

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 9, Issue 2, February 2020

Semi-Automatic dishwasher cum washing machine for smart city

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ABSTRACT: This work represents the new and simple design of semi-automatic mechanical dishwasher. The design over comes the high cost and large space required to previous dishwasher and the main objective of Automatic Dishwasher cum washing machine is to reduce the cost of fully automatic dish washing machine and give good cleaning performance. By using semi-automatic dishwasher, we can reduce time as well as human efforts significantly and also by using plastic material for casing part and trays are made by the plastic material so the overall weight of the assembly is also reduced and we can use it as semi-automatic dishwasher as well as semi-automatic washing machine. This is two in one machine with the same technology and it requires less energy and less water consumption. Time of washing dish can be adjusted as per customer requirement. In this system simple principle is used to clean utensils of washing dishes that have been placed on the racks inside the machine with back and forth rotational of water this system will be used to clean utensil from all side.

KEYWORDS: Dishwasher, Washing Machine

I. INTRODUCTION

Washing dishes is most commonly done activity in the world, in most of families people wash dishes by hand which is straining to muscles and detergent is chemically harmful and it take much time of the people to clean the utensils . 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 timeconsuming. 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 labor 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. This automatic dishwasher is used on mass scale in foreign countries; however the same is rarely seen in our country, so we simplify this design and processes for our country peoples.

II. LITERATURE SURVEY

In Literature survey of Dishwashing Machine many inventions had been done about this project. Many solutions have been provided to focus on issue of Automatic Dishwashing System. In 1917, Mrs. Cochrane introduced an electric motor to operate the centrifugal water pump^[1]. In this solution she also introduced the spraying arms. In that model, the

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rinse phase was also introduced. The Walker Brothers Company patented a dishwasher machine^[2]. In the 1950s, the automation dishwashers machines did not washes dish well, their technological level started to improve quickly so that the transition from hand to automatic washing. The introduction of electric appliances in modern kitchens, has determined the born of a new era and the dishwasher manufacturers have seen a rapid increase of the production volumes for this appliance^[3]. In paper “An automatically Controlled Dishwashing Machine” written by “Wesley C. Cox” they conclude that in order to improve the Dishwashing process without human Efforts and the removal of any bacteria which may remain by rinsing with clear water. The essential steps in washing of eating utensils are the removal of all soil by washing for the optimum length of time with water in which a suitable detergent has been added in proper concentration^[4]. In paper “Field Studies on Two- and Three- Compartment Sink Manual Dishwashing” written by Morris a. Shiffman, They observe that improperly cleaned and sanitized dishes constitute a health hazard. There is no question that used dishes and silverware carry mouth microorganisms. Mallmann and Devereux in 1935 examined beverage Glasses for the presence of streptococci^[5].

III. COMPARISON BETWEEN AUTOMATIC AND SEMI-AUTOMATIC DISHWASHER

IV.

From the analysis and comparison between Automatic dishwasher and Semi-automatic dishwasher as shown in Table 1.

Table 1 Comparison between automatic and semi-automatic dishwasher

Description	Automatic Dish Washer	Automatic Dish Washer Cum washing machine
Material	Stainless steel is used, having three coating for resisting corrosion. It increased cost	Galvanized iron is used having zinc coated for resisting corrosion. It is less costly than SS and easily available
Electronic Circuit and controller Board	Electronic circuit and controller board are used to control and perform all operation sequency. Its total cost is rs.20,000 approximately	These circuit and board are not used in this machine. All operation is performed manually which saved time, water and money.
Motor and Gear	Mostly two motor and Gear used for rotation of jet which running cost is high ,high energy consumption and make design complicated	Only one motor with centrifugal pump used for rotation of jet which is less costly, less energy consumption and design become simple.
Time consuming	Fixed cycle (60min) because of electronic circuit and board, this is time consuming.	No electronic circuit and board used ,so cycle can be fixed as per customer requirement
Water consuming	It consume 23 to 25 liter water	It consume maximum 10 liter water
Cost	Cost of Automatic Dish washer is Rs.28,000 to Rs.40,000 (IFB,Electrolux,Samsung,LG etc.)	Cost of automatic dish washer cum washing machine is Rs.10,000 to 15,000 Attachments (Rs.5,000)

