DESIGN AND FABRICATION OF SOLAR POWERED TREADMILL BI-CYLCE

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Abstract—As a part of dissertation work, the solar assisted bicycle is fitted with a dc hub motor on front axle of a bicycle with power rating of 250W and with a traveling speed of around 20-25 kmph. It is provided with a pair of lead acid batteries of 35— our project deals with the design and the fabrication of solar powered treadmill electric bicycle. This is a simple project which may be used for traveling for a shorter distances. As a humongous steep increase in global warming and major novice health concern which are caused due to combustibles, are in linkage to transportation facilities as humans are dependable, which cannot eradicate it. Solar power, a non-conventional or renewable energy source and some fitness components are used in this project which is feasible. So we took up an opening in combining these two major concerns and developed a new treadmill electric bicycle using solar energy, which consists of a tread mill belt and a 12V brushless dc motor, motor controller, a sealed lead ion battery, throttle valve and motor controllers. So by this Unorthodox design, human can achieve in minimizing the rise on effect in global warming and major health theme such as obesity, heart attack etc. and can also attain short distance travel to homage, office, etc. thereby reducing the pollution, as well as a great results in physical fitness by using this E-bicycle. The sun-rays falling on the solar panel is directly converted to the electrical energy and is stored up in the battery which drives a motor and the motion to the machine is achieved. The power from the treadmill setup is transmitted to the wheels by suitable arrangement so that when the person walks, the wheels of the bike moves and the bike attain motion. Also with the help of the battery and the motor, the vehicle can be operated as an electric bicycle. "We aspired to build a vehicle that is faster than walking and easier to ride than a bike."

Keywords *: Treadmill , Solar Powered Bicycle ,Eco-friendly bike*

INTRODUCTION: The treadmill bike is totally new way of moving it is done by the combination of electric and Mechanical part i.e. battery and gear .Motion of bike from one place to another place will be done by human effort. The electric assist in the combination with the gear has three gear pair boosting your walking pace up the regular bike. With the electric assist it takes no more efforts than a walk in the park. Treadmill bike is basically a new concept for traveling and exercisingBi cycles are one of the most ubiquitous forms of transportation in the world. Most children remember their first bike; with it came the chance to explore their world with more freedom than ever before. As we grow, however, bicycling becomes more than just a childhood rite of passage. Wind in our hair and feet on the pedals, we have several good reasons to climb on and take a trip. Much of the world uses bicycles as a primary form of daily transportation. What would take several hours of travel on foot becomes faster and more efficient on two wheels. Some cyclists take trips across entire states or cross-country solely on a bicycle. Reaching speeds of 15

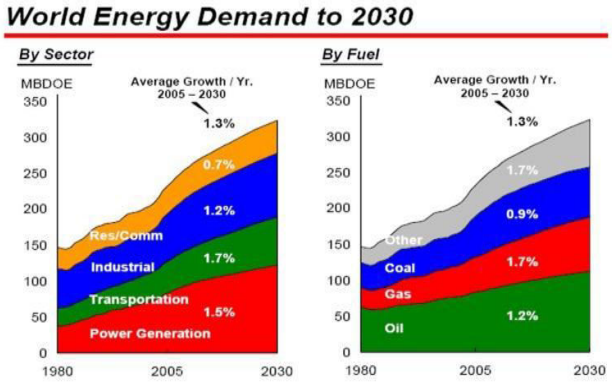
miles or 30 km an hour is achievable by even beginning cyclists, while more experienced riders can reach speeds equivalent to automobile travel. "Century riders" travel 100 miles or more within a typical day. Not to be constrained by simple transportation, bicycles (stationary and otherwise) have helped people become healthier by losing excess weight and improving cardiovascular fitness. The exercise benefits of cycling are well known. Using the largest muscles in the body, bicycling allows riders to reach aerobic heart rates that drive up metabolism, and give a good workout. With the relative newcomer in the bicycle world, mountain bikes, this form of transportation is taking us on rugged terrain once thought impassable by anything other than hiking boots or pack animals.

