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Fabrication and Analysis of Bicycle Washing Machine

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Abstract

In many developing countries it is not possible to machine wash clothes due to the absence or scarcity of electric power or the absence of machine itself. Washing clothes by hand leaves one breathless and takes an awful amount of time. A washing machine is a machine designed to wash laundry, such as clothing, towels and sheets. Generally these machines have been powered by electrical energy but pedal powered machine runs with our energy. In order to overcome the limitations of conventional washing machine pedal based washing machines are implemented. Bicycle washing machines can be very useful for rural places in developing countries where electricity is out of reach. Moreover, in developed countries too, it can be used to save electricity and getting some work out. In this project fabrication and analysis of pedal based washing machine is done, performance parameters are calculated on the basis of load and weight at different speeds and graphs are drawn.

Keywords: Fabrication, Bicycle, Washing Machine.

Introduction

In the developing world, washing laundry is a difficult, time-consuming task that falls solely on women. People spend 8 hours each week scrubbing each piece of their family's clothing and wringing out the harsh washing solution by hand. However electricity charges are increasing now a days and the demand for electricity increases. Powered washing machines exist, but they are impractical in rural regions because running water and electric are expensive or unavailable. Several groups already tried to build machines for these regions but they have been unsuccessful. Their machines were either expensive to build and repair because they require imported parts or they do not wash effectively. A washing machine basically works in three cycles. These are washing, rinsing and spinning. Different mechanical parts work together to carry out each cycle.

A washing machine is a popular electronic home appliance, which is found in almost every household. In this fast age, a washing machine is highly popular because of its great utilities. It does the laundry quite fast, saving a lot of time and labour. It manages to do so, quite effectively and efficiently, as it follows a set wash process. Our invention is a low cost, pedal-powered washing machine that is designed around readily available parts. Its innovation is its simple design and its use of inexpensive plastic barrels and bicycle components. The pedal based machine is reliable, easy to operate and uses no electricity.

The parts are available locally, so they can be manufactured and repaired in the community without depending on imported goods.

Clothes washing are very specific to particular cultures, but most cultures perform the task in the same way. In almost all underdeveloped rural areas, people wash clothes by hand, using cold or lukewarm water that they carry from a river or pull up from a well.

Existing technologies for washing clothes do not work well in underdeveloped rural areas. Lack of electricity make powered machines unusable. Difficult transportation due to poor road conditions or just geographical distances creates problems with imported devices that might need replacement parts or maintenance repairs.

Our Pedal Based Washing Machine is novel because it solves the clothes washing problem in an efficient, affordable and practical way. To our knowledge, no one has successfully built a washing machine with these goals in mind.

Experimental investigation

Its innovation is its simple design and its use of inexpensive plastic barrels and bicycle components. It is reliable, easy to operate and uses no electricity. The parts are available locally, so it can be manufactured and repaired in the community without depending on imported goods.

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Working principle

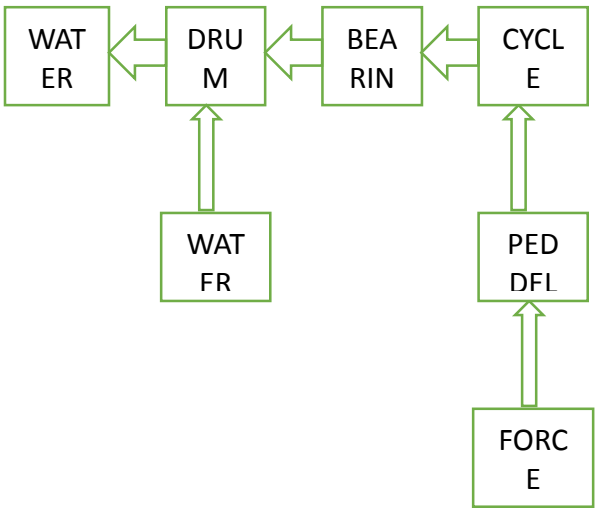
It is based on very simple concept. The basic idea is to use a stationary bicycle stand as the power source, and use an assembly of belts and pulleys to connect it to an washing tub. This machine has pedals which are connected with disc inside the drum or box. When we pedal, the disc inside the drum revolves with clothes and detergent; it started to work like any electric machine.

