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Cabinet Type Washing and Drying Machine

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Abstract **- The requirements were to produce a washing idea which is very simple in application with less resource to input and fit for the purpose. For the purpose to achieve we studied the available washing machines in market and the one present on the site The requirements were to produce a washing idea which is very simple in application with less resource to input and fit for the purpose. For the purpose to achieve we studied the available washing machines in market and the one present on the site. Present washing machines studied were Cabinet Washing Machine, Most of machine were comprising of pumps for high pressure pumping of water on the components, motors for automatic oscillation of nozzle frame , heaters and chemical caustic additives to enhance the water quality in order for effective and qualitative cleansing properties.**

Keywords - Nozzle, Heating Coils, Tank, Pump, CAD Modeling.

INTRODUCTION

The Industrial Cleaning today is a major problem. 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. This machine is more preferred over the existing machine like less cycle time, less operating cost, economical for small surfaces and less maintenance cost.

This Special purpose machine (SPM) is not available in the market. Therefore they have to be designed as per the costumer requirement. They are also called as bespoke machines. This special purpose machine (SPM) is operating continuously for 24 hours a day, with minimum cycle time. The special purpose machine is generally used to washing of specific component. These special purpose machine (SPM) are used hydraulic and pneumatic energy. This machine is operating automatically or manually.

The productivity achieved after all the equipment is very high. Productivity of product is increase by 3 to 10 times than other washing. This industrial washing machine is a special purpose machine which is manufacturing for special purpose. This machine is designed according to the need as per the component to be washed for e.g. In various industries different jobs are manufacturing and as per the job the machine is designed. In this machine various sensors are provided which indicate and also reduce the chances of operations failure and assures the safety of operator.

This machine helps in quick operations as well as good performance. This machine highly cleans the job which is to be washed. This minimizes the time and this can be used in small as well as large scale industry. Purpose machine is a high productivity machine, with specially designed tooling and fixture, dedicated for mass producing the same component day in and day out. In this machine there are combination of limit switches, sensors, controller, and other safety devices etc. the essence of a SPM. A well-conceived Special Purpose Machine finds ways and means to utilize the man and machine to the optimum.

In this Special purpose machine (SPM) there are various components are used such as pump, blower, nozzle, filter, oil skimmer, tilting mechanism, water level indicator, temperature switches, etc.

A. PROBLEM STATEMENT:

In existing washing machine, there is a problem of washing and drying of casting components. Also the machine is working manually, due to this machine consuming more time in operation. The efficiency of machine and quality of washing component is also not good; due to this we are modifying the existing machine with new one.

Fig 1 Existing Machine

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B. OBJECTIVES:

1. To optimize the washing machine by reducing the heavy components.
2. To modify the existing machine with new design.
3. To get better performance by existing machine.
4. To convert poor performance of existing machine with good performance.
5. To compare the existing machine result with new machine result.

C. METHODOLOGY:

1. To determine the problem in existing machine.
2. To prepare the CAD model by using CAD software.
3. To fabricate and select the standard parts for given machine.
4. To take trail and run of machine
5. Object verifications.
6. To compare the results of new machine with existing machine

D. SCOPE:

1. It is used to wash the critical passage in components very easily & quickly.
2. This machine is widely used in automobile industry.
3. This machine can be more efficient working in the any atmospheric condition.
4. This machine improved the quality of washing.

II THEORY

This industrial washing machine is made for washing of specific components which are critical to wash or which cannot be washed by other method. Design of the machine is designed according to the use of machine, the environment in which the machine is used, in which type of industry it is being used. The main components of this are motor, pump, tank, filter, safety valve, and washing cabin. The machine is provided with stator, sensors etc. the A.C current is supplied to the stator circuit, this circuit consists of start and slop switches and internal connections The machine is start by the start button indicated by green color, by pressing this button the machine starts.

Pump is pumping the water from the clean tank and to supply the nozzle. Then the distance between the nozzle and components are specified then wash the components on the both side. Water from the washing components is flow to the dirty tank with the mixture of various lubricating fluid such as (grease, oils, wax) the capacity of the dirty tank is more than the clean tank. Water level indicators are used in both tanks to indicate the water level in the tank. In the clean tank two water heaters are used to heat the clean water the temp of the water in the clean tank in between $95c^0$ to $65c^0$ the temp. Of the water below than $55c^0$ then water heater is start automatically.

