

Design And Manufacturing Of Waste Segregation Machine

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Abstract-Modern world meets lots of challenges that include Smart waste management system. It is become matter of big concern if proper disposal system is not managed. Managing waste effectively and recycling efficiently, a nation can move one step forward. Most of the waste generated in the city comprises of biodegradable, compostable and recyclable material. This is due to the high quantum of vegetables waste along with the high amount of waste generated due to plastics. [2]

In this work, an automatic sorter machine is developed for vegetable market which can sort out the wastes in various categories to make waste management easier and efficient. It can be possible to sort out paper, plastics and biodegradable waste by developing a mechanical system using conveyor belt, toothed wheel and blower. For sorting paper and plastics blower and toothed wheel is used. In this project, the packaged waste will be passed through the hopper where the toothed wheel has been placed. Further the waste will follow the conveyor path where the blower arrangement is there, where the light weight waste i.e. paper and plastic will be thrown away and the biodegradable waste will be segregated effectively. This sorted biodegradable waste will be used for production of energy and that energy will be used for various applications. The sorting procedure will make recycling more efficient.

I. INTRODUCTION

In recent times, garbage disposal has become a huge cause for concern in the world. A voluminous amount of waste that is generated is disposed by means which have an adverse effect on the environment. The common method of disposal of the waste is by unplanned and uncontrolled open dumping at the landfill sites. This method is injurious to human health, plant and animal life. This harmful method of waste disposal can generate liquid leachate which contaminate surface and ground waters; can harbour disease vectors which spread harmful diseases; can degrade aesthetic value of the natural environment and it is an unavailing use of land resources.

In India, rag pickers play an important role in the recycling of urban solid waste. Rag pickers and conservancy staff have higher morbidity due to infections of skin, respiratory, gastrointestinal tract and multisystem allergic disorders, in addition to a high prevalence of bites of rodents, dogs and other vermin. Dependency on the rag-pickers can be diminished if segregation takes place at the source of municipal waste generation.

The economic value of the waste generated is not realized unless it is recycled completely. Several advancements in technology has also allowed the refuse to be processed into useful entities such as Waste to Energy, where the waste can be used to generate synthetic gas (syngas) made up of carbon monoxide and hydrogen. The gas is then burnt to produce electricity and steam; Waste to Fuel, where the waste can be utilized to generate bio fuels. When the waste is segregated into basic streams such as wet, dry and metallic, the waste has a higher potential of recovery, and consequently, recycled and reused. The wet waste fraction is often converted either into compost or methane-gas or both. Compost can replace demand for chemical fertilizers, and biogas can be used as a source of energy. The metallic waste could be reused or recycled. Even though there are large scale industrial waste segregators present, it is always much better to segregate the waste at the source itself. The benefits of doing so are that a higher quality of the material is retained for recycling which means that more value could be recovered from the waste. The occupational hazard for waste workers is reduced. Also, the segregated waste could be directly sent to the recycling and processing plant instead of sending it to the segregation plant then to the recycling plant. Currently there is no system of segregation of dry, wet and metallic wastes at a household level. [1]

A. Technical Background

The mixed waste is sorted based on the following methods at the industrial level. Larger items are removed by manual sorting. Then the refuse is sorted based on its size by using large rotating drums which is perforated with holes of a

certain size. Materials smaller than the diameter of the holes will be able to drop through, but larger particles will remain in the drum.

For metallic objects electromagnets or eddy current based separators can be used. Near infrared scanners are used to differentiate between various types of plastics based on the ability of the material to reflect light. X-rays can also be used to segregate materials based on their density. [3]

The methodology adopted in this paper to resolve the issue of waste segregation is by making the entire process automated and to the reduce cost such that it could be adapted in a market level.

B. Proposed Solution

In this project, the packaged waste will be passed through the hopper where the toothed wheel has been placed. Further the waste will follow the conveyor path where the blower arrangement is there, where the light weight waste i.e. paper and plastic will be thrown away and the biodegradable waste will be segregated effectively.

II. COMPONENTS

A. Hopper with splined wheel arrangement

A hopper with splined wheel mechanism has been placed at the starting of automatic waste segregation system. It allows the packaged waste to flow. A splined wheel is attached in order to give motion to the waste.



Fig.1 Hopper



Fig.2 Splined Wheel

B. Conveyor belt mechanism

A motor with VFD is used to move the conveyor. This high torque motor drives the toothed wheel and conveyor belt. The waste from hopper is transmitted through conveyor belt system.



Fig.3 Conveyor Belt

C. Blower mechanism

Dry and wet separation is based on their weight. Due to its high density and weight, wet waste refuses to be blown off even in the presence of a high speed blower. This technique is used to distinguish wet and dry waste. As the blower blows dry waste is thrown out into the dry bin via a collecting chamber. Wet waste stays on the belt. It then falls off due to gravity at the end of the belt as it rolls.



Fig.4 Blower

D. Motor with VFD

A motor of power 2 HP with speed of 1410 rpm is used to drive conveyor belt and toothed wheel mechanism. Variable Frequency drive (VFD) is used for reducing speed as low speed is required for both conveyor and toothed wheel.



Fig.5 Motor

III. WORKING

We are trying to segregate biodegradable waste from packaged waste. The packaged waste contains plastic, paper and biodegradable waste (such as vegetables, fruits, etc.) as the area we are trying to cover is vegetable market. We will be using the biodegradable waste in biogas plant in order to produce energy. And this energy can be used for various applications.

In this work, a packaged waste is passed through hopper where splined wheel is attached so that the waste will

be separated at the initial level of segregation. A splined wheel is placed at the end section of the hopper.

The initially separated waste then flows through conveyor belt where blower is placed. Blower is used to throw away the light weight waste i.e. paper and plastic. Then biodegradable waste is segregated.

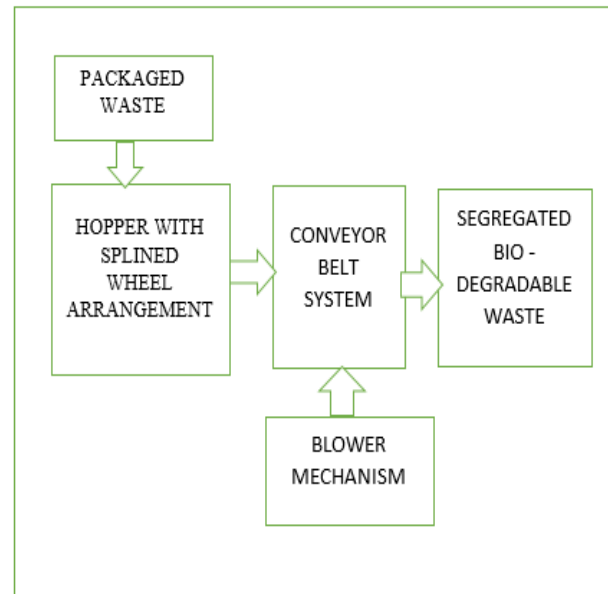


Fig.6 Schematic Diagram

IV. CONCLUSION

We conclude that by using this waste segregation machine, we can get biodegradable waste which can be used for energy production, fertilizer and other biodegradable application. This machine can only be used for segregation of vegetable market waste which contain mostly biodegradable waste, paper waste and plastic waste. This machine can only be used on small scale. Waste segregation is a biggest problem in India until now nobody could segregate whole waste together. In this project we are trying to segregate small portion of waste to reduce pollution, wastage of nature product and utilize it in best way.

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