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V. CONSTRUCTIONAL LAYOUT

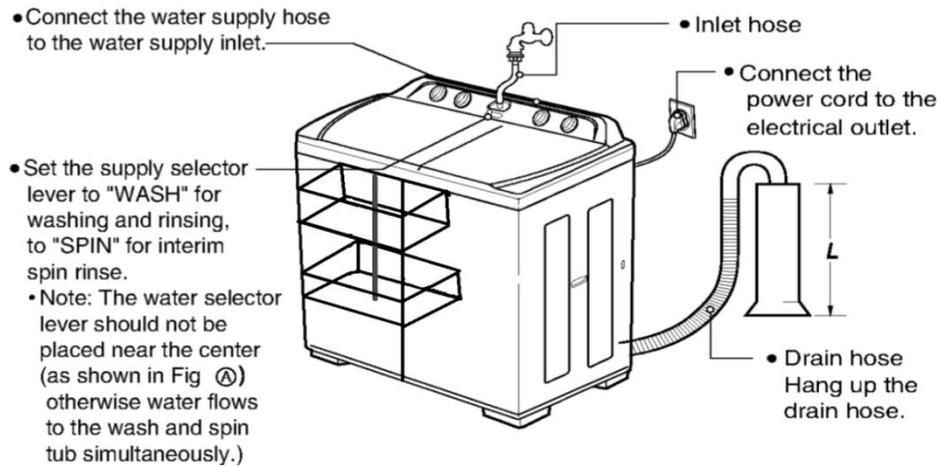


Fig.1 Layout of our model

A. MOTOR WITH CENTRIFUGAL PUMP

In semi-automatic dish washer, electric motor coupled with centrifugal pump shown in fig Centrifugal pumps are dynamic pumps which move fluids through a system using one or more impellers. They are the most common type of pump because of the simplicity and effectiveness of their design and operation. Because they are the most familiar, they also tend to cost less than other types of pumps. Compared to positive displacement pumps, they provide higher flow rates and lower pressures. When the impeller is made to rotate, it makes the fluid surrounding it also rotate. This imparts centrifugal force to the water particles, and water moves radially out. Since the rotational mechanical energy is transferred to the fluid, at the discharge side of the impeller, both the pressure and kinetic energy of the water will rise.

B. TIMER SWITCH



Fig.2Timer Switches

The water level control on washing machines is used to turn the water valve on and off at the selected levels, as well as to supply power to the timer motor when the correct water level is reached. The timer is used to control all the functions of the water inlet and outlet. The timer will have a series of gear contacts that are operated by a cam assembly which is advanced by a timer motor.

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C. SOLENOID VALVE



Fig.3 Solenoid Valve

Solenoid valves are the most frequently used control elements in fluidics. Their tasks are to shut off, release, dose, distribute or mix fluids. They are found in many application areas. Solenoids offer fast and safe switching, high reliability, long service life, good medium compatibility of the materials used, low control power and compact design. Domestic washing machines and dishwashers use solenoid valves to control water entry into the machine. They are also often used in paintball gun triggers to actuate the CO₂ hammer valve. Solenoid valves are usually referred to simply as solenoids.

