ISSN No:-2456-2165

Effect & Energy of Recycling Mechanical Parameters Waste Plastic and Glass to Produce Usable Composites

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Abstract:- The task of this research is to address the issues of plastic waste disposal in developing countries. In this study, we designed and built a plastic slicing machine. The machine consists of the following main parts; Hopper assembly, shredder, drive shaft, frame, V-belt, electric motor. Although the shape of the plastic is very different in the case of large-scale recycling, the gap energy gap still highlights the environmental benefits of re-cyclone plastic use. The engine has a hopper capacity of 0.0725 m^3, a central thrust of 36.17 N, a maximum torque of 733.83.5 N, a shear force of 500 N, a shaft diameter of 40 mm and a torque of 42 MPa at 477.21 Nm.

This information is important in selecting the conditions that contribute to the recycling process and assessing the market for re-cyclones. This work is fundamentally important for providing new data sets for life cycle assessment to assess the environmental benefits of using recycled plastics. Therefore, environmental impact can be linked to industrial and commercial planning and its application in next-process planning and supply chain management. It can be a small business or a small government unit set up to produce entrepreneurship. Initiative plastics have no future, and due to the low breakage time, plastic disguise can be seen as a blessing that can be effectively reused. It will never be thrown away for irreparable damage atmosphere.

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Keywords:- *recycling; plastic; polyethylene; waste; cement; disposal, composites; recycling; mechanical recycling, Resource Modeling, Energy Demand, Granulator Mechanical Recycling .*

I. INTRODUCTION

Solid waste is not a new problem because humans always produce trash and dispose of it in some way. What has changed is the human values and understanding of the type, quantity and disposal methods of the waste and what to do with it. Due to the low cost and ease of construction, applications of plastics and their alloys are growing more rapidly. Therefore, large amounts of waste plastics accumulate, which pose major challenges to their disposal.

Municipal solid waste generation (MSW) is a major concern for governments, institutions and society in developing countries; Increasing population pressures and socio-economic factors make this solid waste unique. Solid waste is an unused and undesirable by-product that is ignored by members of the community. Generally, solid waste can be classified on the basis of its origin: municipal solid waste, industrial solid waste, agricultural solid waste. Most cities in India spend 20-50% of their environmental budget on solid waste management and collect 20-80% of their waste. In addition, solid waste management standards are among the lowest in India, due to waste generation rates, poor documentation of inefficient storage and collection systems, and poor utilization of waste disposal sites. Urban cities in India today face the problem of collecting solid waste from the environment. India's strategic centers are now being seized with a purity of tons of solid waste that does not affect society. City officials cannot deal with the hazardous and illegal disposal of industrial waste, which is a clear deficiency of clean air and hygiene laws in our environmental hygiene laws and regulations.

Plastic waste is a component of solid waste, including polyethylene terephthalate (PET). PET is used in the manufacture of plastic, glass bottles and many other plastic products. Most bottles made with pet food are transparent and water and soda are used for packaging. They have been biodegradable and inactive for over 4500 years and are threatening our land, rivers and drainage systems. More than 20% of India's municipal solid waste is plastic waste. The problem of plastic waste is not limited to India, it is a worldwide phenomenon. The annual consumption of plastic goods in the world increased from 5 million tons to 100 million tons in the 1950s; thus, twenty (20) times more plastic is produced than fifty (50) years ago. That means more resources are being used to meet the growing demand for plastic, which means more plastic waste is being generated. Lack of safe drinking water in rural and urban areas of India's growing population is a continuing cause of global warming and hot weather. Demand for bottled water is constantly growing. Although public water systems are available in some areas, supply lines that provide safe drinking water are not reliable. Most Indians have private pits, but the purification system is often bad.

There is an economic incentive to recover high-value carbon fiber in the context of recycling. However, the biggest waste in terms of quantity is plastic waste. These conflicting incentives are a difficult challenge for research and industry in the development of recycling technology. Landfill removal laws such as the West fill Landfill Directive (1999) affect industry-specific laws such as the End of Life Vehicle Directive (2000) and the Waste Electrical and Electronic Equipment Directive (2002).Developing resource efficient reuse strategies for integrated materials. The industry needs to address the lack of recycling at the industrial level, which eliminates waste that is acceptable to law enforcement and waste (production and end of life). This is a global problem. Along with recycling technologies, there must be high throughput capacity to be technologically efficient and environmentally friendly. The tearing machine is designed to divide small solid particles into smaller or smaller ones. Tearing machines are commonly used to reduce the size and shape of materials, so they can be used effectively. Smaller fragments, such as wounds, create deformity by suppressing the material by adding mechanical force to the material. Clipping materials should have better strength and hardness than plastic materials.