Extreme sport enthusiasts have adapted the bicycle to perform gravity defying stunts, such as flips and mid-air acrobatics, in a style known as BMX (Bicycle Motor cross). In short, bikes remain a popular way to get people between points A and B, whether those destinations are found on a map, from one state of health to another, or to explore the unknown. Bicycles have become an important part of the landscape"as easy as riding a bike." Or we understand that some dormant skill is easy to pick back up if it's "just like riding a bike." Likewise, many immediately think of bicycles when we make an allusion to "coasting", "picking up speed", or "going downhill". Because of technological advances in storage cells and electric propulsion systems in recent years and in response to the growing demand for clean, efficient methods of transportation in our urban communities, electric bicycle development and marketing has surged ahead, especially in Asia and Europe... E-bikes are not a replacement for conventional bicycles. However, they allow a greater number of people to travel on two-wheeled vehicles. In the future, they could even become a means of locomotion that could substitute for the automobile, particularly in warmer weather. E-bikes are for everybody, especially those who are not very active in sports, those with physical disabilities and seniors. They are also for veteran cyclists who commute to work on conventional bicycles to save money on fuel but wish to avoid arriving at the office covered in perspiration. Growth in e-bike use has skyrocketed since the electrically assisted bicycle (EAB) was introduced in 1997 by the Japanese firm Yamaha. This version of the e-bike has a small motor mounted on the back wheel to double the power generated by the cyclist. In 1998, the company scored a major commercial success by selling 500,000 units worldwide, making Japan the e-bike market leader. The European market is growing as well, with more than 100,000 units sold in 1999. The electric bicycle (e-bicycle) market varies greatly by product type and regional demand. The placement of electric motors for e-bicycles is also receiving increased consideration. E-bicycle can have motors in one of three locations: the front wheel hub, mid-mounted at the bottom bracket (pedals), or the rear wheel hub. The rear wheel hub is the most popular location, and most of the large Chinese market is utilizing rear hub motors. Rear wheel hubs are thought to be best for throttle-controlled bikes, whereas the other locations work well with e-bicycles that only provide electric power when the pedals are being used (pedal assistance). The mid-mount motor is the fastest growing segment, in part due to strong competitors like Panasonic and relatively new competitors including Bosch and AEG. The mechanism used in solar powered electric bi-cycle is versatile of its kind in which, the cycling pedals are replaced a treadmill belt. The prototype design requires a treadmill belt, shafts, the frame of treadmill, the free wheel gears, chain drive and gear chain .The platform on which the treadmill belt is placed is fabricated. All the links are made up of normal MS (mild steel) including the head which has a direct contact with the treadmill belt. The system is expected to move as heavy weights up to 150 KGs approximately. The aim of the project work is to design and fabricate a solar walking cum cycle mechanism that makes much easier to move. People from one place (section) to the other even while processing in the factories, industries, etc.

GLOBAL SCENARIO ABOUT FUEL ON 2030:

The study published by Stanford University says that fossil-fueled cars will vanish within eight years and the people who want to buy cars will have no choice but to invest in electric vehicles or vehicles working on similar technologies. This is because the cost of the electric vehicles; which includes cars, buses and even trucks will decrease and this will result in the collapse of the petroleum industry.Car companies like AUDI,VOLKSWAGEN ,BENZ and VOLVO have already started working on autonomous technology and electric cars and probably the 'no internal combustion engine scenario' has been already envisaged by them. As electric cars takecenter stage, it looks like we might

have to coin a new word for people like us as well.



