Experimental Study of Home Automation by Bicycle Pedal Power Using of Different Sprocket

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Abstract- This study attempts to measure the optimal pedaling rates for given power output levels as well as design the optimal number of gears and the corresponding gear ratios. With respect to human performance and power efficiency, the gear system in typical multi-speed bicycles is often biased and redundant. The efficiency are increased by using of five different sprocket with having various teeth. A bicycle gear system is frequently designed without ergonomic expertise in terms of performance and efficiency. The optimal performance during bicycle riding, thereby facilitating the efficiency and effectiveness of human exercise using a bicycle.

Key Word- Gear ratio; Bicycle riding; Ergonomic design;

1 -Introduction- A preliminary user survey revealed that the average utilization of multi-speed gear system is less than 40%. Thus, hard to use because of the many number of unnecessary shifts. This study not only measures the optimal pedaling rates for given power output levels, but also designs the optimal number of gears and corresponding gear ratios. The measurement are obtain at five different power output levels (40, 80,120,140 and 160 W) and four different pedaling rate levels (60,100,125 ,150 and 175 rpm). Various riding conditions including slope gradient and cruising velocity are also converted to the equivalent power output level.

Pedal power is the transfer of energy from a human source through the use of a foot pedal and crank system. This technology is most commonly used for transportation and

has been used to propel bicycles for over a hundred years.

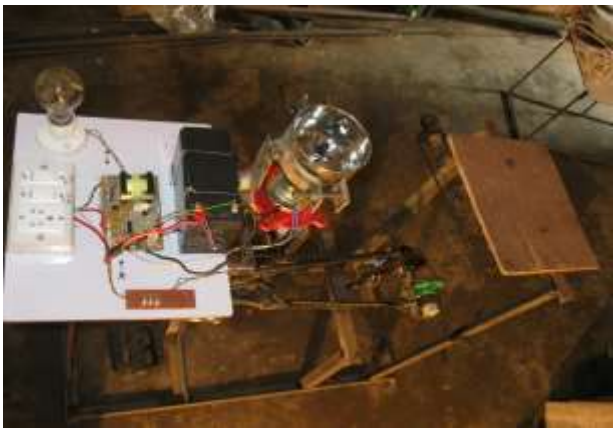

Figure 1.1 - Setup

Less commonly pedal power is used to power agricultural and hand tools and even to generate electricity

2- Pedal power-

Some applications include pedal powered laptops, pedal powered grinders and pedal powered water wells. Some third world development projects currently transform used bicycles into pedal powered tools for sustainable development. The articles on this page are about the many wonderful applications for pedal power technology.

3-Sprocket - The name 'sprocket' applies generally to any wheel upon which are radial projections that engage a chain passing over it. It is distinguished from a gear in that sprockets are never meshed together directly, and differs from a pulley in that sprockets have teeth and pulleys are smooth.

Sprockets are used in bicycles, motorcycles, cars, tracked vehicles, and other machinery either to transmit rotary motion between two shafts where gears are unsuitable or to impart linear motion to a track, tape etc. Perhaps the most common form of sprocket may be found in the bicycle, in which the pedal shaft carries a large sprocket-wheel, which drives a chain, which, in turn, drives a small sprocket on the axle of the rear wheel.

Sprockets are of various designs, a maximum of efficiency being claimed for each by its originator. Sprockets typically do not have a flange. Some sprockets used with timing belts have flanges to keep the timing belt centered. Sprockets and chains are also used for power transmission from one shaft to another where slippage is not admissible, sprocket chains being used instead of belts or ropes and sprocket-wheels instead of pulleys. They can be run at high speed and some forms of chain are so constructed as to be noiseless even at high speed.

4-Chain

Chain types are identified by number; ie. a number 40 chain. The rightmost digit is 0 for chain of the standard dimensions; 1 for lightweight chain; and 5 for roller less bushing chain. The digits to the left indicate the pitch of the chain in eighths of an inch. For example, a number 40 chain would have a pitch of four-eighths of an inch, or 1/2", and would be of the standard dimensions in width, roller diameter, etc.

The roller diameter is "nearest binary fraction" (32nd of an inch) to 5/8ths of the pitch; pin diameter is half of roller diameter. The width of the chain, for "standard" (0 series) chain, is the nearest binary fraction to 5/8ths of the pitch; for narrow chains (1 series) width is 41% of the pitch. Sprocket thickness is approximately 85-90% of the roller width.

5-Gearing

There are several gears available on the rear sprocket assembly, attached to the rear wheel. A few more sprockets are usually added to the front assembly as well. Multiplying the number of sprocket gears in front by the number to the rear gives the number of gear ratios, often called "speeds".

Figure 5.1 - Gearing

Hub gears use epicycle gearing and are enclosed within the axle of the rear wheel. Because of the small space, they typically offer fewer different speeds, although at least one has reached 14 gear ratios and Fallbrook Technologies manufactures a transmission with technically infinite ratios.

Causes for failure of bicycle gearing include: worn teeth, damage caused by a faulty chain, damage due to thermal expansion, broken teeth due to excessive pedaling force, interference by foreign objects, and loss of lubrication due to negligence.

6. Control panel

Figure 6.1 - Control panel

7.Test and analysis

Table 1. List of component

Sr No.	Name	Specification
1	D.C. motor	25 W
2	Five sprocket set	1 no.
3	Pedal set	1 no.
4	Chain	1 no.
5	Mixer	Small type
6	D.C. convertor	12v D.C. to 220v A.C.
7	Battery	12v dc 7.2 ah
8	Connection wire	1mm
9	Generator	DC type
10	stand	1 no.

Table 2.

Sr No.	Power in watts	Required RPM
1	40	60
2	80	100
3	120	125
4	140	150
5	160	175

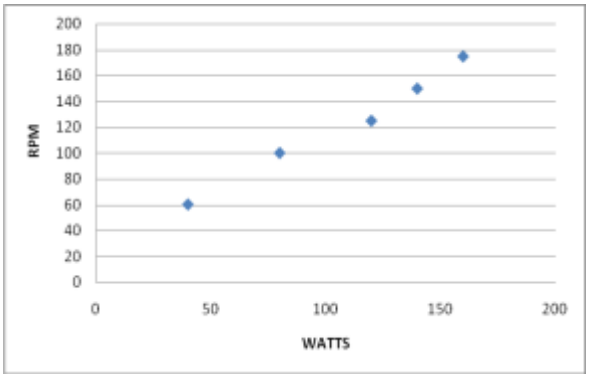

Figure 7.1 – Graph

8.Applications

Table.3

Sr. No.	Home Appliances	Required using of 12v dc motor
1	Food Grinder	40 watts
2	Washing Machine	85 watts
3	Small water pump	45 watts

Table.4

Sr. No.	Device	Power used with the help of dc convertor
1	CFL	28 watts
2	Mobile charger set	20 watts
3	Laptop	45 watts

9-Conclusion-

1.High power is obtain as 120 with the required RPM are 125 those measured by non contact type tachometer.

2.Results in this study imply that a fewer number of gears which are optimal can provide a performance equivalent to the multi-speed gear system. As expected, reducing the number of gears without a loss of physiological efficiency would result in easier gear shifting.

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