Plastic recycling means getting scrap or waste plastics and re-processing the materials into useful products. Because most plastics are not biodegradable, waste recycling, especially 8 million metric tons of waste plastics will enter the Earth's oceans as part of a global effort to reduce plastic.

Similar to the low value of glass recycling, plastic polymer recycling is more challenging due to its lower density and lower value than the attractive recycling of metal. There are many technical barriers to plastic reuse. Material recovery facilities facilitate plastic degradation and processing. By 2019, due to the disruption of their financial security, these facilities have made significant contributions to the plastic supply chain.

When various types of plastics are dissolved, they are separated by a step, such as oil and water, and placed in these layers. Phase limitations cause structural weakness in the material, which means that polymer composites can only be used in limited applications. Two widely used plastics, polypropylene and polyethylene, limit their use for reuse. Whenever plastic is reused, additional Virgin material should be added to improve the integrity of the material. Therefore, new plastic materials have been added to recycled plastic. The same plastic piece can only be reused 2-3 times before its quality is reduced to unusable levels.

The use of biodegradable plastics or plastics that can be systematically recycled or disposed of in industrial fertilizers is growing for some short-term packaging applications.

Plastic percentage can be completely recycled, down-cycle or packaged goods manufacturer reduces the mix of packaging materials and eliminates contamination. The Plastic Recyclers Association has released the "Design Guide for Recycling".

The objective of this work is to develop and validate an industry-wise model for estimating specific demand energy requirements for milling as an alternative to waste recycling. Most Life Cycle Assessment (LCA) software has no relevant data for recycling

Alloys. LCAs are important for assessing the environmental impact (potential benefits) of re-cyclone use, and it is important to demonstrate these potential re-cyclones if new products are added to the landfill. It should be noted that the quality of any environmental assessment depends on the quality and availability of the data. This highlights the need for an accurate resource model. Mechanical processing (milling) has been chosen as there is a market for machines capable of disposing of industrial waste. Since other recycling technologies (pyrolysis, liquefied bed and chemical processes) have been developed from an industrial-scale pilot plant, resource models need to be developed to perform optimal environmental analysis (usually LCA). Improving the integrity of environmental data is critical and critical to supporting the best sustainability decisions.

A. Background

Waste is now a global problem and must address global resources and energy challenges. Everything we eat, including plastic bottles, is wasted. Plastic is the most commonly used material in the world today. The five main categories are polyethylene terephthalate (PET), high density polyethylene, polyethylene (HDPE), polyvinylchloride (PVC), polypropylene (PP) and low density polyethylene. Removing waste plastics (PET, PP, etc.) is the biggest challenge because repeated use of pet bottles can be carcinogenic and only a small percentage of pet bottles are reused.

Plastic is a synthetic organic matter produced by polymerization. They are generally of high molecular weight and may contain materials other than polymers to improve performance and reduce cost. These polymers can be molded or molded into their shape.

Plastic and glass bottles are made from a petroleum product called polyethylene terephthalate (PET) and require large amounts of fossil fuels for manufacturing and transportation. You may find that plastic and glass bottles are difficult to recycle. Some plastic bottles are used worldwide and most of them are not recycled because only certain types of plastic bottles can be reused by other municipalities. They can be solved in landfills, injecting dangerous chemicals into the ground or they can penetrate our roads. There is a big disadvantage of plastic that is difficult to decompose.

So we need to recycle plastic and there are different ways to recycle plastic. Also, scrap collectors avoid plastic bottles due to high volume and low weight. Available machines are expensive, so it is necessary to develop low-cost cutting machines to overcome this problem. The project is related to the development of a plastic bottle cutting machine that helps dispose of used plastic bottles, which helps to manage waste and reduce transportation costs. A cutting machine is designed to cut large pieces into smaller pieces.

Cutting will add more force to the force generated by the mechanical gain of the material made of atoms and prevent more deformation than the material breaks down. The basic principle is to destroy a plastic bottle that relies on scissors and impact strength.

