

Automatic Hybrid Machine for Bike and Car Wash (A step towards green environment)

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Abstract— The particulate matter in atmosphere is increasing day by day and is likely to shoot up in coming years because of which the need of washing has been increased, simultaneously the water scarcity has been the measure issue over the years hence water recycling is the need of the hour considering the today's scenario. Some other parameters which are equally important from washing point of view is to minimize the time and that to with good quality finish. The main feature of this product which defined its uniqueness was the water recycling system which made it stand out with its competitors in the market. The tag line on basis of which we start working on the project was 'Machine for Common Man' looking at the prices of automatic machines in the market we also want to make it affordable to a common man who can also enjoy the benefits of automatic system without paying much penny.

Keywords—hybrid machine, water recycling, machine for common man

I. INTRODUCTION

Living in the 21st century the population is increasing day by day, as the population increases the demand for transportation is on a rise. One of the key mode of transportation is road transportation, in this the use of cars and bikes are most preferred by people. As the demand for cars and bike is increasing their number is also increasing which leads to rise in maintenance work. The maintenance includes different parameters which are follows:

- Enginework
- Body maintenance
- Tyres
- Washing

Our main focus is to work in the field of washing. Washing is a facility used to clean the exterior and some part of interior of the motor vehicle. For exterior purpose the different type of washings is used, they are categories as follows:

- Hand wash: where the vehicle is washed by workers.
- Automatic wash: where the vehicle is washed by automated machines.
- Tunnel wash: which uses the conveyor mechanism to move the vehicle in series of washing system, usually used in showrooms?
- Chemical wash: where we use chemicals to wash and polish the car surface (also called waterless system).

Steam Wash: where we use jet of steam to wash the vehicle.

In India conventional washing of vehicle is mostly preferred because of its low cost, work load and other parameters. Hand wash is most effective washing because in this the labour can have access over the parts which cannot be cleaned by automatic machine but it has certain drawbacks such as it is time consuming, number of labor required is more, health issues of labor mostly skin related problems, wastage of water, pollution of environment, etc. The trend of washing is changing and now everything is being automated. The world is moving on a fast-track & for which time plays a very important role; people want everything to be done within seconds without wasting much time & for which automation is the key to save time.

II. WHY WASHING?

The air quality index of cities are getting worse day-by-day, according to the report of System of Air quality and Weather Forecasting and Research (SAFAR), the city air quality index is very poor in the recent times as compared to the previous year's stats, this shows that the quality of air in the city has slipped from the good benchmark to satisfactory benchmark within very short span of time. The rise in air pollutants is mainly due to rise in no. of vehicle. Nitrogen oxide, carbon monoxide and sulphur are released by vehicles which are to the pollution and increase in amount of particulate matter (pm). The following is the graphical report of Air Quality Index of Pune city.

Washing not only gives good outfit to your vehicle but also has technical reasons. As pollution is on a rise there are various minute particles which are imposed on the surface of the vehicle, engine parts, lubricating parts, etc. This leads to problems like engine cease due to improper heat dissipation and affecting the lubrication system of the vehicle due to friction. In monsoons mud is stuck on mud-guards, under-chassis and body of vehicle which leads to increase in friction on tyres, vehicle jamming and affecting the aesthetic look of vehicle. To reduce such issues washing of vehicle is necessary.

Due to this 'Varadom Technologies' built separate automatic machines for bike and car wash. This machine has reduced the efforts required for manual wash and also the time required is cut to half. It had a positive response from customers but the demands of the market were not satisfied as the end users expected a single machine setup which will wash cars as well

asbikes.

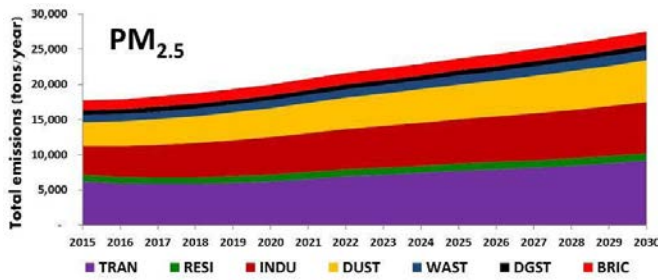


Fig.1. Predicted emissions value of pm 2.5. [6 & 7]

III. FIELDSURVEY

The aim was very clear about what we have to build and how we have to build. The first step which would lay down the foundation of the project was field survey, technically what we have to do was to gather the 'customer voice' across the city of Pune which would serve as the design parameters for the project.

We prepared questionnaire form which included 15 questions covering various keypoints. The target was to survey as many washing center as possible for which we got divided into groups and covered the appointed areas of survey.