D. UTENSIL TRAY GRILLS

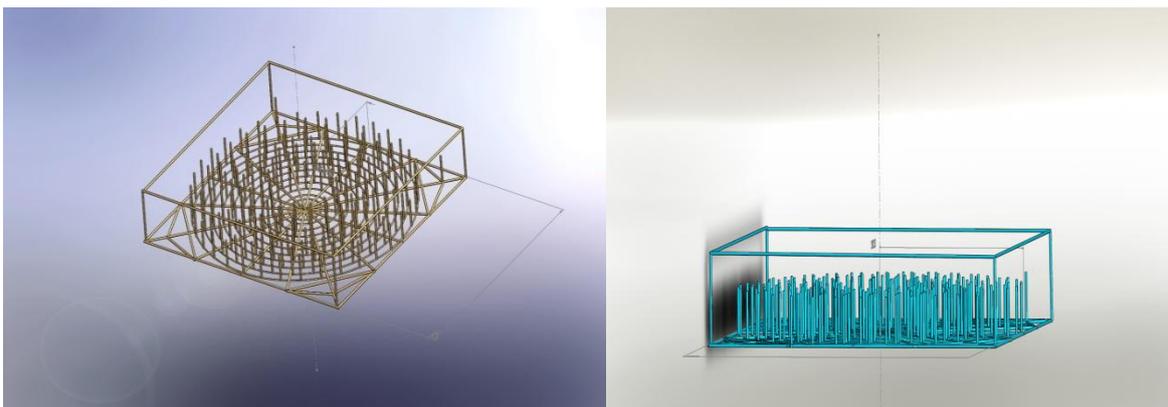


Fig.4 Model of Tray grills

Utensil Tray Grills used in Automatic dish washer cum washing machine is to carry the number of plates, Bowls, cup, spoons and other utensil for washing purpose. It consists of Acrylic, SS (plastic material and Stainless steel) it is easily available and low cost. For larger and heavier items such as plates, serving platters, saucepans, bowls, upper grill used. Glasses, cups and small items such as saucers can also be placed in the lower basket. Do not place thin, delicate glassware in the lower basket. Place very large plates in the center of the lower basket. When tilted, plates up to 35 cm in diameter can be accommodated. Multi Comfort zone the rear section of the lower basket is used for washing cups,

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glasses, plates and pots. Hinged spikes 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.

E. DRAIN PUMP



Fig.5 Drain pump

The drain pump removes water from the washing machine tub at the end of the wash and rinse portions of the cycle.

VI. RESULT AND DISCUSSION

The tests were carried out in order to determine the performance of the machine. This was done by comparing the rate of washing with the designed dish washer to the hand-washing (manually) and also comparing Automatic & Semi-automatic Dish washer. From all the experimentation and comparisons, it is clear that Semi-automatic dish and utensil washer is better than Manual dish washing and Automatic dish washer. It is less time, water and energy consumption. It is less costly than existing dish washer. And it is affordable by every class. This project is very useful in the smart city project. This project can be further also modified as a mechatronics machine. This will make this machine fully automatic and more users friendly in the future. Evaluation automatic dishwasher cum washing machine is shown in Table 2.

Table.2 Evaluation Automatic dishwasher cum washing machine

Sl. No.	No. of Plate	Quantity of Detergent used (ml)	Quantity of water used in washing (liters)	Quantity of Water used in Rinsing (liters)	Time used in Washing (sec)	Time used in Rinsing (sec)
1	1	1	0.3	0.6	10	3
2	4	1.5	0.7	1.1	15	5
3	10	4	1.2	3	30	17
4	24	10	1.7	4.2	80	40

Table.3 Performance of Hand washing

Sl. No.	No. of Plate	Quantity of Detergent used (ml)	Quantity of water used in washing (liters)	Quantity of Water used in Rinsing (liters)	Time used in Washing (sec)	Time used in Rinsing (sec)
1	1	1	1.5	1	15	5
2	4	1.5	1	2	40	10
3	10	4	2	4	60	20
4	24	10	3	6	150	60

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VII. CONCLUSION

From the study and comparison of automatic and semi-automatic dish washing machine, it is clear that function of both machine are 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 dishes washing.
- Capacity of machine to wash 24 utensils per wash
- 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 components 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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