

Research Article

## Design and Fabrication of Dish Washing Machine

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### Abstract

*Plate washing is a daily activity across the globe which involves a lot of energy to accomplish manually or mechanically. As the human hand cannot take the same and less but sufficient amount of water, it is needed that the dish washing process should be mechanized. The objective of this project is to design and fabricate a dish washing machine that is efficient and easy to operate. It is possible to earn substantial income by machine after making deduction for interest on capital, rent maintenance and sale commission etc. Hence, the capital amount required for machine is less and market for this type of work is good. Because the semi scale labours can be used for the operation of machine. The machine can be produce different types of dish washing just by changing bucket assembly; the product can be changed as per requirement of market. This machine can be produced industrial and domestic material dish washing and cleaning.*

**Keywords:** Domestic, Efficient, Labour, time period, Washing machine

### 1. Introduction

Now a day's there is lot of competition in the market. So there is need of developing a new method or process for effective manufacturing. That process or methods should fulfill the requirement about accuracy productivity etc. Ever since the industrial revolution human have been dependent on electricity, now world is entering in the 21<sup>st</sup> century with new invention and new technology. But also make new type of problems day to day. When problem is increased and it becomes more difficult to meet demand of energy and power needs. As looking towards household and industrial problems the solution is "Automatic dish washing machine". Electric energy (70-90%) used by electrically heated dishwashers and washing machines is used for heating the water, the crockery, the laundry and the machine and could as well be replaced by heat from other sources than electricity (Odesola I. F., 2012). In this paper the dish washing machine is discussed which is simple in construction and it gives the output in differential ways. Due to its multi output operation it can be used in many small scale industries or in rural areas. It is possible to earn substantial income by machine after making deduction for interest on capital, rent maintenance and sale commission etc. Hence, the capital amount required for machine is less and market for this type of work is good. The wages of worker to be give is less. Because the semi scale labour can be used for the operation of machine. The machine can be produce different types of dish washing just by

changing bucket assembly; the product can be changed as per requirement of market. This machine can be produced industrial and domestic material dish washing and cleaning. For atomic operation of machine, we just have to press button, which is on control panel. Due to pressing this button, whole operation is carried out automatically. The operator only has to insert the dish due to automatic operation of machine (Konakalla Naga, 2003). It is necessary to reduce the total machining time. There are various ways by which the total machining time can be effectively minimized there are various time consuming steps or sub process which can be minimized by various methods. In mass production the time criteria is very important within small time limit a single unit job has to be completed for minimizing the job time the handling of job should minimum. So that labour time considerable saves for many household & other establishments, the dryer or dish washing is on indispensable convenience & necessity. So, we have to be develops a new concept for water saving technique.

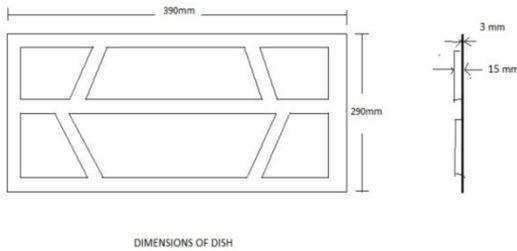
The main aim of the paper is to achieve economy through latest energy saving technology & innovations. The capital investments are required to be studied thoroughly while finalizing the long term action plan. Conservation of energy is using energy more efficiently by substituting time convenience labour & capital for effective optimization of cost energy today has become on indispensable component of industrial production (V. B. Bhandari, 2003). This paper reflects a development of a dish washing or dryer applications. It has unique capability to dish washing the product. As

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per specifying our application, materials, weight & reach requirements & cycle times. Then find machine solution that can best need our materials handling needs. Another application we can be used as dryer any wetted particles or product we can material out by using this machine. The success of this project is due to the some discernment, which is necessary for the application of theory (R. S. Khurmi, 2014). We offer best quality machine that are widely demanded for various industrial usages. We configured with latest technological methods this machine accomplishes the complete process of mixer/cleaning.

