

Study for The Manufacturing of Manually Operated Washing Machine

Pramod H. Sahare¹

pramodsahare@yahoo.com

Tejswini Madavi²

Balaji S. Kamble²

Manish J. Kajliwale²

Arti Dhurve²

Mrunal Ataram²

¹Assistant Professor,
Department of Mechanical
Engineering, Rajiv Gandhi
College of Engineering,
Research and Technology,
Chandrapu, Maharashtra, India

²Students, Department of
Mechanical Engineering, Rajiv
Gandhi College of Engineering,
Research and Technology,
Chandrapu, Maharashtra, India

Abstract— A manually operate machine is the exchange of energy from a human source to a required mechanism. A pedal operated mechanism is most ordinarily utilized for transportation and has been used to drive bicycles for over a hundred years. A pedal mechanism is used for the manufacturing of manual washing machine where pedal power is utilized for run mechanism for washing of cloths. A machine is specifically designed for rural areas where electricity is not available with several mechanical components. A machine transmits power through a pedal mechanism that transforms mechanical energy into a work. Another person is capable of providing multiple times higher power (1/4 HP) through pedaling and continual pedaling, i.e. around ten minutes for machine washing of clothing. As a result, a pedal-operated washing machine with a chain mechanism can move to rotate a drum in order to wash clothes over a certain period of time and also reduce human stress.

Keywords— Pedal Powered, washing machine, manually operated

I. INTRODUCTION

A pedal-powered washing machine would enable ladies to wash clothing faster and less stressfully. When asked how they could deal with their time, ladies said they would try to make a payment by making works of art or selling food. Young girls helping their moms with homegrown orders can also have the opportunity to concentrate more on their tests. Miniature washing machines can even come up when our washing machines are efficient. Conditions in farming nations change, yet ladies in many districts physically wash clothes, while doing more beneficial or

rewarding work elsewhere. [1-2].

Some nearby Central America and Africa associations have just expressed interest in innovation driven by pedals. In contrast to powered or non-renewable energy-controlled gadgets, it is a reasonably environmentally friendly option. Because it depends on the segments of the bicycle, local machines can be manufactured and fixed components are reasonable and accessible. We are confident that we will ensure the delivery and maintenance in every culture where bicycle innovation exists. We will support women in agricultural countries around the world in carrying fitting innovation and opportunities. [2-5].

The main aim is to use a fixed bicycle as a source of strength and to connect it with the washing bathroom with a collection of belts and pulleys. This machine has pedals in the drum or box connected to the plate. At the time of pedaling, the cycle in the drum rotates like an electric machine with clothing and cleanser.

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A. Problem Statements

Ladies wash their garments physically in the public arena, but the cleansers artificially destroy their hand, and the muscles are stressed by the movement of scouring. It is likely that we plan a modest and strong pedal-controlled washer for tender washing in country areas. Due to cost constraints, the clothing rinser should be shared among a few families or used for running a washing administration by a neighborhood business visionary. The washing machine must be everything but difficult to build and maintain locally with nearby material, simple to work (required advances are insignificant) and easy to control by women or young people. It should also be useable more than manual and socially dignified strategies in the public sphere.

II. PARTS OF PEDAL WASHING MACHINE

A. Pedal Arrangement

The bicycle part that drives a rider with his foot to move the bicycle is a bicycle pedal. It connects the foot or the shoes of the cyclist to the wrist so that the leg turns the base axle and drives the wheels of the motorcycle. The pedals are usually an axle stringed at the end and a body attached or attached to the stands, which may be activated by the course of the shaft.

Initially, the pedals were mounted directly on the specified wheel (usually front). When the pedals have been attached to an arm that pulls the power transmitting. As it is known today, the safety bicycle was made available to the given wheel using a roller chain.

B. Bevel Gear

Bicycle equipment comprises a bicycle drive train which decides how fast the pedals, driver speed and driving wheel velocity are connected to the bicycle.

If a motorcycle is to travel at the same speed, the rider must pedal faster but less powerfully, using a lower gear (high mechanical advantage). Higher materials give a certain rhythm a higher rate (less than a mechanical advantage) but require the rider to exert a greater strength.

The rhythm and speed may be accelerated by different cyclists. Excess power consumption at too low averages can increase the likelihood of knee damage; after short blows, rates over 100 rpm are less effective than during a run.

C. Bearing

Orientation is a component of machinery which only ideally forces relative movement between moving components. For example, the plan for weight can allow the freely straightforward development of the moving component, or it can predetermine a movement by controlling the vectors of the common powers on the moving parts in the hope of a complementary revolution. Type of activity, motion or heap (power) used to perform the parts is extensively characterized in the header.

