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DESIGN AND ANALYSIS OF MANUFACTURE OF BRICKS BY USING PLASTIC

[1]Mr. D. VENKATESH, [2]PABBOJU NAVEEN KUMAR, [3]DUDDEDA SHRUTHI, [4]VADLA SOUJANYA, [5]GATTOJI SHIVA KUMAR, [6]PANGA ARUN KUMAR

[1] Head Of Department,[23456] B.Tech Student

DEPARTMENT OF CIVIL ENGINEERING

SIDDHARTHA INSTITUTE OF TECHNOLOGY AND SCIENCES(UGC-AUTONOMOUS),

Narapally (V),Korremulla road, Ghatkesar (M), Medchal Malkajgiri (Dist), 500088.

ABSTRACT

Nowadays due to development and urbanization, plastic becomes a part of our daily life. The only flaw is it is non-biodegradable and it takes thousands of years to breakdown or to decompose. This study elaborates the work done by the writer to Use plastic as a construction material to replace the clay brick as well as to find a way to effectively utilize the waste plastic. Plastic waste Has recyclable characteristics that may be used to recycle it and create a new product that has lesser environmental effect. One way to Recycle plastic trash is to make plastic bricks by combining plastic with sand at a particular temperature and using them to replace Regular clay bricks. Various authors conducted a comparison study with masonry bricks made of other materials using various testing Methods such as scratch testing, water absorption test, porosity testing, soundness testing, scratch testing, efflorescence testing, and concluded that more research in this field could improve the durability, strength, and quality of these masonry plastic bricks. We observe that these plastic bricks are light weighted which absorbs very less amount of water or near to minimal water absorption which enhances its property and the strength is also much better than clay bricks, nearly double of a clay brick. These plastic bricks can hold two time the weight of concrete of same size if compressed thoroughly.

Plastic waste which is increasing day by day becomes eyesore and in turn pollutes the environment, especially in high mountain villages where no garbage collection system exists. A large amount of plastic is being brought into the tourist trekking regions are discarded or burned which leads to the contamination of environment and air. Hence, these waste plastics are to be effectively utilized. Low-density polyethylene bags are cleaned and added with sand at particular percentages to obtain high strength bricks that possess thermal and sound insulation properties to control pollution and to reduce the overall cost of construction; this is one of the best ways to avoid the accumulation of plastic waste which is an on-degradable pollutant. This alternatively saves the quantity of sand/clay that has to be taken away from the precious river beds/mines. The plastic waste is naturally available in surplus quantity and hence the cost factor comes down. Also coloring agents can be added to the mixture to attain desired shades.

1. INTRODUCTION

Plastic is a wide range of synthetic or semi-synthetic materials that use polymer as a main ingredient, plastic can be made into different shapes when they are heated in a close environment. Plastic has few advantages, some of them are weather resistant, impact resistant, durable, versatile, light weighted, etc. Plastic is a pliable substance which makes it easier to moulded into solid things. According to Central

Pollution Control Board (CPCB) report 2018-19, 3.3 million metric tonnes of plastic waste was generated in India in 2018-19. This roughly translated to 9,200 tonnes a day, and in 2019-20, 3.4 million metric tons of plastic waste was generated annually. The total municipal solid waste generation is 55 to 65 million tonnes, plastic waste is approximately 5-6 percent of the total solid waste generated in the county.

Many plastics are, in theory at least, highly recyclable. Unfortunately, in reality, most plastic ends up as waste instead, harming the environment and providing no ongoing value to society. Wanting to investigate possible ways to repurpose this material, [Rehaan33] built a rig to create bricks out of waste plastic for a school project.

The aim of the project is to take waste plastic, in this case high-impact polystyrene, and reform it into a brick that could be used as a low-cost building material. The material is shredded, before being packed into a steel mould and heated to 270 degrees in an oven. As polystyrene is a thermoplastic, it can readily be heated in this way for reforming without harming the material's properties. Once heated, the mould is placed into the press rig, which uses parts of an old drill press to force down a steel plate, helping shape the final form of the brick.

While you're unlikely to see old soda bottles used to build a skyscraper in New York any time soon, such techniques could be a good way to help eliminate plastic waste in impoverished areas and stem the flow of plastic into the world's oceans. The project served as a useful learning experience, allowing [Rehaan33] to pick up skills in metalworking, machine design, and working with thermoplastics. Recycling plastics is a key area of interest for many, particularly in the 3D printing space, with many exploring ways to reuse thermoplastics in more efficient ways. If you've got your own project turning waste plastics into useful material.

