

VESSEL CLEANER

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ABSTRACT

Automation is currently giving a new shine to the mechanical sector. While most of the industries are switching towards using automatic robots for their production, thereby increasing their production, reducing man power consequently. But use of automation at the domestic level is still not trending. Aim of our project is to make the vessel cleaning process in the home smoother and less clumsy. The project would be help-full for house-wives in cleaning their home utensils in less time without investing more time and efforts.

Keywords: Wiper motor ,Base frame , Shaft , Water motor .

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I. INTRODUCTION

In semi-automatic vessel cleaner we study about system which reduces human effort and gives high accuracy. In India vessel washing activity is manual process involving considerable human efforts or with automatic dish washing machines available in market which only cleans dishes and not vessels and they are expensive too. Manual dish washing activity requires more number of people and also it is time consuming process involving human efforts. Cost required for labour work is also considerably high.

From past 20 years automation in every field is increasing rapidly. Human always tries to reduce his mechanical efforts with the help of mechanical linkages of robots. In that automation home appliances and household working machines are getting special demand. In western countries this automation has growing rapidly. In earlier years the many home appliances has invented and were globally accepted such as dishwasher. The working speed and quality working of dishwasher made it an essential and useful home appliance. Using various engineering design perspectives dishwasher can be considered as complex system.

Thus the attempt has been made to achieve solution of above problems with semi-automatic vessel cleaning machine with objectives that it should minimise human efforts and should have low cost with less time consumption

and must have all the basic mechanisms washing with soda water, scrubbing with brush and rinsing in clean water.

The Industrial Cleaning today is a complex undertaking. Each cleaning problem is unique from other because of many variables in a manufacturing process. Integrating the cleaning process with production and plant requirements through a proper equipment sizing and selection is very important. To reduce human efforts in dishwasher. 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.

II. LITERATURE REVIEW

1. "Design, Fabrication and Performance Evaluation of a Domestic Dish Washing Machine" at an International Journal of Science and Technology (2012)
Odesola&Afolabi

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. "Design of Gears in Semiautomatic Dish Washing Machine" at International Journal of Innovative Research in Science, Engineering and Technology (2016)
PranaliKhatake

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.

3 "Review of Semi-Automatic Dish Washing Machine "at International Journal of Innovative Research in Science, Engineering and Technology.(Feb 2017)
Prof. Pankaj H. Jaiswal, Vaibhav V. Chitriv, Praful C. Panchabhai, Mohit H. Solanki , Yogesh S. Date

In this type the working principle 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 oil. The dishwasher must also remove oil-laden waters from the machine after each phase of the cycle and provide for the drying of dishes after cleaning process has been completed. In the design the motor is coupled with the rotating plate by spur gear mechanism. The shaft rotation depends upon the rotation of motor by spur gear mechanism. The high forced water is sprayed to the rotating plate by water pump. This is a simple type of semi-automation project.

4. "Design and Development of Semi-automatic dish washer and its comparison with Automatic dish washer" at International Journal of Innovative Research in Science, Engineering and Technology. (December 2016)

Er. Shaila S. Hedaoo, Dr. C. C. Handa, Er. Vikrant D. Dhopte

This design consists of motor and centrifugal pump. Water flows through PVC pipes which is connected to two rotary jets which is upward and downward side, pump helps to rotate jet. Jets sprinkle the water with required pressure on plates and utensils. This dishwasher combines water and detergent into very effective cocktail then sprays it against the dishes regulator is provided in the machine which controls operation at machine, water consumption depends on operation, time, energy and water consumption is very less. Motor is used to convert electrical energy into mechanical energy and then water suck by centrifugal pump and it passes through pipe to rotary jet.

