International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 10 Issue: 08 | Aug 2023 www.irjet.net p-ISSN: 2395-0072

Use of Waste Polythene in Concrete

Aman Kumar Saral[1], Gautam Bhadoriya[2]

[1]*Post Graduation Student, Department of Civil Engineering, MITS Gwalior, Madhya Pradesh, India*
[2]*Professor, Department of Civil Engineering, MITS Gwalior, Madhya Pradesh, India*

Abstract - *Solid waste management systems across the world face a challenging issue of safe disposal of non-recyclable thin polythene bags. The plastic uses day to day increases and make the integral part of our life style. The first part for construction in many countries is concrete, if plastic wastes can be mixed in the concrete mass in dry form, without significant change on its basic properties or slight compromise in strength, we can consume large quantities of plastic waste by mixing it in the concrete mass. This study presents a comparative study of compressive strength of concrete made using plastic bags as fibrous material and focuses the effect of polyethylene plastic bags on the workability and compressive strength of M25 concrete. This test examination completed to contemplate the appropriateness of expansion of waste plastic sacks on mechanical properties of cement. The proportions of waste plastic added in concrete are 0.25%, 0.5%, 0.75% and 1% by weight of cement and compressive strength is determined at 7, 28 and 56 d of curing. It is observed that the workability is reduced with increase in dose of polythene and the compressive strength is increased on inclusion of waste polythene in concrete at all edges up to 0.75% and thereafter it starts decreasing.*

Key Words: **Concrete1, waste polythene2, compressive strength3, workability4, etc.**

1.INTRODUCTION

We were going to throw into the rubbish because plastic waste covers the majority of the area. Soil, water, and air are all unclean. In light of this, an effort has been made in this study to investigate the usage of waste materials in concrete, such as waste polyethylene. The engineering qualities of the concrete are often enhanced by the addition of discarded polyethylene. The primary benefits of economic and ecological waste and the utilization of plastic waste in concrete.

One trillion plastic bags are used worldwide each year, making the plastic sector one of the fastest expanding industries. Because plastic is long-lasting and not biodegradable, it is seen to be a major difficulty to dispose of polythene waste in the environment. Polythene is extremely robust and has increased resilience to natural deterioration due to its chemical connections. The prevalence of plastic materials in our daily lives has increased the amount of plastic waste that is available, which either gets mixed with municipal rubbish or is flung across a land area and has an influence on the ecosystem.

The use of plastic waste to improve roadways is currently the subject of research. Recently, another concept for using plastic waste as an additional material in cement blends that are both plain and fortified has also been developed. This investigation looks for a viable application of used polythene bags in cement to prevent the biological and ecological stresses they cause.[1] incorporated plastic garbage to fiber structures at varying water-to-concrete ratios (0% to 1.5% by cement volume), combined with fly debris (0% to 30% by cement volume). To measure the influence of substance assault and the corresponding change in the compressive strength of solid blend, various restorative circumstances were used. In a different study [2], common plastic packs with thicknesses under 20 microns were employed as plastic strands (0% to 1.2% plastic by volume in cement), and the compressive strength of the building was examined. The plastic was cut and destroyed periodically. To avoid problems during labor, it is assumed that the plastic sacks should be used, ideally in damaged structures. However, the hand-cut filaments made from plastic bags are not appropriate due to their low angle proportion. The strength of the strands made using plastic packs that were thinner than 20 microns and contained more solid volume than 0.6% decreased. Utilizing polymer fiber in cement by weight, Kandasamy and Murugesan [12] reported an increase in compressive strength of 0.68% at 7 days and 5.12% at 28 days. According to Naik et al. [11], showed as the percentage of plastic in cement increased, particularly above 0.5%plastic, the compressive strength decreased.

The functionality, compressive strength, and flexural strength of cement at different doses (0.25%, 0.50%, 0.75%, and 1.0%) of waste plastic in stringy structure are all taken into account in this work, along with a comparison to conventional cement.

2. MATERIAL AND METHODS

2.1Cement:

Throughout the examination, Portland Pozzolana Cement (PPC) of the Birla brand is used. The real PPC characteristics that were chosen. The concrete satisfies an IS 1489:1991 requirement.