The use of plastic overwhelms all other products, including aluminum and glass, for its advantages and properties. 5% increase in global plastic production, crusher can be used to break aluminum and plastic over 300 million tonnes per year over the last 20 years. Adding single or multiple bins gives you extra space for easy storage options in a recycled compartment. This machine can reduce the amount of empty bills for storage and removal. Fill soft drinks and other beverages in plastic cans.

Businesses such as restaurants and bars must deal with this empty or leftover garbage. Storage is often a problem because they can use a lot of space, which increases the amount of waste. This whole storage problem can be easily avoided with a crusher. You can put more bags in the bag if you bake properly, as it takes less space to dry.

The cutting process, cutting the blade to a certain speed, operates the motor with the cut motor. But it is very difficult to cut plastic directly on small blades with small clipping edges.

The discovery time of a plastic cutting process like scrap can be easily processed with some treatment.

The procedures to be done before the slicing process are as follows: discretion, autoclaving and tearing. But the combustion and autoclaving process reduces the quality of the chopped product. Surface area and molten edges made of hard tool steel to reduce the quality difference in the cutting process. The thickness of the blade should not exceed 5 mm. Therefore, the pieces obtained after cutting are less than or equal to 5 mm. Since these pieces are less than or equal to 5 mm, the products do not need to be treated with heat, which does not reduce the quality of the material. Therefore, these pieces can be fed directly into the injection molding machine. It does not use high temperature in the products and the resulting product gets better quality after the molding process. This process allows the recycled product to be used multiple times before the grade is too high.

B. Related Work

Ragheti Atul has done research on "plastic to improve their properties". Plastic bags commonly used to pack vegetables and meat can cause serious environmental problems. Since plastic bags are many years old, plastic bags have been in the environment for over 1000 years, increasing the number of plastic bags each year. Removing large quantities of plastic bags can result in land, water and air pollution. A plastic bag recycled as a material in concrete can help improve some of the properties of concrete made by adding plastic to the concrete. The properties of concrete with different percentages of plastics were tested for compressive strength and split tensile strength, and showed that the introduction of chopped plastic bags improves the tensile strength of concrete. The effects of plasticity on concrete properties are summarized based on the experimental results.

- Including plastic pieces affects the compressive strength of concrete and increases the plastic percentage by 1% after 28 days of curing and reduces the plasticity strength of concrete by 20%.
- The split tensile strength test improves the tensile strength of the concrete. Increasing the strength recorded after the plastic correction of 0.8% reduces the strength of the concrete with the addition of plastic.
- Therefore, plastic can be used to increase the tension of the concrete.
- From the above discussion it has been shown that the use of stick plastics as a plastic method can improve the properties of concrete.

Ibrahim Azee investigated "the use of selective wastes in solid mixtures". Modern lifestyles, coupled with technology, have led to an increase in the quantity and type of waste, causing the wastewater crisis. This stud y solves the problem of contamination from broken concrete, glass and plastics. To reduce or reduce the accumulation of certain types of waste, it is suggested that some of these waste be reused to change the percentage of basic materials used in standard Portland cement concrete.

The recycled waste in this study consists of glass, plastic, and demolished concrete. Such recycling not only protects natural resources but also helps to address the growing waste management crisis.

Ground plastics and glass were used to replace 20% of the total concrete in the concrete mix, while crush concrete used up to 20% of the crush concrete. To evaluate these alternatives on the properties of OPC composites, several laboratory tests have been conducted. These tests include operating efficiency, unit weight, compressive strength, flexibility and endogenous tensile strength. The main results of this research show that three types of waste can be successfully used as sand or coarse aggregates as a partial substitute for concrete compounds. The researchers concluded that the experiments in this study were mainly designed to address the advantages and disadvantages of using solid waste such as broken concrete, plastic and glass. It provides an overview of construction waste recycling in

ISSN No:-2456-2165

the construction industry. Based on test results and physical observations, the following conclusions can be drawn:

- Develop waste and reuse management plans for any construction project before beginning operations that uphold environmental, economic and social development principles.
- The surface area of recycled broken concrete, due to its irregular shape, requires the growth of cement and water; So irregular shape can adversely affect the efficiency of the said mixture.
- Comparing the supply of prime aggregates (aggregates) to the cost of breaking down glass, plastic and concrete, the availability of key materials and space should be considered in project management plans.
- The strength of concrete alloys can be improved by partially replacing fine aggregates with broken glass aggregates, but the high alkalinity of such aggregates affects the strength and strength of the aggregates, both of which require long-term research.
- In contrast to the use of plastic and broken aggregates, the use of different percentages of glass does not significantly affect the breakage, which decreases as the percentage of consumption increases.
- In addition to recycling glass in concrete alloys, glass aggregates can be used in aesthetics to give a shiny, clean finish to the surface of the concrete product.
- When using up to 20% of concrete using plastic and broken concrete, the strength of concrete used by natural aggregates is compressive and split-tensile than that of ordinary concrete. Therefore, in some civil engineering applications it is recommended to use concrete with low strength recycled materials, especially in non-structural applications of less than 25 MPa. This helps to reduce the cost of using non-structural concrete.

Concrete performance has also been investigated using disposable plastic waste as a concrete constitution. Safe disposal of recycled thin plastic bags is the most challenging to dispose of solid waste worldwide. To date, at least 15% of all plastic waste is untreated. Concrete is the first choice for construction in most countries today. This has led to the rapid extinction of natural resources. It may be worthwhile to use disposable plastic bags in concrete to meet the shortage of raw materials and to safely remove the plastic left to the environment. This paper presents a comparative study of the compressive strength of concrete by mixing plastic bags into concrete parts. This study focuses on the use of 20 μm thick polyethylene plastic bags in M25 concrete. Plasticity by volume is added from 0% to 1.2%. Compressive strength is compared to manually cut and torn plastic. Based on the experimental data obtained after extensive sampling of different proportions of polyethylene fibers, the following conclusions are reached.

- Plastic bags can be used to avoid confusion in the form of chopsticks.
- Macro fibers made with hand-cut bags are not suitable for viewing rates.
- The strength and compacting factor of the fiber measured by the use of plastic bags of less than 20 microns was reduced by approximately 30%, 1.2% to 50% compared to the controlled concrete.
- With the exception of polyethylene fibers less than 20 meters thick, concrete is suitable for non-structural work, where strength of concrete is not a major concern.
- Different durable elements should be investigated with a wide range of models and tests.
- To examine the possibility of using such waste for alternative solutions to solid waste, the authors use different types and proportions of different types of post-consumer plastic waste.

C. Aims And Purpose

A tearing machine is designed to divide small solid particles into smaller or smaller pieces. Tearing machines are commonly used to reduce the size and shape of materials, so they can be used effectively. Small pieces, such as disassembling, can be defined as the process by which the energy transmitted by mechanical gains are combined with atomically made materials, and with greater deformation than breaking the material. Clipping materials should have greater strength and hardness than plastic materials.

The objective of this study is to investigate the effect of operational parameters on process energy demand and re-cyclone quality in the mechanical recycling of glass fiber composites. The three control factors investigated are hammer mill screen size, material thickness, and material size. The performance of two different granulator technologies is also compared. The focus is to develop a knowledge base to reduce the power footprint and to select the right parameters to re-evaluate storm quality.
In short, the main goals of the project are:

- Construction of shredding machine that works for plastic waste.
- This can easily separate future modular PSUs.
- After testing the performance machine, re-design the small pieces to improve performance, output quality, assembly and / or user-friendly.
- Rebuild the machine with new improvements, if possible.
- Reduce building costs

II. LITERATURE REVIEW

High voltage fission and mechanical recycling of glass fiber thermoset composite. (Pual.t Mativenga, Norshah) 2016.

Glass has introduced fiber reinforced plastic material, which is 98 percent of the product size. The different process of recycling is Biotechnology, Electrical, Fluidized Bed, HVF, Mechanical, Microwave Pyrolysis, Pyrolysis. Two devices are discussed, such as the SELFRAG High Voltage Fission Laboratory and the Whitman Macy Granulator, high voltage fission equipment that operates by supplying voltages. Whitman granulator motor driven mechanical reducer. This literature survey classified HVF for a new application in the recycling of GFRP and compared it to its mechanism.

The global growth of mixed waste requires innovative recycling technology. Three-dimensional cross-linked structure makes melting and repair of the thermoset alloy impossible. In this study, high voltage fission, originally intended to break rocks, was investigated as a potential process for total recycling. It was then benchmarked against its competitor mechanical recycling. This research has been instrumental in differentiating the overall stages, the energy demand and the quality of the returning storms. This work is a new contribution to the performance evaluation of key technologies for fast recycling glass fiber thermoset composites, a major challenge for manufacturing and end-of-life waste generation.