Characteristics of Waste Plastic

- Tensile strength: The tensile strength or the toughness of the plastics are dependent on the materials that are used in the production of the plastic. Usually, the tensile strength or the toughness of the plastics are less when compared to the alloys such as steel.
- Lightweight: They weigh less than that of the metals which makes their transportation easy or carrying them from one place to another becomes easy.
- Reactivity towards chemical: When plastics are compared with natural polymers such as cotton, wool, etc, plastics are not affected by the acids and alkaline.

Appearance: Usually plastics are transparent and can be coloured to desirable colours. Also, they can be moulded into shapes depending on their usages.

OBJECTIVES

- The main target of this study is to analyse the carbon dioxide free cementitious material, various properties and their effects on Geopolymer brick.
- The efficient usage of waste plastic in plastic bricks has resulted in effective usage of plastic waste and thereby can solve the problem of safe disposal of plastics, also avoids its wide spread littering.
- A Present Study aims at evaluating the Performance of Plastic for Bricks Use in Construction and Other application areas.
- As Properties for Plastic Bricks, the same have Been of Studied for Various Mixes varying % of Materials.

Scope

The reduce the Co2 Emissions of Plastic Bricks.

The Plastic are Using Show Many Problems, Effects Are Affected on Human & Animals. Plastic is a very toxicity material.

To Control the Environmental Pollution & Remove Waste Plastic on Society.

It increased greatly over few decades. People's reliability on plastic is increasing rather than decreasing. Various disasters have occurred due to increasing plastic waste and one example of the same is Apex regional landfill situated in Las Vegas, USA. It is regarded as worlds one of the most and disastrous landfills which as its spread area is 2200 acres. It daily receives about 9,000 tons of municipal solid waste and was opened in the year 1993. Based on this detail it can be easily estimated the amount of harm it's doing to the environment. New York Department of Health reports methane and carbon dioxide as the major gases produced and makeup to 90 to 98% of landfill gas. Nitrogen, oxygen, ammonia, sulphides, hydrogen and various other gases are also produced in small volumes. These gases have an odor similar to rotten eggs and hence it gets difficult to live in an area which is near to landfills. Besides odor, landfill gases can also impact health causing problems that can be acute or chronic which is a major concern. Landfill causing fire is also a recurring problem. The University of Iowa reports that there are more than 8000 landfill fires occurring every year in U.S. Smoke from these fires can cause respiratory diseases if they are contaminated by chemicals, and water in fire suppression efforts can spread leachate pollution of soil and water sources. Not only air quality is affected by landfills, but also is a major source of groundwater contamination. It is reported that leachates from landfills do have heavy metals like barium, chromium, cobalt, nickel, and lead which enters the soil and into the groundwater contaminating it. They destroy the soil properties which are required for growth, nourishing, etc. for a plant. Leachates from landfills pollute rivers and other water sources. Ammonia which is one of the common gases found in landfills converts itself into nitrogen and causes eutrophication, where algal growth increases and uses up all the oxygen present in the water killing marine life. Moreover, toxins in leachates can kill wild and domestic animals that drink this water. In humans also, its side effects are felt, they cause nausea, stomach pain, rashes, fever, and headaches. This generally happens because surface water and groundwater are connected and hence pollutants can move back and forth. Hence, it is evident that dumping into landfills has to be avoided and an alternate solution to it is the requirement of time. To humans, plastic is available in a variety of forms such as HDPE, PET, Bakelite, LDPE. Plastic is usually made from long chains of hydrocarbons along with additives and can be easily molded into any desired shape. Plastic is categorized as Thermoset plastics and Thermoplastics. Plastics once melted can be easily molded and then once if its again heated it again softens and can take any desired shape. Thermoset plastics, however once melted and takes any shape, it cannot be reheated. Thermoplastics include variety products such as PPS, LDPE, PVC, HDPE, PET, etc. while Thermoset plastics include Nylon, Bakelite, etc. In the MSW, the contribution of Thermoplastics is about 80% and Thermoset constitutes approximately 20% of the total plastics waste generated. Table 4 shows the types of typical thermoplastic and thermosetting resins. Owing to the number of side effects use of plastic have instead of decrease in the consumption, its utilization is increasing rapidly. This is proved by the estimated difference in plastic consumption in 1950's and its current consumption. Estimates have shown that plastic consumption increase from 5 million tons in 1950's to nearly 100 million tons at present. So, reducing the plastic waste is a need for the time and here plastic extrusion can be regarded as one of the most

