International Journal of Advances in Engineering and Management (IJAEM)
Volume 3, Issue 7 July 2021, pp: 2211-2215 www.ijaem.net ISSN: 2395-5252

Implementation of Plastic Waste in Manufacturing of Paving Blocks for Different Shapes: Conclusion

Rugved G. Wankhade[1], Dr. S. G. Makarande[2], R. S. Kedar[3]
[1] *PG Student, BapuraoDeshmukh College of Engineering,Sevagram,Wardha*
[2,3] *Professor, BapuraoDeshmukh College of Engineering,Sevagram,Wardha*

Submitted: 01-07-2021 Revised: 13-07-2021 Accepted: 16-07-2021

ABSTRACT- Block Paving is a commonly used decorative method of creating a pavement or hardstanding. The main benefit of Paving Blocks Over other materials is that it can later be replaced. Also from Asthetic point of view, Pavers are good. Paving Blocks are generally used for Pedestrian, Parking, etc. Different types of manufacturing methods are now carried out to use some non-degradeablematerial.PlasticWasteisincreasingday by day which pollutes the environment. So, it is very much important to implement these waste material such that it can be used for different purposes like recycling and reusing. The disposal of waste plastics (PET, PP, etc.) is a biggest challenge, as repeated recycling of PET bottles poses a potential danger of being transformed to a carcinogenic material and only a small proportion of PET bottles are being recycled. Because of costly conventional recycling techniques, there has been an increased demand for more scientific and innovative technologies to effectively recycle these materials. But it is not completely possible to reuse and recycle those waste again and again due to danger of cancer. In this project we will use plastic waste in the manufacturing of paving blocks for different shapes and compare theirstrengths.

Indexed Terms- Poly ethylene teryphthalate (PET), PolyPropylene (PP).

I. INTRODUCTION

Plastic is a very useful substance in our daily life work, but after the use of plastic it is very difficult for us to dispose of it because it is a non-biodegradable substance. After its usage it is a hazardous material. Thepropertiesofplasticareveryuniqueanditcanmixwitheverykindofmaterial.Plasticisacompositionof syntheticandsemisyntheticorganiccompounds.They are malleable and ductile andremold into any solid substance. Plastic is used in various objects which we use in our daily life like polythene, plastic cups, furniture, bags, packaging of food and other accessories, drinking containers, bottles, frames, basins etc. We need to use better advance techniques and methods to dispose plastic waste properly, otherwise, the time is nottoo far away where we see it as a big challenge for us to dispose it. Researchers suggest that if plastic isn't disposed of soon, it can sustainfor4500yearswithoutdegradation.Now,these days the rate of plastic use keeps increasing. So the collection of plastic waste is increasing at a rapid speed.Theusageofplasticcan'tbebanned,butwecan reuseitinmanyways.Plasticcanbereusedinvarious sectors like marketing, manufacturing, transportation etc.Inconstructionsector,wecanusetheplasticwaste on a very large scale after recycling it, which means theproblemofplasticwastecanberemovedforalong time period. It seems to be more practicable and efficient method to solve thisproblem.

II. AIM & OBJECTIVE

Aim: To Implement the Plastic Waste which is harmful for environment/Ecological imbalance by using them in manufacturing of paving blocks.

Objective:

- Tolearnaboutnewwastemanagementtechniques, whichwillhelpinreducingtheharmfulsubstances present in theenvironment.
- To develop an alternative material which could satisfy requirements of goodmaterial.
- To reduce the consumption of naturalresources.
- Develop appropriate environmental assessment, implementation and monitoring activities related todifferentwastecollectionmethodologiesandthe respective benefits to improve current waste managementpractices.

International Journal of Advances in Engineering and Management (IJAEM)
Volume 3, Issue 7 July 2021, pp: 2211-2215 www.ijaem.net ISSN: 2395-5252

III. LITERATUREVIEW

- Influence of non-metals recycled from waste printed circuit boards on flexural properties and fracture behaviour of polypropylene composites, YanhongZheng, ZhigangShen

It has been done the work to describes Flexural strength and flexural modulus of the composites can be successfully improved by filling nonmetals recycled from waste printed circuit boards (PCBs) into polypropylene (PP). By using scanning electron microscopy (SEM), the influence of IJTSRD38110International Journal of Trend in ScientificResearchandDevelopment(IJTSRD) @ www.ijtsrd.comeISSN: 2456-6470 @ IJTSRD | Unique Paper ID – IJTSRD38110 | Volume – 5 | Issue –1 | November-December 2020 Page 967 nonmetals on fracture behavior of PP composites is evaluated by in situ flexuraltest.

- Use of recycle plastic bag waste in the concrete, YoucefGhernouti etal.

