

Eco Mechanic Burner & Crusher a New Approach to Solid Waste Management

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ABSTRACT: Solid Waste Management (SWM) is a biggest challenge for the city authorities in developing countries mainly due to the increasing generation of waste, the burden posed on the municipal budget. This result in the high cost associated to waste management, the lack of understanding over a diversity of factors that affect the different stages of waste management and linkages necessary to enable the entire handling system's functioning. Solid waste includes Biodegradable waste (Organic waste) and Non-Biodegradable waste (e-waste and Inorganic waste). Bio- Degradable is one which can be easily converted into some other product which becomes raw material for secondary processes. Waste disposal causes adverse effects on Environment if disposal protocols are not meticulously managed. This paper introduces a novel design for Eco Mechanic Burner- Crusher which is a Recent Development in Mechanical Engineering Stream, with enhanced capability to convert the Bio-degradable waste into useful form as that can be utilized as the raw material to the agro based and food based industries for pets, Fodder for cattle and Poultry farming. The fundamental idea of this product is to provide a waste converter to every house of a city at the cost of a Smart phone so that everyone in the city will directly or indirectly contribute to the Environmental pollution control resulting in Eco system's sustainability and also Optimizes the Health of Humans. This paper demonstrates the importance of finding new SWM approaches for developing country in post-normal science and complex adaptive systems

KEYWORDS: Solid waste management (S W M), Municipal Budget, Eco Mechanic Burner- Crusher.

I. INTRODUCTION

A city is a large and permanent human settlement. Cities generally have complex systems for sanitation, utilities, land usage, housing, and transportation. The concentration of development greatly facilitates interaction between people and businesses, sometimes benefiting both parties in the process, but it also presents challenges to managing urban growth. [1] Once a city expands far enough to reach another city, this region can be deemed a conurbation or megalopolis. [2] Waste and wastes are unwanted or unusable materials. Waste is any substance which is discarded after primary use, or it is worthless, defective and of no use. [3]

Solid waste means any garbage, refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility and other discarded materials including solid, liquid, semi-solid, or contained gaseous material, resulting from industrial, commercial, mining and agricultural operations, and from community activities, but does not include solid or dissolved materials in domestic sewage. In Simple Words - Solid wastes are any discarded or abandoned materials. Solid wastes can be solid, liquid, and semi-solid or containerized gaseous material. Solid waste can be classified based on the physical and chemical characteristics of the waste and they are

- Bio Degradable waste
- Non Bio Degradable waste

Bio degradable waste is the unwanted material which can be easily converted into other forms without much adverse effect on the environment. As the name indicates it is the waste which gets decomposed under the action of Biological things or living organisms. Examples for Bio Degradable waste are paper, Vegetable wastes, fruit wastes, Food wastes etc.

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Non Bio Degradable Waste is the unwanted material which cannot be easily converted into other forms or cannot be processed. If this waste is processed then this affects the environment in an adverse way resulting in pollution and other nonsense things to the nature. Examples for Non Bio Degradable waste are Plastics, E wastes etc., Electronic waste (e-waste) is one of the fastest-growing pollution problems worldwide with the presence of a variety of toxic substances which can contaminate the environment and causes severe human issues, if disposal protocols are not meticulously managed.

Solid waste management is a term that is used to refer to the process of collecting and treating solid wastes. It also offers solutions for recycling items that do not belong to garbage or trash. As long as people have been living in settlements and residential areas, garbage or solid waste has been an issue. [4]

According to Britannica, “Solid-waste management, the collecting, treating, and disposing of solid material that is discarded because it has served its purpose or is no longer useful. Improper disposal of municipal solid waste can create unsanitary conditions, and these conditions in turn can lead to pollution of the environment and to outbreaks of vector-borne disease—that is, diseases spread by rodents and insects.”

II. LITERATURE SURVEY

There is lot of Research and Development on Solid Waste Management SWM and number of scholarly articles and Journals on SWM. A study of 2 journals has been made and started to work on the same project because no such developments were done for SWM.

- Rafael M. Gavilan et al. studied about the Strong relationships between poor productivity and high waste generation in United States of America. He introduced to us about the construction industry contributes a major portion of the waste stream in the United States. This paper addresses one critical step in developing a comprehensive waste-management system. The presented research data indicate that solid wastes in residential construction are primarily scraps resulting from cutting dimensional stock material to size.
- George P. Korfiatis et al. studied about the Solid Waste Management and explained the physical processes governing moisture transport in solid waste landfills are analysed by the theory of unsaturated flow through homogeneous porous media and experimental work. The theory of unsaturated flow through homogeneous porous media was successfully used to model moisture transport through the refuse material of a laboratory column.

Many designs and developments have been developed for the Solid Waste Management to reach its comprehensive ability. In this paper gives a design of “Eco Mechanic Burner- Crusher” has been discussed and the prototype results are established.

III. OPERATIONS INVOLVED IN ECO MECHANIC BURNER & CRUSHER

Many methods and developments are done for solid waste management and our product is Eco Mechanic Burner and Crusher which uses double crusher and a Burner mechanism which helps the Bio Degradable waste into powdered form. The waste is first put into the Hopper and from where it passes through a Shedder which cuts the waste into fine product and this is again burned inside the electrically fired Burner and extracts the moisture from the powdered waste and then finally the waste is again crushed in the final Crusher and converted to powdered material.