Energy intensity and environmental analysis of carbon fiber composite mechanical recycling
Jack Hogarth 2014

It explained that the shortage of industrial standards of total recycling required the law to become an acceptable waste management solution to increase industry waste accumulation. It is becoming a global problem and recycling technology to have the technical potential and environmental benefits. The main methods for recycling composite materials are classified into thermal, chemical, mechanical and radiation categories. Extrapolating mathematical models for estimating energy demand for specific energy modeling and mechanical recycling of various composite materials.

Environmental assessment using fly ash filler, reinforced by the mechanical properties of acrylonitrile butadiene styrene (ABS). Narshasat (2018).

Fly ash is commonly used as an acrylonitrile butadiene styrene (ABS) filler reinforce to develop lightweight alloys. However, the study of particle size is very limited in the mechanical properties of thermoplastic-based fly ash products. Information is important in developing products for high performance applications. This study compares the mechanical properties of fly ash fortified thermoplastic products made with different particle sizes. Products are mixed and cured using a hot press machine before performing many mechanical tests and environmental assessments. The results indicate that as the fly ash particles increase in size, the tensile and elastic properties of the sample decrease. It is difficult to disperse the size of large particles all the same. In contrast, environmental assessment reinforces large cells of ABS and fly ash, resulting in less global warming due to the use of less electrical energy in the filtration process. The results of this study provide important insight into the mechanical properties and global warming effect of fly ash based thermoplastic products.

Comprehensive reuse of efficient fiber reinforcement.
Narshahisatzub (2016)

US materials have different properties. Thermoset matrices used in most high-grade applications have three-dimensional cross-linked structures that cannot be melted and refined. Such complex behavior requires appropriate reuse strategies, many of which are currently in research and development. At this early stage, it is important to select and develop sustainable solutions in terms of economic performance and low environmental impact. Unfortunately, there is a limited number of highly comprehensive environmental data in the literature to help assess the life cycle benefits of total reuse. This information is important in examining the environmental potential of composite recycling processes, the efficient use of productive resources, and the integrated waste of life.

We also investigated the effects of key process variables on mechanical energy recycling in terms of process energy demand and re-cyclone quality. This study highlights the importance of selecting the right markets to handle recycling processes and creating high market value storms. The potential of new recycling techniques such as high voltage distortion is also evaluated. The performance of the method originally developed to break rocks has been compared to that of the adult mechanical recycling process. The last part of this study used the life cycle assessment method to assess the end of life choices for automotive integrated products with highlights on the beneficial environmental impacts of recycling conditions.

Polyethylene waste is recycled to produce plastic cement
Ahmad K. Jasim (2017)

Disposal of plastic waste in the environment is considered a big problem because its bioavailability is low and its large size. Therefore, finding alternative ways of disposing of waste using convenient means is becoming a major research problem. In this research, we consider the possibility of mixing high-density polyethylene waste with Portland cement to produce plastic cement and the effect of replacing sand with polyethylene waste with different properties. Experiments were performed using polyethylene packages in a small reinforcement structure consisting of 10% to 80% volume, bottles and food boxes. The results indicate that plastic cement from polyethylene waste and Portland cement is likely to produce 60% and 40%,

respectively. In addition, they reduce their density, increase flexibility and improve job efficiency, producing lighter materials.

Design and Fabrication of Paper Shredder Machine
Dr. Fauzia Siddiqui

This paper deals with the detailed study and design process of a paper slicing machine. The special parts of the Schras der Machine, Stand (Frame), Transmission System and Cutting System are specially developed and designed. A short paper deals with the study of the cutting system of a machine, namely the type of blade, its different profiles, its dimensions, its arrangement, and the advantages and disadvantages of different types of blades. The second part is the detailed design, purpose and definition of the design process of each part of the cutting and transmission system, the design of the blade and some changes to it. The third and final part is the design of various components of the Dassault system and its analysis of "Solid Works 2014" and its kinetic studies and ANSYS15.

Keywords:- SolidWorks2014, ANSYS15, Shredder Machine. Introduction Paper shredder is a mechanical tool used to cut paper into sheets, usually strips or thin cells. It is used by government agencies, businesses and private individuals to destroy private, confidential or sensitive documents. Privacy experts recommend that thieves use bills, tax records, credit cards, bank account details and other items to exclude people for fraud or identity theft.

