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# Design and Fabrication of Garbage Handling System

***Sakib Mujawar[1], Monika Ghadge[2], Sakshi Tonemare[3], Parth Mulye[4], Swapnil Thikane[5*]***
*[1,2,3,4]Student, [5*]Lecturer*
*Department of Mechanical Engineering, Sanjay Ghodawat Polytechnic, Atigre*

***Corresponding Author***
***E-Mail Id**:- swapnil.thikane@sgipolytechnic.in*

***ABSTRACT***
*Solid waste includes empty bottles, polythene bags, papers etc. Garbage waste can lead to blockage of the drainage system. In order to avoid such situation these impurities are needed to be taken out time to time for cleanliness of the environment. Garbage can be cleaned continuously by the help of model using the drive system to remove the solid waste and threw it into waste bucket. This project is designed with the objective to design & fabricate efficient garbage handling system. This project will collect the garbage from various locations using conveyor which are driven by chain sprocket grasp the solid waste and threw it into the waste bucket to avoid blockage. This machine results into saving in labour cost and also reduces harmful effects on human beings.*

***Keywords:-****Solid Waste, Garbage, Environment, Fabrication, Pollution, etc.*

## INTRODUCTION

Government of India in working to make various smart cities in India and also focussing on clean India campaign through various initiatives like Swacch Bharat Abhiyan and Digital India. The population of India is increasing as rapid rate in last few years. Along with the increase in population, the amount of garbage produced through various ways is also increasing.

Due to this, the problem of garbage management has risen in many parts of the country and is a vital issue considering its effect on human beings and environment. The development of the nation is taking place at fast rate but the people are not much aware about the waste towards the waste disposal and management.

At many public places throughout the nation, there is a very common situation where the waste or garbage is overloaded in the collectors and that garbage is spilled out trough it on roads. This results into bad smell and ultimately causes the pollution. This garbage if kept at those locations for longer duration then it leads to increases number of diseases as large number of bacteria as well as mosquitoes stays over it. So to make a Digital India campaign successful, everyone have to ensure that they will make a clean and a healthy global environment to protect the environment [1].

In past few years, the population is increasing rapidly which has led to increase in urbanization and also rise in industrialization in India. This has led to creation of severe problems related to solid waste management in many cities across the nation [2]. The rise in consumption of food, vegetables, water and other natural resources by the human beings living in various cities across the nation has led to production of large quantities of solid waste material in garbage form.

The impacts of such pollution are felt both at local, as well as, at global level.

  

Discharge of garbage through domestic, agricultural and industrial applications as shown in Figure 1 has resulted into contamination of air, harmful effects on nutrient and creation of toxic materials which in turn lead to degradation of air, water, fertility of land and affect flora and fauna badly.

***Fig.1:-****Domestic and Industrial Garbage Collected in Garbage Collection Area*

**LITERATURE REVIEW**

Ranjit Kumar [3] et al in his research has carried out the modelling and analysis of floor cleaning machine by using commercially available software. From the results of finite element analysis it was concluded that stress generated in manually operated floor cleaning machine is within safe limit. These floor cleaning machines can be widely used in cleaning railway platforms, airport platforms, schools, offices, hospitals, etc.

Patil [4] et al designed rocker bogie mechanism for garbage collection. This mechanism resulted into increased efficiency, stability and reliability. However it was observed that the mechanism results into complicated construction and it needs complex programming too.

Based on the literature review, it was observed that due to increase in population and technological developments the amount of garbage produced on day to day basis has increased drastically in past few years. And there is need to have a certain system to handle such large amount of garbage safely and efficiently. So we decided to design and fabricate a garbage handling machine that can tackle this garbage collection related problem.

Karande[5] et al carried out the research to reduce efforts of human beings required to collect garbage from sea ways using automated system. The automated cleaning machine is kept in the drain system in order to separate out the solid wastes components like bottles, clothes, etc. from the water using chain drive mechanism to which teeth are connected. The collected waste material is stored in the separate collector. This automated cleaning system is run by using electric motor connected to the chain drive mechanism. The electricity required to run this system is produced by hydraulic turbines. Wire mesh filters are connected to the chain in order to ensure free flow of liquid which assists in separating the solid material from liquid.

