

Design and Fabrication of Semi-Automatic Dishwashing Machine

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Abstract: This paper deals with design and fabrication of semi-automatic dish washing machine .the cad drawing of semi-automatic dish washing machine is elaborated .the details of time required ,cost, energy consumed are discussed in this paper . The literature surveys were carried to know the problems of system and to improve it. The principle of operation of semi-automatic dish washing machine is viewed in this paper. The future scope of semi-automatic dishwashing machine is also discussed in this paper.

Key words: semi-automatic, dish washing machine, time, cost, energy, water and detergent.

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. 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, 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.

In most of the restaurant, households and college- mess the dishwashing are done manually. When this process is done manually, a man can wash approximately 100 to 150 dishes in 1 hour. This process is not only very laborious and boring but also time consuming.

The machines performing the stated task i.e. washing and cleaning are available in market, but they are of very high cost. So, most of the colleges- mess and restaurants are provide labour for washing dishes. They have to pay money to labour for washing dishes so it can be costlier at longer period. We are going to develop and manufacture a machine to make the task of cleaning and washing of utensils semi-automatically to reduce the wastage of human hours. The machines performing the stated task i.e. washing and cleaning are available in market, but they are of very high cost. So, most of the colleges mess and restaurants are provide labour for washing dishes. They have to pay money to labour for washing dishes so it can be costlier at longer period. We are going to develop and manufacture a machine to make the task of cleaning and washing of utensils semi- automatically to reduce the wastage of human hours. The primary objective is to develop and manufacture a machine to make the task of paper stapling and folding automatically to reduce the wastage of human efforts, time and cost. The machine will save human hours. As the machine will require very low investment compare to other general purpose machines available in market, it will provide service to each and every restaurant and colleges-mess in quiet easy and economical manner.

The dishwasher has made cleaning and drying dishes much easier and more efficient. This project work has been conceived having studied the difficulty in washing the any type of plates. Our survey in the regard in several home, revealed the facts that mostly some difficulty occurs in washing the dish in Hand. The washing power contains the chemical substances and this is reacting with human hand. Now the project has mainly concentrated on this difficulty, and hence a suitable device has been designed. Such that the dish washing can be done without application of any impact force. By using semi-automatic dishwasher, we can reduce time as well as human efforts significantly. In conventional dish washing process large amount of human power as well as quantity of water is used. So keeping that in mind, to reduce this semiautomatic dish washing machine is developed.

1.1 Working Principle

The main purpose of this machine is to clean the plate in mass by using rotating brushes. The main components used are motors, brushes, and pressure washer. The 4 plates kept in closed square form in the rotating table which is rotated by 12 volt DC motor at 100RPM. With the help of Half HP pump, water is sprayed over the plate at high speed.

Brush is used either end of the rotating table, which scrubs the plates while rotating. At the same time soap water is sprayed over the plate, which is mounted at one end of the rotating table with the help of 12 volt DC pump. Rotation of table depends on the stains on the plate. Cleaned plate will after a required no. of rotation. Entire rotation of table, soapy water spray and pressurized water spray is controlled by switches.

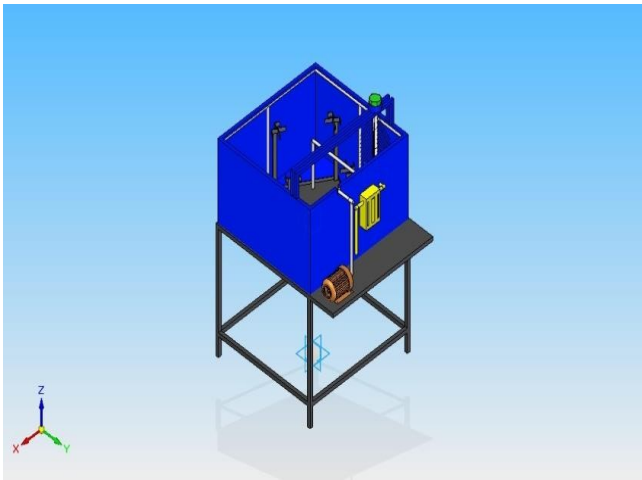


Fig 1.1 3-D semi-automatic dish washing machine

1.2 Machine Components

The construction of semi-automatic dish washing machine are explained as follows. The major components of semi-automatic dish washing machine are half HP motor for pumping water, 12 v DC pump, 12v DC motor, 2 brushes and PVC pipes. The major components are Pump, DC Pump, DC motor, Brush, PVC Pipe, Battery.