Types of Paper Cut:

- Strip-cut pieces: These rotating knives cut narrow strips as long as the original sheet paper. These strips can be retrieved by a determined and patient researcher or competitor, because the production of these pieces (information loss) is irregular.
- Cross-cut or confetti-cut shredders: They use two pregnancy-rotating drums to cut rectangular, horizontal cubes or flexible (diamond-shaped) pieces.
- Particle-Cut Clipping: They can be shaped into small rectangles or circles.
- Cardboard Pieces: - These are specially designed for cutting coherent materials into strips or mesh boards.
- Pierce and Tear Shredder: - They have rotating blades, which are pieces of paper.
- Waist: - Rotating shaft with paper grinding cutting blades.

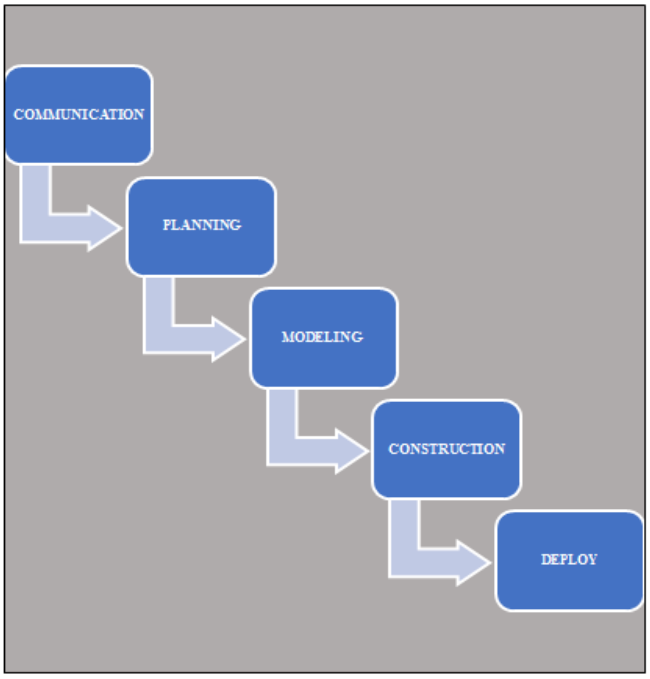

Fig 1: Waterfall Model

Reuse of polyethylene plastic waste in concrete
Venkat Narsimha Rao

Due to population growth and altered lifestyles, the volume of plastic waste has increased significantly. This project deals specifically with the possibility of using waste polyethylene as a partial re-installation of solid or coarse aggregates in waste. After mixing concrete is formulated with 2%, 4%, 6% pulverized / non-pulverized polyethylene material. Various tests on cement such as specific gravity, elegance, timing, etc., are tested on coarse and granular aggregates such as sieve analysis, fine modulus, specific gravity. Composites are formulated using the IS code system and the cubes and cylinders are poured for M25 grade concrete and understand their behavior and utility in the use of deceleration, cube testing and cylinder testing without testing on plastics and concrete. Standard mechanical properties of concrete, such as compressive strength, split tensile strength, are tested and compared with the results of standard models.

Impact of process parameters on mechanical recycling of glass fiber thermoset composites.
Paul Trisamatunga

Manufacturing and life waste are eliminated as there is a high demand for glass fiber reinforced thermoset composites. Mechanical recycling is currently a mature and fast process for recycling such waste on an industrial scale. Unlike manufacturing processes, the impact of important process variables on the quality of re-cyclets is not well understood. Diversity analysis was used in this study to establish the key mechanical granulator process variables that recycle energy demand and quality. Two different granulator technologies were also compared. This information is important in selecting conditions to drive the

recycling process and assessing the potential market for generated hurricanes.

Recycling of polyethylene waste to produce plastic cement
Ahmad K. Jasim

Disposal of plastic waste in the environment is considered a major problem because of its low biological capacity and large size. Therefore, finding alternative ways to dispose of waste using convenient methods is becoming a major research problem. In this research, high-density polyethylene waste is mixed with Portland cement to investigate the possibility of producing plastic cement, and the effect of replacing sand with fine polyethylene waste with different percentages of product characteristics. Experiments were conducted using polyethylene packages of waste, with 10% to 80% by volume, bottles and food boxes in a small reinforcement structure. The results indicate that plastic cement is more likely to be produced from polyethylene waste and Portland cement using 60% and 40%, respectively. In addition, their density is reduced, flexibility is increased and work efficiency is improved, producing lighter materials.