Gaddam [6] et al carried out the research study to propose smart solution for the problem of garbage handling issue using internet of things. In this research study processing of information is done by using raspberry pi and the size of bin is measured by using ultrasonic sensor. The data collected is sent to the android device through cloud system. The location of the

bin is shared through the android app using Google maps when the amount of garbage in the bin crosses the set threshold level. This location is shared with the truck driver who is available nearest to that bin using location tracker.

## METHODOLOGY

The design and fabrication of garbage handling machine is done by following the below methodology as shown in Figure 2. This methodology indicates the work that has been carried out in this project.

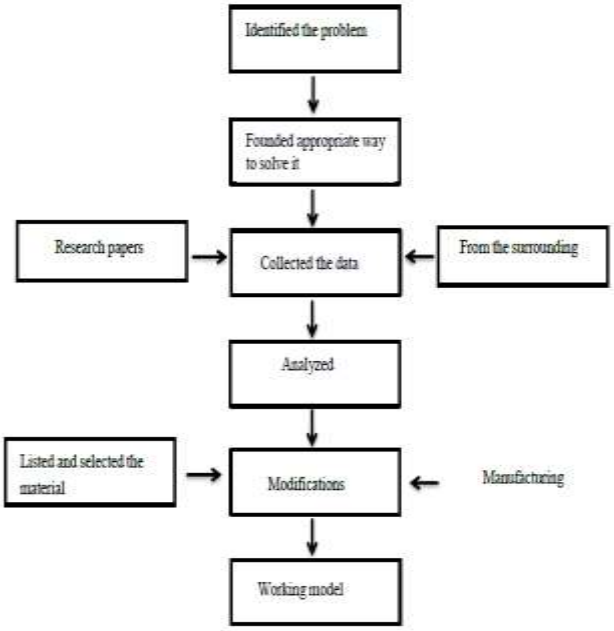


***Fig.2:-****Methodology followed for design and fabrication of garbage handling machine*

The total plant work has been into in two parts. 1. System Design 2. Mechanical Design

### A. System Design:

Frame work configuration is for the most of the parts concerns the different physical limitation and ergonomics, space necessary, numbers of controls, man-machine collaboration, position of controls, extent of change, workplaces, add up to weight of machine and significantly more.

### B. Mechanical Design:

In mechanical design, the components are listed down and stored on the basis of their design in two categories. These are the parts to be purchased at Mechanical outlines stage. These are mostly important to use from the perspective of originator as the entire achievement of venture relies on upon the right plan. Examination of the issue numerous preparatory options are killed amid this stage. Creator ought to have sufficient learning about physical properties of material load stresses and disappointment. He ought to recognize all insides and outer powers following up on machine part.

Steps followed during the design and fabrication of garbage handling machine are as below:

***Problem identifying*:** We first identified the problem, which was needed to be solved as the pollution and increase in garbage level and which is a not sign for our city and country also.

***Finding appropriate way:*** We found an appropriate to solve this problem which was by designing a mechanism for proper handling of it.

***Collection of data:*** As now we had found a solution on this problem, we started finding ways and techniques and took ideas from our surrounding and mostly from the research paper which were available on the internet.

***Modifications:*** As we had the information regarding the idea which found by us, with some identical models and did some modifications as per our requirement with enlisting the required material and manufacturing process and took help of our supportive guide for proper guidelines.

**Components of the Garbage Handling Machine:**

Following components are used during the fabrication of garbage handling machine.

***Pillow Block Bearing:***

A pillow block bearing (or Plummer block) as shown in Figure 3 is a pedestal used to provide support for a rotating shaft with the help of compatible bearings & various accessories.

***Fig.3:-****Pillow Block Bearing*

**Pulley:**

A pulley as shown in Figure 4 is a wheel on an axle or shaft that is designed to support movement and change of direction of a taut cable or belt, or transfer of power between the shaft and cable or belt.

