iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 **Issue:** IV **Month of publication:** April 2023

DOI: https://doi.org/10.22214/ijraset.2023.50298

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue IV Apr 2023- Available at www.ijraset.com

Experimental Analysis of Polymer Insertion in Bricks Formation Under Sustainable Development Approach

Rohit M Mahajan[1], Atharva D Mankar[2], Amol K Kute[3], Vivek R Awari[4]
Student, Department of Mechanical Engineering, Guru Gobind Singh College of Engineering and Research Centre, Nashik, Maharashtra, India

Abstract: ***The plastic waste is the hazardous problem in today's world. This is most dangerous problem in front of society. The most hazardous type of wastes are HDPE and PTE and the plastic below 50 micron is also causing a serious problem like plastics wastes, non degradable, environmental pollution. These plastic mixed in the soil, it directly effects on fertility of the soil. Nowadays, the large amount of plastic is deposited into sea. This plastic wastes gives hazardous effect on the aquatic life and quality of seawater also polluted by this plastic. By recycling and reuse we try to find efficient way to solve this problem of plastic waste. So by various test trials in the project we added this plastic wastes into the bricks and create the bricks by using plastic wastes. It is most economical solution present in the construction industry and it is also economical and environment friendly solution of the plastic wastes. Plastic brick is another type of brick which can be made from the plastic waste. This bricks are the solution of the pollution from the waste plastic. This bricks are easy to make and the pollution from the brick kilns can also be stopped using these bricks as there is no requirement further for the brick kilns. This brick have more strength than normal bricks and having light weight which can give further benefits to sustainable structures In our project we are making bricks by using waste recycled plastic due to shortage of cement. Waste plastics are widely available in all areas. We are using recycled PET bottles, carry bags, HDPE, LDPE and to make plastic bricks. Primarily recycled plastic PET bottles, carry bags, HDPE, LDPE was collected in nearly areas. It was converted into grains.A handmade wooden mould is taken and the mixture was poured in that and compacted. It is allowed to dry for a period of 24 hours. The curing period was 7 days and 28 days. By this process plastic bricks are obtained and it is compared with conventional bricks. To check its properties several tests were conducted. They were Compression test, Water absorption Test, Efflorescence test, Hardness test and Soundness test.***

Plastics which are used in our day to day life are

1. ***(PP) Polypropylene***
2. ***(HDPE) High density polythene***
3. ***(LDPE) Low density polythene***

Above plastics are the plastics which are used in our day to day life and due to this big amount of scrap waste gets in environment which cannot be decompose and nor can be destroyed so we try to put it to use in most efficient way possible.

I. INTRODUCTION

Plastic is the very hazardous material and very difficult to decompose it is main problem in the world. Use of plastic is high in our daily life such as polythene bags, disposals, furniture's, packing food packets and other accessories. Plastic is very in large and various types according to their chemical composition. So, to separation of plastic wastes and mainly big problem in front of us. Nowadays, In the world plastic deposited by burning procedure. They emit large amount of hazardous and toxic gases. These gases effect on the human health and also living animals. Human suffers by the toxic gases such as cancer, high blood pressure, Asthma. etc We are not completely able to stop the use of plastic but we are able to recycle and reuse it by many ways and minimum effect on environment. We use such recycle plastic in the various industries such as construction, transportation, manufacturing. etc. In construction industry, larger cost of project is include in materials up to 60% to 70% of the total cost of the project. So, construction industry large amount of bricks are used and they available in various forms such as clay bricks, concrete bricks, fly ash bricks and foam bricks. In this project, we try to use wastes plastic to manufacture the bricks and increase the strength. Plastic is one of the daily increasing useful as well as hazardous materials. At the time of need plastic is found to be very useful, but after its use, it simply thrown away, creating all kind of hazards. Plastic is non-biodegradable, so it will continue to be hazardous for centuries.

