

Waste Management by Compact Bin

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Introduction

Summary

The problem of Waste management is rising to its zenith and needs to be addressed right from the roots. Decentralization of waste collection is the only way to achieve this goal. A machine that can collect all kinds of waste separately in a very compact place can bring a revolution in waste management.

Compact bin, maintains the purity of recycling materials (i.e. prevents contamination), households can buy it as one time investment and earn money from their garbage. A weight sensor beneath each sac of the bin triggers a signal to corresponding local recycler. A shredder is used to decrease the volume of the waste. The waste lies in sacs, so as to allow the uncertain amount of waste everyday. The transport costs which have been cut down because of compact collection and periodic vehicle trips can be used as perks to consumers. The purity of the waste avoids any further purification of recycling material.

Background

India generates 1,00,000 metric tonnes of waste per day.

Only about 25000 tonnes is treated.

The only reason behind not being able to treat or manage waste is a centralized waste management system. This is a world wide scenario where sorting of waste is getting more and more complex because of introduction of new materials in the market.

The problem with decentralizing the waste collection is higher cost of transport and processing.

Leachate from landfills contaminates the groundwater

Few existing machines in this stream are

INCINERATORS:-

Incineration is a waste treatment process that involves the combustion of organic substances contained in waste materials. Incineration and other high-temperature waste treatment systems are described as "thermal treatment". Incineration of waste materials converts the waste into ash, flue gas and heat. The

ash is mostly formed by the inorganic constituents of the waste and may take the form of solid lumps or particulates carried by the flue gas. The flue gases must be cleaned of gaseous and particulate pollutants before they are dispersed into the atmosphere. In some cases, the heat generated by incineration can be used to generate electric power.

Incineration with energy recovery is one of several waste-to-energy technologies such as gasification, pyrolysis and anaerobic digestion. While incineration and gasification technologies are similar in principle, the energy produced from incineration is high-temperature heat whereas combustible gas is often the main energy product from gasification. Incineration and gasification may also be implemented without energy and materials recovery.

In several countries, there are still concerns from experts and local communities about the environmental effect of incinerators (see arguments against incineration).

In some countries, incinerators built just a few decades ago often did not include a materials separation to remove hazardous, bulky or recyclable materials before combustion. These facilities tended to risk the health of the plant workers and the local environment due to inadequate levels of gas cleaning and combustion process control

Industrial Shredder:-

An industrial shredder is a machine used for reducing the size of all kinds of material. Industrial shredders come in many different design variations and many sizes.

Some examples of materials that are commonly shredded are: tires, metals, car wrecks, wood, plastics, and garbage. There is no common use of an industrial shredder as they can shred paper as well as wood, plastic, metal including a whole car depending on the size and design of the industrial shredder. The industrial shredder is commonly used to process materials into different sizes for separation or to reduce the recycling cost of transport but a primary use is the upgrading of the material by shredding metals, plastics, aluminium, metal and cars and as well as waste materials such as municipal solid waste or nuclear waste, medical waste, hazardous waste including common garbage.

An industrial shredder is any shredder that can be used in an industrial application (rather than a consumer application). They can be equipped with different types of cutting systems: horizontal shaft design, vertical shaft design, single-shaft, two-shaft, three-shaft and four-shaft cutting systems. These shredders are slow speed or high speed, and are not restricted in being classified as an industrial shredder by their speed or horsepower.

The largest scrap metal shredder in the world was designed with 10,000 hp by the Schnitzer steel group of Portland, Oregon in 1980. The 9,200 hp (6,860 kW) Lynx at the Sims Metal Management plant at the mouth of the River Usk in Newport, Wales has access by road, rail and sea. It can process 450 cars per hour.

But this is very expensive and limited for single type of waste.

All these existing products can't fit into the Indian scenario of mixed materials and economic issues.

These do not address waste decentralization.

But these systems aim at removal of waste (getting rid of them).

On the other hand , compact bin aims at collection of waste in such a way , so as to preserve the quality of recycling material.

Few initiatives that overlap with it are:

ThoughtWorks Technologies India Pvt Lt

Bangalore was once called the city of lakes . For centuries the Puttenahalli Lake in J.P. Nagar had been a pristine water body, playing a vital role in maintaining the fragile ecosystem of the neighbourhood. Like many other lakes in Bangalore, this one too fell prey to indiscriminate exploitation and neglect. The easy availability of packaged food and the ever increasing use of plastics has led to dumping of waste in and around the lake and burning of dry waste. The residents are unaware that they are breathing in deadly dioxins and furans being released by burning of plastic waste.

The Puttenahalli lake waste management project aims to address the problem of waste being dumped and burnt in and around the lake by residences and shops on the periphery. There are low-medium income housing colonies around the lake where no proper door-to-door collection of waste takes place. The objective of the project is to create awareness about the ill effects of burning of non-biodegradable waste and establish source segregation practices and regular door-to-door collection in the areas around the lake with the aim to minimize dumping of waste around the lake and remove the black spots.