D. Chain and Sprocket

When making your own vehicles, it is possible, because it is a reasonable, simple, and profoundly effective system, that the picked-up movement framework will be a chain drive. Bicycle chains are very simple and require only one sensitive connection removal tool. Due to the frequent need for a majestic cycle, you should know a chain that is one and a half times the length of a standard bicycle chain, as the chain for your vehicle will have to be built. The chain width of each type varies greatly from 3/32" to 1/8" with a pitch of 1/2 inch.

The single-speed bicycle chain is wider and 1/8 inch wider. This type of chain does not adapt to a freewheel multiple speed or to a derailleur. It has a much greater side-to-side flex to allow it to function properly using a derailleur frame. Adaptability of a multi-speed framework is significant because the arrangement of the front and the back chain rings can be shut by up to five inches, according to which r is the most widely known. The Multi Speed Chain is available with different widths with a width of 3/32."

E. Shaft

Shaft is a mechanical part of torque/revolution transmission, usually used to associate various parts of a

drive train that cannot be easily linked because of their separation or the necessity to take account of their relatively different trends. The drive shafts are forces carriers: they depend on the pressure of twist and height, similar to the difference between the strength and the heap of information. They should therefore be capable of tolerating the pressure sufficiently while avoiding excess weight, so as to increase their inactivity. Driver screws often fuse at least one general joint, jaw joints, or cloth joints and, in some cases, a splined joint or prismatic joint to take into consideration variants in the arrangement and distance between driving and driving segments.

F. Shaft Collar

In many force transmission applications, most remarkably motors and gearboxes, the shaft collar is a basic yet important machine piece. The necklaces are used as mechanical stops, section findings and bearing faces. The simple plan fits into a simple institution. Many people are comfortable using Meccano with shaft collars.



Figure 1: Mechanism for transfer of torque from pedal to tub

G. Washing Chamber

It is only a room in which water is filled with additional detergent towels for rinsing.

Cleaning: Machine-washing clothing must be just as perfect for 5 minutes with the hand-washing: you must wear clothes at a slower rate than hand-washing.

Limit: At least 5 lb garments/load – should be hard to rebalance.

Water: Effective washing must be done at temperatures of 70-120°F in delicate and hard water.

Use of water: max. 15L water/1 kg clothing.

Dynamic acceleration time for viable washing: for washing and fluffing cycles, maximum 20 minutes each.

Total time of activity: maximum three hour, which shall include water bringing, filling, watering, washing, depleting and cleaning power: maximum 100W (satisfactory level of human-power yield)

Materials: Vicinity (wood, weldable metals, oil drum, bicycle parts, and so on)

Measures: less than the combined size of a bicycle and a laundry.

Weight: max. 30kg or 45kg if she has wheels off (one lady can move her inside to avoid harm or damage).

Socially worthwhile: appropriate appearance, position of the customer and movement, with the goal of most women using the machine.

III. DESIGN PARAMETERS OF MACHINE

The design parameter for transmission of power from pedal mechanism to shaft with tub are calculated. A standard diameter of shaft is taken as 22 mm with 36 cm length which transmits a torque of 62.72 N-m. A bevel gear connected between tub and smaller pulley at 90 degree having pitch circle diameter is 3 mm with screw length 1.4 mm. All other parameters are given in table 1.

A. Cycle Frame Arrangement

The main part of a bicycle that is fitted with other components is a bicycle frame. The cutting edge and most regular border plan for a raised bicycle depends on the wellbeing bicycle and includes a primary triangle, a matched rear triangle and two triangles. The precious stele edge is called this. The articulation of the edges with

various materials and forms requires strength, hardening and lightweight.

TABLE 1

DESIGN PARAMETERS OF PEDAL OPERATED WASHING MACHINE

Sr. No.	Parameters	Value
1	Diameter of shaft	22 mm
2	Design torque	62.72 mm
3	Length of shaft	36 cm
4	Pitch circle diameter of bevel gear	3 mm
5	Number of teeth on bevel gear	26
6	Screw length	1.4 mm
7	Hole of key	5 mm
8	Diameter of bearing	17 mm
9	Diameter of pinion	20 mm
10	Diameter of gear	35 mm
11	Gap between center of two teeth	3 mm
12	Module	1.5 mm
13	Width of gear face	10.5 mm
14	Cone length	20.15 mm



Figure 2. Cycle Frame Arrangement

IV. WORKING OF PEDAL WASHING MACHINE

The tubing is rotated according to the rotation of the wheel in this project. For the transmission of torque from wheel to wheel a chain drive mechanism is used. When a single starter peddles, the sprocket shaft is turned off and the torque is transferred by the chain drive to the wheel shaft. The transmitted power is then transferred to the tub via the bevel gear via the smaller slip connected to the frame. This transmits the torque from the pedal mechanism to the bath, which depends entirely on manpower.