III. OBJECTIVES

- Build a functioning shredding machine for plastics waste.
- Make an easily detachable modular PSU that can be used for other future applications.
- Redevelop the shredder to improve performance, output quality, assembly and/or user-friendliness, after testing of the machine.
- If possible, rebuild the machine with the new improvements.
- Minimize building cost.

IV. METHODOLOGY

We have decided to complete the project in simple waterfall model.

- *Communication Phase*

Communication phase includes:

- Discussion of topic with guide
- Actual farm visit and understanding various farming method
- Literature survey
- Problem identification
- Analysis of problem
- Concept development
- Discussing various certainties and uncertainties

The very basic and important step was to study the basics of the shredder machine. It included the machine element. The main component of a paper shredder machine is the blade. Thus our more focus is on the research and the study of an appropriate blade design which will serve our purpose.

- *Planning Phase*

Planning phase includes:

- Process planning
- Raw material planning
- Force analysis
- Process scheduling

- *Modeling Phase*

Modeling phase includes:

- Design of various components
- CAD modeling of components
- Assembly model of component
- Prototype model making

Once the blade type is fixed, the second important thing is the machine design. The design was being done in Creo Parmetric 4.0. The different components designed along the blade are frame/stand, shaft, washers, gears, pulley etc.

Thus the designing phase is briefly classified as the machine construction, cutting system and the transmission system. The main aspect while design is the space occupation. Our main aim is to create a horizontal machine (like a Xerox ones) such that the space occupied will be horizontal in nature.

- *Construction and Testing*

Construction phase includes:

- Selection of proper manufacturing methods
- Working as per process scheduling and plan
- Testing of equipment on field
- Error analysis
- Repair if any
- Construction of Prototype using wooden shaft and metal blades
- Rework of design based on failure of results in prototype stage
- Construction of the model in stages: Welding the square pipes for the frame,

Bending of sheet metal for hopper, fitting of motor and Pulleys, Assembly of shredder shaft with the spur gears and fitting through nuts and bolts, and usage of dampers.

- *Deployment*

- Comparing the project with the designed output
- Preparation of testing results
- Preparation of project report
- Final submission of project

V. PROBLEM DEFINATION

- From the reference sheets, we explore the problem of the shredder machine, where load factors are caused by noise and excessive vibration.
- The normal cutters used, which are able to shred/cut papers into strips can't be considered as a reliable method of disposing the stuff. The strips are easy to be arranged or assembled again by some wiser brains.
- Because of the mechanical components like the blades, gears, etc. a periodic maintenance and through lubrication is required.
- There can be a problem of paper jam due to the back flow of paper along with the blades.

VI. WORKING PRINCIPLE

Plastic and glass bottles have more volume than their weight, so the scrap collector stops taking plastic bottles because these plastic and glass bottles hold more space than other scoring. If we break or cut this plastic, scraping the collector for transportation is convenient and economical and can be used for direct processing.

So we decided to build an affordable motorized plastic cutting machine for the consumer. Bottle Crusher can rotate parts from bottles, rotate or cut two parts with rotary cutting tools at a certain depth and speed. The machine works with the motor. Principle of Operation:

- Align the plastic bottle into the hopper.
- Cutter will rotate when the shaft is rotated after starting of motor.
- Bottle will cut when contact with the cutting tool.
- The scroll will fall in the collector provided.

A. Components And Their Specifications

Before we started modeling the CAD, we listed all the dimensions and specifications based on the design calculations done before. Further below is the table of all components and their specifications.

- *Frame*

The construction machine consists of a stand, support plate, nuts and bolts. Auxiliary member frame that supports parts such as gears, shafts and blades. Two plates (bearing support blades) are fastened with nuts and bolts to achieve the required strength. The material used for the machine frame is MS (lightweight steel). The framework was analyzed to see if the cutting and transmission system could support the load of the assembly. The A36 measures 7,850 kg / m3. Design and frame structure to follow the measurements:
Length (L) = 311 mm, Width (W) = 224 mm, Height (H) = 192 mm.