©IJRASET: All Rights are Reserved

The idea of this paper is to use the Waste Plastic as a Building Materials such as Bricks. So as to reduce the Plastic Waste and Save the natural resources like Yamuna which is degrading due to Waste Plastic. As more the cities become industrialized surplus problem of the plastic waste management comes along with it. Technological and economic advancement has made the type and kind of plastic very diverse and their management much more complex. The Outbreak of disease like cholera, diarrhea etc. is becoming more due to this waste Plastic. Furthermore the changing economic trends and rapid urbanization disarrange plastic waste management in developing countries. Also various tests we are going to perform on bricks like

1) Crushing strength
2) Water absorption
3) Hardness tests on bricks
4) Sound tests of brick
5) Structure of bricks

II. LITERATURE REVIEW

1) Due to increasing population, the demand of plastic materials and necessary requirement also increases. Brick is largest materials used in the construction industries and occupied in very large amount of materials of the project especially in residential projects. We use various types of plastic with various combinations to produce different type of bricks. We find the different properties of bricks by conducting various tests on it. Among them compression and water absorption test is most common test conducted on bricks by the various researches. But the use of such types of bricks is very limited in the industry. We need to convenience the people to use the such types of bricks and increase the use of it.
2) The bottled water, junk foods and pepsi coke culture in the country distributes to the increasing plastic waste generation in india. The problem becomes very vast when there is no effective end of life management to take care of the litter, and this creates an environmental, social as well as economic problems.
3) High amount of plastic waste has a value, and is constantly taken care of by the informal recycling sector.
4) Inspite the attempts from the formal and the informal sector, massive quantities of the plastic waste remain uncollected. Waste management is also embarrassed by the lack of public awareness and low municipal finances in the country.
5) In view of the limited resources and availability of land for disposal, especially in the mega cities, there is a great need for an effective effort to develop cost-effective and feasible policy options for overcoming the waste management problems.

III. PROBLEM IDENTIFICATION

1) For effective plastic waste management, it is necessary to carry out the work in a systematic step by step manner.
2) For these areas where waste management is required is studied out and then which techniques of waste collection and disposal will be the most suitable is being analyzed and carried out.
3) Plastic waste contains high amount of polythene bags and crisp bags which is further collected and used for manufacturing of newly designed plastic brick which proves to be cost effective and beneficial as it is used in a proper way rather than disposing or burning it in the atmosphere.
4) Also the waste disposing techniques of plastic waste such as pyrolysis, chemical decomposition of waste, land filling, incineration, composting are quiet time consuming techniques and does not offer to clear out large quantities.
5) Due to daily use of plastics like (HDPE) high density polythene, (LDPE) low density polythene, (PP) polypropylene huge amount of plastics gets in environment and due to which animals like cows and other animals unknowingly eats them which results in blockage in respiratory system.
6) This plastics do not get use in other way and it cannot ger decompose easily not by burning and not by any means.
7) So to use it in proper manner rather to try disposing or burning it we can put it in a better use.

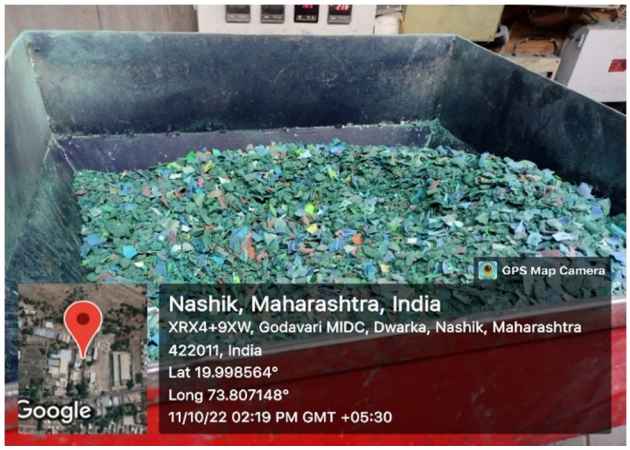
A. *Objectives*

1) To minimize and reuse generation of waste plastic on the land to avoid land degradation and consequent pollution hazard.
2) To develop an efficient way and to effectively utilize the waste plastics.
3) To Reduce The Plastic Waste Saving Non Renewable Resources
4) To minimize and reuse generation of waste plastic on the land and water to avoid land and water degradation and consequent pollution hazard
5) Reduce the non-biodegradable plastic wastes and to provide an effective way to minimize plastic wastes by producing bricks in the construction.