The tub is filled with cloths powder and water for washing. The water level can be maintained as required by an individual. When a tub has been ready to be washed, it can be turned over the pedal mechanism by transmitting

power. The torque necessary for washing is high, because the bath is filled with water and cloths. Washing time may vary as per the health of an individual who applied force over pedal. Once washing is complete, one can remove water from tub and again rotate tub for rinsing. A manual washing machine is therefore operated.

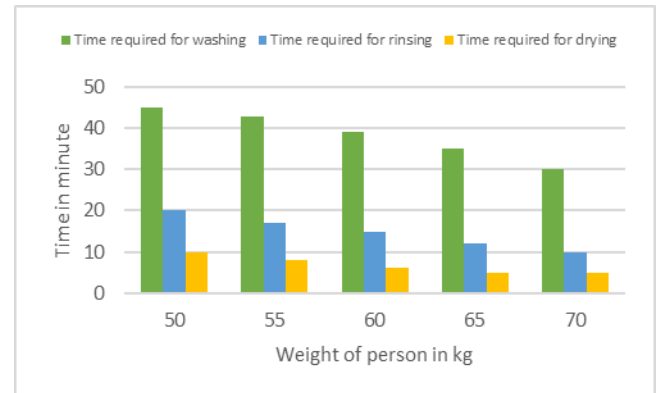


Figure 3: Time required for washing, rinsing and drying

To check the result of manual operated washing machine, some case studies are considered i.e. as per health condition of an individual. The maximum weight capacity of machine for washing is 5 kg. The case studies are given in figure 3.

V. CONCLUSION

In case of receipt into the network, the machine must be economical and easy to build. In the light of minimum effort, we perceived this need and planned the machine from the start. The machine contains only parts that can be accessed immediately in rustic areas. The need to apply or import parts for the washing machine is dispensed with. The machine also uses bicycle components for all the precision components. These parts are extremely cheap because of the overflow of unused bicycle components in the provinces. We will carry out various preliminaries with neighborhood ladies to help energize the appropriation of the washing machines, so we can change the plan to deal with the issues. We run the tests on bundles like the pleasant ladies, now familiar with pedal-controlled machines; they have just shown that they are happy to try new innovations. In the absence of a good acknowledgement and use of the machines women are then

filled up in their neighborhood network as spokesmen for the new machine. Their assistance will greatly strengthen the validity of this machine so that neighborhood people try it. For example, we have accomplished our aim of building a physically determined, minimum stress clothing washer that can be easily washed and flushed by locally accessible materials. The washers don't consume power in our clothes. During exercise and activities, the clothes washer can also be used by metropolitan people. It can meet duplicate requirements. During cycling, clothing can be washed with the individual's acceleration. In case this washing machine is produced at the business level, the absolute machine production cost may then be reduced to 40% of the estimated cost.

REFERENCES

- [1] Tawanda Mushiri, Tererai J. Mugova, Charles Mbohwa, "Design and Fabrication of a Pedal Powered Washing Machine", Proceedings of the International Conference on Industrial Engineering and Operations Management Bogota, Colombia, October 25-26, 2017.
- [2] Pal Pandian P, Salinpaul Valooran, "Design and Fabrication of Pedal Power Top Loaded Washing Machine", International Journal of Innovative Research in Science, Engineering and Technology, Vol. 4, Issue 8, August 2015. DOI:10.15680/IJIRSET.2015.0408191
- [3] Prof. G. S. Jagushte, Akashdeep Singh, Gourang Bhatawdekar, Salman Budye, Nilesh Chiplunkar, "Design and Fabrication of Pedal Powered Washing Machine", Journal of Advance Research in Mechanical and Civil Engineering, Volume-2, Issue-3, March, 2015.
- [4] Ajay, R. S. Jadoun, Sushil Kumar Choudhary, "Design and Fabrication of Manually Driven Pedal Powered Washing Machine", Innovative Systems Design and Engineering, Vol.5, No.6, 2014.
- [5] Hari Babu, A.V., Dr. Subba Rao, Naresh, P., Madhava, V. and Sudhakar Reddy, "performance of a peddling washing machine", International Journal of Current Research, Vol. 8, Issue 9, 2016.