The survey involved visiting various washing center across the city and the required data was collected according to the questionnaire which already included the necessary data required for the design of the system. The survey was not only restricted to the questionnaire form there were various other systems which we came across such as steam washing and foam washing, also as shown in the figure below the automatic washing is not restricted to the cars and bikes the busses as well can also be washed using the automatic system which include the additional features such as vertical brushes which were operated by the electronic control unit.

DATA ANALYSIS

After successful completion of the survey we were having all the required data which helped us to go for further part of the project that is deciding upon the design of machine. The data collected from survey then was jot down on the excel sheet which helped us to sort out the most appropriate or optimum data for that particular problem for instance the optimum area for washing or the amount of water required for washing likewise many questions were answered in a very appropriate way which made the idea more clear on how to approach for design and what parameters to be considered while designing, also we took the help of bar graph and pie chart for the statistical analysis of data which we obtained from the survey.

IV. DESIGN

The concept was finalized but this only decided on how the setup would be working that is only the framework of the machine and its trajectory (boom) was decided, but this was only one part of the washing centre the other things on which we need to work was the selection of pump, selection of compressor, selection of filter, selection of hoses & nozzles etc.

The concept that is single boom with whole platform cover, is based on the principle of overhead crane, in this concept the boom is given motion along two dimension first that is along X axis and second that is along Y axis by providing two degrees of freedom to the setup we are able to cover the whole car for washing. Overhead crane, also called bridge crane, is a kind of crane traveling on the elevated track to lift goods. Overhead crane move in longitudinal direction along the erected track and its trolley move in transverse along the elevated track, which work in a rectangle scope. Crane operators can lift and transport cargo with the space under the overhead crane without being hindered by ground equipment. The outcome of our model was to wash both bikes and cars in the same machine after studying the above six concepts and looking at their advantages and disadvantages we found that concept number four was the most appropriate with least disadvantages and was easy in terms of manufacturing, Also the main motto was to make this machine available for the common man with the least possible cost of the model present in the market that is to increase the affordability of the model so we have to select such model:-

- Can wash both bikes and cars
- Express washing so that time required for washing is less
- Less consumption of water
- Water recycling
- Easy Programming for PLC

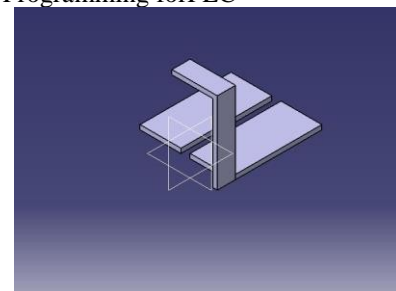


Fig. 2: Concept model of finalized design

As per the design calculation and the other parameters the complete model is built by using the CATIA software. The designed model was then sent for manufacturing.

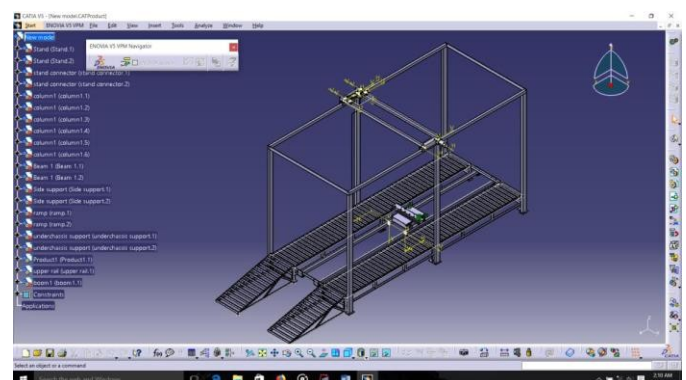


Fig.3. Render Model(Using Catia)

FABRICATION

Fabrication is done in such a way that the product has not been compromised over its quality but simultaneously the most suitable material with optimum cost has been utilized while its fabrication. The entire product is built with the limited number of manufacturing processes only which helped us to cut down the prices. From the company's point of view cost of manufacturing and customer satisfaction plays a vital role. It includes various manufacturing processes like casting, forging, welding and cutting operation. At the end of this the testing of the product before it enters the market is done to check the durability of the product.

Material science that is study of various materials to be used in product manufacturing is key factor to be considered during fabrication processes. Selection of material is done on the basis of following strength, corrosive effect life cycle (endurance limit) and factor of safety.

V. WATER RECYCLING UNIT

Now a day due to scarcity of water most of the industrial start-ups are facing problems to deal with it. The system has water recycling system installed in it so that the problem of availability can be tackled. In this system the water used for car and bike wash is collected at the bottom and with the help of pump it is pumped back to the feed tank.

To make the water pure for recycling two stage filtration processes is used.