Table-1: Properties of cement

S. No.	properties	Experimental value
1.	Normal Consistency (%)	32.5
2.	Initial setting time	145min
3.	Final setting time	215min
4.	Soundness of cement	0.70 mm
5.	Fineness of cement	3.77%
6.	Specific Gravity	3.67
7.	Compressive	-
8.	3 days	-
9.	7 days	33.0
10.	28 days	41.7

Polythene waste: Shredded polythene garbage was employed in this investigation. Waste made of polythene has a specific gravity of 0.41 and an aspect ratio of between 250 and 500.

2.2 Fine Aggregate:

Fine aggregate is described as material that primarily passes through 4.75mm IS sieves. the fine aggregate's specific gravity, bulk density, and fineness modulus.

Table-2: properties of fine aggregate

S.No.	Test	results
1	Zone	II
2	Specific gravity	2.650
3	Fineness modulus	2.808%
4	Water absorption	0.9%

2.3Coarse Aggregate:

The stones that are kept in a 4.75 mm sifter are coarse totals. Locally available coarse totals come in two sizes; one division goes through a 20mm sifter and the other section goes through a 10mm strainer. The specific coarse total gravity for the two sections and the fineness modulus for the coarse total in sizes of 10 mm and 20 mm.

Table-3: properties of coarse Aggregate

S. No.	Test	result
1	Fineness modulus for 20.0 mm	7.440
2	Fineness modulus for 10.0 mm	6.680
3	Explicit gravity	2.70
4	Impact value	25.380%
5	Crushing value	24.70

2.4 Waste Polythene: Shredded waste polythene was employed in this investigation. Waste made of polythene has a specific gravity of 0.41 and an aspect ratio of between 250 and 500.

2.5 Super plasticizer: For improving the workability and compressive strength of cement in this investigation, 0.5% weight of super plasticizer from the Sica firm is added to the cement.

2.6 Concrete: According to IS 10262(2009), the solid's blend plan has been finished. In order to avoid the balling effect, the concrete used in the blend configuration has a density of 372 kg/m3, which meets the minimum requirement of 300 kg/m3. M25 grade concrete was intended for the current examination.

3. RESULTS AND DISCUSSION

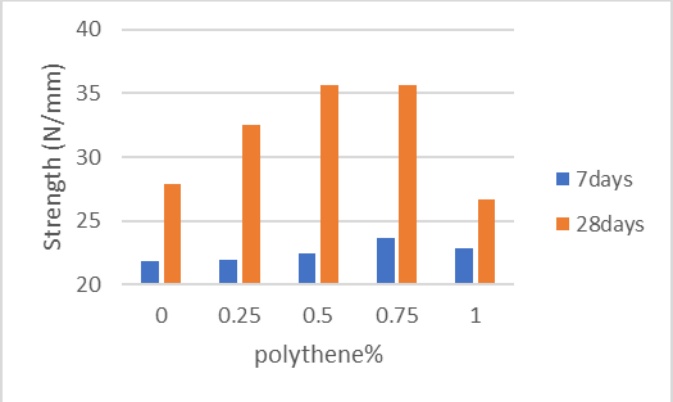
To determine how adding waste polythene to concrete may affect its workability and compressive strength, a comparative analysis of concrete mixes is conducted.

3.1COMPRESSIVE STRENGTH OF CONCRETE

To assess the concrete's compressive quality for 7 and 28 days, a compressive strength testing apparatus is used. 150 mm' of test driving on cement mixtures is carried out using the bearings indicated in IS 516-1959. Examples are rapidly tested after being taken out of the water while still taking into account the damp environment. Any protruding balances are isolated, and the example is cleansed of surface water and mud. Before testing, the examples are weighed to establish their thickness. The compressive burden rises until the instances are crushed.

Table-4: Compressive strength of concrete

S.No.	Dose of waste polythene (%)	Compressive strength ($N/mm^{2)}$	
		7days	28days
1.	0.0	21.81	27.89
2.	0.25	21.96	32.52
3.	0.50	22.39	35.67
4.	0.75	23.65	35.68
5.	1.0	22.83	26.65



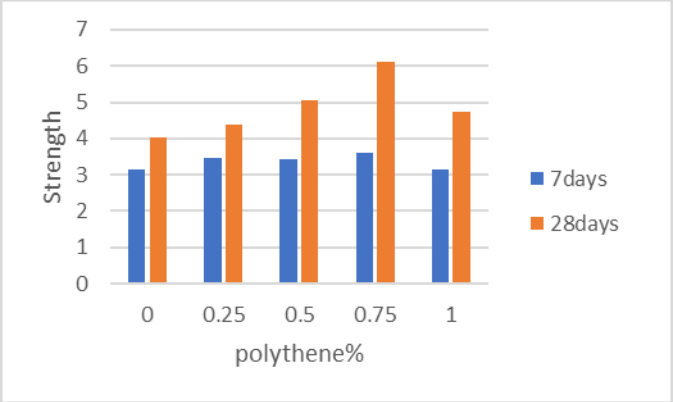
Graph-1: Compressive strength of concrete

3.2Flexural Strength of concrete

The flexible strength of the cement made by the polythene after curing periods of 7 and 28 days is given in the table 10. The test of the flexural strength is shown in table 5. And all these results are clearly shown in table 6. After performing the test we get increase the flexural strength by the increase the percentages of the polythene debris in the cement.