To produce cost-effective materials which a common person can afford easily.

IV. PROCESS OF MAKING PLASTIC GRAINS

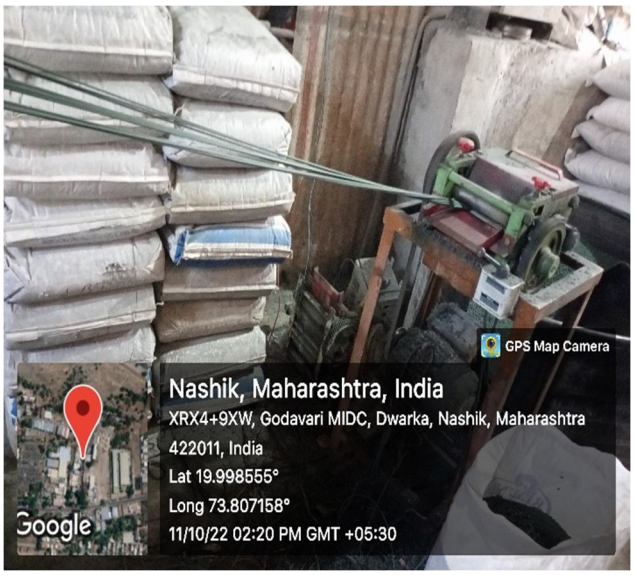
1) *Scrap:* First of all scrap of different type of plastic is been stored together the scrap which is collected is not generally clean most of the scrap include plastic like (PP)Polypropylene, (HDPE)High density polythene, (LDPE)Low density polythene. These types of plastics are used in day to day life.
2) *Washing:* As scrap which has been collected in not generally clean washing process is been done to clean all the scrap which has been collected.
3) *Mixing:* Once the scrap has been clean a very little amount of moisture is present in scrap to remove this moisture mixing process is done du to which the remaining moisture which is present in scraps also gets removed.
4) *Extruder:* After mixing the final stage of the process is extruding in this process the scrap from which moisture has been removed gets in extruder from which it comes out in long wire type form and as it goes further it gets cuts due to cutter as thus grains are formed from it.



Plastic Scrap



Plastic Scrap Being Converted into Long wires Due to Extruder Machine for making Plastic Grains



Extruder Machine Use for Cutting

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue IV Apr 2023- Available at www.ijraset.com

V. SELECTED POLYMER GRAINS

A. HDPE (High Density Polythene)

High Density Poly Ethylene (HDPE) is a thermoplastic polymer made petroleum. AS one of the most versatile plastic materials around ,HDPE plastic is used in a wide variety of applications, including plastic bottles ,milk jugs , shampoo bottles , bleach bottles, cutting boards, and piping . Known for its outstanding tensile strength and large strength to density ratio, HDPE plastic has a high impact resistance and melting point.

Beside its use foe food applications, it can be found in unusual places, including:

1) Wood plastic composites
2) Plastic surgery, specifically skeletal and facial reconstruction
3) Snowboard
4) Shoe lasts
5) 3-D printing filament
6) Food and beverage containers

High-density polyethylene, or HDPE, is a type of plastic that's tougher and stronger and can endure higher temperatures than most other polymers. This durable plastic is used in a wide variety of applications, from transporting water to storing school books while students are in class. But those who aren't familiar with this versatile material or who have had negative experiences with other materials in the past might be concerned about the product's safety.