- *Cutting Blades*

The cutting system consists of shafts, cutting blades, washers and gears. The cutting blade is a circular blade with 3 (three) cutting edges, providing a circular hole in the center along the keyway, which operates simultaneously on the main shaft and the main shaft.

In the drawing of the cutting blade in the Cryo 4.0 software, the cutting blade splits into equal angles and connects each cutting edge of the cutting blade to the specified length of the cutting edge from one cutting edge to another.We design the cutting system in such a way that angle between keyway of each cutter blade is 40 degree. And cutting blades are placed in such a manner that after first blade apart from 40 degree from second blade. This concept used in paper shredder machine. Because of that, power which was requiring rotating the shaft was large. Now that power to rotate the shaft is lesser than previous. Material used for cutting blade is EN31 steel.

- *Shaft*

The shaft is a rotating machine element, usually circular in cross section, transmitting energy from one part to another, or absorbing energy from a power generator such as a power generator.

Various members have been installed, such as cutting blades, gears and spikes. For the cutting system, circular shafts with a key (rectangular) with a circular cross section are used. The material used for the shaft is EN31 steel. The shaft is made and the diameter of the shaft is 40 mm.

- *Spur gear*

Gear or cogwheel is a rotating machine piece with jigs or pigs that mesh with another tooth to provide torque. Equipped equipment provides the required speed, torque and direction of the power source. The teeth of the two duplicate gears have the same shape and the material used is EN31 steel. The ratio of the required gear to the cutting system is 1. Therefore, the design and construction of the gear is equal to the number of teeth and the diameter of the gear. A set of gears with two spur gears is used.

- *Pulley and belt*

V-belt pulley (also known as V-belt belt sheaves) is a device that transmits power between pivots using the V-belt, which is a mechanical connection to the trapezoidal cross-section. The V-belt pulley can only be used to power the force between two horizontal pivots.

The most efficient belt drive is the transmission from the V-belt (sometimes 98%) and its complementary winch. The material is used for lightweight steel and rubber and for belts and belts respectively. Adequate strength is required for large spot diameter (d) = 667 mm, small spot diameter (d) = 400 mm, and distance between two spots = 1000 mm. The velocity ratio between the two pullies is 1.67. So, the belt number 32/849 was selected from the list. The design of the belt and pulley pitch line speed, which is 11 m / s.

➢ *Bearing*

The bearing is a machine component that provides relative speed to the desired speed and reduces the tension of the machine part. Bearing is a mechanical component that allows one part to bear the other. The material used is steel for bearing. The 6208 SKF number is selected from the chart.

➢ *List of all components*

S. NO	COMPONENT NAME	SPECIFICATION
1	AC MOTOR	3 PHASE, 500 RPM
2	PULLEY	CAST IRON, 2 NOS. (666 MM AND 400MM DIA)
3	SHAFT , HOT ROLLED PCS	40 MM DIA
4	BEARINGS	2 NOS, 60 MM ID,110MM OD,N0. 6208 SKF
5	SPUR GEARS	2 NOS, 40 MM ID
6	STEEL FRAME	2 ‘ SQUARE PIPE
7	HOPPER	MS,0.22 MM THICK
8	BELTS	V-BELT,3.6 M LONG, 22X14 MM CROSS SECTION
9	KEY	12*08*85 MM

Table 1

VII. CONCLUSION

We have concluded that there are many parameters on which the entire project is based, such as all information about the system, the design of a single blade, and the alignment of its main shaft, rotation reduction. Motion studies were conducted successfully at SOLIDWORKS14 after the entire assembly was completed. Some basic analysis is needed to test whether the framework is burdened. The following analysis was done on ANSYS15 and the results were positive. Before starting the actual construction, we did a test on our design to ensure the expected result on our design. Prototype testing was also performed positively. Original construction on prototype testing has begun. There is a problem with gear alignment and bearing plate alignment. We also need to change the position of our reduction gear at the end due to the pulley arrangement. These difficulties were overcome by the advice of some experts. There is a paper jam problem, which is eradicated by the use of stripper fingers. There are very few vibrations in the original machine.

ACKNOWLEDGMENT

We express our sincere thanks to PG coordinator, Dr K.M. Munde, for his continuous support. We also thankful to our Guide and Head of Department of Mechanical, Prof. Ganesh E. Kondhalkar, for support.

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