Using water heater in the tank to increase the temp. of the water then some amount of oil and other fluids are present in the water then increase the temp. of the oil then viscosity of the oil is reduced and easy to wash the crates with less time.

Oil skimmer are used in the dirty tank to remove the oil in the tank when the operations is start then oil skimmer is stop. In the operations water wave are present in the tank then oil mixed with the water. Operations is stop then oil in the water float above the water and easy to remove with the help of chain type oil skimmer. One additional transfer pump is used to pump the water from the dirty tank to filter to clean tank. The duplex type filter is used to remove the water partials with filtrations capacity up to 300 micron. One standby mode because of cleaning of filter and choking of the filter then filter water id passed to the clean tank. Two parts are providing to both the tanks to remove the water and supply the press water with the specified period. For the drying of component blower with some arrangement are used. Blower is fitted to bottom of the cabin and on the frame. Tilting mechanism is used to hold the component in the cabin. During the operations movement of the tilting mechanism with the help of some arrangement on the cabin such as motor, reductions box, flange, chain, and sprocket and 'L' type link is used.

One additional cylinder & piston arrangement is provided to up & down movement of the assembly for proper cleaning of the component. During the washing of component nozzle speed water to the component and small water drops are mixed with the work environment and dangerous to the operator by eliminating this problem we use mist eliminator.

Total cycle time of the operations is 3min to washing of components is 2 min and drying 1min.

III DESIGN OF MACHINE COMPONENTS

In this topic, some important points have been discussed which are useful in the washing machine

E. CAD MODEL OF TILTING MECHANISM:

The tilting mechanism is made up of SS304 this material are high strength and corrosive resistance. The dimension of mechanism are 1500*1200*150mm.In the mechanism three support rods are provided on each side of the mechanism horizontal and vertical.

The distance between horizontal rods are 300mm and vertical rods are 400mm. on the bottom of mechanism there are 9 rollers are used for easy to insert and remove the components with less efforts.

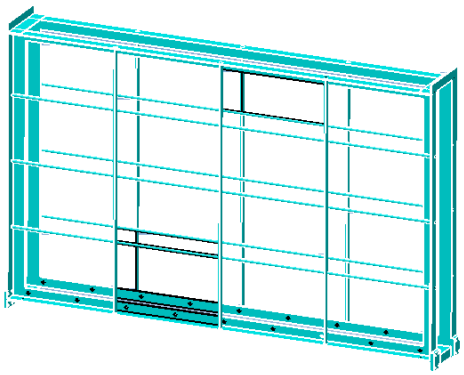

Fig 2 Cad Model of Tilting Mechanism

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F. CAD MODEL OF NOZZLE FRAME:

The nozzle frame is made up of SS304 this material are high strength and corrosive resistance with the dimensions are 1500*1500*400mm. By the required dimensions of hollow pipe are used with 50mm diameter. Three pipe are located in front or rear side of the tilting mechanism. And one are top and side of the mechanism. Each pipe makes eight holes using drilling machine by using tapping tool to make internal threads in the hole to fit the nozzles.

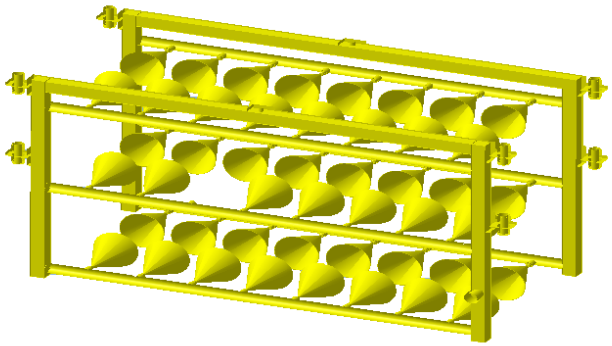

Fig 3 Cad Model of Nozzle Frame

G. CAD MODEL OF TANK:

Clean Tank;-The tank is mounted on frame, and on tank motor, pump, and filter are mounted .The tank is having four lids

The tank used in industrial washing machine is made up of SS 304(stainless steel) material. The sixteen gauge SS sheet is used for tank .The storage capacity of the tank 673.5 liters.

The capacity of the clean tank is less than the capacity of the dirty tank.