Table-5: FLEXURAL STRENGTH OF CONCRETE

S.No.	Waste polythene (%)	Flexural strength (N/mm²)	
		7days	28days
1	0	3.13	4.02
2	0.25	3.48	4.38
3	0.50	3.43	5.06
4	0.75	3.62	6.13
5	1.00	3.14	4.72



Graph-2: Flexural Strength of concrete

4. CONCLUSIONS

- Polythene bags made from leftover plastic can be used effectively without significantly changing their mechanical qualities.
- Workability declines with increasing waste polythene content in cement at all ages, such as 7 and 28 days.
- Here, the ideal total amount of polythene was replaced with an equal amount of concrete while giving consideration to both compressive strength and split rigidity.
- After taking waste polythene in cement into account, an increase in both compressive strength and flexural strength is observed throughout all cement periods.
- So, it stands to reason that the idea of mixing trash polythene with cement could be a very natural, peaceful method of getting rid of serious abuse of our country.

REFERENCES

[1] Bhogayata, K. D. Shah, B. A.vyas, N. K. Arora " Feasibility of wastes metallised polythene used as concrete constituent" in International Journal of Engineering and Advanced Technology (IJEAT),Volume-1, Issue-5, June 2012

[2] Bhogayata, K. D. Shah, B. A.vyas, N. K. Arora"Performance of concrete by using Non recyclable plastic wastes as concrete constituent" in International Journal of Engineering and Advanced Technology (IJEAT),Vol. 1 Issue 4, June – 2012

[3] Ankit Kumar, Vikas Srivastava and Rakesh Kumar , "Effect of waste polythene on compressive strength of concrete", Journal of Academia and Industrial Research, Volume 3, Issui 3, August 2014 pp. 152-155.

Baboo Rai,S. Tabin Rushad,2 Bhavesh Kr, and S. K.Duggal"Study of wastes plastic mix concrete with plasticizer" in International Scholarly Research Network ISRN Civil Engineering Volume 2012, Article ID 469272, doi:10.5402/2012/46927

[4] IS: 456. 2000. Indian Standard "Plain and Reinforced Concrete" - Code of practice. Bureau of Indian Standards, New Delhi

[5] IS: 516. 1959. Indian Standard "Methods of Tests for Strength of Concrete"-Code of practice. Bureau of Indian Standards, New Delhi.

[6] IS: 10262. 2009. Indian Standard "Recommended Guidelines for Concrete Mix Design"-Code of practice. Bureau of Indian Standards, New Delhi

[7] IS: 383. 1963. Indian Standard "Specification for Coarse and Fine Aggregates from Natural Sources for Concrete"-Code of practice. Bureau of Indian Standards, New Delhi.

[8] K. S. Rebeiz, "Precast use of polymer concrete using un saturated polyester resin based on recycled PET waste" in Construction and Building Materials, vol. 10, no.3, pp. 215–220, 1996

[9] Marzouk OY, Dheilly RM, Queneudec M. "Valorisation of PostConsumer Waste Plastic in Cementitious Concrete Composites", Pub Med, U.S. National Library of Medicine, National Institute of Health,vol. 27 (2), Issue-12, 310-May, 2006

[10] Naik, T.R., S.S. Singh, C.O. Huber and Broderson, 1996 "Use of postconsumer waste plastic in cement based composites". Cem.Concr. Res26: 1489-149

[11] R. Kandasamyand R. Murugesan"Fibre reinforced concrete using domesticwastes plastics as fibres" in ARPN Journalof Engineering and Applied Sciences,Vol. 6, No. 3, March 20

[12] D. Kornack and P. Rakic, "Cell Proliferation without Neurogenesis in Adult Primate Neocortex," Science, vol. 294, Dec. 2001, pp. 2127-2130, doi:10.1126/science.1065467.