

RESEARCH ARTICLE

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Design of Multi Cleaning System Using Steam

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ABSTRACT

The multi cleaning system is supposed to be system that uses steam which can clean up things that are used by human in day to day life. The commercial detergent washers are compared with the system and it was found that the washing is very convenient and soapy forms are not produced that made the washing very clumsy. The removal of bacterial populations formed on surface of any material would be totally eradicated. The surface to be cleaned are given bath with steam with high pressure from 3 bar to 7 bar by which removal of dirt and stain particles were washed off very comfortably. High pressure steam would be generated by heat the water in the tank which will mounted on the system itself. The reason behind using the steam for washing purpose is the less wastage of water and also its availability. The development of steam based cleaning system has revolutionized the process of washing. One can choose an appropriate type of high power steam cleaners for challenging cleaning applications in office, commercial and industrial settings. The steam does that thing that commercial washing system cannot do. A steam can remove grease and grime while for normal cleaning requires expensive detergents. The multi cleaning system cannot be only used for industrial use but also for the housework stuff. So our prime focus is to use the steam and make multiple cleaning.

Keywords: multicleaning system

I. INTRODUCTION

Steam cleaning is process through which one can clean any type of surface very efficiently. Steam cleaning is deep cleaning process that makes use of a high-pressure blast of hot water and steam to remove germs and other bacteria from different materials and surfaces. Steam has been used in recent times for cleaning purpose but hasn't been the major alternative still. Compared to normal wash, the steam cleaning has significant benefit which is the main purpose of our project. With high steam pressure one can cleaning those surface where stains and germs are unreachable. Steam cleaning has wide applications in human life as they are better than the detergents used cleaning. Not only in the industry but even our in day to day we can clean at house. From an industrial worker to housewife, the steam plays a significant role. All household surfaces can be cleaned by the use of steam, but one must always keep in mind that the material he/she is cleaning and think about how it will react to direct water and heat. Before directly cleaning the surface, the person should take a small area of surface he/she is cleaning. The reason behind this is to know whether the surface to be cleaned gets major changes in its appearance, such the colour getting dull. The following picture shows a steam used while cleaning.



Fig.1.1 cleaning system

1.2: Objective

- The basic aim of our project is to design model that uses steam as main purpose of cleaning. The project is to prepare high pressure steam that has function of multi-cleaning.
- The design is such that we are trying to make the model as compact as possible also the availability of portability. We are trying to make the model that has less losses of power that allows the system to work very efficiently.
- The model is supposed to be very handy and also long life.
- The aim is also make least use of electricity so we are thinking to add up some components such as motor, battery etc. These components are going to make the utmost use of electricity.
- Not only saving the electricity but also to give very efficient cleaning with a better surface finishing.

1.3: Why is steam preferred?

- With the change in the era, the steam has achieved great importance as human have found great use. Steam is chosen as the best alternative because primarily it is very easily available. Well steam can be prepared by simply heating the water and then being used up.
- While the process of steam cleaning is usually thought to be for cleaning carpeting only, the same process can also be employed to clean jewellery, bathroom tile, and brick. Various types of cleaners are employed for the task of cleaning with steam, depending on the specific application.
- The steam is the medium through which any area that out of reach of human hands can be cleaned. With high amount of steam pressure not only the unreachable area would be cleaned but also the small microorganisms would get washed off.
- This is also used as the water is mostly available at every location so the steam cleaning makes its application in wide location. So at any individual where we have water the system can work.
- When it comes to cleaning carpeting, steam cleaning is a deep cleaning process that helps to dislodge dirt and grime that has ground into the fibres of the carpet.

1.4: Problem Statement

Normal cleaning faced several problems. The points of problems are discussed below:

• Controller loss

In the words of John Pinson (director of operations for Palms Car Wash), the biggest malfunction is the losing control in cleaning.

"Without a brain keeping time and the telling applications to a fire on a time, and keeping the accurate track of the functions then location is a flying blind," he says.

Pinson explains that a preventative maintenance for problem a involves the backing up the controller files. It can be as a simple as operators utilizing fresh the memory sticks.