effective methods for reducing the plastic waste. Extruder machine can intake the waste plastic which might go into landfill otherwise and converts it into various sustainable construction material. The advantage of extruder machine is that it not only helps in making construction material but also helps in plastic disposal problem. The method which extruder machine employs is, raw plastic is this raw plastic is melted and forms a continuous profile allowing production for various construction materials. This process causes no harm to any form of life or environment and is very useful. Recently increasing awareness has led companies to manufacture products made from recycled plastics such as recycle rubber, road rail tile resins, P/C tiles etc.

Plastic waste which is increasing day by day becomes eyesore and in turn pollutes the environment, especially in high mountain villages where no garbage collection system exists. A large amount of plastic is being brought into the tourist trekking regions are discarded or burned which leads to the contamination of environment and air. Hence, these waste plastics are to be effectively utilized. High-density polyethylene (HDPE) and polyethylene (PE) bags are cleaned and added with sand and aggregate at various percentages to obtain high strength bricks that possess thermal and sound insulation properties to control pollution and to reduce the overall cost of construction, this is one of the best ways to avoid the accumulation of plastic waste which is an on-degradable pollutant. This alternatively saves the quanta of sand/clay that has to be taken away from the precious river beds/mines. The plastic waste is naturally available in surplus quantity and hence the cost factor comes down. Also Colouring agents can be added to the mixture to attain desired shades. Hence in this thesis, an attempt is made to study regard the properties of the brick which is manufactured using plastic wastes.

This project reviews one of the sustainable and effective ways of managing plastic waste in urban and rural parts of India in order to minimize their adverse environmental impacts. The requirement for such research is validated as it is desirable to change the unsustainable arrangement of consumption, production and disposal associated with these materials. After studying the whole scenario, I developed an effective way of utilizing the soft plastic waste and recycling it into plastic bricks which are v niery light in weight and can withstand high amount of pressure as compared to standard modular bricks. However due to some physical and chemical properties of plastic which can be disadvantageous to the brick created from it, some changes in its design and manufacturing processes can be made.

Plastic is also one of the main concerns in waste management. The most common waste disposal method in Sto. Nino National High School is compost pitting. With the growing school population, the volume of solid waste continues to rise despite the school's efforts to regulate the amount of trash it disposes to the waste management system. This worsening problem has encouraged researchers to look for other ways to monitor and innovate the school's waste management for the benefit of the school and the community.

2. METHODS

Two methods were utilized to use plastic wrappers as an ingredient in brick production. The plastic wrappers were shredded. For the first set-up, a portion of the shredded plastics that were collected are liquefied and moulded again. For the second set-up, partially liquefied plastic was allowed to harden and was pulverized. Some of the shredded plastics were used without undergoing the melting process. The crushed and the shredded plastics were individually mixed with binders and allowed to dry.

RESULTS

This study shows that shredded and melted plastics have great potential in brick production, particularly with plaster of Paris, which exhibited characteristics similar to the standard bricks in the market. Plastic can be utilized as either the main ingredient or an alternative aggregate in brick production Plastic could be liquefied, hardened and pulverized, shredded to be used in alternative brick production. Liquefied plastic wrappers can be moulded purely, or mixed with a binder to produce bricks. Partially liquefied plastics that have hardened are also pulverized and can be bound by an adhesive (either cement or plaster). The same with the shredded plastic, when linked with plaster and cement, produces bricks alternatives. Brick products created from different variables and conditions can be utilized in specific purposes upon which these products are most suitable. The alternative bricks lessen the plastic wastes in the community and at the same time, have particular characteristics similar to standard brick used in construction.

Plastic has been most used that plastic pollution has become one in every of the environmental problems of the planet and also to blame for the global climate change. The utilization of plastic in our day-to-day life, like polyethene bags, food packets, disposal materials, etc. it's impacted the environment, our health and wellbeing. We've got all contributed to the present problem, and now it's our responsibility to figure towards it to cut back and ultimately End Plastic Pollution. The employment of plastic is additionally a serious issue everywhere the planet. Every day, thousands of loads of pollutants are discarded into the air by natural events and human actions. Way more damaging are the substances discharged into the atmosphere by human actions. Most plastics are highly proof against the natural processes of degradation. As a result, it takes an extended period of your time to degrade the plastic. It's resulted within the enormous presence of plastic pollution within the environment and, at the identical time, affected human health adversely. it's estimated that plastic waste constitutes approximately 10% of the full municipal waste worldwide which 80% of all plastic found within the world's oceans originates from land-based sources.

