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# Air Powered Electric Bicycle

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**Abstract –** Nowadays, personal and efficient modes of transportation used in India include bi-cycles, mopeds, and motorcycles. These mopeds and motorcycles tend to be more costly in terms of initial buying cost, ever-rising prices of fuels especially petrol required for driving these vehicles, high maintenance cost. Also the fossil fuel deposits are getting depleted day by day and it's hard to find the new ones to replace them. Again the pollution due to these fuels is jeopardizing the environment continuously. On the other hand, the low buying cost, and zero running cost traditional bi-cycle sometimes tends to be inconceivable as lots of muscle power is wasted by rider propelling the pedals to rotate the driving wheel. Keeping all this in mind, engineers are left to think of a new way to cater these economically poor people as well as to provide a solution for environmental pollution.

***Key Words*: PMDC, Lead-Acid Battery, Solar Panel, Propellers, Air-Thrust, Air Powered Electrical Bicycle, Prototype.**

## 1. INTRODUCTION

World markets are filled with mopeds, bikes and cars. Bu5t for small distance travel mopeds and car come out as a good option for transportation. But they come with some major drawbacks like high initial buying cost, ever-rising prices of fuels especially petrol required for driving these vehicles, high maintenance cost. On the other hand, the low buying cost and zero running cost traditional bi-cycle sometimes tends to be inconceivable as lots of muscle power is wasted by rider propelling the pedals to rotate the driving rear wheel. Hence we are left to find some other means to overcome these drawbacks and find new ways to cater economically challenged people and at the same time protect the environment. When thinking of possible projects, we all decide that we wanted to do something that world somehow be beneficial to the planet. After discussing with Devendra Gowda Sir, we decided that the air powered electric bike would be the best fit. Thus solar energy turns out to be freely and abundant available energy source which could be harnessed easily and converted to electrical energy using a low cost mechanism and used for the purpose if instilling mobility. Hence, a air powered electric bicycle is proposed over. Also our main concern is to properly utilize the generated energy and get a good output out of the same. Improvising the available technology and find a good one to replace the old one was the main reason behind choosing this energy harnessing and utilizing project.

## 2. METHODOLOGY and DESIGN

This is basic Block Diagram of our project that we need to follow for designing purpose and it will also assist the cycle for efficient running.

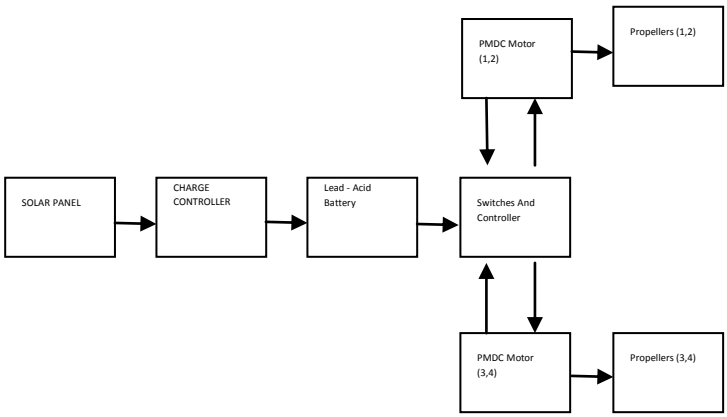


**Fig.1**: Basic block diagram

3. Parts of System

I. **PMDC Motor:**

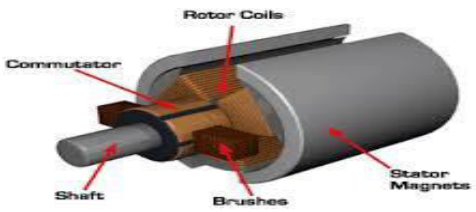


**Fig.2: PMDC Motor**

In a dc motor, an armature rotates inside a magnetic field. Basic Working principle of DC motor is based on the fact that whenever a current carrying conductor is placed inside a magnetic field, there will be mechanical force experienced by that conductor. All kinds of DC motor works in this principle only. Hence for constructing a dc motor it is essential to establish a magnetic field. The magnetic field is obviously established by means of magnet. When permanent magnet can by any types i. e. it may be electromagnet or it can be permanent magnet. When permanent magnet is used to create magnetic field in a DC motor, the motor is referred as permanent magnet dc motor or PMDC motor. Have you ever uncovered any battery operated toy, if you did, you had obviously found a battery operated motor inside it. This battery operated motor is nothing but a permanent magnet dc motor or PMDC motor =. These types of motor are essentially simple in construction. These motors are commonly used as starter motor in automobiles, windshield wipers, washer, for blowers used in heaters and air conditioners , to raise and lower windows, it fixed it cannot be controlled externally, field control of this type of DC motor cannot be possible. Thus permanent magnet dc motor is used where there is no need of speed control of motor by means of controlling its field. Small fractional and sub fractional KW motors now constructed with permanent magnet.