The study presents the partial replacement of fine aggregate in concrete by using plastic fine aggregate obtained from the crushing of waste plastic bags. Plastic bags waste was heated followedbycoolingofliquidwastewhichwasthen cooled and crushed to obtained plastic sandhaving fineness modulus of 4.7. Fine aggregate in themix proportion of concrete was replaced with plastic bag waste sand at 10%, 20%, 30% and 40% whereas other concrete materials remain same for allfourmixes.Infreshpropertiesofconcrete,itwas observed from the results of slump test that with increase of waste content workability of concrete increases which is favorable for concrete because plastic cannot absorb water therefore excessive water isavailable.

- Use of plastic in a concrete to improve its properties, RaghatateAtulM The paper is based on experimental results of concrete sample casted with use of plastic bags pieces to study the compressive and split tensile strength. He used concrete mix by using Ordinary Portland Cement, Natural River sand as fine aggregate and crushed granite stones as coarse aggregate, portable water free from impurities and containing varying percentage of waste plastic bags (0%, 0.2%, 0.4%, 0.6% 0.8% and 1.0%).

- innovative technique of waste plastic use in concrete mixture, PramodS. Patil.etal This study presents the use of plastic recycled aggregate as replacement of coarse aggregate for production of concrete. They used forty-eight specimen and six beams/cylinders casted from variable plastic percentages (0, 10, 20, 30, 40 and 50%) used as replacement of coarse aggregate in concrete mixes. They have conducted varioustests and observed decrease in density of concrete with increase percentage of replacement of aggregate with recycle plastic concrete. They also reported decrease in compressive strength for 7 and 28days with increase in percentage of replacement of coarse aggregate with recycle plastic aggregate. They have recommended feasibility of replacing 20%willsatisfythepermissiblelimitsofstrength. Again, these researchers limited their research to only compressive strength property and no work was carried out to study the other important properties of concrete. Their research also lacks use of various admixtures in concrete to cater for the loss instrength.

- Study of Strength Property of Concrete Using Waste Plastics and Steel Fibers, KhileshSarwe. [2014]

This study presents the results of addition ofwaste plastics along with steel fibers with an objective to seek maximum use of waste plastic in concrete. Two different categories of mix were casted in cubes (150mm x 150mm x 150mm), one with varyingpercentagesofplasticwastes(0.2%,0.4%, 0.6%,0.8%and1%weightofcement)andanother mix of plastics waste/steel fibers (0.2/0.1, 0.4/0.2, 0.6/0.3, 0.8/0.4 and 1/0.5 % by weight of cement) tostudythecompressivestrengthat7-and28-days strength. The combine mix of plastic waste and steelfibershasshownmorestrengthascompareto concrete mix prep only with plastic waste. He has reached to conclusion that a plastic waste of 0.6% weight of cement when used with steel fiber of0.3 % (weight of cement) has shown the maximum compressive strength.

IV. MIXDESIGN

4.1 Definition

Mix design is the process of selecting suitable ingredient if concrete and determines their relative proportions with the object of certain minimum strength and durability as economically as possible.

4.2 Objective of Mix Design

The objective of concrete mix design as follows.

- The first objective is to achieve the

International Journal of Advances in Engineering and Management (IJAEM)
Volume 3, Issue 7 July 2021, pp: 2211-2215 www.ijaem.net ISSN: 2395-5252

stipulated minimumstrength.

 Thesecondobjectiveistomaketheconcretein the most economical Manner. Cost wise all concrete's depend primarily on two factors, namely cost of material and cost oflabor.

4.3 Mix Proportion

Cement	Fine aggregate	Coarse aggregate	Water
288	790.02	994	170.39
1	2.21	3.09	0.45

V. MATERIALPROPERTIES

5.1 Cement

Ordinary Portland cement of 43 grade conforming to IndianStandardIS12269-1987**9**wasusedthroughout the experimental program. The standard consistency was 28%, whereas the initial and final setting times were 95 min. and 210 min. respectively. The specific gravity of cement was 3.14 and its compressive strength after 28 days was 57MPa.

5.2 CoarseAggregate

In this investigation, two types of coarse aggregates were used for preparation of concrete, Natural Coarse Aggregate. (NCA) and Plastic Coarse Aggregate.

5.3 Natural Coarse Aggregate(NCA)

Crushed hard granite chips of maximum size 20 mm were used in the concrete mixes. The bulk density of aggregate was 1460 kg/m3 and specific gravity was found to be 2.65. IS: 383-1970 10. The fineness modulus was 2.81.

5.4 Sand

Fine aggregate (sand) used for this entire investigation for concrete was river sand conforming tozoneii of IS: 383-1970 10. The fineness modulus was 2.81.

