DESIGN & FABRICATION OF POWER SKATEBOARD

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Abstract - This project is based on automobile, which is “DESIGN & FABRICATION OF POWER SKATEBOARD”. The main objective of the skateboard is to transport a person from one place to another place. Generally skateboard is operated by human power. But here we are using a 12V battery to drive a skateboard, which is mounted at the center of the skateboard. Produced power from battery is transmitted to rear wheel by a cable wire. In rear wheel servomotor is fixed. To control a speed of engine hand held controller is provided in skater’s hand, which is connect with controller. To control the speed of skateboard here we are using accelerator and brakes as a controller. To drive a skateboard footrests are provided besides the both side of the battery box as a standing platform. Suspension system is also installed in front & rear of the battery for easily carrying heavy weight and drive on bad roads. It provides easy & fast transportation, portability too. In addition we are also making new design of chassis and frame and also fabricate it for a power skateboard. Electric power skateboard gives noiseless, vibration less and ecofriendly drive and atmosphere.

Keywords - Skateboard, Suspension, Controller, Battery, MCB Switch, Servomotor etc.

I. INTRODUCTION

A. INTRODUCTION TO PERSONAL MOBILITY

In roadways transformation has enormous scale evolved since the first motor vehicle was invented all over world century ago. Now a days, nearly million cars & trucks are used to move a peoples and goods by a roadways. Also cars & trucks consumer spend billions of dollars per year [including cost of fuel, time, taxes pay, deprecations, parking] achieved the more benefits of mobility.

The growth of automobile transportation has occur with virtually no more change to the fundamental system conceived & popularized by Karl Benz & Henry Ford. While this mobility system provides calculated personal freedom for those who can achieved it & enables substantial economic activity, it is attached with serious side effects like safety, Energy, Land use, Congestion, Time used.

Here in broad range of business holder & technology are hope that, when combination in innovative ways promise to transform the people & goods move around & impact socially & economically. Now roadways transportation is ready for comparison with TV, media, pharmaceutical company were the two past decades.

B. WHY ECOFRIENDLY

We had the technology we need to expand our addiction to oil, stabilize the climate and maintain our standards of living, at the same time. By the use of sustainable technologies, such as solar and wind power, we can achieve energy independence and stabilize human-induced climate changes.

To increasing transportation efficiency it is the best place to make your efforts to reduce emissions of carbon-dioxide (CO₂), which is a directly affect in global warming. Of all CO₂ emissions in the USA, about 33% comes from vehicle transportation.

Our electric vs. internal combustion(IC) engine chart shows the advantages of electric vehicle —over the engine vehicles. By the use of electric hybrid power and all-electric power, we can achieve significant cost and environmental savings. By adding no. of batteries and recharging capability to electric hybrid vehicles, we have plug-in hybrids that offer the range of hybrids (500 miles or more), plus the benefit of all-electric power for short trips, which are reduces the amount of gasoline used. EVs require no gasoline fuels, and recharged from renewable energy sources, produce zero emissions.
Generally, even if we switched our vehicle from gasoline to EVs and plug-in hybrids recharged by our existing utility grids (which generally use fossil fuels), we see a 42% national average reduction in CO\textsubscript{2} emissions, according to research by Peter Lilienthal of the National Renewable Energy Laboratory (NREL).

As we approach the peak of world oil extraction and witness the consequences of climate change, it is important to reflect on how the world’s most technologically advanced nation came to base its economy on the use of polluting, finite resources. It is also important to recognize that corporations exist, for the most part, for one reason: to make money. This gives us, the consumer, and the ultimate power to shape corporate behavior through how we spend our money.

C. EIGHT REASONS TO MAKE ELECTRIC SKATEBOARD OVER GASOLINE ENGINE

1. Inexpensive To Operate
   According to the U.S.A Environmental Protection Agency, an average all-electric car requires $3.74 worth of electricity to travel 100 miles distance. A comparable to conventional car costs to travel same distance are $13.36. So here we save $10 per every 100 miles distance. This is based on assumptions of average fuel and electricity costs, and your actual difference may of course vary.
   For someone who drives 12,000 miles per year, a conventional car driver would average $1,603 in fuel costs versus a EVs driver who had pay $449 for electricity. This equals $1,154 saved per year, and – not counting for rising gasoline prices almost certain to happens – it equals $5,771 saved in six years.

