Abstract— 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 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. Washing dishes is not the most rewarding task. Cooking can be creative, but cleaning up afterward seems like a waste of time and leaves the person washing complaining about "dishpan hands." But Automatic dishwasher uses large amount of energy, time and is costly. And being costly, the usage of automatic dishwasher in our country is very less. By using semi-automatic dishwasher, we can reduce time as well as human efforts significantly. Also 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 jet controlled by single pump using parallel connection.

Key words: Semi-Automatic Washing Machine, Semi-Automatic Dish & Utensil Washing Machine

I. INTRODUCTION

We all know that dish and utensil washing are most difficult and time consuming work. But if it is done by Automatic dish washing machine, it becomes costly for every person. So that we introduce Semi-automatic dish and utensil washing machine. The dishwasher has made cleaning and drying dishes much easier and more efficient. This Concept discusses the problems faced in Automatic Dishwasher and solutions on those problems. Automatic dishwasher uses large amount of energy, time and is costly. And being costly, the usage of automatic dishwasher in our country is very less.

Most conventional dishwashers installed in U.S. households today use 7-14 gallons per load and account for less than 2 percent of the water used in an average American home. Energy savings also result from upgrading to an efficient dishwasher because fewer gallons of water need to be heated per cycle. Many new dishwashers feature microprocessor-controlled, sensor-assisted wash cycles that adjust the wash duration to the quantity of dirty dishes or the amount of dirt in the rinse water. This can save water and energy if the user runs a partial load. The dishwasher has made cleaning and drying dishes much easier and more efficient. The Concept discusses how to reduce human efforts in dishwasher. The problems faced in usage of Automatic Dishwasher and solutions on those problems. Automatic dishwasher uses large amount of energy, time and is costly. And being costly, the usage of automatic dishwasher in our country is very less. By using semi-automatic dishwasher, we can reduce time as well as human efforts significantly. 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.

II. DESIGN CALCULATION

A. Design for Jet: (From the Book of R.K. Bansal)

1) Force Exerted By A Jet On Vertical Plate

\[ F = \pi \cdot \frac{V}{2} \cdot D^2 \]

Where:
- \( F \) is the force exerted by a jet on a vertical plate.
- \( V \) is the velocity of the jet.
- \( D \) is the diameter of the jet.
- \( A \) is the area of cross-section of the jet.

Fig. 1: Utensil Washing Machine
The force exerted by the jet on the plate in the direction of jet,

\[ F_x = \frac{\rho V^2 \sin \theta \cos \theta}{m} \]

where

- \( F_x \) is the force exerted by the jet on the plate in the direction of the jet.
- \( \rho \) is the density of water (1000 kg/m³).
- \( V \) is the velocity of the jet in the direction of the jet.
- \( \theta \) is the angle between the jet and the plate.
- \( m \) is the mass of water per second striking the plate.

The force exerted by the jet on the plate in the direction normal to the plate is given by

\[ F_y = \frac{\rho V^2 \sin^2 \theta}{m} \]

III. SPECIFICATION

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Part of the m/c</th>
<th>L x W x H in mm</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Outer Body</td>
<td>585 x 570 x 430</td>
<td>GI</td>
</tr>
<tr>
<td>2</td>
<td>Inner Body</td>
<td>510 x 470 x 430</td>
<td>GI</td>
</tr>
<tr>
<td>3</td>
<td>Door</td>
<td>585 x 570 x 75</td>
<td>GI</td>
</tr>
<tr>
<td>4</td>
<td>First Grill</td>
<td>480 x 380 x 150</td>
<td>SS</td>
</tr>
<tr>
<td>5</td>
<td>Second Grill</td>
<td>480 x 380 x 100</td>
<td>SS</td>
</tr>
</tbody>
</table>

Table 1: Specifications

A. Galvanized iron [GI]

It is used for outer body, inner body and door. It is low cost. Great corrosion resistance. It is coated with layer of zinc oxide which provide protective layer, protect from rusting. It is more durable.

B. Stainless steel [SS]

It is used for both Grill. (6mm Rod, 4mm base rod), Costing is low .Corrosion resistance and easily available.

IV. OBJECTIVE

Main objective of semi-automatic 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...
V. PROPOSED SYSTEM

- Semi-automatic
- No use of electronic Circuit Controlled by knobs and switches
- No programming necessary
- Material used GI (Galvanized iron) to reduce cost
- Light in weight
- Single centrifugal pump used
- 2 rotary jets controlled by single pump using parallel connection
- No gears used to reduce cost
- Jets are directly connected via pump through PVC pipes
- Less time to wash due to high pressure
- Can change washing time no fixed cycle necessary

A. Detail of Parts

1) Ball Valve
A ball valve is a form of quarter-turn valve which uses a hollow, perforated and pivoting ball to control flow through it. It is open when the ball's hole is in line with the flow and closed when it is pivoted 90-degrees by the valve handle. The handle lies flat in alignment with the flow when open, and is perpendicular to it when closed, making for easy visual confirmation of the valve's status.

Ball valves are durable, performing well after many cycles, and reliable, closing securely even after long periods of disuse. These qualities make them an excellent choice for shutoff and control applications, where they are often preferred to gates and globe valves, but they lack their fine control in throttling applications.

The ball valve's ease of operation, repair, and versatility lend it to extensive industrial use, supporting pressures up to 1000 bar and temperatures up to 752 °F (500 °C), depending on design and materials used. Sizes typically range from 0.2 to 48 inches (0.5 cm to 121 cm). Valve bodies are made of metal, plastic, or metal with a ceramic; floating balls are often chrome plated for durability. One disadvantage of a ball valve is that they trap water in the center cavity while in the closed position. In the event of a freeze, the sides can crack due to expansion of ice forming. Some means of insulation or heat tape in this situation will usually prevent damage. Another option for cold climates is the "freeze tolerant ball valve". This style of ball valve incorporates a freeze plug in the side so in the event of a freeze up, the freeze plug ruptures, (acts as a sacrificial disk), thus making for an easy repair. Now instead of replacing the whole valve, just screw in a new freeze plug.

2) Centrifugal Pump
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.

3) Electric Motor
Electric motors operate at their best power factor and efficiency when fully loaded, so you do not want to purchase a motor that is too big, and common sense dictates that one that is too small is even worse.

a) Motor Specification
   - Power Rating(HP) = 0.5
   - Power Rating(KW) = 0.37
   - Flow Rate (Liter Per Minute) = 30
   - Pressure (BAR) = 2.2

b) Motor Power
   \[
   \frac{1}{2} \text{ Hp} \\
   \text{Power} = 0.5 \times 746 \text{ kw} \\
   = 0.373 \text{ kw}
   \]
Fig. 7: Motor Specification

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