows the front wheel suspense up and down giving a comfortable ride. The bottom of the forks is connected to the front axle around which the front wheel spins. In telescopic fork, the upper portion part known as the fork tubes must be made smooth in order to seal the fork oil inside the fork, slide inside the fork bodies, which are the lower part of the forks. They allow the front wheel suspense up and down giving a comfortable ride. The bottom of the forks are connected to the front axle around which the front wheel spins.

Calculations:

PARAMETERS:

Total weight =150 kg; Rake angle = 27˚; Fork length = 67cm;

Shock ride height = 28cm; Sprung weight = 20; Motion Ratio =0.960;

Un sprung weight =150 kg; Front damping Rate =7.87 kg/cm;

1. LOAD TRANSFER ON FRONT SUSPENSION

Weight of bike=80 kg

Weight with drive=80+70=150kg

Assuming dynamic loads = Rear suspension + front suspension For front considering dynamic load

2. load on Damper:150x9.06xcos (90-rake angle) =492.5N 615.6N; Load on front damper =61.56;

Compression=61.5/7.87=7.81 kg/cm

Fig:5 Telescopic suspension

Rear Suspension:

Dual suspension is used on rear of the vehicle to have a flawless comfort to rider while riding and to get resist to the maximum bumps faced by the vehicle and the rider. An H-shaped swingarm is pivoted at the front to the motorbike frame. On either side there are basic coil spring units which provide the suspension. The shocks are inside the coil spring units. There are two types of rear suspension which are Dual or twin-shock regular swing arm and Mono shock regular swing arm.

Calculations:

1. Load transfer on rear suspension

For rear, assuming 65% of total weigh t = 52kg

So, considering the dynamic loads on rear= W = 52+150-70 = 122.75N

2. SPRING CALCULATION

Mean diameter of coil (D) =45mm Diameter of the wire (d) = 6mm Total no of coils (n) =16

Height (h) = 380mm

Outer diameter of spring coil Do = D + d =45+6=51mm

Active no of turn = 15

C= spring index = D/d =7.5mm Solid length Ls=n×d=16*6=96 (For Steel Wire G=81370N/mm2)

Stiffness, K = Gd4/8nD3

= (81370*64)/ (8*16*453)) K = 9.037 N/mm

Shear stress, Ƭ = (8 Ks D F) / (π d3); Ƭ = (8*9.037*45*150)/ (3.14*63)

Specifications of Rear Suspension

Sprungweight	60 kg
Unsprung weight	235kg
Spring index	7.5
Stiffness	9.037N/mm
Motion ratio	0.960
Front damping rate	7.87kg\cm (taken in cm instead of inches)
Swing arm angle	20

Fig:6. Dual shock absorbers

7. Brakes:

Brake is a device by means of which artificial frictional resistance is applied to a moving machine member, in order to retard or stop the motion of a machine. The braking system is one of the important systems in vehicle safety. The purpose of the brake system is to prevent or reduce the severe injury during accidents. The function of the brake system is to slow or stop the moving vehicle**.**

- **Disc braking system (Front Braking):**

  In a disc brake system, a set of pads is pressed against a rotating disc and due to friction, heat is generated at the disc-pad interface. This heat ultimately transfers to the vehicle and environment and the disc cools down. Disc brakes have similar function like drum brakes but in different manner, in this instead of a drum we have a rotating thin disc, this disc is grabbed by two pads causing the braking action. In a disc brake, the brake pads squeeze the rotor instead of the wheel, and the force is transmitted hydraulically instead of through a cable. Friction between the pads and disc slows the disc down. It is an important component in the braking system. The caliper clamps on to them to slow their rotation, and then slow or stop the bike. The pad which is nearer to the center of the vehicle is called the inboard pad while the one that is away is called the outboard pad.

Fig:7. Disc brake

- **Drum braking system (Rear Braking) :**

  A **drum brake** is a brake that uses friction caused by a set of shoes or pads that press outward against a rotating cylinder-shaped part called a brake drum. The basic procedure explanation of a brake drum is actually simple. Drum brakes has a drum which rotates with the wheel, and have stationary pads which when engaged touches the rotating drum and causes braking action. This type of a brake initiates with friction which actually caused by a set of shoes or pads that constrain against a spinning surface. Drum brakes actually operates as same as a disc brake. Nonetheless, in the brake drum case, the shoes are designed to operate with a self-energizing action. This type of brake normally placed in the rear wheel of a vehicle. Having the best to incorporate an emergency brake mechanism, brake drum also is less expensive to manufacture by comparing it with a disc brake.