B. LDPE (Low Density Polyethylene)

Low density polyethylene (LDPE) is a thermoplastic made from the monomer ethylene . It was first grade of polyethylene , produce in 1933 by Imperial Chemical industries (ICI)using a high pressure via free radical polymerization. Its manufacture employs the same method today. LDPE's lower density and branched molecules give it somewhat different properties than HDPE, although they do share some similar uses, such as packaging. LDPE/HDPE differences typically cause them to be collected separately for recycling … but not always LDPE is resistant to impact (doesn't break easily), moisture (water proof), and chemicals (can stand up to many hazardous materials). What happens to all that LDPE collected for recycling? When recycled, LDPE is given a second chance to live on as other useful products, such as:

1) Shipping envelopes
2) Garbage can liners
3) Floor tile
4) Paneling
5) Furniture
6) Compost bins
7) Trash cans
8) Landscape timber
9) Outdoor lumber



©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |

C. PP(Polypropylene)

(PP) also known as polypropylene is a thermoplastic polymer used in a wide variety of applications. It is produced via chain-growth polymerization from the monomer propylene . Polypropylene belongs to the group of polyolefins and is partially crystalline and non-polar. Its properties are similar to polyethylene, but it is slightly harder and more heat resistant. It is white, mechanically rugged material and has a high chemical resistance. Polymer used in a wide variety of applications. It is produced via chain-growth polymerization from the monomer propylene. Polypropylene belongs to the group of polyolefins and is partially crystalline.

PP has become a material of choice, especially when you are looking for a polymer with superior strength (e.g., vs Polyamide) in engineering applications or simply looking for cost advantage in blow molding bottles (vs. PET).

Depending how it is produced and formulated, polypropylene can be:

1) Hard or soft,
2) Opaque or transparent,
3) Light or heavy,
4) Insulating or conductive,
5) Neat or reinforced with cheap mineral fillers, short or long glass fibers, natural fibers or even self-reinforced.
6) Polypropylene is a type of polyolefin which is slightly harder than polyethylene. It is a commodity plastic with low density and high heat resistance. Its chemical formula is (C3H6)n. It finds application in packaging, automotive, consumer good, medical, cast films, etc.



VI. PROCESS FOR MAKING POLYMER BRICKS

1) In our project we have manufactured bricks by using polymer grains first after selection of polymer grains we mixed it with all the required ingredients that needs for making concrete brick like cement, ash, grate, water and along with it we have mixed polymer gains it we have taken 5gm of polymer for each type and then increased their strength for every type with 5gm for Example: 5gm of (HDPE) High density polymer 10 bricks 10gm of (HDPE) 10 bricks and so on till 50gm of each polymer type.
2) Then all the polymer bricks are tested according to normal bricks such as compression test, water absorption test, soundness test and also they are kept in oven.
3) After all this test we will compare its properties with normal bricks and then we can come to a conclusion weather the bricks can be used for construction or not.
4) We have manufacture total of 300 concrete bricks with 3 types of polymer each type of polymer has 100 bricks in total







Bricks With Naming

VII. CONCLUSION

1) Waste plastic, which is available everywhere, may be put to an effective use in brick making Plastic bricks can help reduce the environmental pollution, thereby making the environment clean and healthy.

2) Plastic bricks give an alternative option of bricks to the customers.

3) Local people of these areas will be free from the hazardous issues of waste around them and this brick will be used for redesigning their houses which used to get washed away in the monsoon season.

4) This project is an innovative and new idea in itself because it deals with the problem at a very macro level but solves it in a very micro perspective view.

5) This project can be further implemented in the other parts of the world after its success in india.

6) We conclude that the plastic sand bricks are useful for the construction industry when we compare with Fly Ash bricks and polymer brick.

