

Sustainable Washing Machine Design

1. Introduction

This article is about sustainable washing machine design.

The designs shown in this article do not include the use of timing belts or gears. However, gear motors can be used. The basic idea is to use wheels with tyres (inflated or solid rubber wheels) to rotate the washing machine cylinder filled with clothes and submerged in water.

Placing the motors at the top of the washing machine will prevent water damage to the motors and also reduce the risk of short circuits.

All motors in this article are connected in series or parallel, eliminating the need for separate control signals for each motor. However, series connection will require a higher voltage input. That means the motors will spin in the same direction.

The motors control system might not require 240 V mains AC power supply or PWM modulation signal controls.

2. History

The idea of using a direct drive floating washing machine cylinder is not new. This is when a washing machine cylinder filled with clothes is suspended in the air and rotated with electromagnetic forces. This idea requires expensive and complicated control systems. This research began in the 1980s and over the years there have been successful implementations of such systems.

For decades many people considered creating washing machine design similar to the dishwasher designs where the clothes are simply sprayed with water pumps and heated at high temperature to kill bacteria thus eliminating the need for using high power electrical motors and complicated and reliable mechanics.

3. Cross Section View

Cross section view shows the tap water fill system.

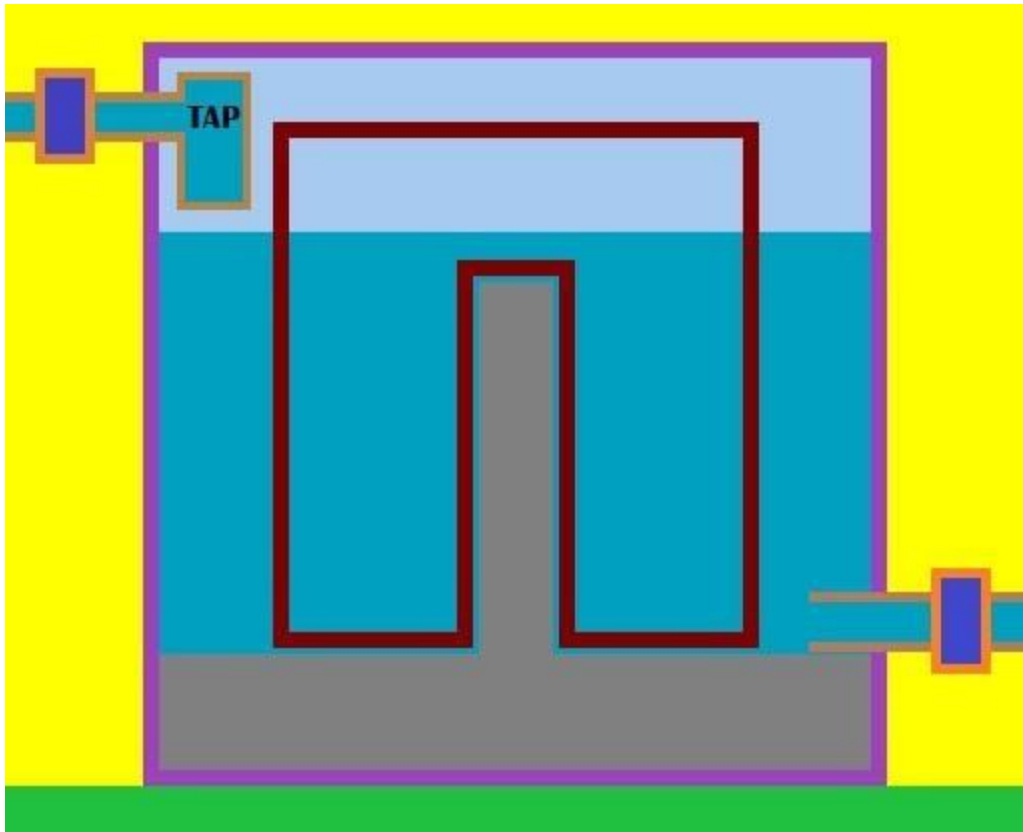


Figure 1: Cross Section View

The water filling system can consist of two taps (hot and cold water). A water sensor can activate tap control that will stop the water flow.