Fig:8. Drum brake

8. Alloy Wheels:

The rim is the "outer edge of a wheel, holding the tyre. In cross-section, the rim is deep in the center and shallow at the outer edges, thus forming a "U" shape that supports for the bead of the tire casing. Traditionally motorcycles used wire-spoked wheels with inner tubes and pneumatic tyres. Although cast wheels were first used on a motorcycle in 1927, it would not be until the 1970s that mainstream manufacturers would start to introduce cast wheels on their roadgoing motorcycles. Alloy wheels are automobile wheels which are made from an alloy of aluminum or magnesium metals (or sometimes a mixture of both). Alloy wheels differ from normal steel wheels because of their lighter weight, which improves the speed of the vehicle, however some alloy wheels are heavier than the equivalent size steel wheel.

The advantages of the cast wheels versus spoked are several, and include the use of tubeless tires for higher speed and better retention of inflation; better runout tolerance and the elimination of spoke maintenance; better rigidity and thus better handling; weight reduction due to smaller hub size; and better handling of side loads for motorcycles.

Fig:9. Alloy Wheels

9. Transmission:

Transmission means transfer. So the work of transmission system is to transmit power from Engine or Motor to the wheels of an automobile through various mechanisms. There are different types of transmission systems. A Transmission is a mechanism in a power transmission system, which provides controlled application of the power. Often the term transmission refers to provide speed & Torque conversations from a rotating power source to another device. The most common use is in motor vehicles, where the transmission adapts the output of the internal combustion engine to the drive wheels. Such engines need to operate at a relatively high rotational speed, which is inappropriate for starting, stopping, and slower travel. The transmission reduces the higher engine speed to the slower wheel speed, increasing torque in the process. Transmissions are also used on pedal bicycles, fixed machines, and where different rotational speeds and torques are adapted. Power is transmitted from BLDC motor shaft sprocket to rear wheel sprocket via chain drive. There are two sprockets, one sprocket which is attached to BLDC motor shaft and other is attached to rear wheel of e-bike.

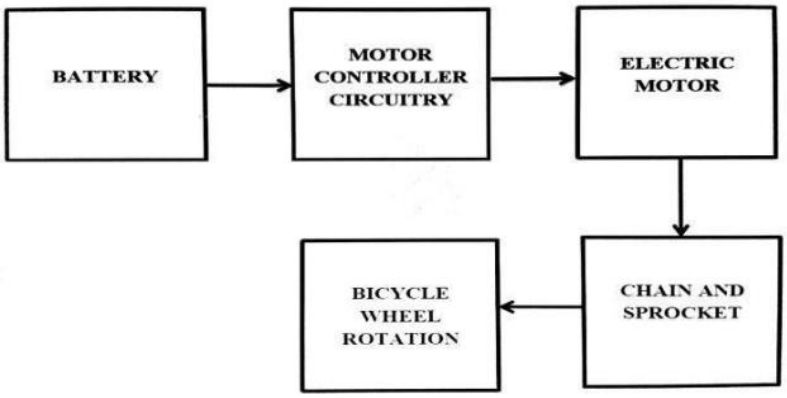

Fig:10. Block diagram of Transmission Process of Electronic Bike

10. Chain Drive:

A Chain is an array of links held together with each other with the help of steel pins. This type of arrangement makes a chain more enduring, long lasting and better way of transmitting rotary motion from one gear to another. The major advantage of chain drive over traditional gear is that, the chain drive can transmit rotary motion with the help of two gears and a chain over a distance whereas in traditional many gears must be arranged in a mesh in order to transmit motion

11. Sprockets:

The chain with engaging with the sprocket converts rotational power in to rotary power and vice versa. The sprocket which looks like a gear may differ in three aspects:

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

12. BMS and Chargers:

To protect and charge your pack. Lithium batteries are light and durable but they must be used within their specified limits. In order to ensure a long life, battery packs should contain a BMS, aka: Battery Monitoring System. It stands between the actual battery and the power wires, monitors all the voltages of cells within and also typically watches how many Amps are flowing. If any limits are reached the BMS should intervene by cutting off the power safely. In a perfect world, the BMS will sit there and do nothing but if you do ride until you use up all the energy available, it will shut you down and prevent any damage to the battery cells. Similar situation with the charger, the BMS will allow the charger to do it as long as all the cells are in harmony and within their limits, a quality charger is very important and often completely over looked, I have witnessed.