PROBLEM STATEMENT

In our day to day life we see that many people's use bikes cars as a source of transportation. This results in environmental¬ pollution and fuel consumption. In manual treadmill the motion of the treadmill is rough to overcome this we use a motor to rotate the rotors.¬ Batteries which are widely used in automobile sector is not rechargeable thus when they disposed create pollution.¬ To improve all above phenomenon we take initiative by designing something which would help to reduce these harmful¬ phenomenon. B. Objectives Pollution control.¬ Useful for exercise purpose. ¬ To reduce the use of non-renewable **energy sources** ¬

WORKFLOW

Sun rays consists of photons hits solar panel and electrical energy is generated

↓

Electrical energy generated goes to battery via charge controller and voltage regulator

↓

Energy stored in battery is given to the motor

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Power from motor is transferred to treadmill belt via sprocket and chain mechanism

MATERIAL SELECTION

A. Mild Steel

The frame of treadmill and front & rear rollers are made up of mild steel. Reasons: Mild steel is readily available in market. It is economical to use. It is available in standard size. It has good mechanical properties i.e. it is easily machinable. It has moderate factor of safety, because factor of safety results in unnecessary wastage of material

and heavy selection. It has high tensile strength. Low co-efficient of thermal expansion.

B. Nylon Rubber

Fabric Standard material available for tread belt is nylon fabric. So we use this material for treadmill belt. Nylon rubber Fabric is cheap and easily available, less in cost & having property of wear resistance.

C. PVC(Polyvinyl chloride)

PVC pipes are used as a supportive roller in treadmill frame. PVC pipes are used because those are light in weight, easily available, cost is less and also having a smooth surface finish which gives smooth motion of belt on the surface of supporting rollers

COMPONENTS AND DESCRIPTION

The main components are

A. Lead Acid Battery

Where high values of load current are necessary, the lead-acid cell is the type most commonly used. The electrolyte is a dilute solution of sulphuric acid (H_2SO_4). In the application of battery power to start the engine in an auto mobile, for example, the

load current to the starter motor is typically 200 to 400A. One cell has a nominal output of 2.1V, but lead-acid cells are often used in a series combination of three for a 6-V battery and six for a 12-V battery. The lead acid cell type is a secondary cell or storage cell, which can be recharged. The charge and discharge cycle can be repeated many times to restore the output voltage, as long as the cell is in good physical condition. However, heat with excessive charge and discharge currents shortens the useful life to about 3 to 5 years for an automobile battery. Of the different types of secondary cells, the lead-acid type has the highest output voltage, which allows fewer cells for a specified battery voltage.

Hub Motor: The hub motor is an electric motor that is incorporated into the hub of a wheel and drives it directly. Hub motor electromagnetic fields are supplied to the stationary windings of the motor. The outer part of the motor follows, or tries to follow, those fields, turning the attached wheel. In a brushed motor, energy is transferred by brushes contacting the rotating shaft of the motor. Energy is transferred in a brushless motor electronically, eliminating physical contact between stationary and moving parts. Although brushless motor technology is more expensive, most are more efficient and longer-lasting than brushed motor systems. A hub motor typically is designed in one of three configurations. Considered least practical is an axial-flux motor, where the stator windings are typically sandwiched between sets of magnets. The other two configurations are both radial designs with the motor magnets bonded to the rotor; in one, the inner rotation motor, the rotor sits inside the stator, as in a conventional motor. In the other, the outer-rotation motor, the rotor sits outside the stator and rotates around it. The application of hub motors in vehicular uses is still evolving, and neither configuration has become standard. Electric motors have their greatest torque at startup, making them ideal for vehicles as they need the most torque at startup too. The idea of "revving up" so common with internal combustion engines is unnecessary with electric motors. Their greatest torque occurs as the rotor first begins to turn, which is why electric motors do not require a transmission. A gear-down arrangement may be needed, but unlike in a transmission normally paired with a combustion engine, no shifting is needed for electric motors. Wheel hub motors are increasingly common on electric bikes and electric scooters in some parts of the world, especially Asia.