Dirty Tank- Dirty tank is made for this machine is tapered at the base. This taper is provide for easy cleaning of tank for e.g. While washing components the impurities wash out are collected into tank along with water, because of the taper this impurities slide along the taper and comes towards the slope

Between the pump and washing chamber the cage is provided. this cage prevents the impurities or any part of components fallen into the tank .The storage capacity of the tank is 845 litters

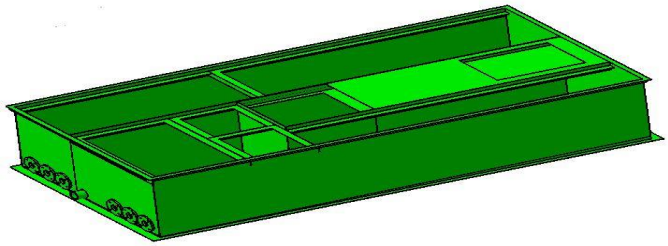

Fig 6 Cad Model of Tank

H. CAD MODEL OF CABINET:

The cabin is mounted on the upper side of the frame. Cabin is at the top of the machine. Cabin is made of SS 304 material in cabin two doors are provided one for the operations & other for maintenance purpose. Inside the cabin the tilting mechanism provide on which the is placed this provides easy to wash the tray. On the side of cabin pressure gauge are provided to indicate the working pressure. Operator will open the door and load the tray in the mechanism. After loading the tray operator will close the door and will start the cycle. Tilting mechanism are mounted on the top of the cabin

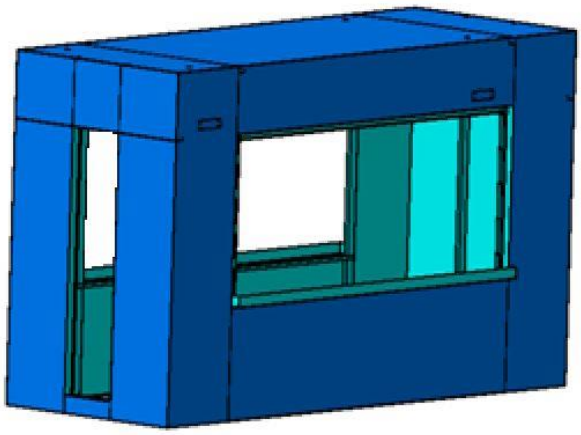

Fig 5 Cad Model of Cabinet

I. CAD MODEL OF BASE & SUPPORT:

The function of base frame is to support the part mounted on it. On the base frame overall assembly is mounted. At the side of the frame control panel is fitted to control the operations. It supports the total components of machine. The design of frame is based on deigned considering by design data book. While design the frame will consider all stress on it such as tensile stress, bending stress, compressive stress. All considering these design factor and we get proper frame design the frame of industrial washing machine is made up of 50*50mm MS square pipe having thickness of 1.6mm

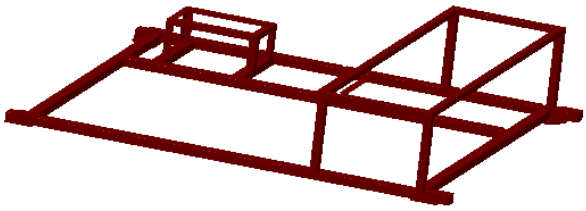

Fig.7 *Cad Model of* Base & Support

III FABRICATION OF MACHINE PARTS

J. TILTING MECHANISM:

The tilting mechanism is made up of SS304 this material are high strength and corrosive resistance. The dimensions of mechanism are 1500*1200*150mm. by give dimensions to cut the bar using cutter machine. All the cutting components are

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used to make structure for using gas welding. One addition 'L' type link is used to tilting the structure for proper cleaning of trey. One end of the link is connected to flange.

In the bottom of the mechanism are roller are provide for easy to insert and remove the trey or components.

Fig.8 Tilting Mechanism

K. NOZZLE FRAME:

The nozzle frame is made up of SS304 this material are high strength and corrosive resistance with the dimensions are 1500*1500*400mm.By the required dimensions of hollow pipe are used with 50mm diameter. For using given dimensions to cut pipe with 1500mm length, three pipe are located in front or rear side of the tilting mechanism. And one are top and side of the mechanism.

Each pipe makes eight holes using drilling machine by using tapping tool to make internal threads in the hole to fit the nozzles. All pipes are connected to main supply pipe for obtain same pressure in the pipe

Fig 9 Nozzle Frame

L. TANK:

While designing the tank it must be anticorrosive and it is slightly taper inside to flow the water used towards the pump .

