

Design and Fabrication of Sustainable Dish Washer

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Abstract— design and fabricate Sustainable Dishwasher that is efficient and overcome the human work. In market existing dishwasher, the spray arm is not sufficient to spray water in each part of the dish. So keeping this in mind, we designed the rack and spray arm in center of the machine which will spray the water equally and effectively in each and every area of dish. The machine has less cycle time, less energy consumption, less water required for cleaning as compare to manual machine. This Concept discusses the problems faced in Automatic Dishwasher and solutions on those problems. Automatic dishwasher uses large amount of energy, time and is costly. As it is costly, the usage of automatic dishwasher in our country is very less, by using semi-automatic dishwasher, time, cost and human efforts can be reduced significantly. Also by using Galvanized iron material for inner & outer part, the overall weight of the assembly is also reduced.

Index Terms— Energy consumption, Rack, Spray arm, Sustainable Dishwasher.

1 INTRODUCTION

Washing dishes is most commonly done activity in the world wide, in most of families people wash dishes by hand which is straining to muscles and detergent is chemically harmful. As far as manual process is concerned in houses of India, washing is done by hand scrubbing which is straining to the muscles through its energy and postural requirements. It may also lead to clinical, anatomical disorders and back pain which may affect the operator's health. Many of their household chores are performed by the women and some can be very physically challenging and time consuming. So in several ways in which we can improve their lifestyle, and one aspect that we can improve on is the way they wash their dishes. Currently the chore of washing dishes is performed by the women, and can be very labour intensive as it is done for up to several hours each week. The same can be experienced in marriage ceremony with caterers. In today's world of Automation Era it is barely possible to find any field that implemented atomization which reduces Human effort, improves Production rate and also increases Efficiency. Then it could be the biggest manufacturing industry, Pharmaceutical industry, Hospitality field and even Household or Kitchen automation. But still our country is not getting enough benefits from automation and the reason behind this limitation is less Knowledge about automatic products, High device cost, and kind of nascence feeling about atomized devices. However this fear is not seen in the product which does not involves much Sensors, Complex Electronic Circuits and simple easy

User Friendly devices.

The very familiar example of Automatic dishwasher. This automatic dishwasher is used on mass scale in foreign countries, however the same is rarely seen in our country.

A dishwasher is a mechanical device for cleaning eating-utensils and dishes. Dishwashers can be found in private homes and hotels. Unlike manual dishwashing's, which depend largely on physical scrubbing to remove soiling, the mechanical dishwasher cleans by the brush and by spraying water, at the dishes. A mix of water and detergent is circulated by a pump. Water is pumped to one or more rotating sprays arms, which blast the dishes with the cleaning mixture. Once the wash is finished, the water is drained. After the rinse cycle finishes and the water is drained, and the dishes are left in the atmosphere for drying. The function of the dishwasher is to provide the Mechanical action necessary to distribute and direct the detergent solution and rinse waters over, under and around the dishes to loosen and remove soil. The dishwasher must also remove soil-laden waters from the machine after each phase of the cycle and provide for the drying of utensils after the cleaning process has been completed.

2 DESIGN

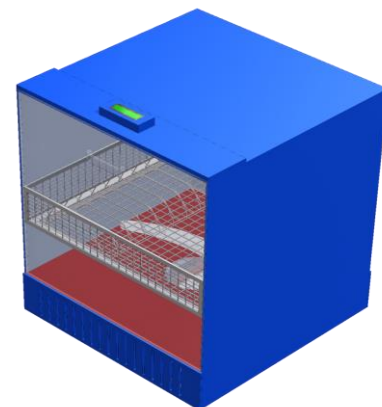


Fig 1: Dishwasher

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This Dishwasher is designed in such a way that, the dishware is placed in a wire rack, called basket. The rotating arms of the dishwasher is placed on both top and bottom of the tray with some clearances. In the bottom part of the dish washer there is a Space provided for the mechanical and electrical equipment's. The below figure1 Shows the isometric view of dishwasher. The working of the dishwasher is represented in the flow chart figure.

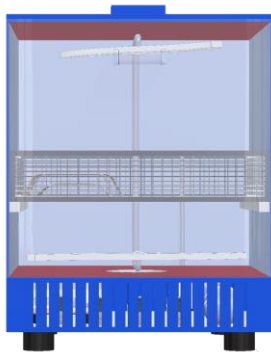


Fig 2: front View of Dishwasher

The figure 2 shows frontview of the Dishwasher represents the rack position and and the rotating nozzles positions. The bottom part is provided for the Mechanical and Electrical equipments of the other parts. The dimensions for the dishwasher is 508x508 x609.6mm (L xB xH) making it compact for the space.