5.5 Water

Potable water conforming to IS 456-200011 was used for casting and curing

5.6 PlasticWaste

In this work Crushed Plastic is used in place of coarse aggregate as partial replacement which is a crushed stone. Plastic bottles were taken to nearby MIDC, Sewagram area and the bottles were crushed in the grinder and small plastic chips were formed.

VI. PREPARATIO OF SPECIMENS

6.1 Batching

All cement, sand, coarse aggregate and coconut shell measured with digital balance. Water is measuring cylinderofcapacity1litandmeasuringjarofcapacity 100 ml and 200ml.

6.2 Mixing of concrete

The ingredients are thoroughly mixed in concrete mixer. The sand, cement and aggregate are measured accurately.

6.3 Rubber Moulds

Rubber Moulds are of two different shapes, cleaned first and oiled for easy stripping. The rubber moulds forconductingtestsonfreshconcreteweremadeready and inner surface wasoiled.

6.4 Placing andCompaction

To avoid the bond formation between moulds and concrete just clean and oil the moulds before pouring concrete. Place the fresh concrete and tamp each surface 25 time. Clean the mounds and apply grease. Fill the concrete in the moulds in 3 equal layers.

6.5 Demoulding

After leveling the fresh concrete in the mould, it was allowed to set for 24 hours. The identification marks of concrete specimens were done with permanent markers and the specimens were removed from the mould. The moulds were cleaned and kept ready for next batch of concrete mix.

6.6 Curing

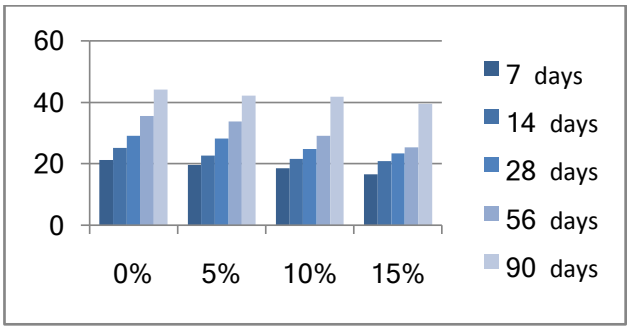
Curing is an important process to prevent theconcrete specimens from losing their moisture while they are gaining their required strength. Inadequate curing is also the cause of unexpected cracks on the surface of concretespecimen.

International Journal of Advances in Engineering and Management (IJAEM)
Volume 3, Issue 7 July 2021, pp: 2211-2215 www.ijaem.net ISSN: 2395-5252

COMPRESSIVE TEST RESULT

% replaced by plastic waste	0%	5%	10%	15%	Curing period(days)
Compressive Strength (N/mm2)	21.35	19.73	18.61	16.63	7 days
	25.20	22.73	21.76	20.88	14 days
	29.16	28.30	24.85	23.55	28 days
	35.73	33.93	29.15	25.51	56 days
	44.26	42.21	41.93	39.66	90 days

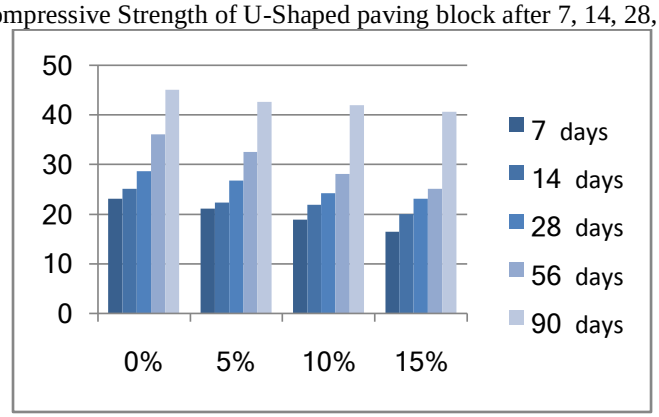
Table No.1 Result of compressive Strength of Unipaver block after 7, 14, 28, 56 & 90 days (N/mm2)



Graph No. 1 Compressive Strength of Unipaver block after 7, 14, 28, 56 & 90 days (N/mm2)

% replaced by plastic waste	0%	5%	10%	15%	Curing period (days)
Compressive Strength (N/mm2)	23.08	21.06	18.85	16.43	7 days
	25.13	22.33	21.85	20.03	14 days
	28.71	26.80	24.26	23.08	28 days
	36.15	32.53	28.13	25.13	56 days
	45.13	42.66	41.96	40.66	90 days

Table No.2 Result of compressive Strength of U-Shaped paving block after 7, 14, 28, 56 & 90 days (N/mm2)



