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Design and Development of Solar Operated E-Bicycle

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Abstract
As we all know the fuel rate the like the petrol is increasing price steadily day by day. Again the pollution thanks to a vehicle in big cities & urban areas is increasing continuously. To beat these problems, an endeavor is being made to search out next alternative sources of energy for the vehicles Again, it's also not effort to induce vehicles (scooters, mopeds or motorcycles) for all the category of society. Keeping this in mind, a glance for a some welcome to cater these economically poor people further on provide a solution for the environmental pollution was current. The solar operated e-bicycle developed is driven by DC hub motor slot in back axle housing & operated by solar power. The solar panels mounted on the carriage. Which successively drive the hub motor by using charge the battery? When the bicycle is idle, battery are going to be charge the battery by the solar. This arrangement are substitute the petrol engine, the gear box & the fuel tank in c an s e of a sequence sprocket or two wheeler, chain & gear shifting arrangement of a conventional bicycle being employed by commonest man. As a area of specific work, the solar assisted bicycle is mounted with a dc hub motor on front axle of a bicycle with power rating of 350W and with a travelling speed of around 25-30kemph. It's supplied with a pair of lead acid batteries of twenty-two.5 Ah each, a photovoltaic electric device with capacity of 20 watt, a transformer of 24v 10 Amp, accelerator and motor controller of 24v 25Amp.There yet a provision for charging of the battery with 220-240V, AC wall outlet supply, just in case of Poor solar supply thanks to rainy or cloudy weather.

Keywords: *Hub Motor, Solar Assisted Bicycle (SAB), Motor Controller, Solar Panel, Voltage Regulator.*

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Design calculation

Bicycle weight=25kg
Rider weight=70kg
Diameter of wheel(d)=60cm
Speed(v)=25kmph
Power calculation ---
(A) Normal reaction (N) on each tyre = W/2
= 47.5N
=47.5×gravity
=47.5×9.81
=465.9 ~466N
(B) Friction force (F) acting on each tire,
For static, u=0.03
F= N × u
= 466×0.03
= 13.9 ~14N
For dynamic, u=0.004
F= N × u
= 466×0.004
=1.864N

Torque Requirement --

For static,

T= F×R

= 14×0.3

= 4.2Nm

For dynamic,

T= F×R

= 1.864×0.3

= 0.559Nm

Speed Calculation --

w= v/R

= 25000/0.3×3600

= 23.14 rad/sec

Power Requirement --

a) On plain ground,

For static friction,

P = T × w

= 4.2×23.14

= 97.188watt

For dynamic friction,

P = T × w

= 0.559×23.14

= 13watt

Overall power requirement

= On plain ground × 2

= 97.188×2

= 194.376 watt

b) On inclined surface ,0°=2

For static, Total force required to move vehicle

f = u.mg cos0° +mg sin0°

= 0.03×95×9.81 cos2 + 95×9.81 sin 2

f = 60.466N

Power required = f × v

= 60.466×25000/3600

= 419.9 ~420watt

Extra power required = power required – overall power required

= 420 – 194.376

= 225.624 watt

Charging time –

Time required to charge the battery by adapter 12v,12Ah

p = 12×12

=144 watt

T = (24×12)/144

= 2hrs

By using solar panel

T = (24×v)/panel watt

= (24×7.5)/50

= 3.6hrs

Panel selection -

Two panel of 25w each having dimension 350mm×550mm

Motor selector

Hub motor of 350w 36v

II. RESULT AND DISCUSSION

Sr. no	Parameter	Solar assisted bicycle	Ordinary bicycle
1	Speed limit max (Km/h)	25-35	15-20
2	Pedalling	No	Yes
3	Cost	15000	5000
4	Weight(kg)	25	10

III. CONCLUSION

Solar assisted bicycle modification of existing bicycle and driven by solar energy. It is suitable for rural, city and country roads that are made of cement and mud. This bicycle is not more costly and easier in construction and can be most used for short distances travelling especially by school children, colleges, office goers, villager's postmen, etc.

It is easily adjustable for young , aged ,handicap people and caters the need of economically poor class of society .The price of the solar operated e-bicycle is budget of middle class people and poor people. It can be operated free of cost. It is not count the more money for any person. The most important feature of this bicycle is that is does not consume costly fossil fuel thereby saving cores of rupees. It is very eco-friendly and pollution free, as it does not have any emission. It is not for noise and can be reached with the AC adapter in case of emergency and cloudy weather. It can be charged to the electricity with the help of adapter. The operating cost per km a minimum around Rs.0.70/km. It can be driven by manual pedaling in case of battery is discharge. It has fewer component can be easily mounted or un-mounted. It is important to identify new ways of transport and generation of electricity and solar powered E-bike pools may just be such a case .E-bicycle are an order of more magnitude energy efficient than the car, bus and other heavy transport mode . Using solar panels at 0.2-0.8m2 per E-bike has been shown to be enough to supply the early energy demand by the e-bike pool dependent to simulated system usage.

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