3 DESIGN & PARTS ANALYSIS OF BASIC DISWASHER STRUCTURE

Semiautomatic dish washer consist of motor with centrifugal pump in which water is flow through PVC pipes which is connected to rotary jets which is in upper side and downward side. Pump is help to rotate the jet. These jet are sprinkling the water with required pressure on the plates. Regulator is provided in the machine which controls the operation of machine. Water consumption of this machine is depends on customer. Time, water and energy consumption are very less.

Motor is used to convert electrical energy to Mechanical energy. When electrical energy convert to mechanical energy, water suck by centrifugal pump and it passes through pipe to rotary jet which is parallel connected. Rotary jet throws the water into plates and at some pressure for cleaning purpose. Semi-automatic dishwasher combines water and detergent into very effective cocktail then sprays it against the dishes. The dishwasher then pumps out the water containing food particles that have been removed from the dishes, and rinses the dishes with clean water and a rinse agent. After pumping out the rinse water, leave the dish for drying.

4 DESIGN CONSIDERATIONS

When designing for sustainability, it is important to look into every phase of a product's lifecycle, from raw materials and manufacturing to end of life. For electronic products, it is often in the use phase where the greatest environmental impact occurs and this phase offers a great potential for improvements. When making efforts in reducing the environmental impact of the use phase, this is often done by making the product more energy efficient, with little attention paid to the user's involvement. But the environmental impact during use is strongly affected by the way that users interact with the product.

- Have the potential to be more sustainable than manual dishwashing
- Not reduce the amount of workspace in the kitchen
- Encourage a sustainable handling of dishes
- Be applicable in a modular and compact kitchen
- Be easy to clean
- Be easy to use and to understand
- Be a natural part of the workflow in the kitchen

UTENSIL GRILL

Utensil Grills used in semi-automatic dish washer is to carry the number of plates, Bowls, cup, spoons and other utensil for washing purpose. It consists of SS (Stainless steel) it is easily available and low cost. For larger and heavier items such as plates, serving platters, saucepans, bowls, etc., upper grill used. Place very large plates in the center of the basket. When tilted, plates up to 35 cm in diameter can be accommodated. The spikes at the front are used for washing plates, soup bowls, platters, dessert bowls, and saucers. The spikes can be lowered to make more room for large items, e.g. pots, pans and dishes.

7 GALVANIZED IRON (GI)

This iron or steel is steel that has been coated with zinc oxide in order to prevent rusting corrosion. These iron is used for making inner and outer body of dishwasher. Normally stainless steel is used for making body of automatic dish washer, but they have required three coating to prevent corrosion and rusting which is costly. But GI is less costly than metal steel. Sometimes the galvanizing process is referred to as hot dip galvanizing. The zinc forms a barrier against corrosion in that the steel underneath does not come into contact with water / moisture in the air.

8 WORKING

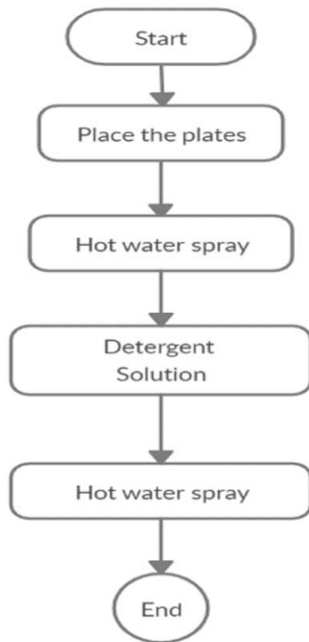


Figure: 3 Flow Chart

The sequence of working of the Dishwasher is represented in the flow chart in the figure 3. Once you place the plates on the tray you will close the door and we will start the machine. Machine start spraying the fresh water on the plates and leaves for a while later it will starts spraying the detergent solution on the plates and it will rinse the plates with detergent solutions, later for the final wash of the plates the hot water is sprayed on the plates to remove all the dirt from the plates. The final wash is carried with the high pressured hot water spraying on the plates this will complete the washing cycle.

9 CONCLUSION

From the study and comparison of automatic and semi-automatic dish washing machine, it is clear that function of both machine is same like washing dishes, utensils, cups, glasses, spoons etc. But their construction and working are different. Following are the conclusion of semi-automatic dish washer.

- The performance of the machine is better than Automatic dish washer and manually dish washing.
- Capacity of machine to wash more plates in less time.
- Low maintenance and easy to operate.
- Design is simple and very efficient.
- Less time and water consuming machine.
- Cost is less than automatic dish washer.
- Every component of this machine is easily available in market.
- Semi-automatic dish and utensil washing machine can be purchased by every type of customer

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