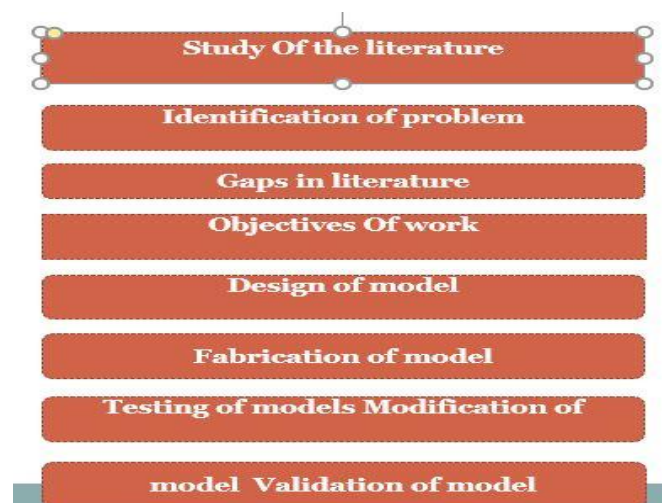
5. "Design of Basic Model Of Semi-Automatic Dishwasher Machine" at International Journal Of Innovative Research In Science, Engineering And Technology. (July 2016)
Shilpa N Dehedekar

This design consist of two steps first one is washing with soda water and scrubbing with bottom dish part on conveyor belt is operated by using universal motor. Motor stops when dish enters in washing chamber entire system is control by using microcontroller with the help of nozzle pressurised spray of detergent water with the help of water pump. Simultaneously brush assembly moves down and start scrubbing and this movement is operated by DC geared motor. In second stage when conveyor belt is enter into fresh water chamber, motor automatically stops and pressured clean water is sprayed on dish with help of another water pump.

III. OBJECTIVE

- To design and develop a prototype model showing the concept of semi-automatic vessel cleaning machine.
- Our main objective is to reduce the cost of fully automatic dishwashing machine.
- To give good cleaning performance.
- To reduce human efforts and time consumption

IV. METHODOLOGY



V. WORKING PRINCIPLE

The working principle of the vessel cleaner is to provide the mechanical action necessary to distribute and direct the detergent solution and rinse waters over, under and around the water to loosen and remove vessel.

The cleaner must also remove vessel-laden water from the machine after each phase of the cycle and provide for the drying of vessel after the cleaning process has been completed.

The motor is coupled with the rotating plate by spur gear mechanism. The shaft rotation depends upon the rotation of motor by spur gear mechanism. The high forced water is sprayed to the rotating plate by water pump. This is a simple type of semi-automation project.

VI. DESIGN AND CALCULATION

DESIGN

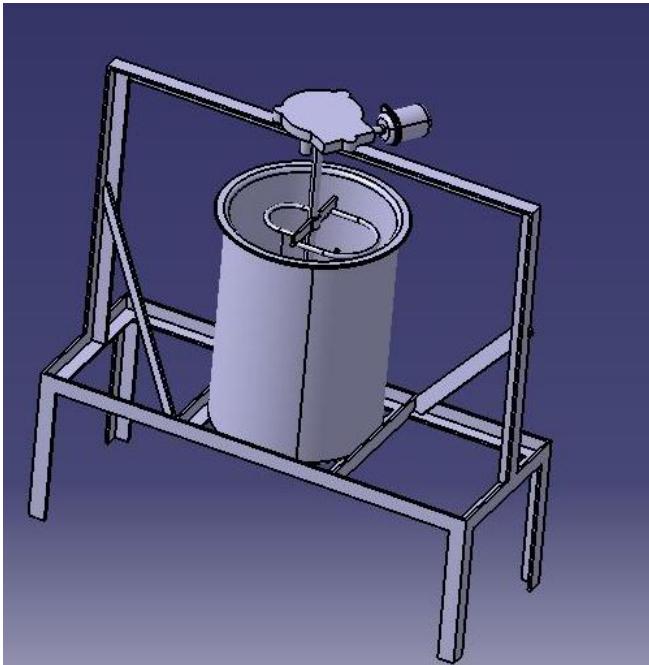


Fig. vessel cleaner design.

CALCULATION

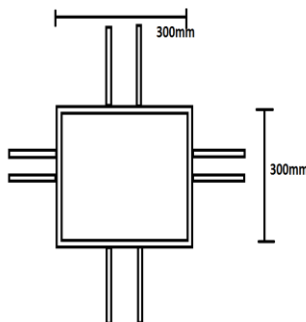


Fig. Base frame.

$$\bullet \frac{M \sigma_b}{I y} \dots\dots\dots(6)$$

Bending moment(M)=force *perpendicular distance
=30*300*9.81

Bending moment(M)=88290Nmm

$$\bullet I = \frac{(b(h^3))}{12}$$

$$= \frac{(25(25^3))}{12}$$

=32552.08mm⁴

$$\bullet Y = \frac{25}{2}$$

=12.5

Therefore above value use in equation no(6).

$$\frac{88290}{32552.08} = \frac{\sigma_b}{12.5}$$

Therefore, $\sigma_b=33.90\text{Nmm}$

33.90<105

Hence design is safe.

