Design and Fabrication of semi-automatic dishwashing machine

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Abstract : The aim of semi-automatic dish washer machine is to minimize human efforts with its innovative simple design which is also eco-friendly. A dishwashing machine is made of cheaply available materials which are used in our daily life. This model of semi-automatic dish washer machine is new concept, in which the plates are placed in vertically and in its one washing cycle does all the operations of conventional dish washing i.e. spraying of soap water, scrubbing with brush and rinsing with clean water similar to fully automatic dish washer machines .

IndexTerms **- DC motor, universal motor, customized conveyor belt, vertical, eco-friendly,etc.**

I. INTRODUCTION

Dish washing is a common activity, in most of families. People wash dishes by hand which gives muscle strain in various parts of the body and detergent is chemically harmful to their skin.
In India, Dish washing is done manually which gives more strain to the muscles of the workers. Since, India is a 2nd populous nation in the world, dish washing by manual process takes more time. Hence there is a need of dish washing machine in the market. Thus the objectives of semi-automatic dish washing machine are:

- it should minimize human work
- It should have low cost with less time consumption
- It must have all the basic mechanisms like in conventional dish washing with soda water, scrubbing with brush and rinsing in clean water**.**

II MATERIALS

1. Frame:

In this section, the whole accessories are to be mounted on a frame, which is made up of Mild steel. The total necessary assembly of frame is to be made by using an arc welding. Frame is two layered assembly, on the top layer two washing chambers are placed.

2. Conveyer belt:

The conveyor belt is designed in such a way that the plate is placed vertically while loading. The diameter of bearing is 25mm.

3. Power supply requirement:

Power supply requirement of automatic dish washer machine
1) For brush motor - 24V DC geared motor
2) For AC water pump - 230V 50Hz
3) 24V DC geared motor
Automatic dish washer machine requires 230V AC as well as 24V constant DC s power supply.

4. DC Geared Motor:

It's supplied with 24V DC supply .Its main function is to rotate the brush assembly and conveyor belt attached to it .

5. DC Water Pump:

230V, 50 Hz AC supply high pressure water pump is used in this dish washing machine. There is one water storage tank used in dish washing machine.

6.WATER TANK:

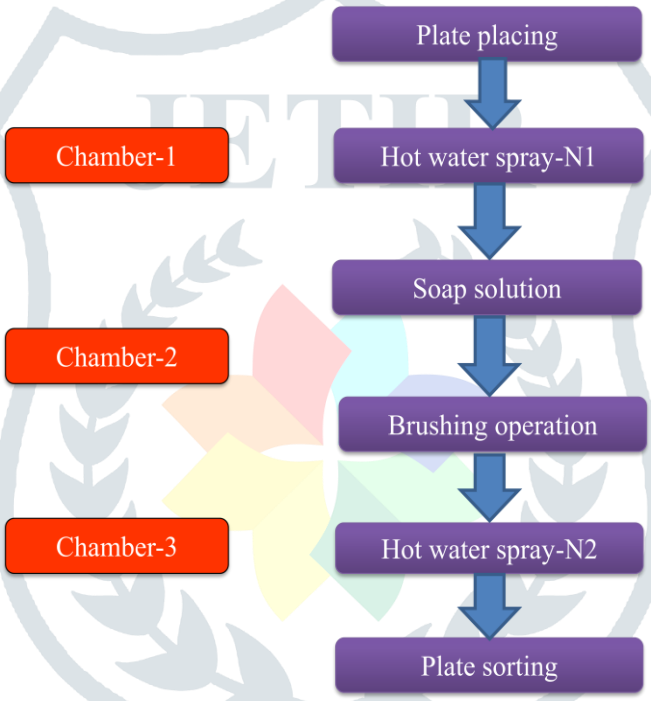
Water tank act as reservoir. It is made of mild steel of thickness 1.6mm and its dimensions are 1000*380*500. Capacity of the water tank is 300litres.

7.PIPES:
CPVC pipes are used for connecting nozzles and pump. Pipe has the dimensions of 3⁄4 inch with outer diameter of 28mm and inner diameter of 25mm. This kind of pipes can withstand high pressure and temperature.