II. LITERATURE SURVEY

2.1 J. G. Gocharan- "Dish washing machine" (1886): This paper gives brief idea described about improvement of dishwashing machine. It related to improvement in machine washing a dishes in which a continuous stream of either soap solution or clean water is supply to crate holding the rack or cage hot water is supply to crate is rotate so as to bring the greater portion thereof under water. In this research paper improvement of designing elevation of machine and it part. The author builds the machine and measures the dishes and inside wire compartment each specially designed to fit either plate's cups or saucer. The wire chamber placed inside a wheel that lay flat inside a copper boiler. A motor turned the

wheel while hot soap water squirted up from the bottom of boiler and rained down on the dishes. The result indicates that model is first reliable hand powered machine uses a water pressure instead of scrubber to clean the dishes inside the machine.

2.2 Odesola & Afolabi- "Design, Fabrication and Performance Evaluation of a Domestic Dish Washing Machine" (2012): This paper discusses about the design, fabrication and performance evaluation of a domestic dish washing machine. The objective of this work is to design and fabricate a dish washing machine that is efficient and easy to operate. Stainless steel and mild steel was used for the construction of the machine considering their availability, cost reduction and corrosion resistance. The result indicates that the dishes are cleaned by spraying hot water rather than cold water typically, between 55 to 75 °C (130 to 170 °F) to loosen the sticky and oily substances. A mix of water and detergent is used for cleaning purposes, followed by clean water to remove the detergent residue. This work has established the fact that washing machines of different capacities can be manufactured locally in Nigeria without compromising standards.

2.3 Dhale A. D. - "Design and development of semiautomatic dishwasher" (2015): This paper discusses about the design, construction and evaluation of a dish washing machine. The capacity of the machine was 20 plates per minutes (i.e. 1880 plates per hour). The designed dishwashing machine is very efficient and easy to operate. The result indicates that the detergent used is quite diluted and is biodegradable, with no phosphates, enzymes, or citrus additives. This leads to less requirement of detergent and cleaning is done mostly by use of water. This might leave a greater ecological footprint than other methods of dishwashing. Also series of test were carried out in order to determine the performance and efficiency of the machine. This was done by comparing the rate of washing with the designed dish washer to the hand washing.

2.4 Pranali Khatake- "Design of Gears in Semiautomatic Dish Washing Machine" (2016): This paper discuss about design of gears in semi- automatic dish washing machine. Why semi- automatic dish washing machines are more popular in India as compared to fully automatic dish washing machine, Automatic dishwasher uses large amount of water, time and is costly. And because of all these reasons, the usage of automatic dishwasher in our country is very less. Use of semi- automatic dishwasher, they can reduce time as well as efforts of human also. The result indicate that in India semi-automatic dish washing machines are used than fully automatic dish washing machine as it is cheap, preferably gears are used in these semi- automatic dish washing machine with belt drive for better life and high efficiency. Paper focused on design of gears used in semi-automatic dish washing machine.

2.5 Shaila S. Hedao- "Design and fabrication of semiautomatic dish and utensil washing machine" (2016):

This paper discusses the main objective of semiautomatic dishwashing machine is to reduce the cost of fully automatic dish washing machine and giving good cleaning performance. It required less energy and less water consumption. Time of washing dish can be adjusted as per customer requirement. In this system rotary jet technology is used to clean utensils. Any type of utensil will be washed in this system, No electronic circuit will be used multi jet system will be used to clean utensil from all side. The result indicates that by using galvanized iron material for inner & outer part, the overall weight of the assembly is also reduced. The capacity of machine is to wash 24 pieces of dinner set at a time by using two rotary jets controlled by single pump using parallel connection.