Graph No. 2 Compressive Strength of U-Shaped paving block after 7, 14, 28, 56 & 90 days (N/mm2)

International Journal of Advances in Engineering and Management (IJAEM)
Volume 3, Issue 7 July 2021, pp: 2211-2215 www.ijaem.net ISSN: 2395-5252

CONCLUSION

- Utilization of partial replacement of Plastic waste is the good alternative for theconventionalconcrete.
- ThePlasticwasteconcretedensityislessascompar edwiththeconventionalconcrete which reduces the costof the concrete and produces the lightweightconcretestructure.
- It is concluded that increasein percentage replacementby Plastic wastereducescompressivestrengthofconcrete.
- TheuseofPlasticwasteinmanufacturingofpaving blocksshouldbeconsideredasPlasticishardtodisp ose.
- ThereplacementofPlasticwasteupto10%showsg oodresultofcompressivestrengthas comparedtoconventionalconcrete.

FUTURE WORK

- Due to continuous increase in population, the use of plastic is increasing day byday. So the disposal of this plastic waste is a severe problem. If this waste isutilizedproperlywithdifferentpercentageincon crete,itcanlowerthepollutionand the key materials required for construction is reduced, resulting in reductioncostofconstruction.
- Reductionofconcretematerialsinconstructionre duceemissions ofcarbonwhichismoreefficient.
- In the paver block there are gaps for percolating the water. It will use on the area wherelotsoftrafficwillbefacedatthatareawecana pplyapaverblockratherthanprovidingslopetothe concrete.

APPLICATIONS

- Low cost paving blocks
- It is used as lightweight concrete in construction of pavements
- It is ecofriendly
- Can be used in parking, pedestrians

REFERENCES:

[1] ZhigangShen, YanhongZheng, ZhigangShen , ChujiangCai, Shulin Ma, Yushan Xing "Influence of non-metals recycled from waste printed circuit boards on flexural properties and fracture behavior of polypropylene composites", materials and design 30 (2009) pp 958–963.

[2] YoucefGhernouti, Bahia Rabehi, Brahim Safi and RabahChaid, " Use of recycle plastic bag waste in the concrete" Journal of International Scientific Publications: materials, methods and technologies volume 8,ISSN1314-7269.

[3] RaghatateAtul M "Use of plastic in a concrete to improve its properties" international journal of advance engineering research and studies.

[4] Pramod S. Patil, J. R Mali, Ganesh V. Tapkire, H.R. Kumavat" innovative technique of waste plastic use in concrete mixture " international journal of research in engineering and technology.

[5] KhileshSarwe "Study of Strength Property of Concrete Using Waste Plastics and Steel Fibers" Department of Civil Engineering, Jabalpur Engineering College, Jabalpur, India. The International Journal of Engineering and Science (IJES) /vol 3/Issue/5/Pages/09- 11/2014/.

[6] AnkitArora, Urmil V. Dave, Utilaization of e-waste and plastic bottle waste in concrete, International Journal of student research in Technology and management, vol.1. no.4 (2013).

[7] M. Elzafraney, P. Soroushian and M. Deru, "Development of energy Efficient Concrete Buildings Using Recycled Plastic Aggregate" Journal of Architectural Engineering © ASCE/ December 2005.

[8] Vishal Kumar, Dr. A. K. Mishra, Utilization of Waste Material in Concrete Paver Blocks, vol.4, issue iv, April 2016

[9] B. Shanmugavalli, K. Gowtham, P. Jeba, Nalwin , Reuse of plastic waste in paver blocks, IJERT, vol 6, issue 2, February 2017.

[10] T. Subramani, V.K Pugal, "Experimental Study on Plastic Waste as a Coarse Aggregate for Structural Concrete" International Journal of Application or innovation in Engineering & Management (IJAIMEM), Volume 5, May 2015.

[11] SatishParihar, PramodPatil, Hemraj R Kumavat, "Recycled plastic use in concrete paver blocks" Volume 3, Issue 9, June 2014.

[12] Miss Apurva J Chavan, "Use of plastic waste in flexible pavements", Volume 2, Issue 4, April 2013.

[13] OwolabiWahabFolorunsho and AkobunduNwanosikeAmadi, "Production of Pavement Blocks from Plastic Waste", Volume 21, number 2, November 2020.

[14] JeevanGhuge, SaurabhSurale, Dr. B.M. Patil, S B Bhutekar, "Utilization of Waste Plastic in Manufacturing of Paver Blocks'', Volume 06, Issue 04, April 2019.

[15] Pooja Bhatia1, NupoorDewangan ,AbhyudayTitiksh, "Paver blocks made of Recycled plastic-bonded sand", Volume 2, Issue 2, November 2019.