B. **Treadmill Setup**

C. A conveyor belt is the carrying medium of a belt conveyor system (often shortened to belt conveyor). A belt conveyor system is one of many types of conveyor systems. A belt conveyor system consists of two or more pulleys (sometimes referred to as drums), with an endless loop of carrying medium—the conveyor belt—that rotates about them. One or both of the pulleys are powered, moving the belt and the material on the belt forward. The powered pulley is called the drive pulley while the unpowered pulley is called the idler pulley. There are two main industrial classes of belt conveyors; Those in general material handling such as those moving boxes along inside a factory and bulk material handling such as those used to transport large volumes of resources and agricultural materials, such as grain, salt, coal, ore, sand, overburden and more. Today there are different types of conveyor belts that have been

created for conveying different kinds of material available in PVC and rubber materials. The belt consists of one or more layers of material. Many belts in general material handling have two layers. An under

layer of material to provide linear strength and shape called a carcass and an over layer called the cover. The carcass is often a woven fabric having a warp & weft. The most common carcass materials are polyester, nylon and cotton. The cover is often various rubber or plastic compounds specified by use of the belt. Covers can be made from more exotic materials for unusual applications such as silicone for heat or gum rubber when traction is essential. Material flowing over the belt may be weighed in transit using a belt weightier. Belts with regularly spaced partitions, known as elevator belts, are used for transporting loose materials up steep inclines. Belt Conveyors are used in self-unloading bulk freighters and in live bottom trucks. Belt conveyor technology is also used in conveyor transport such as moving sidewalks or escalators, as well as on many manufacturing assembly lines. Stores often have conveyor belts at the check-out counter to move shopping items. Ski areas also use conveyor belts to transport skiers up the hill.

D. **Solar Panel**

We use a fixed arrays which is usually oriented east west and tilled up angle approximately equal to the latitude of the site **(tilt ß = Ø, latitude angle).** We kept that **1** angle fixed arrays are mechanically simpler than tracking arrays. Thus array designs fall into two board classes and thus use design as that of flat plat arrays

E. **Throttle**

Throttle is used for speed controlling.

DESIGN METHODOLOGY

In our attempt to design a walking bike, we have adopted a very careful approach. Total design work has been divided into two parts mainly, System Design.¬ Mechanical Design.¬ System design mainly concern with the various physical concern and ergonomics, space requirements, arrangement of various components on the main frame of treadmill, arrangement of tread belt and rollers, position of braking system, arrangement of motor, sprockets, ease of maintenance, scope of further improvements, ground clearance etc. In mechanical design, the components are categorized into two parts. Design Parts¬ parts to be purchased.¬ For design parts, detailed design is done and dimensions thus obtained are compared to next highest dimensions which are readily available in the market. This simplifies the assembly as well as post production servicing work. The various tolerances on work pieces are specified in the manufacturing drawing. The process sheets are prepared and passedon to the manufacturing drawing. The process sheets are prepared and pass on to the manufacturing stage. The parts are to be purchased directly are specified and selected from standard catalogue.

FUTURE IMROVEMENTS

Walking bike has some advantages and some disadvantages. The main disadvantage of walking bike is its discharging battery. Due sudden discharge of battery in between of travelling leads to face many problems to overcome this disadvantage we can do some more improvements in present model. To overcome this discharge problem we can generation of electricity by using dynamo generator. The mechanical energy generated by human due to walking on tread belt is converted to electrical energy by using dynamo generator. It will produce a small amount of energy. Small increment of energy in rechargeable battery will move the bike continuously.

CONCLUSIONS

This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work. We feel that the project work is a good solution to bridge the gates between the institution and the industries. Solar powered health bicycle is modification of existing walking bicycle. In this we have made a shear modification of treadmill and cycle running through solar assisted energy, which is a non-conventional and renewable energy. It has a great variable resistance feature which means people of young and old age can ride this bike with great pleasure as well can attain great body fitness and also can travel to their short from destination . It has also played a predominant role in global warming and also took up some part in fuel less transportation method. It is completely eco-

friendly and emission free with no running cost and less maintenance. This cycle can be an adaptable mode of transportation for rural and urban areas.

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