***Fig.4:-****Pulley*

**Electric Motor:**

An electric motor as shown in Figure 5 is an electrical machine that converts electrical energy into mechanical energy. An electric motor is generally designed for continuous rotation, or for linear movement over a significant distance compared to its size.

***Fig.5:-****Electric Motor*

**Garbage Collecting Tank:**
Garbage collecting tank as shown in Figure 6 is used for collecting the solid waste which is passed from the conveyor belts. It is made of aluminum sheets, because it is corrosive resistant, less weight, and good strength. In some cases high quality plastics like PET (Polyethylene Terephthalate), HDPE (High-density Polyethylene), can also be used according to the production cost, and the load to be carried. PET, HDPE plastics have an advantage of good strength, long lasting and also it can be recycled easily.

***Fig.6:-****Garbage Collecting Tank*

**Wheels**:
Plastic and resin wheels as shown in Figure 7 are made from macerated canvas and resin and molded under high pressure and heat. They are recommended for smooth concrete and can be used for storage. They are also highly resistant to grease, oil, gas, and mild acids.

***Fig.7:-****Wheels*

**Chain Sprocket:**
A sprocket, sprocket-wheel or chain wheel as shown in Figure 8 is a profiled wheel with teeth that mesh with a chain, track or other perforated or indented material. The name 'sprocket' applies generally to any wheel upon which radial projections engage a chain passing over it.

***Fig.8:-****Chain Sprocket*

**WORKING OF GARBAGE HANDLING SYSTEM**
The garbage handling mechanism is basically designed to collect the waste in the more efficient manner by the worker. The whole mechanism is assembled on the chesses made up of (MS) hollow square pipes.

The chain sprocket and the other component's like pulley, bearing, and the shaft help to provide the required function to the mechanism. The basic component is the motor and a v belt to provide the motion to the whole mechanism. When the motor starts then it transmits the motion to the chain sprocket which lifts the garbage. By this way the fabricated equipment can collect the garbage present on any kind of the surface.

**BENEFITS OF USING GARBAGE HANDLING MACHINE**
It reduces the threat to human life as labor is not coming directly in contact with the garbage.

This machine is Compact in construction.
This machine is portable.

This machine is highly efficient. It can be used in domestic as well as industrial applications.

**APPLICATIONS OF GARBAGE HANDLING MACHINE**
It can be used for domestic sewage handling
It can be used for proper treatment of sewage as well as to avoid blockage of drains.

**CONCLUSION**
In this project we have designed and fabricated a garbage handling machine which can be used as the intermediate transporting medium between the ground and the hopper where the waste would be gathered for the further waste or garbage treatment.

This machine will be helpful in reducing the load, man power and cost of garbage handling and treatment the process. This machine will be easy to operate by the municipality garbage handling department workers and it can handle the waste safely.

**REFERENCES**
1. Ferronato Navarro, Torretta Vincenzo. (2019) Mar. "Waste Mismanagement in Developing Countries: A Review of Global Issues".*International Journal of Environment Research Public Health*.; 16(6): 1060.

2. Kumar Sunil, Smith R. Stephen, Fowler Geoff, Velis Costas, Kumar S. Jyoti , Rena Shashi, Kumar Rakesh ,Cheeseman Christopher , 22 March (2017). "Challenges and opportunities associated with waste management in India",https://doi.org/10.1098/rsos.160764.
3. Kumar, M. R., & Kapilan, N. (2015). Design and analysis of manually operated floor cleaning machine. *International Journal of Engineering Research & Technology (IJERT)*.
4. Chinchkar, D., Gajghate, S. S., Panchal, R. N., Shetenawar, R., & Mulik, P. (2017). Design of rocker bogie mechanism. *International Advanced Research Journal in Science, Engineering and Technology*, *4*(1), 46-50.
5. Karande, S.A., Thakare, S.W., Wankhede, S.P., Sakharkar, A.V. Automatic Garbage Collector Machine. *International Journal for Scientific Research and Development*. 6(1).
6. Gaddam, M., Thatha, V. D., Kavuluri, S. R., & Popuri, G. K. (2018). Smart garbage collection management system. *International Journal of Engineering & Technology*, *7*(2.7), 193-196.