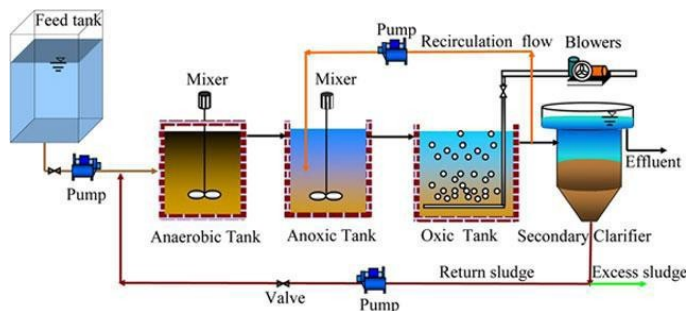


Fig.4. Black Water recycling of black water.

Black water, which is sometimes referred to as sewage is the wastewater that comes from toilets, garbage grinders, and dishwashers. This is different from grey water because it contains bacteria, pathogens, and food particles, which can rot and is more difficult to treat than grey water. The wastewater that comes from showers, washing machines, and sinks is considered greywater because, even though it has particles and contaminants, they are not considered dangerous. However, in areas where proper toilets and washing facilities do not exist, it is likely that even laundry wastewater may contain harmful pathogens or bacteria's. The idea behind it is very simple; Black water flows to a collection tank, where it is allowed to settle and an initial population of microbes begins to break down the solid material within and then after around 24 hours, the water enters a treatment tank.

Grey water or sullage is all wastewater generated in households or office buildings from streams without fecal contamination. By definition grey water is generally waste water from showers, baths, basins, and washing machines. Grey water treatment is easier than municipal wastewater treatment, generating a large interest in its reuse and recycling.

Typical applications for grey water recycling and re-use are toilet flushing, irrigation and other non-potable uses.

Reusing wastewater is a crucial part of the sustainable management of water resources. Grey water can be an important alternative water source, especially in arid and touristic areas, where the biggest water demand is usual in the dry period. The potential ecological benefits of grey water recycling include:

- Reduced freshwater extraction from rivers and aquifers,
- Less environmental impact from septic tanks and water treatment plants,
- Reduced energy use and chemical pollution from water treatment,
- Groundwater recharge and reclamation of nutrients.

However, grey water can be contaminated with different kinds of soluble and insoluble substances and must be treated properly. Contaminants in grey water include traces of dirt, food, grease, hair, and certain household cleaning products.

Typically, aerobic and biological treatments are used as primary grey water treatment to remove dissolved and suspended biological matter, followed by ultra-filtration to prevent particles, bacteria and viruses of passing through. Ultimately, grey water can be disinfected with ultraviolet and/or chlorination, to ensure residual disinfection at point-of-use.

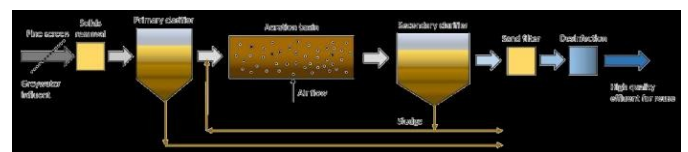


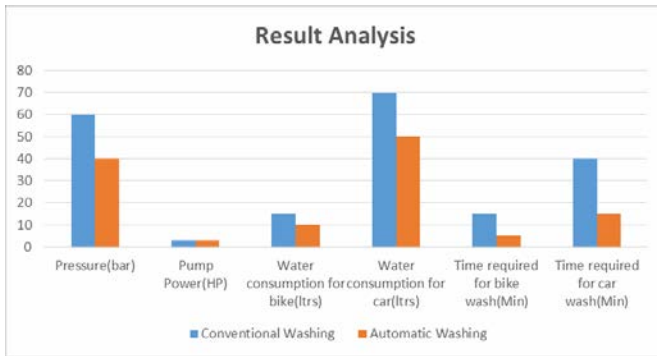
Fig.5. Grey water treatment with conventional technologies

VI. RESULT ANALYSIS AND CONCLUSION

The following comparison is done between conventional washing system and automatic washing system (Patented). The various parameters has been optimized under the new washing machine which is shown in the table.

Table.1. Result Comparison Table

Sr. No.	Parameters	Conventional Washing	Automatic Washing
1.	Pressure (bar)	60	40
2.	Pump Power (HP)	3	3
3.	Water consumption for bike (ltrs)	15	10
4.	Water consumption for cars (ltrs)	70	50
5.	Time required for bike wash (min)	15	5
6.	Time required for car wash (min)	40	15
7.	Area (Sq.ft.)	1500	500



Graph.1: Result Analysis.

VII. CONCLUSION

Results show advantages of using hybrid automatic machine for car and bike wash. The product is technically sound, financially viable, operationally feasible, environmental friendly and of great usability. Future work can be done to make tailor made applications for various vehicles.

VIII. ACKNOWLEDGMENT

We owe many thanks to our Guide Rahul Ralebhat as well as our industrial guides Vijaykumar Kakade and Nilesh Bakshe,

Varadom Technologies Pvt. Ltd. Pune for their immense support and valuable suggestions to conduct this project work.

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