Fig:11. Charger of Electronic Bike

13. Controller:

A motor controller is a device or group of devices that serves to govern in some predetermined manner the performance of an electric motor. A motor controller might include a manual or automatic means for starting and stopping the motor, selecting forward or reverse rotation, selecting and regulating the speed, regulating or limiting the torque, and protecting against overloads and electrical faults.

In this electric motorbike system, some components are installed such as brushless dc motor; controller and battery are required to the controller for controlling the different component of electric motorbike system. There are different functions of this controller such as under voltage protection, over current protection, control power supply, also to drive and control the Brushless dc motor. There is different signal was transmitted to controller to drive and control brushless dc motor, such as current detection signal, motor speed control signal, capacity detection system

Specifications of Controller

Fig:12. Controller of Electronic Bike

Rated Current(A)	48
Rated Power(W)	28
Throttle potential(V)	1000
Rated voltage(V)	5
Current limiting Protection(A)	40 – 42
Ambient Temperature(ºC)	-20℃ to 45 ℃
Dimensions in mm (LxWxH)	175x83x44
Weight(gm)	555

14. DC to DC Converter:

A DC-to-DC converter is an electronic circuit or electromechanical device that converts a source of direct current (DC) from one voltage level to another. It is a type of electric power converter. Power levels range from very low (small batteries) to very high (high-voltage power transmission). The output of lithium-ion battery pack is 48V, it has to be converted in to 12V for functioning of accessories like headlights, horn, tail lights so dc –dc converter as shown in are used. An ever-increasing amount of electric equipment is being used on vehicles. Because most low- voltage equipment, such as headlight, taillights, speedometer and odometer. etc., is designed for 12 Volts, DC/DC converters which deliver a stable 12 Volt supply from a -48 Volt system. These products are also distinguished by high efficiency, together with absolute safety. An inferior supply can cause irreparable damage to your 12 Volt system, but the use of an OPL voltage converter prevents such problems.

OPL DC/DC Converter Features:

· Fully Isolated converters
· Galvanic isolation
· Convection cooling (No Fan Required)
· Input voltage: 48 V (30 – 60 V)
· Output voltage: 12V

Fig:13. DC-DC converter

IV. RESULTS AND DISCUSSION

Result of this Thesis:

The main theme of this project has been to make people aware of this technology, and make it popular among the general mass, so that it helps improving this world by reducing the environmental complications. There has always been this willingness in human race to improve the ongoing technology that is prevailing at a particular time, by bringing a more sophisticated and advanced product than that is what presently available today. There are many other benefits which can be achieved by its popularity. The fossil fuel consumption will be reduced that will bring significant change in the environment pollutions, similarly many diseases which are the direct result of pollution will be reduced. The sudden climatic changes, unexpected behavior of nature, natural disasters will also decrease accordingly. It will help reducing the waste of many non-recyclable resources. The most important benefit that will be rewarded is our health. This act what actually leads into bringing new developments, progress in every aspect of life for better livelihood all around? That is why by the improvements and growth in science and technology in recent decades, we can see similar progress in the field of transportations also as if offers a sustainable transportation. As we know development is a continuous process and until it reaches into a state of complete perfection, there is always room for its improvements, and our study is just to support this idea.

We have tried to analyse the properties of e-bikes, especially the role of controller, motor, along with batteries, so that it may help to improvise this technology where it may be necessary. Public participation is important because that is where the power of change actually resides. We have done analytical study on e-bike, where we tried to analyse the electro mechanical characteristics involved with this system. In the study the major role occupied by the controller, we also make an effort to discover as how can battery efficiency be enhanced. By this study, we get to know that in e-bike fabrication, it is enhanced by effective power management on the motor system, where it is done by precisely regulating the needing power in an appropriate manner. In order to perceive the properties associated with e-bikes, various tests have been accomplished both inside and outside environments. We have noticed some variations in its functions in two different environments just because of the strong influencing factors come into play, such as uneven surfaces, friction on roads, tires condition and distance of traveling, and wind power.