REFERENCES

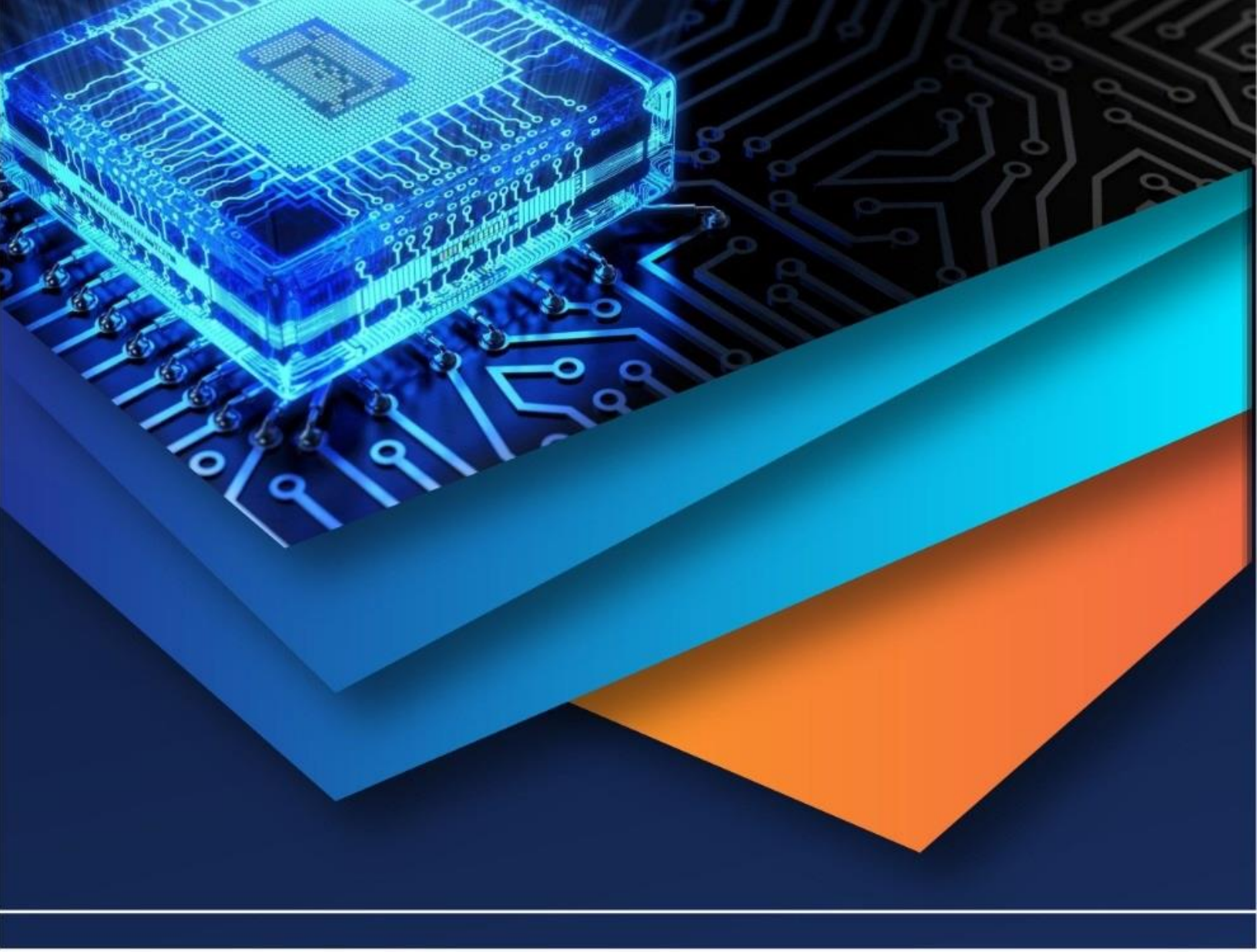
[1] Dinesh S; Dinesh A; and Kirubhakaran K., "Utilisation of Waste Plastic in Manufacturing of Bricks and Paver Blocks" International Journal of Applied Engineering Research, Vol.2 (4), pp. 364- 368.

[2] Nitin Goyal ; Manisha., "Constructing structures using eco-bricks", International Journal of Recent Trends in Engineering & Research, Vol.2(4), pp. 159-164.

[3] Maneeth P D; Pramod K; Kishor Kumar; and Shanmukha Shetty., "Utilization of Waste Plastic in Manufacturing of Plastic-Soil Bricks" International Journal of Engineering Research & Technology, Vol.3 (8), pp.529-536.

[4] Puttaraj M.H; Shanmukha S; NavaneethRai.P.G; and Prathima.T.B, "Utilization of Waste Plastic In Manufacturing of plastic-Soil Bricks" International Journal of Technology Enhancement and Emerging Engineering Research, Vol. 2(4), pp. 102-107.

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)