Hardware requirements:

1. Disc
2. Cycle
3. Bearing
4. Shaft
5. Driving and driven wheels
6. Bush

2.3 BLOCK DIAGRAM:

Block Diagram



Components of experimental setup

Fig 1: Cycle Arrangements (59x85x40) cm

Fig 2: Driving wheel (diameter 18 cm)

Fig: 3 Drum (28x28x59) cm

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Fig: 4 Driven wheel (diameter 8cm)

Fig: 6 Disc (diameter 18cm)

Fig 5: Drum Arrangement

Fig 7: Hub

Fig 8: Final set up

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Experimental procedure

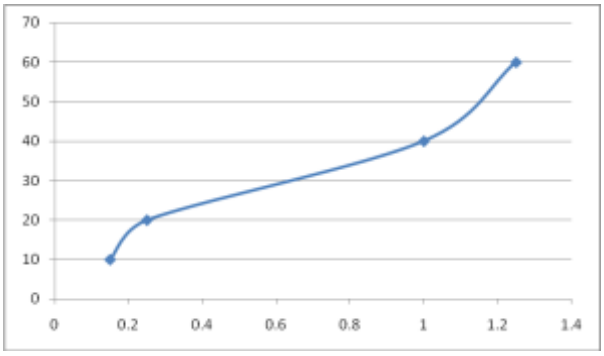
1. Fill the drum with water; pour enough amount of detergent powder.
2. Now dip the clothes in the drum and close the cover to avoid the water spilling from the drum. After covering the drum sit and start pedaling.
3. Measure the time using a stopwatch at different speeds and loads at different operating weights.

Results and discussions

Table 1:- If 50kg weighing person is pedalling with a constant speed of 60 rpm then the following table are obtained.

S.No	Speed(r.p.m)	Load(kg)	Time (min)
1	60	0.15	10
2	60	0.25	20
3	60	1	40
4	60	1.25	60

From above table the data is used for draw the graph at the speed of 60 rpm

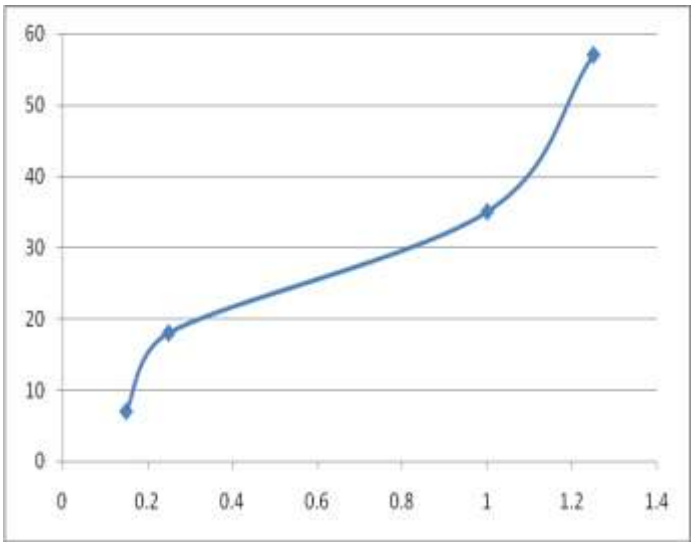


Graph 1: Load on x-axis vs time on y-axis

Table 2:- If 50kg weighing person is pedalling with a constant speed of 90 rpm then the following table are obtained

S.No	Speed(r.p.m)	Load(kg)	Time (min)
1	90	0.15	7
2	90	0.25	18
3	90	1	35
4	90	1.25	58

From above table the data is used for draw the graph at the speed of 90 rpm



Graph2: load on x-axis vs time on y-axis

Table 3:- If 50kg weighing person is pedaling with a constant speed of 150 rpm then the following table are obtained