PRECIOUS PLASTIC:-

Precious Plastic is a project trying to boost plastic recycling worldwide. We try to do that by providing tools and knowledge to people around the world. For free, of course. Trying to give people solutions to fight plastic pollution.

Precious Plastic was started by Dave Hakkens in 2013. By now, the project counts on the contributions of dozens of people joining the project with their skills and knowledge. The project is also helped by hundreds of monthly donations on our Patreon and thousands single donations. Check the video below for the full story behind Precious Plastic.

The project has been picked up by hundreds of people around the world that built the machines and started recycling plastic waste.

What are the gains / wins from creating this tool / solution?

Definitions, Acronyms, and Abbreviations

Decentralization:- Decentralised waste management is about each community managing and processing their waste in their locality and not sending it all to a centralised large processing facility or often land fill.

There are two principles behind decentralised waste management:

When waste is managed at source it becomes a resource

My waste in My Backyard and not in someone else

The earlier we can segregate and process the waste, the resource recovery is much better and transportation and processing costs come down. We all need to take ownership of our waste, we can not dump our waste in other people's backyard and force them to bear the burden of our reckless consumption based lifestyle.

Sacs:- we have used sacs instead of solid compartment because the waste in households is uncertain. For instance a household can produce a 1 kg electronic waste and 2 kg of kitchen waste on one day and 10 kg kitchen waste and absolutely no electronic waste the next day.

Design Overview

Requirements

Bill of materials shredder

Description	Material	Details	Quantity	Where to get it	Remarks	Price
Machine parts						
3mm sheet	steel	cutted	1x	Scrapyard/Hardware store	optional stainless steel	40
5mm sheet	steel	cutted	1x	Scrapyard/Hardware store	optional stainless steel	
6 mm sheet	steel	cutted	1x	Scrapyard/Hardware store	optional stainless steel	

● Hexagon bar	Steel	27M	32cm	Metal shop		15
L Angle profile	Steel	30x30x3 mm	100cm	Scrapyard		10
' Mesh	metal	150x180x1.5mm		Scrapyard	perforated sheet or drill holes yourself	2
Sheet metal	Steel	1mm		Scrapyard		7
Electronics						
Motor	-	+/- 2kw	1x	Scrapyard	preferable +/- 70 RPM	30
Power switch	-		1x	Scrapyard/Hardware store		3
Led indicator	-	220V	1x	Hardware store		3
Powercord	-		5 M	Scrapyard/Hardware store		
Dustbin weight sensors				Hardware store ELECTRONICS		20 15
				Total		150Euros=8,500Rupees Price varies depending on where you live

Documentation

1. <https://drive.google.com/open?id=175NC84nQ7ylwwHc2atlgW-lbBVtM8yCB>

2. Design Data of a standard shredder

<https://github.com/hakkens/precious-plastic-kit/archive/master.zip>

Minimum Viable Product

A compact bin which can shred(reduce the volume) of waste and collect it in relatively small space.

The bin will be able to manually or automatically trigger a message to local recycler after threshold amount of weight is being collected in sac.

Stretch goals

A business model to enhance profitability.

A field test of model and behaviour of customers over it.

Optimising the costs and efficiency of model.

Future work

A network of recyclers to be created .

Most efficient way to use recycling materials inn most profitable way to be figured out.

Commercialization over elite apartments and household masses.

Advertisement and marketing.

commercial site to sell the recycled goods..

Architectural Diagrams

Shredder bracket

<https://drive.google.com/open?id=1uhNSG2IpiLbyiwUIzY4ySbYlwQkp8TJ>

Shredding sleeve

https://drive.google.com/file/d/1HeKO1wsRNqSCdRbS-j22ke-fxiXw_ibo/view?usp=sharing

The architectural diagrams may vary after optimization attempts.

System Diagrams

3d Model

<https://drive.google.com/open?id=1g19DvenG5O5NyVetqvLRNcMZSljrAGZU>

Service Operability

Key Performance Indicators

Acceptance of customers : Will the product trigger their Esteem needs.

Quality of waste collected: The quantity of contamination

Project Overview

Risks

Technical risks like jammed blades

Failure of components

Failure of manual sorting by customers

sudden change in price of recycling materials and transport

Milestones

4th June completion of product

10th June Testing commercial parameters

Project Phases

Phase - 1

Completing Product

Phase -2

Optimising and building commercial model

Phase-3

Testing commercial Model

Cost

1) 10,00 Rupees for product development

2) 30 Hours for product development + 70 Hours for Business model

Frequently Asked Question

Why will customers purchase the product?

Waste management is a serious issue and a solution to this can trigger esteem needs of consumers.

Customers are benefited by the money given b recyclers .

What if motor won't be able to take the load?

A handle is provided which can help getting rid of jams.

moreover critical garbage can be directly thrown into sacs.

References

Precious plastic community

<https://preciousplastic.com/en/info/about.html>

Citizenguage

<http://citizengage.co/>

Suhaas

<https://saahas.org/>