There is also an option of implementing a cheaper and more sustainable manual water control system, consisting of two taps. One for allowing water to flow in and one for allowing water to flow out.

4. Two Motor Design

Two motor design consists of two motors:

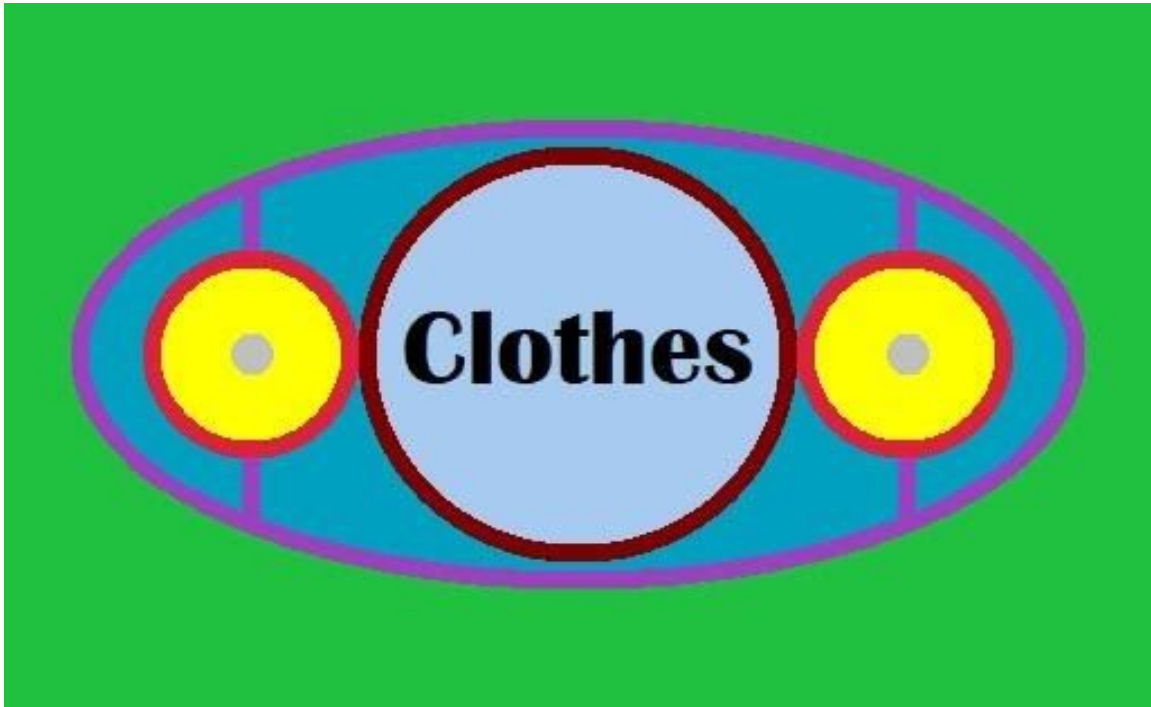


Figure 2: Two Motor Design

The main challenge is creating an oval shape encasement for the washing machine. This design might not be the most compact design of all the washing machines. Also, two motors alone might not be able to sustain the weight of the clothes submerged in water.

5. Three Motor Design

Three motor design is useful for placing the washing machine in the corner.