There are two tanks one cleaning tank and other is Dirty tank on which pump and filter are mounted. The Dirty tank is fabricated in 1.6mm thick SS304 sheet and size is 0.843*2*0.43m & Dirty tank capacity is 752.5m.The clean tank is fabricated in 1.6mm thick SS304 sheet and size is 0.523*2*0.43 & clean tank capacity is 535.78m.

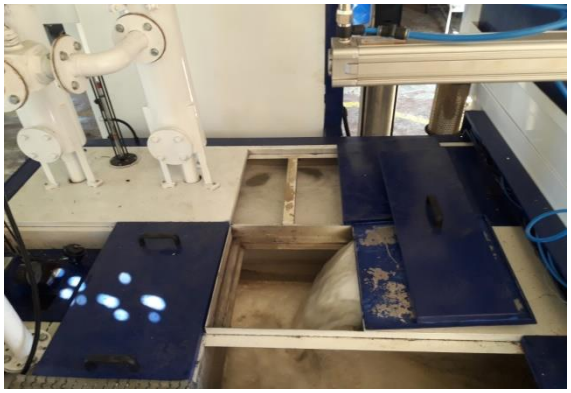

Fig 10 Tank

M. CABIN:

While designing the cabin, it must be anticorrosive. Cabin are fabricated they are made up of 1.6mm SS304 sheet. it has opening from front side to see the cleaning of object and Drying. In this cabin component is placed for washing by tilting mechanism arrangement component is had in the washing cabin.

In the washing cabin nozzle are mounted to the tube which spray and the water on the component with high pressure. The hose is placed at the bottom of washing chamber which is used to store the water in the tank

Fig 11 Cabin

N. BASE & SUPPORT:

While designing the frame we will considering all applied stress by the tank cabin , filter and pump based on that stresses we have to select the material for frame is M.S 50*50 square pipe.

The main purpose is to select of material to lift the overall load of whole assembly or vibrations, the designed of frame must be depends on it, it must be anticorrosive, harden and light in weight.

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Fig 12 Base & Support

IV EXPERIMENTAL RESULT

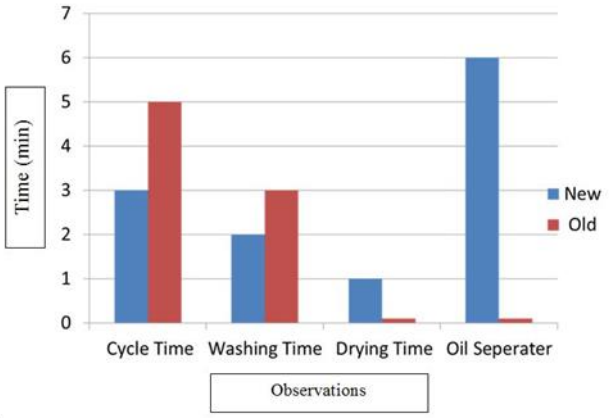
O. CABINET MACHINE

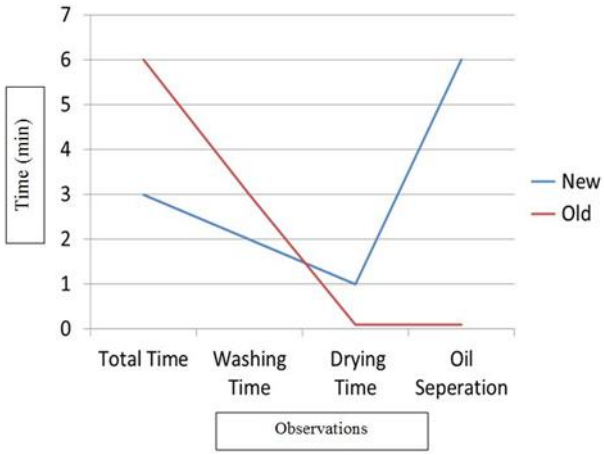
Fig.12 Cabinet Machine

P. RESULT COMPARISON

Sr. No.	PARAMETERS	OLD MACHINE	NEW MACHINE
1	Cycle time	5-6 min	3 min
2	Washing time	3 min	2 min
3	Drying time	-	1 min
4	Oil separator	-	60%
5	Proximity sensor	No	Yes
6	Limit switch	No	Yes
7	Indicator	No	Yes

Q. GRAPH:





CONCLUSION

Conclusion of this paper comprises of Cabinet Type Washing & Drying Machine improvement in the washing of Bin, reduction in the time of washing & Drying time of the Bin, improvement in the washing Quality, optimization and design modification is also included in the conclusion of this paper.

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