Material Required for Manufacturing of Plastic Brick

Plastic waste such as Polyethene, Plastic bottles (Pet), Plastic with other composite materials, Engine oil, River sand (4.75mm) 2. SCOPE OF THIS EXPERIMENT To generate plastic waste in an efficient manner and to use it effectively. To reduce the consumption of natural resources such as clay for the manufacturing of bricks. It takes less time for manufacturing as compared to normal brick. To produce the most cost-effective material and also offer an alternate option to the customer. To minimize the amount of plastic waste being recycled.

Global Production of Plastic and Generation of Waste Plastic

In modern life, plastics are ubiquitous. Its early usage dated back to 1600 B.C., at the time when human hands shaped natural rubber and polymerized into different useful objects in prehistoric Mesoamerica. Diverse usage and manufacturing of plastics and plastic products began in 1839 when polystyrene (PS) and vulcanized rubber were discovered. Production of bakelite which is the first truly synthetic polymer was in 1907 in Belgium, however, by 1930, bakelite was everywhere, especially in fashion, communication and electrical and automotive industries. It took a decade after this for mass production of plastics to begin and it has constantly expanded ever since. As at 2008, the annual plastic production was estimated to be 245 million tons globally. At present, single-use packaging is the largest sector, accounting for almost 40% of the overall plastic usage in Europe, this is followed by consumer goods, materials for construction, automotive,

electrical and agriculture applications at 22%, 20%, 9%, 6% and 3%, respectively. It was estimated in 2015, that the highest rate of production is in Asia (with 49% of total global output, with China as the largest world producer (28%), followed by North America and Europe at 19% each. In terms of production, the rest regions are of lesser importance although not necessarily in terms of plastic consumption.

Provides the total plastics waste consumption in India during last decade.

s.no	Year	Consumption(tons)
1	1996	61000
2	2000	300000
3	2001	400000
4	2007	850000

Source: Central Pollution Control Board; Table 1 Plastic waste consumption in India

A national plastic waste management task force in 1997 projected the polymers demand in the country. Table 2 documents the demand of different polymers in India during years 1995-96, 2001-02 and 2006-07. The comparison of demand and consumption from Table 2 and Table 1 indicates that projections are correct. More than one-fourth of the consumption in India is that of PVC which is being phased out in man niy countries. Poly bags and other plastic items except for PET, in particular, have been a focus because it has contributed to host of problems in India such as choked sewers, animal deaths, and clogged soils. The ways of getting rid of it are harmful; hence there is a need to find the solution to such a devastating problem.

Source: National Plastic Waste Management Task Force; Table 2 Polymers demands in India (million tons)

S.NO	TYPE OF POLYMER	1995-1996	2001-2002	2006-2007
1	POLYETHYLENE	0.83	1.83	3.27
2	POLYPROPYLENE	0.34	0.88	1.79
3	Polyvinyl chloride	0.49	0.87	1.29
4	Polyethylene terephthalate	0.03	0.14	0.29

Current World Production Rate of Plastics

Globally, plastic production was estimated to be 380 million tonnes in 2018. Since 1950 to 2018, plastics of about 6.3 billion tonnes have been produced worldwide, 9% and 12% of which have been recycled and incinerated, respectively. Plastics of about 5 million tonnes are yearly consumed in UK alone, with only about one-quarter recycled, and the rest landfilled. It has been suggested by researchers that by 2050, oceans might contain more plastics than fish in terms of weight. Yearly, approximately 500 billion plastic bags are used out of which an estimated 13 million tonnes ends up in the ocean, killing approximately 100,000 marine lives.

Future Projection of Production Plastic

Plastic production has increased in twenty-fold since 1964. Globally, approximately 311 million tonnes of plastics were produced in 2014, expected to double in about 20-year time and possibly quadruple by 2050. International Energy Agency World Energy Outlook in 2015 estimated that, the largest application, plastic packaging (26% of the overall volume), is envisaged to have continuous strong growth, which might double within 15 years, with a possibility of fourfold increase by 2050, to about 318 million tonnes yearly, which is higher than the whole plastic industry today.