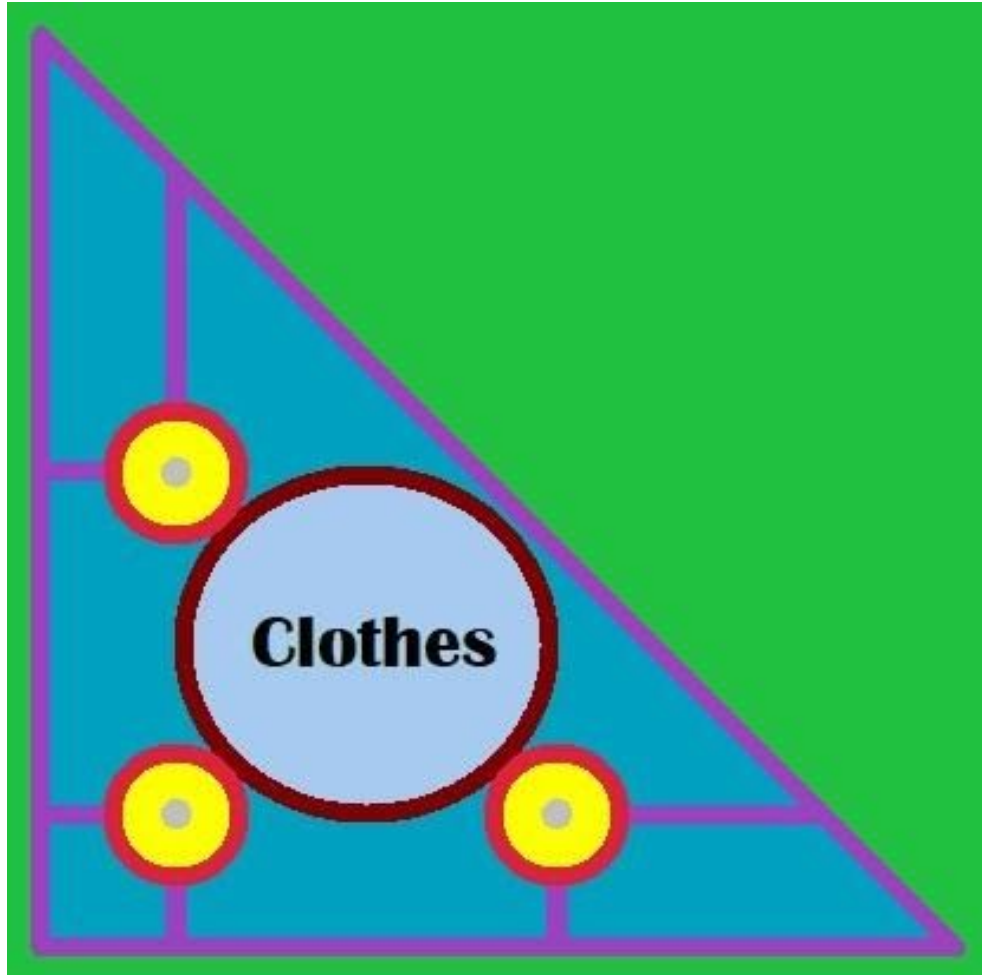


Figure 3: Three Motor Design

You can see that using three motors does not significantly increase the size of the washing machine.

6. Four Motor Design

Four motor control system is made from four motors all spinning the clothes cylinder.



Figure 4: Four Motor Design

Each additional motor reduces the mechanical and electrical pressure of each motor, thus presenting stalling that might damage the control system and cause an electrical fault.

7. Using Five or More Motors

Five motors control design is also possible with the use of pentagon metal encasement. Six motors can be used with hexagonal encasements.

A good way to increase washing machine power is adding additional levels of motors, one level on top of another. However, such a solution might significantly increase the height of the washing machine.

8. Materials

The washing materials include:

- metal/wooden barrels:
 - recycled,
 - wooden.
- metal/wooden encasement:
 - aluminium/iron,
 - plastic,
 - thin wood.
- control systems (placed at the top of the washing machine):
 - motor drivers and oscillators (triac, relay, transistor),
 - PWM (Pulse Width Modulation) controllers.
- wheels:
 - old trolley wheels,
 - go kart wheels,
 - remote control monster truck wheels.

The metal encasement can be used as a heat sink, although such implementation can cause an electric shock with the use of 12 V supply it is not likely that you will be electrocuted. However, there is still an increased risk of short circuits. Other causes of short circuits include water almost reaching the top of the washing machine.

9. Conclusion

This article does not include the details of the various materials that can be used for implementing a sustainable washing machine.

The main risk of building your own machine is not only the electrical faults but also the clothes cylinder not spinning due to insufficient power in the motors, thus creating the need of using gears for rotating the wheels.

10. References

1. https://en.wikipedia.org/wiki/Direct-drive_mechanism
2. https://en.wikipedia.org/wiki/Washing_machine
3. <https://www.youtube.com/watch?v=TikBSN6nP4>