**Table1. Our Motor Selection and Specifications**

| | |
|---|---|
| **Type of Motor** | **PMDC** |
| **Model** | **90 PX 4G 54** |
| **Power Rating** | **54W*4** |
| **Torque** | **200kg/nm** |
| **Rated Voltage** | **12V** |
| **Speed** | **21000 rpm** |
| **Weight** | **0.3kg** |
| **Price** | **800Rs*4** |

## II. Lead Acid Battery:

Battery charging and discharging is the important part when it comes to impart motion to our air powered bicycle. Out of numerous available batteries sealed lead acid batteries were selected for the discharge rate among dischargeable batteries is lowest. Also they are inexpensive and environmental friendly, as they are sealed for driving hour 54w PMDC motor at our rated speed, eight lead acid batteries connected in parallel sufficient.

**Fig.3: Selected Lead Acid Battery**

**Table2: Battery Selection and Specifications**

| | |
|---|---|
| **Type of Battery** | **Lead Acid** |
| **Number of Batteries** | **8** |
| **Voltage** | **6V*8** |
| **Ampere Hour Rating** | **4.5Ahr** |
| **Charging Time** | **2-3 Hours** |
| **Weight** | **0.5Kg*8** |
| **Safety** | **Environment Friendly** |
| **Price** | **230Rs*8** |

## III. Solar Panel:

Our lead acid batteries used for driving the motor are charged mainly by the solar energy trapped by the solar panel. So, solar panel is the main part of the bicycle. Solar

panel consists of numerous solar cells made of silicon. Solar cells devices that convert the energy of sunlight's directly into electricity through the use of the photovoltaic effect .the photovoltaic effect involves the creation of a voltage in a material upon exposure to electro-magnetic radiation the photoelectric and photovoltaic effects are related through sunlight, but are different in that electronics are ejected from a material surface upon exposure to radiation of sufficient energy in photoelectric, and generated electrons are transfer to different bands of valence to conduction within the material, resulting in buildup of voltage between two electrodes in photovoltaic. High efficiency solar cells are a class of solar cell that generates more electricity per incident solar power units. Most of the industry is focused on making the most cost efficient solar cell in terms of cost per generated power. There are many different types of high efficiency solar cells. The three main types of high efficiency solar cells are multi-junction solar cells, thin film solar cells, and crystalline/bulk silicon.

**Table3: Panel Selection and Specifications**

| | |
|---|---|
| **Model** | **SUNSOLAR** |
| **Maximum Power** | **40W** |
| **Open Circuit Voltage** | **21.4V** |
| **Max Power Voltage** | **16.9V** |
| **Max Power Current** | **1.3A** |
| **Type** | **Poly-crystalline** |
| **Lifespan** | **10 years** |
| **Weight** | **5kg** |
| **Price** | **1200Rs** |

### 3. Air Powered Electric Bicycle:

Air powered electrical bicycle is a combination of all the above mentioned counterparts in a proper manner. This fully assembled solar bicycle runs at maximum speed of 20-25km/hr.

This cycle is designed to work even when the battery discharges and can go up to some distance with little pedaling.

Air bicycle consist of mainly these parts:

1) Main Cycle Assembly
2) PMDC Motor
3) LEAD-ACID Batteries
4) PWM Charge Controller
5) Propeller
6) Rotary Switches

**Fig.4: Our Bicycle Prototype**

**Table4: Our Bicycle Specifications**

| | |
|---|---|
| **Name** | **Air Powered Electric Bicycle** |
| **Motor Used** | **PMDC Motor** |
| **Battery Used** | **Lead-Acid** |
| **Initial Weight** | **15Kg** |
| **Weight After Assembling** | **25.3Kg** |
| **Weight Handled** | **120Kg** |
| **Power Used** | **Solar, Muscular** |
| **Charging System** | **Solar** |
| **Charging Time** | **2-3 Hours** |
| **Average** | **15-20km/hr** |
| **Cycle Life** | **1000 times** |
| **Price** | **Approx. 12000Rs** |

## 4. PROTECTION

For protection of high costing solar panel we have implemented a detachable solar panel technology which can be used as per our needs. For protection of battery, we have also used a detachable battery model which gives ample protection for battery from getting stolen. For protecting bicycle from tumbling a side stand with lock is implemented. For protection from initial inrush current the cycle will be started by pedaling and later shifting the power to motor. For protection from braking, special arrangement is made to prevent the shattering of solar panel due to tumbling. The arrangement of solar panel is inclined

## 5. RESULTS-OBSERVATIONS

| Requirements | Bicycle | Air Powered Electric Bike | Conventional Mopeds |
|---|---|---|---|
| **Max. Speed** | 10km/hr | 15-20km/hr | 40km/hr |
| **Power Required for Driving** | Muscular Energy | Solar, Wind and Muscular Energy | Petrol |
| **Weight** | 20kg | 25kg | 100kg |
| **Weight Carrying Capacity** | 80kg | 120kg | 200kg |
| **Initial Cost** | 4000Rs | 12000Rs | 80000Rs |
| **Running Cost** | nil | Nil | 75Rs per Litre |
| **Requirement of License** | No | No | Yes |
| **Affordability** | Yes, anyone | Yes, anyone | Only some people |
| **Environmental Effects** | Environment Friendly | Environment Friendly | Polluting |

From the result and observations we can clearly conclude the goals of the design were achieved. This include, Proper utilization of solar panel, Protection of various counterparts of the solar bicycle, Restoration of generated energy, Maximum speed of 20km/hr was achieved.

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