2. EVs Prices Have Come Down
   There is general hope that the price of batteries per kW-Hr will decline, and economies of scale will help to automakers trim costs which they may pass on to you. And, like any technology, more features and benefits are ought to come in time. The question is that can you benefit now?
   Some people choose to gasoline a car to avoid risks associated with ownership, but others are purchasing EVs and happy with what they can do.
   The range limits of 75-100 miles per charge for average EVs is also a factor to consider, but average daily driving needs might be under 40 miles. The range takes a mental adjustment, but given the potential of charging at route or at your destination point – which can increase daily range by 35-100 %.
   Long-range drivers would be less likely to be a candidate for a pure EVs, except possibly for the 265 miles range Tesla Model S and that company’s expanding Supercharger networks.

3. Less Maintenance
   “Electric Vehicle have 10-times fewer moving parts compare to a gasoline powered car,” that says the advocacy group. “There is no engine, transmission, spark plugs, distributor, fuel tank, tailpipe, valves, starter, and clutch.” A EVs is otherwise a fully equipped automobile, so it does have electrical systems no gasoline systems, HVAC, infotainment, and what not. Because they have regenerative brakes, this tends to saving brake pads and rotors from wearing as fast, at least this is the potential many had realized.

4. Simple than a Hybrid vehicle
   Hybrids have more complexity, it is absolutely true, and it’s a reality of EVs owners can bypass in the tradeoff. All the maintenance concerns about internal combustion-powered cars apply to hybrids, and then you have the battery, controller, motor, and other components as part of the electric power train. The maintenance and resale record for hybrids has been better, and we are not meaning to say they are too accidental or risky, but EVs are simpler machines.

5. Infrastructure in Place Now
   EVs runs on electricity and US is fully wired to handle it. Utility companies do measured grid demands, and in some neighborhoods where several EV have added more draw than they are set up for, utilities have increased equipment, but the country is EV-compatible.
   As for public charging infrastructure, at this stage, there is need for more, and this work is in progress. There are some public chargers that require you to pay for the use of it, but others may provide electricity at no cost or low cost – such as at some workplaces, retail areas, campuses etc.
There is another potential benefit squeezed in here: free juice. It’s like getting free gas, and some report they take advantages of it. A EVs driver’s primary charge point is of course at home, and this assumes one has a place (like a garage, carport, or other private parking) that lets one charge at home. Home charging has been known to be a deal breaker, although some do find ways to work around it. The UCS survey showing 25% of households as EVs compatible did account for available at home charging.

6. **EVs Leverage Solar Panels**
Photovoltaic power generated at your residence can be a good thing, and it clears the reason for an electric car, as it is like getting free fuel when you charge at home. The environmental benefits here are more. Solar systems are not cheap. But it may be eligible for tax breaks or subsidies, and comes down costs.

7. **EVs Reduces Greenhouse Gas Emissions**

EVs have no tailpipe emissions such as carbon-dioxide (CO₂), carbon-monoxide (CO), oxides of nitrogen (NOₓ), particulate matter (PM), formaldehyde (HCHO), non-methane organic gases (NMOG), or non-methane hydrocarbons (NMHC). Electricity comes produced from different sources, and if it’s from a coal-fired power plant, it usually is still cleaner to run an electric vehicle or plug-in hybrid, but there are more exceptions. EVs typically have a well-to-wheel emissions advantage over a similar conventional vehicles running on gasoline or diesel,” says the U.S.A Energy Department. “In regions that depend heavily on conventional fuels for generation of electricity, PEVs may not demonstrate a well-to-wheel emissions benefits.”

On average, CO₂ o/p for a EVs per 100 miles is 54 pounds, and for a relatively efficient conventional vehicles, it is 87 pounds. Powering from no. of renewable resources and cleaner power plant supplied grids of course stands to reduce the CO₂ from powering a EVs.