"Some companies ... have an EOD (emergency operations disk) so that if tunnel watch goes down and you can still a function," he adds.

• Long lines

Another issue a carwashes face is choking; slow flow is causing line of vehicles out to the street, shares Pinson.

"I truly believe that 'Your Line is Your Sign.' So if you have a line out to the street then you are not going to stack business. You are actually choking your business," he states.

To prevent the problem, Pinson says managing the throughput is key. "You have to establish culture that breeds how to a hustle. There was a sports caster one Sunday that I heard say 'it doesn't take talent to hustle.' There is a lot of truth into that. If you hustle and want your people to hustle, they will," he shares.

He continues that it takes everyone to keep the vehicles from stacking. Specific problems that must be addressed are:

- Pay stations are working efficiently.
- Chain speed and the equipment functioning properly.
- Towel dryers cannot stop the conveyor, constricting flow.

• Ensuring quality

The number of operational challenges that face carwashes, but Pinson says biggest challenge is the quality.

"All carwash companies do a good job," notes Pinson. "It is the companies that care about quality that will be set apart from the pack."

Training is as essential, according to Pinson. "You can never stop training. If you stay focused and lead by example, your folks will follow."

To rise above the competition, Pinson adds carwashes need to install efficiency in the culture of the company.

"Operationally I look at a lot of companies, not just in the carwash business. I look at fast-food chains, five-star restaurants, retail cashier lines and amusement park facilities," explains Pinson. "I like to see how they react in high-volume situations. Think about it next time. How was the experience when you were there?"

How much better it's when you see that crew is really efficient.”

- **Wastage of water**

For mobile wash operators, the Optima steam can reduce water consumption by 95%. For example, using steam, an operator can clean a surface using less than once gallon of water. Not only will steam reduce your water consumption and water bill, it will also reduce the equipment and space necessary to contain water. Weight reduction will greatly reduce vehicle fuel consumption.

Compared to traditional pressure washer operators who carry over 946 litres of water and a recovery tank, Steam base car washing system users will need no more than 76 litres of water for all day use with no recovery tank!

- **Use of chemicals**

Steam allows mobile wash operators to drastically reduce their chemical consumption. In fact, steam eliminates your need for window cleaning chemicals, soaps, detergent and other abrasive and harmful compounds. With a moisture control feature, the steam base car washing system achieves wet or dry steam. Heat of the steam will break down dirt and grime easily and sanitize any surface without chemical, and gentle yet powerful steam pressure will lift them up from vehicles' surface. The temperature of steam can be easily controlled by the distance you hold it from the surface, ensuring no damage to surface, especially paint and clear coats!

II. LITERATURE REVIEW

In this section some related work on multi cleaning system has been explained:-

2.1 Reduction in infection risk through treatment of microbial contaminated surfaces with a novel, portable, saturated steam vapour disinfection system

Author: Benjamin D. Tanner Antimicrobial Test Laboratories, LLC, Round Rock, TX

Published year: July 14, 2008

Conclusion: The saturated steam a vapour disinfection system tested for a study is the chemical-free, a broadly active, a rapidly efficacious, and therefore represents novel alternative to the liquid chemical disinfectants.

2.2 Effects of physical interventions on house dust mite allergen levels in carpet, bed, and upholstery dust in low-income, urban homes.

Author: Vojta PJ, Randels SP, Stout J, Muilenberg M, Burge HA, Lynn H, Mitchell H, O'Connor GT, Zeldin DC

Published year: August 10, 2001

Conclusion: Intensive vacuuming and a dry steam cleaning both that caused a significant reduction in the allergen concentration and a load in upholstered furniture samples ($p < 0.005$). Based on data, we can conclude that physical interventions offer a practical, effective means of a reducing house dust mite allergen levels in a low-income, urban home environments.

2.3 Use 'Dry' Steam Vapour Treatment for Healthier Carpet

Author: Jeffery C. May, Principal scientist in Cambridge, Massachusetts

Published Year: January 21, 2014

Conclusion: Since cleaning with the SV produces some moisture, do treatment on a day when the relative humidity is a low or on a day when the windows can be opened. To speed drying, put box fan in window on the exhaust or operate a fan in the room where you are working.