SIZES WITH SECTION WEIGHT OF EQUAL ANGLES

Size	Weight in Kgs.	in Gauge Per Mtr.	Thickness
in mm	Per Feet	Per Mtr.	
20x20x3	0.274	0.899	3mm
25x25x3	0.335	1.099	3mm
25x25x5	0.548	1.798	3mm
31x31x3	0.390	1.280	3mm

DESIGN OF PLATE:

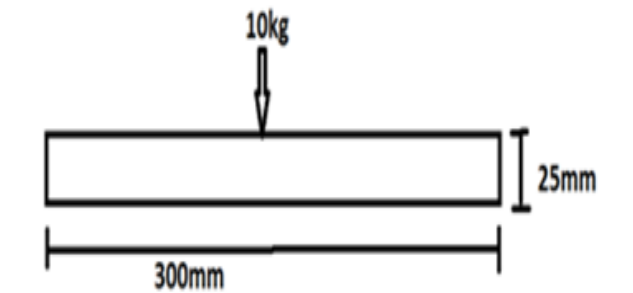


Fig. Plate

- $$\frac{M}{I} = \frac{\sigma b}{y}$$

.....
(7)

Bending moment(M)=force *perpendicular distance

$$=10*400*9.81$$

Bending moment(M)=29430Nmm

- $$I = \frac{(b(h^3))}{12}$$

$$= \frac{(300(3^3))}{12}$$

$$I=675mm^4$$

- $$Y = \frac{3}{2}$$

$$=1.5$$

Therefore above value use in equation no(7).

$$\frac{29430}{675} = \frac{\sigma b}{1.5}$$

Therefore, $\sigma_b=65.4Nmm$
 $65.4 < 105$
 Hence design is safe.

DESIGN OF DISC:

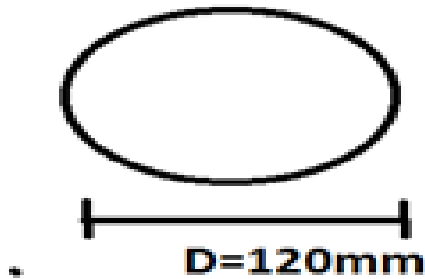


Fig.disc

- $$\frac{M}{I} = \frac{\sigma b}{y}$$

.....
(8)

Bending moment(M)=force *perpendicular distance

$$=10*300*60$$

Bending moment(M)=5886Nmm

- $$I = \frac{(M(R^2))}{4}$$

$$= \frac{(10*9.81(60^2))}{4}$$

$$=88290mm^4$$

- $$Y = \frac{120}{2}$$

$$=60$$

Therefore above value use in equation no(8).

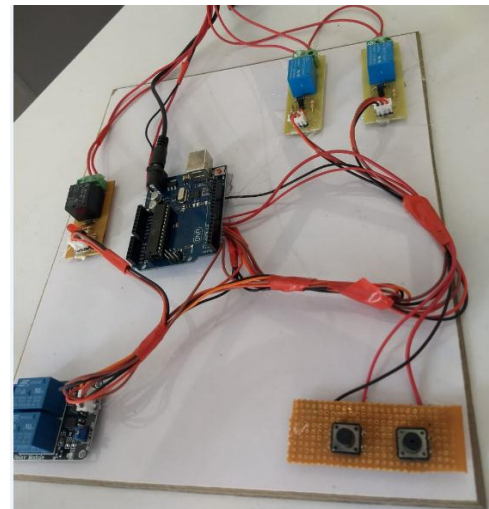
$$\frac{5886}{88290} = \frac{\sigma b}{60}$$

Therefore, $\sigma_b=4Nmm$

$$4 < 105$$

Hence design is safe.

VII.RESULT





VIII. CONCLUSION

We are designing basic model of semi-automatic vessel cleaner to reduce human efforts with saving the time and muscle power. It will satisfy need of small restaurants or family having low budget. The model will be built by using basic material and which are easily available in market. It will be cost effective, Eco-friendly and can be used with almost zero efforts.

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