8. **EVs Means Cleaner Air**
This is not to be confused with the “environmental” concerns that affect our climate, but this is about public health issues and associated costs which affect us all. Economists call smog, haze, and health problems resulting from
emissions “externalities,” a neutral and sterile-sounding word for a nasty reality – people today suffer as a consequence of others’ actions, including releasing toxins into the air. This is part of why policymakers are pushing to clean up the air and an underlying driver to the whole market.

The same concern over cleanliness of power plant emissions exists as above, but the grid is getting cleaner year by year and several watchdog and advocacy groups say EVs are definitely “part of the solution” rather than “part of the problem.” Quantifying the “problem” in actual dollars has been elusive, but it could be more than anyone really wants to pay.

II. DESIGN

Design consist of application of scientific principles, technical information data & assumption for make a new or improvised machine or system to perform a special function with maximum efficiency.

System design mainly consist the various physical constraints & ergonomics, space & arrangement of various components on frame at system, man and machine interactions, no. of controller, position of controller, working environment of system, system failure chances, providing safety and services, ease of maintenance and scope of improvement, weight of system from ground surface, total weight of system and much more. In mechanical design the component are note down to prepare a list and stored on the basis of their required field application. It design in two parts as given below:

- Design Parts
- Parts to be purchase

For designing parts different design is complete & distinctions thus obtained are compared to next a highest dimension which is available in market. This improve the assembly as well as postproduction service work & also different types of tolerances on the works are note down. After prepare process charts it passes on the manufacturing stage. The various parts which are to be purchased directly by the selection from different standard data catalogue specified. So in future anybody can go to purchase same parts from the retail shop with given specification it will be same & standard for all.

A. SYSTEM DESIGN

In the system design we mainly consist & concentrated on following parameters:

- System selection based on physical constraints:
  When we going to selecting any system or machine it must be checked for which type of industry this machine or a system is used like for small scale industry or large scale industry. In our case it is used by small scale industry. So space is a major problem. The system is very compact so it can be adjusted to corner of the room. The mechanical design has directly connected with the system design so the mostly job is to control the physical parameter so that the distinctions achieved after mechanical design can be perfectly fitted in to that.

- Arrangement of various components:
  Keeping into the space restrictions the components should be laid such that their easy removal or service is possible. Every component should be easily seen none should be hidden. Every possible space is utilized in components arrangements.

- Components of system:
  As mentioned above the system should be compact so that it can be perfectly feet at a corner of a room. All the moving parts should be completely closed to each other and compact. A compact system design gives a high weighted structured design which afford it.

B. DESIGN CONSIDERATION

The designs, depending upon the below methods used, it may be classified as follows:

1. Rational design: This type of design depends upon the mathematical formulae on the principle of mechanics.
2. Empirical design: This type of design depends upon the empirical formulae, which is based on the practice and past experience.

In this semester we are going to use empirical design for following drawing and design data. Actually we have so professional technical guide and faculty had a lot and well experience who can guide us for this project. We used AutoCAD design review and AutoCAD software to utilize the proportional dimension for our project design as following:

Our project motto is to design self-propelled personal mobility vehicle so in future we can expand this project to solar vehicle.
C. DESIGN PART LIST

<table>
<thead>
<tr>
<th>SR NO.</th>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>MATERIAL</th>
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<tbody>
<tr>
<td>1</td>
<td>DC SERVO MOTOR</td>
<td>1</td>
<td>STD (Al alloy)</td>
</tr>
<tr>
<td>2</td>
<td>FRONT FORK</td>
<td>1</td>
<td>M S</td>
</tr>
<tr>
<td>3</td>
<td>REAR FORK</td>
<td>1</td>
<td>M S</td>
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<tr>
<td>4</td>
<td>SUSPENSION PAIR</td>
<td>2</td>
<td>STD</td>
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<td>5</td>
<td>STEERING BRACKET</td>
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<tr>
<td>6</td>
<td>KNUCKLE PIN</td>
<td>1</td>
<td>EN8</td>
</tr>
<tr>
<td>7</td>
<td>AXLE</td>
<td>2</td>
<td>EN8</td>
</tr>
<tr>
<td>8</td>
<td>12 V BATTERY</td>
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<td>STD</td>
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<td></td>
<td>PART LIST</td>
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</tr>
<tr>
<td>9</td>
<td>BATTERY BRACKET</td>
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<td>M S</td>
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<tr>
<td>10</td>
<td>CONTROLLER</td>
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<td>STD</td>
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<tr>
<td>11</td>
<td>48 TO 12 V CONVERTER</td>
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<td>STD</td>
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<tr>
<td>12</td>
<td>WIRES AND LUGS</td>
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<td>13</td>
<td>SPEED REGULATOR</td>
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<td>19</td>
<td>CENTRAL FRAME</td>
<td>1</td>
<td>M S</td>
</tr>
</tbody>
</table>