III. IMPLEMENTATION OF MODEL & ITS FUTURE WORK

3.1:- Basic components

- A tank or reservoir is the primary components of our system. This will be used for storing the water to be converted into steam. As a tank we are looking forward to use a cylinder tank that is used in RO water purifier. This is because it is easily available and also large amount of water can be stored.
- We will be using a pressure relief valve that releases high pressure generated in the tank.
- There will be a heating element inserted at the bottom of the tank that will heat the water inside the tank and convert it into the steam. This would be small boiler.
- The hose pipe will used to allow the steam to pass from the reservoir to the area of application.
- A small turbine will used which will be rotated by the pressure of steam and thus the electricity will be produced.
- A small motor battery will be used that will gain electricity from turbine.
- A scrub will be used that will give surface finish to the cleaning area
- Temperature indicator will be mounted with assembly which will let us know the degree of hotness.
- A nozzle will used will be mounted on the hose pipes and that will control the speed of steam flow.
- We have designed a stand with wheel that will hold every component mentioned above.

3.2:- Designed Models

3.2.1:- Electric Steam Boiler



Fig.3.2 Electric steam boiler

Working Principle of Boiler

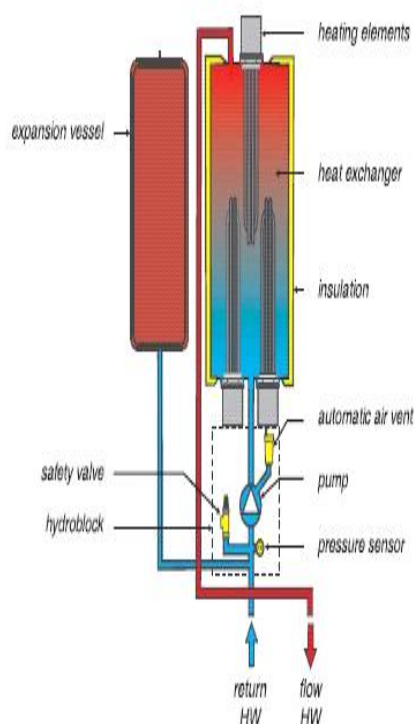


Fig.3.3 Circuit diagram of Boiler

Steam Boiler Efficiency :-

The percentage of total heat exported by outlet steam in the total heat supplied by the fuel is called steam boiler efficiency

$$\text{Steam Boiler Efficiency}(\%) = \frac{\text{Heat exported by outlet steam}}{\text{Total heat supplied by the fuel}} \times 100$$

- The process of creating steam with an electric boiler is fairly simple. Electricity is run through a heating element that acts as a resistor to create heat through resistance.
- Water from the system or holding tank is then run over or near this hot element in a pipe or tank, heating the water to a suitable temperature, then making the water hot enough to boil and become saturated steam, at which point the saturated steam is transported to wherever it is needed via the steam pipes that exit the body of the electric boiler.
- Electric steam boilers work in a very similar way to fire heated boilers with the exception of what heats the water.
- Because electric boilers do not use complicated forms of heat exchange for example tradition fuel heated boilers require multiple different parts to operate successfully they do not contain many of the potential hazards that a fuel heated boiler can present.
- Electric boilers are also much easier to maintain because they do not need tube replacement that a fire heated boiler would require, due to soot and fuel residue, or any of the fire maintenance required for a fire heated boiler.