S.No	Speed(r.p.m)	Load(kg)	Time (min)
1	150	0.15	5
2	150	0.25	13
3	150	1	29
4	150	1.25	52

From above table the data is used for draw the graph at the speed of 150 rpm

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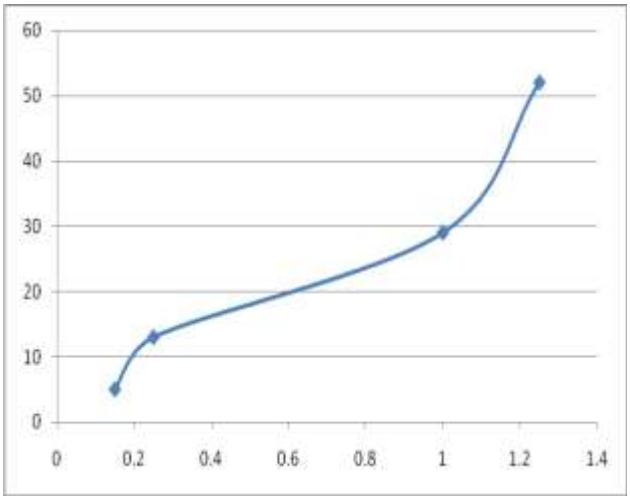
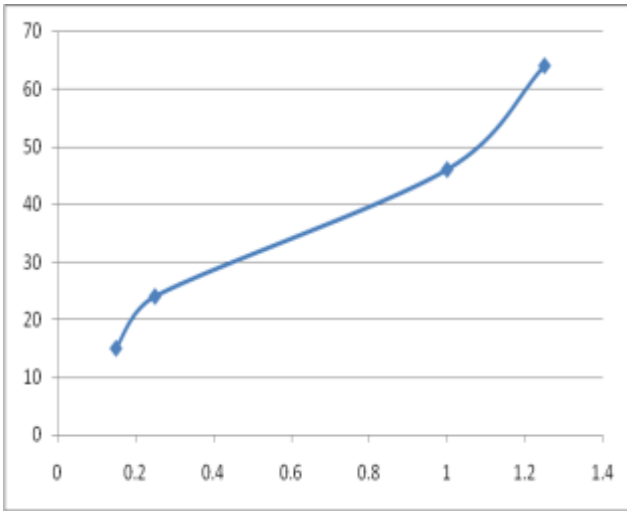


Graph3: load on x-axis vs time on y-axis

Table 4:- If 65 kg weighing person is pedaling with a constant speed of 60 rpm then the following table are obtained

S.No	Speed(r.p.m)	Load(kg)	Time (min)
1	60	0.15	15
2	60	0.25	24
3	60	1	46
4	60	1.25	64

From above table the data is used for draw the graph at the speed of 60 rpm

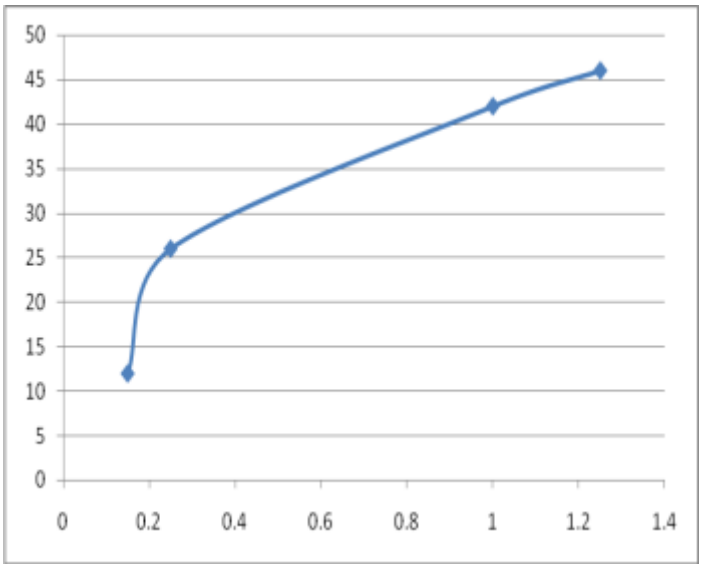


Graph4: load on x-axis vs time on y-axis

Table 5:- If 65kg weighing person is pedaling with a constant speed of 90 rpm then the following table are obtained