3. LITERATURE SURVEY

1."Fabrication and testing of Plastic sand bricks" by S. S. Chauhan, Bhusan Kumar, Prem Shankar Singh, Abuzaid Khan, Hrithik Goyal, Shivank Goyal (2019). They mixed the river sand and the PET plastic (molten form) in the ratio of 1:2, 1:3, 1:4 for mould size of (230*100*75) mm for which they found maximum compressive strength on the ratio of 1:2 mixture for the same size of the bricks. The water absorption of these bricks was observed less than 5% that is less than conventional clay bricks i.e. 15-20%. However, they failed in maintaining fire resistance property of these bricks

2. "Utilization of plastic waste in manufacturing of plastic sand bricks." By Arvind Singhal, Dr. Om Prkash Netula (2018). They used the mixture of plastic and stone dust in the molten form in the ratio of 3:7 in standard brick mould for which stone dust was sieved through 4.75 mm using sieve analysis and conducted test on water absorption to be found as 0%. Compressive strength of plastic sand bricks is 5.6 N/mm2 at the compressive load of 96 KN.

3. "**Plastic in Brick Application." By Siti Nabilah Amir & Nur Zulaikha Yusof (2018).** The studies showed the possibility of using plastic as binder with the aid of catalyst through depolymerization of PET to replace cement. It was observed that a significant decrease in compressive strength is observed for more than 50% replacement of binder with PET waste. With increased amount of PET, the softening point of the bricks produced was also increased. They used the different size of moulds like (150*150*150) mm, (200*100*100) mm etc.

4. "Study of plastic dust brick made from waste plastic" by Ronak Shah, Himanshu Garg, Parth Gandhi, Rashmi Patil, Anand Daftardar (2017). They used plastic dust as the main component of waste product which is the by – product of many industrial products such as PVC pipes and they have heated plastic dust at 220°C. The final product from plastic dust was tested for the compressive strength and it was observed as 6.66 N/mm2 which is higher than conventional bricks (3-5 N/mm^2).

4. EXISTING AND PROPOSED SYSTEM

This work was under taken with following objectives

- The study was intended to evaluate the index properties of laterite quarry waste and general properties of Poly-ethylene terephthalate (PET).
- To arrive at the optimum dosage of PET that could result in building material with good strength and less water absorption.
- To arrive at the optimum dosage of bitumen that could enhance the binding capacity of plastic in molten state, to achieve a mix with better binding quality there by leading to bricks with good strength & lesser water absorption.
- To develop an alternative building martial that could satisfy requirements of good building material. And also, to arrive at a