Electric boilers have smaller carbon footprints than their traditional cousins fuel heated steam boilers, and require less space overall making them a good choice for a smaller operations that are in need of a boiler

IV. OPERATION & ANALYSIS OF DATA

4.1 : Construction

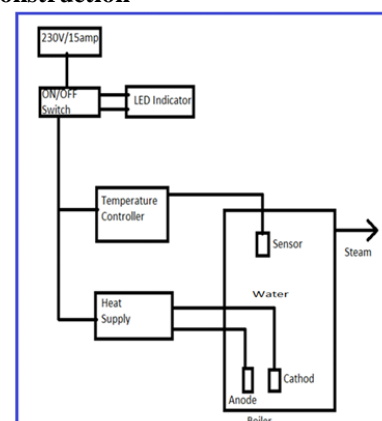


Fig.4.4 Schematic diagram of Steam Based Washing System

The 230V, 15 amp, 3-phase supply is connected to the manually operated ON/OFF switch. The switch is parallel connected to the LED indicator, Temperature Controller and the heating element. The LED indicator glows when the supply is ON. The Temperature Controller is connected to the Temperature sensor placed in the container acting as boiler shell. The Temperature Controller is equipped with the LED display indicating the current temperature of stem in the container. The heating element contains two aluminum blocks provided with insulation to prevent the problem of short circuit placed in the container.



Back View



Top View

4.2 : Operation

The tank is filled with liquid which may be various qualities of water or distilled water or a mixture as already described in the foregoing. The system is turned on by closing the manual switch which controls power to the heater. Energization of signal light indicates that the power is on. Signal light flashes only when the generator is energized. The steam generator acts as a flash boiler, the liquid being instantly vaporized and pressurized so that it is delivered through the tube and pipe into the cavity in the steam generator. The steam generator acts as a flash boiler, the liquid being instantly vaporized and pressurized so that it is delivered through the pipe and tube through the discharge tube. Since the discharge tube is not far removed from the generator, the vapor delivered is dry and serves to clean and disinfect whatever it is directed to. If disinfectant is included in a mixture, the discharge from the jet discharge tube immediately sterilizes and the steam or other vaporized liquid blows the surface clean.

4.3 : Analysis of Data

Input Power Supply : 230 V, Three phase
Input Supply Frequency : 50 Hz

The Electric heater : 250 watts
Generator temperature : 100° - 400° C.
Discharge tube OD : 1.8 cm
Discharge Tube ID : 1.2 cm
Water Storage Capacity : Max. 500 litres
Switch type : Two way
Pressure : 87 to 101 psi

V. UNIQUE FEATURES

Advanced Structure :-

Steam's advanced mechanical and electrical structures make maintenance and repair easy. The Steam was developed by experienced engineers of the industry who have worked with industrial pressure washers, vacuum cleaners, and other industrial cleaning equipments of top brand names in the past. Their own know-how and expertise are reflected on the Steam. A good machine "makes sense" for easy maintenance and durability.

Unbeatable Steam Power :-

Steam's large capacity boiler provides continuous steam as long as water and heating power sources (diesel or electricity) are supplied. The Steam Based Car Washing System uses the most heat-efficient and safest steam boiler. Our boiler keeps heat inside and maintains steam at a constant temperature and humidity. The boiler's unique design maintains the machine cool even during operation. Also, the moisture control valve lets you choose the right moisture content of steam.

Appealing Design :- The Steam Based Car Washing System is less industrial-looking and visually more appealing to anyone. different color choices are available: Red, Yellow, Blue, and Green.

Multi-stage Safety Features :- The Steam Based Car Washing System was designed with user and machine's safety in mind. Our safety features includes thermostat and pressure switches, fluid level sensors, check valves, pressure release valve, and much more.

Reliable Parts :- Each part of the Steam was handpicked by our engineers from the best manufacturers around the world. We use the best parts for Steam performance of the machine, not the cheapest.

VI. BENEFITS AND DRAWBACKS

6.1:- Benefits

- The consumption of water is less.

- A steamer can clean between consoles, seats, dashes, air-vents, cup holders, door pockets, door jambs, and more.
- Steam dries within second is one of the advantage.
- The steamer will not leave an interior soaking wet a major reason for bad odour is over-wetting with an extractor.
- Hard surfaces including your car's windows to perfection can be cleaned by steamer.
- Dirt from roof, seats, carpets and mats can be lift up by steamer.
- Leather seats can be cleaned better than using harsh chemicals and a brush by the steamer.
- Leather will be soft and supple and still require less time and effort by use of the steamer
- We are using is a super-heated water with the steamer.
- No harsh cleaning products are to be needed there will be no fear of an allergic reactions to chemicals because we will not use any!
- The inside of the car will smell fresh because of steam deodorises.
- The inside of the car will be bacteria-free because of steam sterilises.
- Two operators can clean at a once, saving the valued customers considerable waiting time.
- With over 30(10m) of hose length, the steamer can reach out quite easily.
- The steamer is a mobile, quiet and easy to operate and maintain.
- The steamer has the adjustable moisture control valve and suitable for cleaning engines.
- The steamer has the automated boiler and safety features and is safe to use.