S.No	Speed(r.p.m)	Load(kg)	Time (min)
1	990	0.15	12
2	90	0.25	26
3	90	1	42
4	90	1.25	46

From above table the data is used for draw the graph at the speed of 90 rpm



Graph5: load on x-axis vs time on y-axis

Table 6:- If 65 kg weighing person is pedaling with a constant speed of 150 rpm then the following table are obtained

S.No	Speed(r.p.m)	Load(kg)	Time (min)
1	150	0.15	12
2	150	0.25	18
3	150	1	35
4	150	1.25	57

From above table the data is used for draw the graph at the speed of 150 rpm

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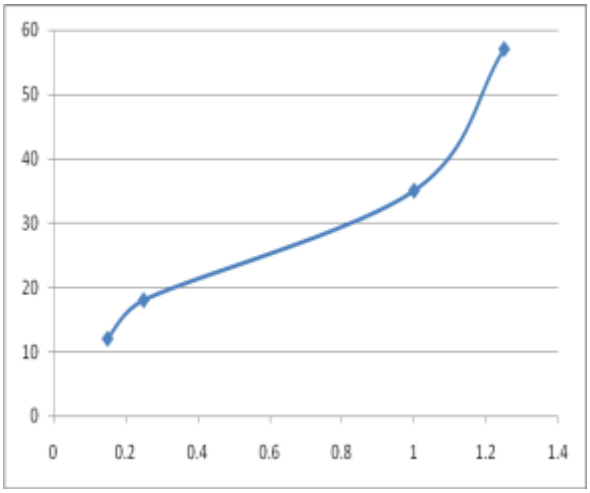
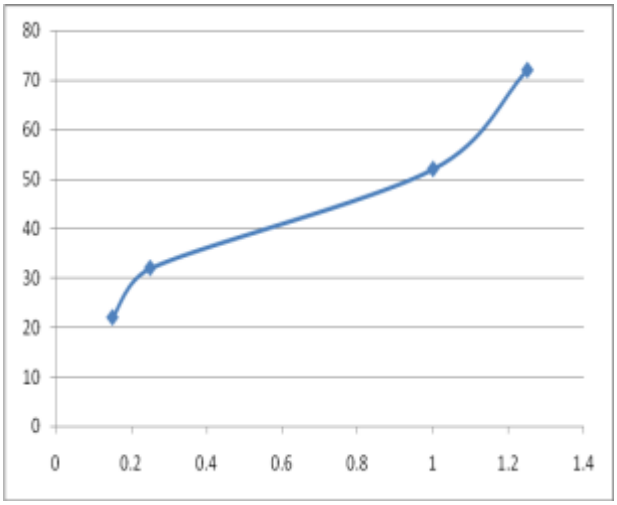


Graph6: load on x-axis vs time on y-axis

Table 7:- If 80kg weighing person is pedaling with a constant speed of 60 rpm then the following table are obtained

S.No	Speed(r.p.m)	Load(kg)	Time (min)
1	60	0.15	22
2	60	0.25	32
3	60	1	52
4	60	1.25	72

