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Design and Fabrication of Garbage Handling System

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ABSTRACT: Solid waste includes empty bottles, polythene bags, papers etc. Garbage waste can cause damage of the drainage system due to blockage. To avoid such problems related to drainage system it is necessary to remove such garbage waste on timely basis in order to keep our environment safe. The garbage produced through various processes should be cleaned by using some kind of machine which can be driven through some kind of chain or belt mechanism using electric drive system. The mechanism should be provided with a collector tank in order to collect the garbage. In this project our aim is to design & fabricate an efficient, low cost, compact garbage handling system which can be used for domestic as well as industrial garbage handling purpose. This project will collect the garbage from various locations using conveyor which is driven by chain sprocket mechanism. This machine will collect the garbage in the form of solid waste and then it will be transferred into the collector tank. This machine will ensure that the drainage system will not get blocked due to garbage. This machine results into saving in labour cost and also reduces harmful effects on human beings.

KEYWORDS: Solid Waste, Garbage, Environment, Fabrication, Pollution, etc.

I. INTRODUCTION

Government of India is working to make various smart cities in India and also focussing on clean India campaign through various initiatives like Swachh Bharat Abhiyan and Digital India. The population of India is increasing at a 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 a 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, it is a common situation that we observe the garbage collector tanks are overloaded with waste or garbage and that garbage is spilled out through it on roads. This results in bad smell and ultimately causes pollution. This garbage if kept at those locations for longer duration then it leads to rise in spreading of various diseases as a large number of bacteria and other similar kind of insects like mosquitoes fly over it. So to make a Digital India campaign successful, everyone has to ensure that they will create a hygienic and healthy surrounding which will ensure the protection of environment.

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. 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 amount of garbage in the form of solid waste material. This garbage will cause harmful impact on environment at local and global level leading to pollution. Discharge of garbage through domestic, agricultural and industrial applications as shown in fig.-1 has resulted in contamination of air, harmful effects on nutrient and degrading the quality of air and water through production of toxic materials. It also causes reduction of the fertility of soil land and affects vegetables and crops badly.



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

II. LITERATURE REVIEW

Ranjit Kumar [1] et al in his research used various software to carry out the modelling and analysis of floor cleaning machine. 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 [2] 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[3] 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 [4] 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 cloud system is used to send the data collected to the android device. 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.

III. METHODOLOGY

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

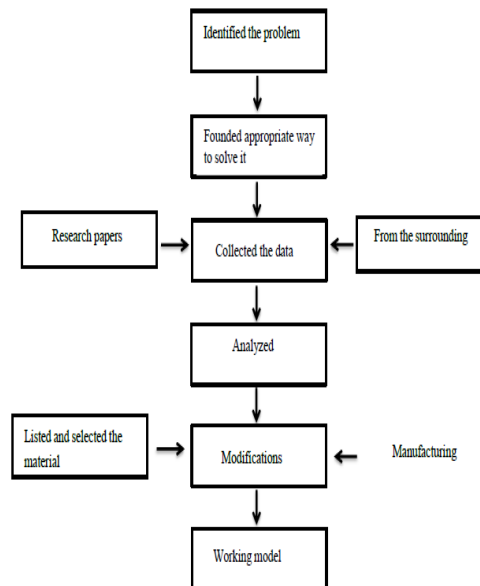


Fig.-2: Methodology followed for design and fabrication of garbage handling machine

This project work is carried out in two parts viz. design of the system using conventional design procedure mechanism and mechanical design.

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.

IV. COMPONENTS OF THE GARBAGE HANDLING MACHINE

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

Pillow Block Bearing:

In this machine we used a particular type of bearing named as pillow block bearing. It is also called as Plummer block. It is shown in fig.-3. It is a platform that provides support and carries the thrust load from the rotating shaft using suitable type of bearing & other supporting accessories.



Fig.-3: Pillow Block Bearing

Pulley:

A pulley as shown in fig.-4 is a mechanical device in the form of a wheel rotating on the axle or the component like mechanical shaft. The pulley is designed with the purpose of supporting the movement and to carry out direction change of the component like belt or chain. It also helps to transfer the power between shaft and chain or cable or belt.



Fig.-4: Pulley

Electric Motor:

In order to drive the chain sprocket mechanism an electric motor is required. An electric motor as shown in fig.-5 is an electrical device which produces rotary mechanical energy by using input electric energy. An electric motor is selected to ensure continuous rotation of the chain sprocket mechanism.



Fig.-5: Electric Motor

Garbage Collecting Tank:

Garbage collecting tank as shown in fig.-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 or resin wheels as shown in fig.-7 are used to move the garbage handling machine. These wheels are made either from canvas like material or using resin. The wheels are molded by the application of heat and pressure. These wheels can be used on smooth concrete roads as well as slightly rough roads. These wheels are having good resistance to oil, grease and mild acids.



Fig.-7: Wheels

Chain Sprocket:

A sprocket, sprocket-wheel or chain wheel as shown in fig.-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

V. 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 chasses 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:

- This machine can be used for domestic as well as industrial garbage handling purpose.
- This machine can also be useful in carrying out proper treatment of garbage as well as to prevent drainage blockage.

VI. 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.

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