6.2:- Drawback

- Electronic engine controls can be easily damaged through the hot water and high pressure steam.
- There is high risk of these types of the components being exposed to water, if you do not use the steam in the correct way.

6.3: Applications

- Car wash & detailing services
- Self-service car wash establishments
- Mobile car wash businesses
- Motorcycle wash and detailing services
- Cleaning of machinery
- Removal of weed
- Cleaning of boat
- Landscaping professionals
- Construction services
- Military
- Public sanitation

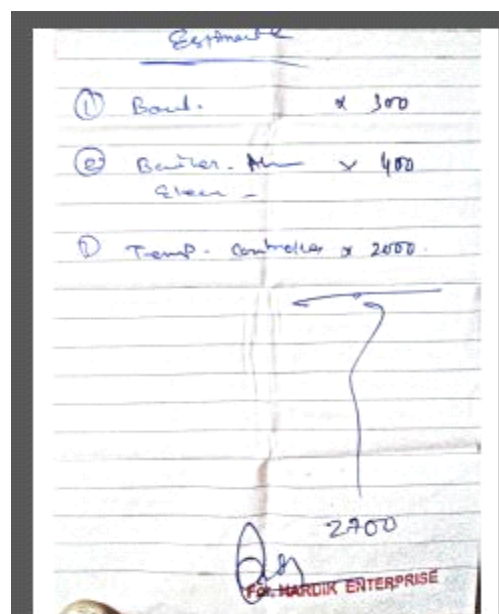
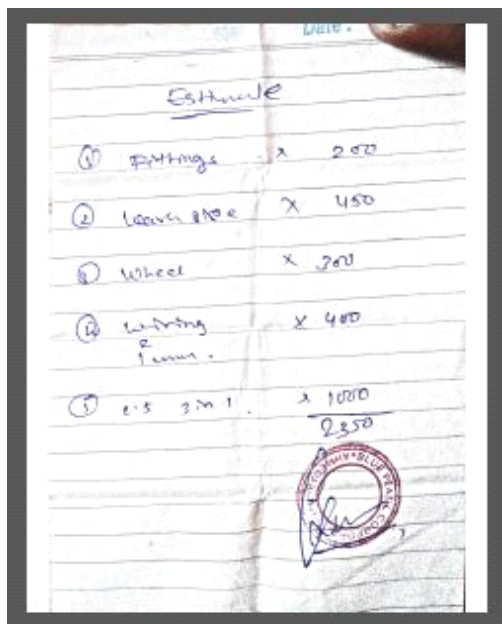
- Food packaging factories
- Government offices and more

VII. OVER-ALL COST

Cost of equipments :-

- Temperature Controller : Rs 2000
- Boiler aluminium block : Rs 400
- Discharge Tube : Rs 1000
- Wheel : Rs 300
- PVC pipe : Rs 120
- Fittings : Rs 200
- Bowl : Rs 300
- Wire : Rs 400
- 15 amp top : Rs 50
- Other costs : Rs 200

Total Cost : Rs 4970



VIII. CONCLUSION

- By application of STEAM BASED CAR WASHING SYSTEM we can save huge amount of water giving high return to environment
- Thus, it is very wide field still to be explored and can be pioneer in saving water and maintaining good condition of vehicle

The improvement using steam for car washing which are listed below :-

- Consume little as 3.78 litres of water per car wash.
- Chemical free sanitation.
- Eliminate waste water.
- Remove dirt, stains and grease.
- Deodorize and sterilize surfaces
- Remove stains from upholstery in less time.
- Clean interiors, exteriors, engine compartments, door jams, floor mate, tire.

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