Therefore, in order to get the accurate measurement result, laboratory testing has been given the preference, so that it corresponds with reality better so that our predictions can come true in almost all circumstances. We could not possibly do elaborate survey, therefore the result which we have collected in survey may contain truth but not extensive enough to give the exact information.

Fig:14. Final Presentation of Electronic Bike

Specifications of Electronic Bike Designed

Voltage (v)	Capacity (ah)	Energy (watt hours)	Range (mi)
48v	40ah	1920watt hours	93.2mi (150km)

Technical specification sheet:

Wheel Base	1320mm
Length	2000mm
Width	755 mm
Height	1120mm
Ground Clearance	150mm
Rake Angle	27°
Head Tube Angle	19°
Transmission	Chain drive
Kerb weight	80kg
Targeted Speed	60 kmph
Suspension	Front-telescopic Back-dual
Brakes	Front-Disc Back-Drum
Motor	1.5KW
Battery	48V, 40Amps
Ride Height	920mm
Swing Arm	Central dual mount
Tyres	Front 17" (90/100) Back 17" (100/90)
CG Point	0.41 m
Trail	5.3 cm
Turning Radius	745 mm

Future Possibilities

This thesis is in a way defining e-bikes, trying to analyse the basic functions of various mechanisms which are available only in such e-bikes. Besides the aim is to highlight its importance in general, to promote the possibility for global Welfare, where Clean Climate plays a role. Having this basic purpose in place, it is also be said that this subject contains simple to advanced features containing all three departments, therefore very useful Thesis for Bachelor level students, just because in e-bikes all three variations of engineering is associated. Such as electronics in controller, mechanical in motor, and electrical in batteries. The study of e-bikes can be done extensively, and it has been left for those interested researchers for exploring in depth of its possibilities in defining it.so here are some future possibilities which are called as innovations.

1. **E-Bike Lock:** If you are thinking this is nothing new, you could not be more wrong. The future of smart bikes has seen an improvement in the standard bike lock, from chains which were heavy and clumsy to locks of varying futuristic designs which are operated through wireless features; this is plus for ease and efficiency.

2. **Anti-Theft Features**: The anti-theft feature has put a stop to majority of bike thefts in recent years. The beauty of this feature is its versatility and diversity. Ranging from sirens and alarms to theft indicator maps, you are assured of security

3. **The Smart E-Bike Monitoring System (SEMS):** The Smart E-Bike Monitoring System is a means of acquiring data in problem solving time. It analyses the data it gets from monitoring location through the global positioning system and sensor input as well as the rider control data gotten from level of assistance. The riders can view their data through an innovative online interface and share it on social media.
4. **Custom Sensor Feature**: This feature is inexhaustible in terms of uses, from cycling sensors with the ability to measure RPM speed and cadence, to high-tech proximity sensors that detect cars in your blind spot, to health centric bikes that measure the level of the rider's fitness. The future can only see more innovation and an addition of various and diverse types of sensors.

V. CONCLUSION

In modern context, there are so many developments going on every direction. Taking into account these progressive trends in the developed countries, we cannot ever imagine that there could be any shortage of energy in this world or there should be necessary for other solutions. Considering the developments, it seems that everything is going smoothly and this energy crisis seems to be unreal. But when we move towards other side, the countries who are developing and mainly those countries who are under-development, then we realize how heavy this energy crisis is. People living there do not have regular electricity even for their household needs then how it is possible to use it for the external requirements that is where the alternative ways stand as the only rescue option for them to function somehow if it is made available there.

The reason to get motivation also by the fact that we already have less energy in this world in the form of fossil fuel and until there is possibility gained for some stable solutions. It is better to be careful and not totally finish off this fossil fuel option. It might have many other benefits than just the fuel for vehicles. Therefore, those particularities we should never undermine is always a safer choice, is the moral lesson of this study.

Besides when people use car, usually people ride alone to go to offices and other places, when the capacity consisting of four, suggesting clearly that it is the wasting of scarce fossil fuel for limited gain. We may have some situations where there is no better option than car riding, but still there are so many possibilities where it can be easily replaced with other transportation services, and importantly the fuel saving services.

That is why, to suggest the possible area we propose this e-bike as one of the better options for saving energy, especially in short distant traveling. This helps save the fuel and also the environment altogether by reducing pollutions causing mainly by combustion engines.

That is why to accommodate them also in this development, there must be some affordable solutions which can compensate this requirement and this e-bike transportation can have this potential to address this issue.

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