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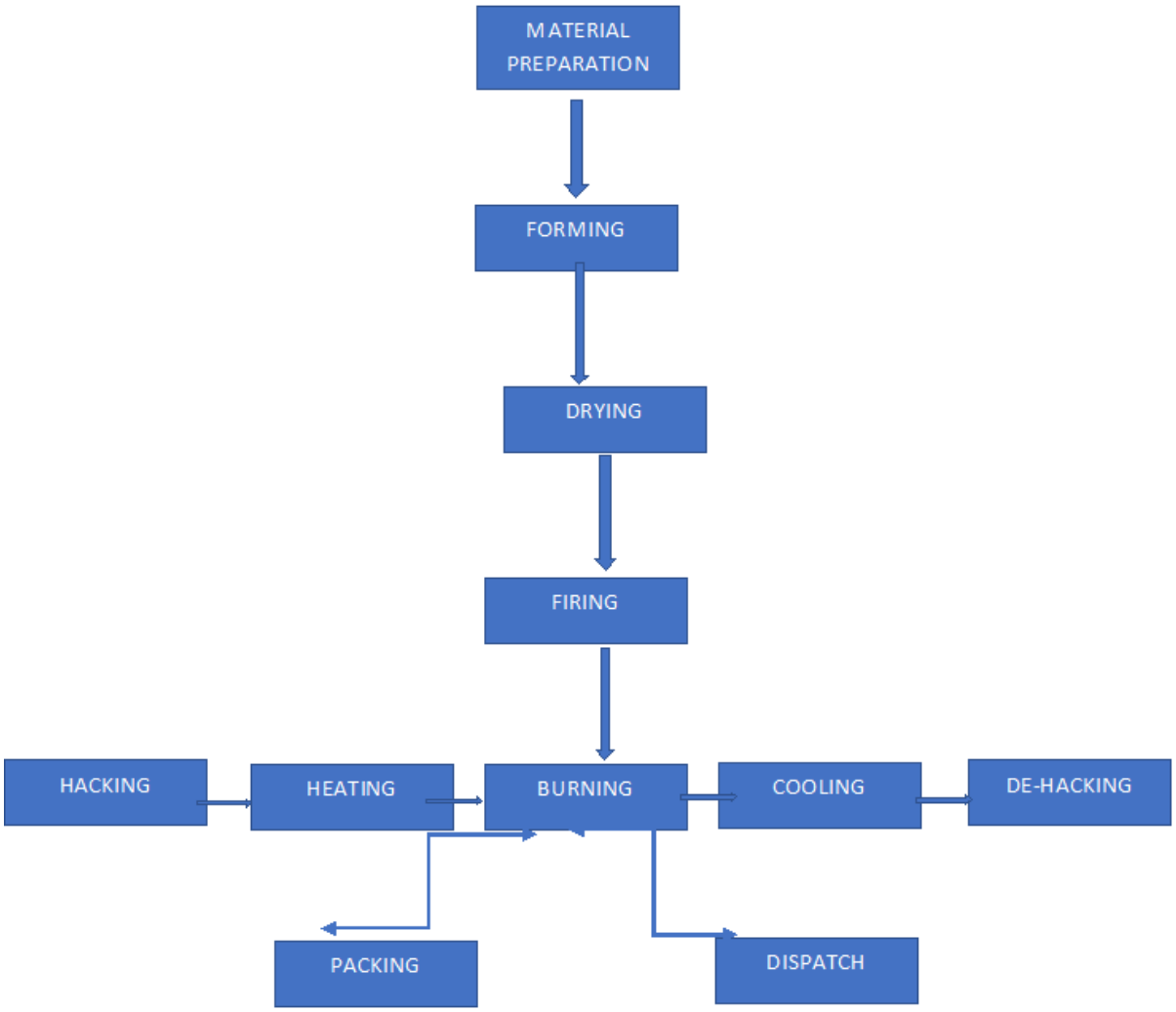
solution for the problem of imbalance between the availability and the demand of conventional building materials. To develop a scientific way of reusing waste plastic (PET bottles) along with utilization of laterite quarry waste that could result in alternative building material

5. MODULE SPLIT UP

ER DIAGRAM



6. EQUIPMENTS REQUIRED **Plastic**

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Plastics are made up of synthetic or semi-synthetic materials with a polymer as the primary chemical component. Plastic is created mostly as a result of plastic products such as plastic bottles, one-time-use plastics, multi-layer plastics, and other similar items, which clog our environment and have a significant impact on human and wildlife habitat on the planet. Due to its low density, when plastic garbage is exposed to sun radiation, it releases two particularly dangerous greenhouse gases known as methane and ethylene. Generally, there are seven types of plastics available on our earth name as, PET - Polyethylene Terephthalate, HDP - High Density Polyethylene, LDP - Low Density Polythene, PVC - Polyvinyl Chloride, PS – Polystyrene, PP – Polypropylene, and other remaining plastics. Plastic is an essential component of many items, including water bottles, combs, and beverage containers. Knowing the difference, as well as the SPI codes, will help you make more informed decisions about recycling. When it comes to promotional giveaways, and even items we use around the house, there is no material more important than plastic. The same can be said for the items we use at the office. Most of our supplies contain at least a little bit of this material. In fact, humans have thus far produced 9.1 billion tons of plastic. For the sake of the environment, it's important to know the different types of plastic and their uses, as well as the resin identification codes found on each.

Take a walk through your house or office and you're guaranteed to stumble across a variety of plastic products like water bottles and pens. No material is more commonly used in our everyday lives! It's easy to classify everything as simply "plastic." We are using LDPE plastic for our project because it takes less time for melting when compared with other of plastics.

Sand

Sand is a granular substance made up of small rock and mineral particles that have been coarsely split. Its size distinguishes it from gravel and silt, being finer than gravel and coarser than silt. Sand is composed of all kinds of rocks and minerals, so its chemical properties greatly vary. Most sand is made of quartz, which is largely silicon oxide. Physically, sand is made up of tiny, loose grains of rocks or minerals that are larger than silt but smaller than gravel. Sand is a granular material composed of finely divided rock and mineral particles. It is defined by size, being finer than gravel and coarser than silt. Sand can also refer to a textural class of soil or soil type; i.e., a soil containing more than 85 percent sand-sized particles by mass. The composition of sand varies, depending on the local rock sources and conditions, but the most common constituent of sand is silica (silicon dioxide, or SiO2), usually in the form of quartz. Sand is a non-renewable resource over human timescales, and sand suitable for making concrete is in high demand. The sand passing through 4.75mm sieve is used in concrete. The collection and utilization of sand is as per the Indian standards of IS. Normally the river sand will used for making of paving.