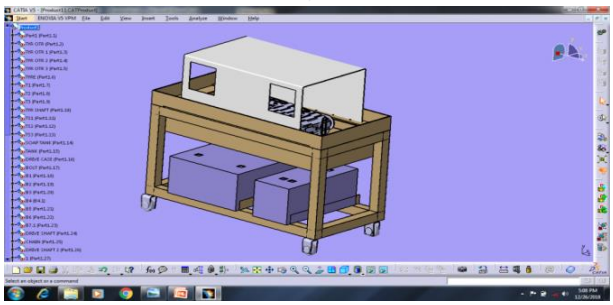
8.WATER LEVEL INDICATOR :
A water detector is an electronic device that is designed to detect the presence of water and provide an alert in time to allow the prevention of water leakage. A common design is a small cable or device that lies flat on a floor and relies on the electrical conductivity of water to decrease the resistance across two contacts. The device then sounds an audible alarm together with providing onward signaling in the presence of enough water to bridge the contacts. These are useful in a normally occupied area near any infrastructure that has the potential to leak water, such as HVAC, water pipes, drain pipes, vending machines, dehumidifiers, or water tanks.

9.IR SENSOR :
An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor.

III FLOW CHART



IV DESIGN DESCRIPTION :
Configuration comprises of use of logical guideline, specialized data, and creative energy for advancement of dish washer to perform particular capacity with most extreme economy and effectiveness. Thus cautious outline approach must be embraced.



V METHODOLOGY :

In washing of dish, first step is sensing of plates by using IR sensor and then followed by clearing off the waste food on plate and then scrub it with soap solution. Here also, we are following same first step in which the dirty plates which has to be wash is put into washing chamber. The plates are kept in vertical position in the conveyor belt and then it enters the washing chamber. Where the spraying of pressurized water is done using nozzle and washing of plates takes place. Plates put on the conveyor belt are

operated by using 24V DC motor. At first pressurized spray of hot water are thrown on plates with the help of nozzles. The operation performed with help of water pump. Then the plates are send to the soap oil section where the soap oil is sprayed on the plates .Next stage which is scrubbing. There the plates are cleaned by using the rotary brushes, here in this stage almost all the impurities are removed in this process. Finally the plates enter the last stage were the hot water is sprayed on the plates to remove the soap solution present in the plates and again by another IR sensor for sensing plates .Then the plates are collected wiped with a cloth and arranged in a proper manner . The water is sent through the discharge port which is connected to the machine.

Fig -1: Internal view of dishwasher

Fig -2: External view of dishwasher

VI ADVANTAGES:

1) Semiautomatic system

Semi automatic control is the use of various control system for operating equipments such as machinery, processes in factories, boilers and heat treating ovens, switching on telephone networks, steering and stabilization of ships, aircrafts and other applications and vehicle with minimal or reduced human intervention. Some processes have been automated. The biggest benefit of semi automation is that it saves labor, however it is also used to save energy and materials and to improve quality, accuracy and precision.

2) Low in cost

Our system is very low in cost because we are using very simple mechanism. So we can say that our mechanism will be very easy to construct and it will not incur any high labor cost and also the cost components will be very low and it will be low in cost.

3) Easy maintenance

Our mechanism will be very easy to maintain because it is having components which are detachable in nature and we will be able to maintain each and every components individually and also if any particular needs to be replaced so we can replace them readily and since we have said earlier that our components are very simple in nature so this makes our system more maintainable.

4) Energy saving

The mechanism used in this project consumes less electricity when compared to other dish washing machines . The total amount of energy consumed is 0.5 units per hour and cost of using electricity will be Rs9.

5) less timing consuming :

The taken for washing 1 plates at low speed is 38 sec whereas in high speed the time taken is 7 sec . Therefore this machine consumes less time when compared to other dishwashing machines .

VII APPLICATIONS:

- It is used for removing the waste from the plates at faster rates
- It is can be used in messes, hotels, colleges , companies etc.

- Cleaning and maintenance of dish washer is easy.
- It is used for a hygienic way of disposal of waste.
- Project to use this in efficient way to control the manual of plates.

VIII DESIGN CALCULATION :

- Time taken for washing 1 plate = 38 sec
- No. of plates washed in 1 hour = 450 plates
- Power consumed by 1 universal motor for 1 hr = 0.25 kWh
- Total Power consumed by 4 universal motor for 1 hr = 1 kWh
- Power consumed by 1 transformer = 0.5 kWh
- Total Power consumed by 2 transformers = 1 kWh
- Power consumed by the dishwasher for 1hr = 2 units
- Cost of one unit of current = Rs.10
- Total cost after running the dishwasher for 1 hr = Rs.20

XI CONCLUSIONS :

This dishwashing machines are very efficient to operate. In order for this comparison with the conventional dish washing process. This semi-automatic dish washing machine, it is found that mostly the studies are carried out on the way the plates are placed, time and energy consumption. thus the project based on the way of plate being placed in the dishwashing is made experimentally

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