2.6 Shilpa N. Dehedkar- "Design of basic model of semiautomatic dish washer machine" (2016):

This paper gives a brief idea and analysis of the semi-automatic dish washer machine. It also states the mechanisms incorporated in this model for the process of washing the dish. In this research the dishwasher operates with help of DC motor, universal motor, conveyor belt and microcontroller for time delay. Microcontroller is used to provide delay to universal motor, DC brush motor & DC geared motor. Dish which is placed on the conveyor belt enters the first washing chamber where it is cleaned with soda water and scrubbed with the brushes. This is then passed to next chamber where it is rinsed with the clean water and finally moves out as a complete washed dish. The result indicates that the model is built with very basic material and can be more standardize by altering motor used. The product designed has minimal operating cost, cost effective, eco-friendly and it can be used with almost zero efforts.

2.7 J.HOUGHTON- "Table furniture dish cleaning machine" [1] (1850):

This paper discuss on invention of semi-automatic dish washing machine. This paper tells about brief idea of semi- automatic dish washing machine construction and their design. He constructed a cylindrical vessel which is of metal or wood. One side of cylinder say one forth, is left

open from near the top to bottom.

Inside the cylinder there is a vertical shaft, resting on the centre in a socket on the bottom, and which passes up through and above the top or cover of the cylinder. Through the top of this shaft there is hole, through which pin passed, by means of it he gave it a rotary motion. Connected to this shaft is a cylindrical rack or crib, which is supported by shaft. The diameter of crib is so much less than that of cylinder as it allows revolving freely within it.

The design indicates that the construction of the machine is made to wash the dishes. For this he had constructed a cylindrical vessel with a shaft resting upon, the rack within a conical rack, a hoop to hold a table furniture in a combination with a curb. The whole system is supported with a frame and by these mechanical means ,cleansing the surface of dishes without uses of hand, the all parts are being arranged , combined and operated substantially as to work as a complete machine.

III. FUTURE SCOPE

This machine is very useful to the household women which is wash the dishes by the manually and its dish washing rate is more as compared to the manually washing the dishes. The cost of this machine is very less as compared to the market machine.

It can be used as a commercial machine such as marriage ceremony, hotels, schools etc. This can also be used in places where labourers are hard to find.

IV. RESULTS AND DISCUSSION

From all the experimentation and comparison, it is clear that Semi-automatic dish washer is better than manual dish washing and automatic dishwashing machine.

It is less time, water and energy consumption. It is less costly than existing dish washer. And it is affordable by every class.

The test was carried out to determine the performance of machine.

Sino	NO. of Plates	Quantity of Deter gent used (ml) approx....	Quantity of water used in washing(liters) Approx....	Quantity of water used in Rinsing(li ters) Approx. ...	Time used in washi ng(Se c)
1	1	1	0.2	0.4-0.5	8-10
2	2	1.2- 1.5	0.4-0.5	0.8	15
3	3	2	0.7	1	20-25
4	4	2-2.2	1	1.2	30

Evaluation of Semi-Automatic Dishwasher

S.No	No. of Plates	Quantity of	Quantity of Water	Quantity of Water	Time used in
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		Deter gent used (ml)	used in Washing (liters) approx...	used in Rinsing (liters) Approx..	Washing (sec)
1	1	1	0.6	1	15-20
2	2	1.2- 1.5	1	1.2-1.5	30
3	3	2	1.5	2	50
4	4	2.5	2-2.5	2.5	70-80

Evaluation of manual washing

V. CONCLUSION

The review of semi-automatic dish washing machine was successfully carried out on various aspects like consumption of time, energy required, water required and cost analysis.

The designed semi-automatic dish washing machine was easy to construct and operate. It is very efficient in operation. 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. But their construction and working are different. Following are the conclusion of semi-automatic dish washer. 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.\

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