**TABLE:01 PART LIST**

D. PARTS OF DRAWINGS

1. FRONT FORK

![Front Fork Diagram]

2. REAR FORK

![Rear Fork Diagram]
3. CENTRAL FRAME

4. CENTRAL AXLES
5. STEERING BRACKET

6. STEERING LEVER PIN

7. FRONT WHEEL
9. REAR WHEEL

10. SERVO MOTOR

11. BATTERY BOX

12. BATTERIES
13. CONTROLLER

![Controller Image]

14. MINIATURE CIRCUIT BREAKER

![Miniature Circuit Breaker Image]

15. SUSPENSIONS

![Suspensions Image]

16. SUSPENSIONS FORK END

![Suspensions Fork End Image]

**E. MATERIAL PROCUREMENT**

Material is obtained as per material required specification & quantity of parts. For deciding the process of manufacture and appropriate machine parts process planning should be required completely done.
1. **STAINLESS STEEL**
Stainless steel also known as an inox steel from French inoxydable, in a metallurgy. It is a steel alloy with content by mass minimum of chromium 10.5 %.
Stainless steel does not generally corrode, rust or stain with water as generally steel does, but as the name it is not fully stain proof, most notably under low oxygen, high salinity or poor environments. Stainless steel has a different grades & surface finishes suit the environment the alloy must endure. Where both the properties of steel & resistance to corrosion are required there stainless steel is used.

2. **MS-MILD STEEL**
Mild steel consist 0.16-0.29 % carbon, so it not brittle or ductile. It is cheap & malleable compared to stain steel but has a low tensile strength. By carburizing surface hardness of MS-Mild steel can be increased.It is mostly used where large quantity of steel is required. Mild-steel density is – 7.85 g/cm³. Young’s modulus of MS steel is 210000 Mpa.

3. **EN8-PLAIN CARBON STEEL**
- EN-8 in US equivalent is to AISI- C7038/C1041
- Chemical composition of EN8 - 0.35-0.46
- Silicon 0.05-0.35
- Maximum Phosphorus 0.06
- Mechanical Properties:
  - Min. Tensile strength – 483 to 552 N/mm²
  - Min. Yield strength – 248 to 386 N/mm²
- Weldability – POOR.
APPLICATION: Medium strength material used for nuts b.olts, for high tensile & studs & for rotor forgings.

4. **POLYVINYL CHLORIDE**
Polyvinyl chloride commonly abbreviated PVC, is the third most widely produced plastic, after polyethylene & polypropylene. PVC used in construction. PVC is more effective than traditional materials such as copper, iron, wood in piper and other profile application. By the addition of plasticizers it can be made softer and more flexible because of this property mostly widely used being phthalates. In this insulation & in many application in which is replace rubber.

### III. CONCLUSION
- Automobile commonly used in all over the world because it has many value aided advantages over walking or cycling or over public transport.
- After the change Design & frame work of skateboard, also by putting IC engine we can drive skateboard easily.
- Improved balancing and controlling problems also reduced human efforts.
- Get more speed and fun by using IC engine.
- This project used for some portability transportation & for sport adventure.
- Autonomy can give a good mobility experience & also secure personal mobility for all population.
- By reinventing the automobile and the ownership model, it is possible to deserve its advantages while significantly reducing the effects by urban use.
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