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Procedure for casting of brick

Melting

begin, set up the container, as well as the firewood, stove, heater or extruder. If a heater is to be used, the container must first be adequately heated to remove the moisture. After that, place the little cut pieces of plastic (chips) in the container and melt them. Remember, all the plastic which will be used should be fully in dried condition, no moisture should be present in the plastic so that it can be easily get melted without releasing excessive smoke.

Mixing

The sand is incorporated into the container while the temperature of the melted plastic remains about 180°C to 220°C. The molten plastic and sand are constantly stirred to ensure that they are properly blended and bound.

Moulding

Apply the oil on the inside surface of the mould to make it easier to remove the bricks. If no oil is used the plastic and sand combination has solidified, the brick will be difficult to remove. As a result, appropriate oiling is required prior to pouring the mixture into the mould. The prepared mixture is poured into the metallic mould and tamped down with a rod to ensure adequate compaction and filling.

7. EXPERIMENTS ON PLASTIC BRICK

COMPRESSIVE STRENGTH TEST

The compressive strength test of brick may be determined by placing them in a compression testing machine. After that, load is given to these plastic bricks. This will raise the load by 140 kg/cm2 each minute until the brick cracks and can no longer carry any more weight. Note the value of the failure load, and then multiply the highest load at failure by the area of the bricks to get the compressive strength of the bricks.

$$\text{Compressive strength} = \frac{\text{Maximum load at failure}}{\text{Average area of bed surface}}$$

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Method

An Experiment Design

In this manufacturing experiment we made 3 samples with 9 specimens with different compositions in each sample such as the following table

Composition of materials used

No	Materials	Unit	Sample 1	Sample 2	Sample 3
1	Waste plastic bottles	Kg	1	1.15	0.85
2	Sand	Kg	1	0.85	1.15
3	Water	Lit	Sufficiently	Sufficiently	Sufficiently
4	Lubricant	Lit	Sufficiently	Sufficiently	Sufficiently
5	Firewood	Kg	Sufficiently	Sufficiently	Sufficiently

In making this plastic brick the method used is the experimental method. This method is a method of conducting an experiment by experiencing to prove itself a statement being studied, this method of doing an experiment about something, observing the process and writing down the results of the experiment.

B. TEST EQUIPMENT

IV. Result

A. Product Results In this study, 2 products are as follows:

1. Specimen Sample product is a product that is tested strong for the optimal results of the strong strength of plastic bricks Press test in concrete laboratory, civil Engineering, University of North Sumatra.

2. Plastic Bricks Products Plastic bricks products are products that will be applied with the dimensions (24cm x 11, 5cm x 5.2 cm) and the hole diameter (2cm).

B. Compression Strength Analysis

Based on the results of strong test research of plastic brick press with material: plastic and sand waste with 3 samples of 9 test objects using the Digital Compression Machine tool as follows.

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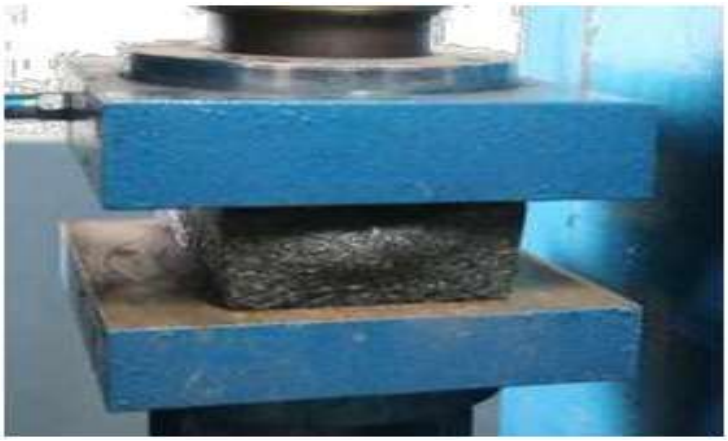