From above table the data is used for draw the graph at the speed of 60 rpm

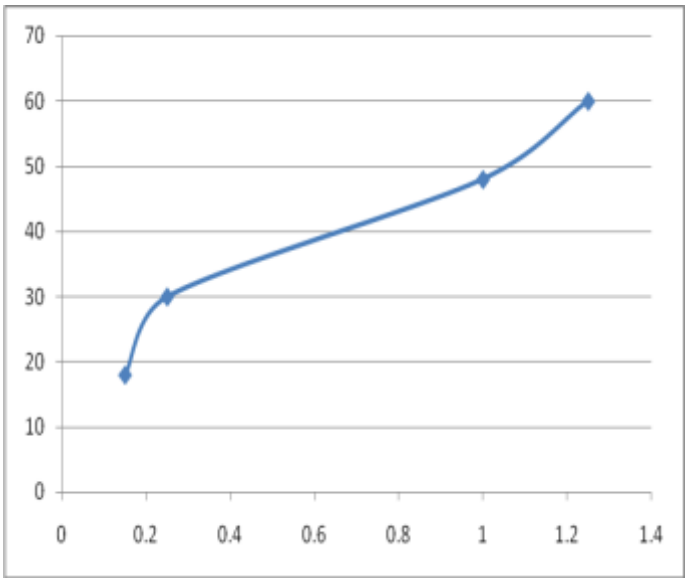


Graph7: load on x-axis vs time on y-axis

Table 8:- If 80kg weighing person is pedaling with a constant speed of 90 rpm then the following table are obtained

S.No	Speed(r.p.m)	Load(kg)	Time (min)
1	90	0.15	18
2	90	0.25	30
3	90	1	48
4	90	1.25	60

From above table the data is used for draw the graph at the speed of 150 rpm



Graph8: load on x-axis vs time on y-axis

Table 9:- If 80kg weighing person is pedaling with a constant speed of 150 rpm then the following table are obtained

S.No	Speed(r.p.m)	Load(kg)	Time (min)
1	150	0.15	16
2	150	0.25	28
3	150	1	42
4	150	1.25	58

From above table the data is used for draw the graph at the speed of 150 rpm

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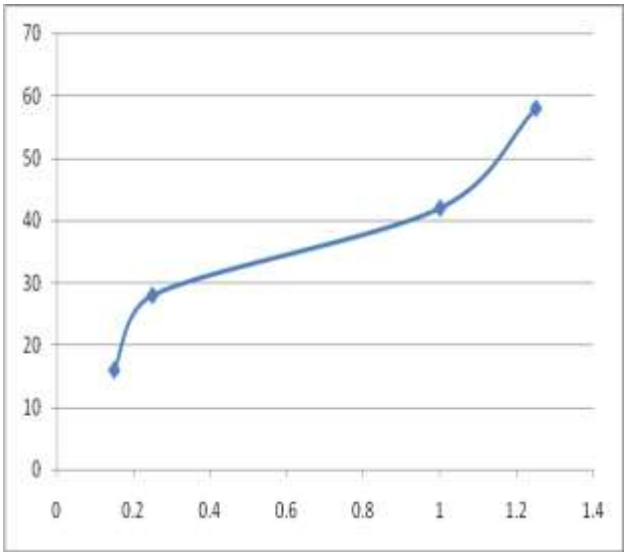

Graph 9: load on x-axis vs time on y-axis

From the above experiment the optimal speed is for different loads are

1. For 50 kg person peddling then optimal condition at 60 rpm, clothes weighing 1.25 kg.

2. For 65 kg person peddling optimal condition is at 90 rpm clothes weighing 1.25 kg.

3. For 80 kg person peddling optimal condition is at 150 rpm clothes weighing 1 kg.

Conclusion

1. A lot of electricity is consumed in households through washing machines. This not only adds to the environmental problems but also adds to our financial woes at a time when prices of everything are soaring all over the world.

2. Our Pedal Based Washing Machine aims to address both the issues. Moreover, pedalling can be a good exercise that you can do without having to hit the gym for your daily exercise.

3. The washing machine has greatly influenced people's life styles by providing easy means of washing clothes and drying them out to a considerable extent.

4. It not only saves time and amount of water used but also helps the user to wash and dry clothes with a lot of ease due to its fully automatic nature.

Future scope

1. We can go for circular cross section type of drum also for washing and to increase efficiency of the system.

2. Vertical type of drum also can be used for increase efficiency of the system.

3. Pedal powered machines would be ideal in the present context of our changed lifestyle and search for alternative 'green' sources of power.

4. Not just this, these machines are eco friendly as they do not contribute to environmental pollution.

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