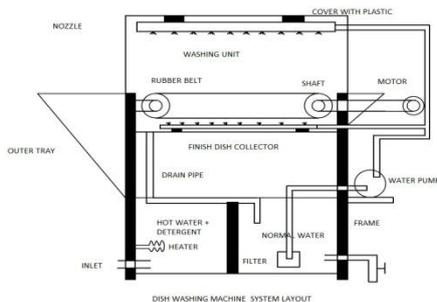
**2. System Development**

The standard dish is selected for application, which mostly used in college canteen, industrial canteen etc. The figure 1 shows the design parameters used for the dish having a mass of 2 kg.



**Fig. 1** Design parameter for standard dish

A Dish washing is simplest form consists of water tank, belt, conveyor system, water pump and spray nozzle arrangement as shown in figure 2. The belt conveyor is selected with length of 2000 mm, which can use to transfer for number of plates with 290 mm of width for balancing the system. The Mushroom and flat head nozzles of 0.66 mm diameter are used for spraying the water. The different forces is calculated which is acting on a shaft pulley. The maximum diameter of the shaft is selected as 40 mm. The single row deep groove bearing is selected with radial load of 40 N and speed of 60 RPM. For washing the water is required which is stored in a water tank having a volume of 0.20 m<sup>3</sup>. The 200 litres of water can handle by machine. Two plates at a time are placed on conveyor belts; water is sprayed on be plates through nozzles.



**Fig. 2** System layout of dish washing machine

The used water on belt conveyor is again re-circulated to the nozzles with the help of pump of capacity 0.5 hp

and by passing through the filter .The heater is introduced in the finish dish collector in order to heat the water to be used for washing the effective cleaning. The water is heated by using the solar water heater. After collecting the dishes in finish dish collector, the cleaned dishes are taken out from it. The operation sequence is maintain as per the application of dish washing as shown in the full set up of machine in figure 3.



**Fig. 3** Experimental setup of dish washing machine

**3. Performance Analysis**

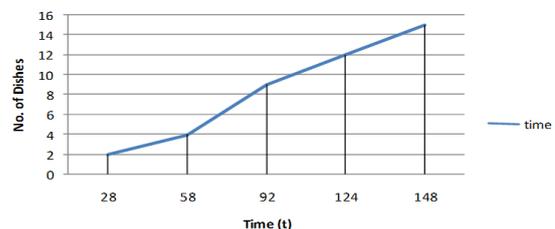
The experiment is carried out to calculate the time required for number of dishes in seconds. The table 1 shows the parameters which is changed according to number of dishes. The time required to wash one plate is 14 sec, so accordingly the calculations are carried out for the different number of plates as shown in table 1.

**Table 1** Experimental observation of dish washing machine

Sr.	Content	Result				
		2	4	9	12	15
1.	No. of plate	2	4	9	12	15
2.	Water used for washing ( litre)	0.5	1.024	2.25	3	3.75
3.	Detergent (ml)	1	2	2.75	3	3.5
4.	Time used in washing(sec)	28	58	92	124	148

**4. Performance Analysis**

From the observation the results are obtained with respect to time. The results are correlated with the human work. The time verses number of dishes is plotted on graph and it is observed that as the number of dishes increases the time period required for washing is also increases proportionally as shown in figure 4.



**Fig. 4** Variation of time Vs No of Plates

From the graph the parameters are calculated for the 2 dishes to compare with human work as follow.

- The time required to wash 2 dishes by machine is 28 seconds.
- The quantity of water required for washing 2 dishes is 0.5 litre.
- The detergent required for 2 dishes is 1 ml.

The table 2 shows the comparison of human work and machine work. From this values the efficiency of human and machine in terms of capacity is calculated. The dish washing machine can wash 299 dishes per hour by using 1/4<sup>th</sup> of water as compared with human use.

**Table 2** Comparison between human and machine for washing a dishes

Sr	Factors	Human	Machine
1	Time	40 sec	14 sec
2	Water	1 litre	0.25 litre
3	Cost	Rs. 600 /month	Rs. 300 /month
4	Reliability	Less	More
5	Capacity	90 dishes per hr	255 dishes per hr

## Conclusions

The dish washing machine is design with minimum cost of Rs. 16032 which is less than market cost. The capacity of machine is 240 plates per hour which is efficient as it reduces 50% of labour cost. And the 75% of time saving is achieved as compare to human. The power required for the dish washing machine id 322.8 Watt for two dishes.

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