Result of compression test

Compressive strength for 1:2 plastic to sand ratio, plastic sand brick

Plastic sand brick(1:2)	**Maximum load (KN)**	**Compressive strength (Kg/m)**
Specimen 1	500	193.87
Specimen 2	525	203.56
Specimen 3	490	189.99

Compressive strength for 1:3 plastic to sand ratio, plastic sand brick

Plastic sand brick(1:3)	**Maximum load (KN)**	**Compressive strength (Kg/m)**
Specimen 1	350	135.71
Specimen 2	320	124.07
Specimen 3	335	129.89

Compressive strength test for 1:4 plastic to sand ratio, plastic sand brick

Plastic sand brick(1:4)	**Maximum load (KN)**	**Compressive strength (Kg/m)**
Specimen 1	165	63.97
Specimen 2	150	58.16
Specimen 3	155	60.10

ANALYSIS OF THE PRODUCT

Plastic dust bricks contain 100% waste plastic in the dust form. Other products such as fly ash, bitumen, etc. could have been added along with the waste plastic to see a change in the strength of the resulting product, but with a point of view to achieve highest economy addition of any other product was avoided.

This plastic dust was fed into the hopper which acted as an inlet of extruder machine and went through the various process to get end product at nozzle inside a mould. After the removal of brick from the extruder machine, it was cooled down in a controlled environment. To accelerate the cooling process, the mould was even dipped inside a bucket of water with its upper face open to the atmosphere.

As density impacts the strength of the product, density of the samples used are found and presented above in table 4. Next, to find the compressive strength of the brick thus produced, Universal Testing Machine was employed. In this, the plastic dust brick is placed between 2 cushion pads of the machine and then the load is applied vertically. Failure load is noted and accordingly, the compressive strength is found out.

Sample no	Composition in weight %	Density (g/cm3)
1	100% plastic dust brick	O.8888
2	Burnt brick	1.890

RESULT

 Since plastic is commonly available worldwide, we can find plastic everywhere as a waste and we collect it to make bricks. It is a low-cost building material. The use of plastic in bricks benefits the environment since the best method to dispose of plastic is to reuse/recycle it, and land and other hazardous effects could be stopped or cannot be
damaged.

 In compared to native clay bricks, plastic bricks are more cost-effective, have stronger compressive strength, have negligible water absorption, and are lighter in weight.

 Whereas the purpose of these plastic bricks is to dispose of plastic waste from natural environment. Plastic waste in landfills, oceans, etc has also decreased. Plastic has shown to be cost-effective and a tremendous replacement of the clay bricks.

 Plastic is a non-biodegradable and unsustainable substance that has a negative impact on the environment. However, because plastic is a versatile material with varied properties (lasting, strong, and easy to mould), it may be used as a green material
and is the greatest answer for minimizing pollution.

 These plastic bricks are appropriate for all countries, but especially for those who have difficulty disposing of plastics. Although plastics have the disadvantage of generating pollution, they also offer various positives such as providing superior insulation, low porosity, being inexpensive and readily accessible, and so on. As a result, it's utilized in bricks, which improves its overall quality.

8. CONCLUSION

The proposed project presented above intends to resolve in reducing the plastic waste disposal problem as it utilizes the waste even in its finest form and converts that useless material into a useful construction material. Extruder machine plays a prominent role in the conversion of waste plastic into its melted form. Also, extruder does not possess any threats to the environment and hence can be used without any restriction. It also helps in reducing the usage of natural resources which are utilized during the manufacturing of burnt bricks, also it reduces the pollution which is generated from kiln during brick manufacturing. The final end product can be used as brick, which is having a higher strength than conventional brick. Also,

the water absorption capacity is higher in comparison to conventional brick with a lower weight. Its uses are not restricted as only brick; it can even be utilized as a building block by increasing the dimension of the mould. Also, it reduces the use of wire used for fencing. Floor tiles, sleepers, etc. can also be produced from it. This brick also turns out to be economical than conventional brick, by reducing the cost of incinerators for burning purpose and landfills.

On the basis of the results obtained, it can be concluded that:

- Plastic bricks can a very good alternative of traditional earthen bricks.
- Plastic bricks can be used for partition walls and exterior walls; however, they must not be used in load bearing walls.
- Cost of manufacturing per unit plastic brick is significantly lower than traditional earthen bricks, hence they are cheaper alternative.
- Plastic bricks are water resistant, hence can be used in underwater structures.
- Re using plastic will reduce environmental pollution.

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