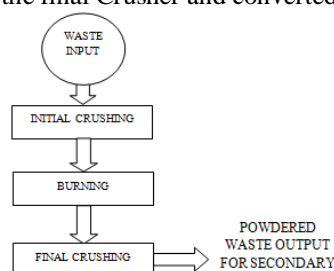


Fig 3.1. Process Flow Chart

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IV. DESIGN OF PRODUCT

The product is designed using the Autodesk Fusion to show the details of the product. The detailed engineering drawing is shown in the below fig.

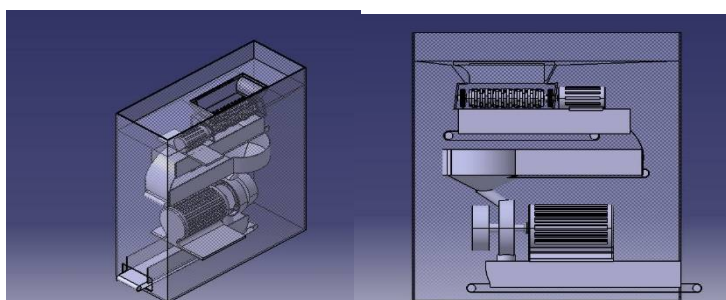


Fig 4.1 Design of Burner and Crusher

4.1.1. UNIQUE PROPERTIES OF THE PRODUCT

The product has several unique properties that gives positive impact to nature and thus controls pollution.

- The product uses Double crushing mechanism to remove moisture from Bio degradable waste in efficient way.
- Electrical Burner is used to provide clean and healthy moisture removal (Heat exchange process), hence no carbon release.
- The heating element used for the Burner is Copper whose properties are given below
 - Resistivity: 40 $\mu\Omega$ -cm.
 - Temperature coefficient of resistance: 0.0004 /C.
 - Melting point: 1400C.
 - Specific gravity: 8.4gm /cm³
 - High resistance to oxidation.
- Material used for Cylinder of Burner and Hopper is Galvanized Iron sheet 18Grade (Melting point= 1538-degree C) which is low cost, so overall cost of the product is cut down.
- Stainless steel 18-8 (300 series) plates and shafts used in the equipment that give good resistance to rusting and corrosion resistance.
- Temperature adjustment can be done for different types of waste (Dry waste and Wet waste)
- Overall service cost of the product is low so that it is a one-time investment.

V. BILL OF MATERIAL OF ECO MECHANIC BURNER & CRUSHER

SI No	Part	Material	Quantity in kGs	Cost / kGs	Amount in Rs
1	Cylinder Hopper	GI Sheet	2	50.0	100.00
2	Opening gates	M S Plate	4	25.0	100.00
3	Crushers	S S Plate	5	180	700.00
4	Burning element	Nichrome	1	1000	1000.00
5	0.5 hp motor				1000.00
6	Voltage controller				100.00
7	Nylon washers	Thermosetting Plastic			100.00
	TOTAL				3500

Table 5.1. Bill of materials

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5.1. CONTRIBUTION OF OUR PRODUCT TO THE PLANS GIVEN BY CENTRAL GOVERNMENT

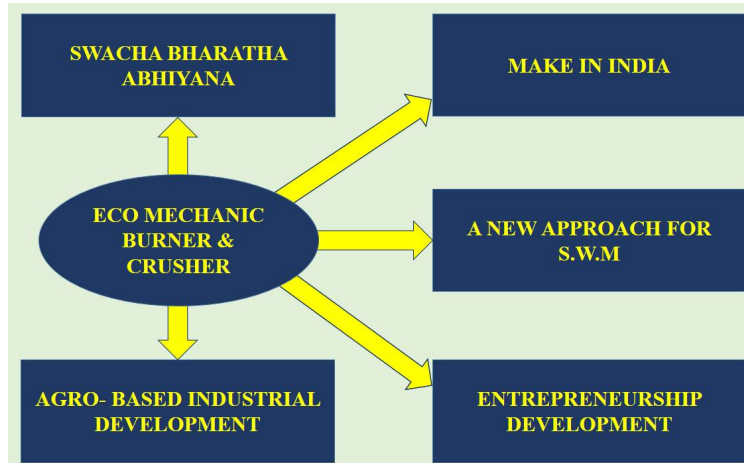


Fig 5.2. Contribution chart of EMBC

The proposed product will contribute to all the following programs implemented by The Government of India. Swacha Bharath Abhiyana- as the main intention of the product is SWM; it contributes to the Swacha Bharath Abhiyana. To utilize the available facilities to make positive impact to human health. Make in India Program: the design and development of the product is done in our India using our own technologies. Our product gives a new approach for Solid Waste Management systems. Production of this product helps in Entrepreneurial development.

VI. CONCLUSION

With the development of Eco Mechanic Burner and crusher gives a new approach to the Solid Waste Management and easily convert Bio Degradable Waste into powdered form at a very efficient way and thus results in the environmental pollution control.

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