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A PERFORMANCE STUDY OF POLYMER INDUSTRIAL WASTE UTILIZATION IN CONCRETE AS COARSE AGGREGATE

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Abstract - about 2 billion tons of waste being generated in the world annually. This waste cause of various diseases. Open dumping of waste also destroys valuable agricultural land various researchers have beneficially used plastic waste, cement concrete and asphalt concrete in the past, and the effect on recycled plastic on the fresh and hardened concrete. In this experimental study as the use of aggregate made from different type of plastic waste which is collected from vetri venayaga polymer industry in salem, as partial replacement of coarse aggregate in asphalt mixes. The suitability of recycled plastic as coarse aggregate in concrete and its advantages are discussed here. Test were conducted to determine the properties of plastic aggregate such as specific gravity, density, aggregate crushing value, as 100% replacement of natural coarse aggregate with plastic coarse aggregate is not feasible, partial replacement of various percentage were 0%, 5%, 10%, 15%, 20% and 25%. M_{30} grade of concrete taken for mix design. And heat resisting behavior of the plastic coarse aggregate concrete is also discussed in this study.

***Key Words*: plastic waste, thermal process, compressive strength, split tensile strength, flexture strength, density.**

1. INTRODUCTION

Concrete is one of the most widely man made construction material in the world and its second only to water as the most utilized substance in the planet. Seeking aggregates for concrete and to dispose of the waste from various commodities is the present concern. Today sustainability has got priority in construction industry. In the present study the recycled plastics were used to prepare the concrete for recycling the coarse aggregate and provide suitable option to deal with plastic waste. Now a days many recycling plants across the world, but plastic are recycled they lose their strength with the number of recycling, remaining will end up as earth fill. In this circumstance instead of recycling it repeatedly, if it is utilized to prepare aggregate for concrete it will be growth to the construction industry.

1.1 Objective

1. To study the effect of replacement of coarse aggregate by plastic waste on strength aspects and durability.
2. To compare the product cost of concrete with the above replacement.
3. To determine the strength at various percentage of plastic waste (0%, 5%, 10%, 15%, 20% and 25%) level for making M_{30} grade of concrete.

1.2 Scope

1. This work more emphasis given to develop and study strength and durability properties of concrete, using plastic waste so as to achieve better concrete composite with number of recycling as partial replacement of various percentage.
2. It increase the use of plastic waste to maintain ecology.

2. METHODOLOGY

2.1. Material used

2.1.1. Cement

Table -2.1: Physical properties of OPC 53 grade cement

S.No	Test for Cement	Apparatus	Value Obtained
1.	Standard consistence test	Vicat apparatus	26.5%
2.	Initial setting time	Vicat apparatus	30 Minutes
3.	Final setting time	Vicat apparatus	230 Minutes
4.	Specific gravity test	Conical flask	3.10

2.1.2 Fine aggregate

Table-2.2: Physical properties of fine aggregate

S. No	Test for fine aggregates	Apparatus	Value obtained
1.	Fineness modulus	Sieve	2.39
2.	Specific gravity	Pycnometer	2.44
3.	Water absorption	-	0.37%

2.1.3 Coarse aggregate

Table-2.3 : physical properties of fine aggregate

S.NO	Test for coarse aggregates	Apparatus	Value obtained
1.	Fineness modulus	Sieve	6.73
2.	Specific gravity	Cylindrical container	2.50
3.	Water absorption	-	0.7%
4.	Impact value	Impact testing machine	10%

2.1.4 Plastic waste

Table-2.4 : Physical properties of plastic waste

S.No	Characteristics	Experimental value of plastic waste
1.	Specific gravity	1.387
2.	Bulk density loose (kg/m^3)	$75kg/m^3$
3.	Fines modulus	6.20
4.	Water absorption	-

3. MIX DESIGN

3.1 Concrete mix proportion

The mixes were designated in accordance with IS 10262- 2009 mix design method. Based on the results, the mix proportions M30 was designed. Concrete mix with w/c ratio of 0.40 was prepared. The details of mix proportions for $1m_3$ of concrete are given in Table below

Mix proportions for M30 Grade of

Concrete (Kg/m^3)

Grade	Cement	FA	CA	Water
Mix 30	478.95	575.35	1048	191.58
	1	1.13	2.26	0.40

4. TESTING OF SPECIMEN

4.1. fresh concrete test Table-

4.1 : Slump flow test

Sl .No	Sample	Status
1.	0% of PW	Collapse
2.	5% of PW	Collapse
3.	10% of PW	Collapse
4.	15% of PW	Collapse

4.2. Hardened concrete test

4.2.1. Compressive strength test

Table 4.2 : Compressive strength test for 7 days

S.No	% of plastic waste	Avg. Compressive Strength
1.	0	20.44
2.	5	20.08
3.	10	20.00
4.	15	19.90
5.	20	19.38
6.	25	19.02

Table 4.3 : Compressive strength test for 28 days

S.No	% of plastic waste	Compressive Strength
1.	0	34.96
2.	5	34.37
3.	10	34.07
4.	15	33.95
5.	20	33.62
6.	25	33.02

4.2.3. SPLIT TENSILE STRENGTH TEST

Table 4.4 : Split tensile strength test for 7 days

S.No	% of plastic waste	Avg. Split tensile strength
1.	0	2.12
2.	5	2.37
3.	10	2.50
4.	15	2.54
5.	20	2.44
6.	25	2.28

Table 4.5 : Split tensile strength test for 28 days

S.No	% of plastic waste	Avg. Split tensile Strength
1.	0	4.15
2.	5	4.26
3.	10	4.30
4.	15	4.56
5.	20	4.40
6.	25	4.25

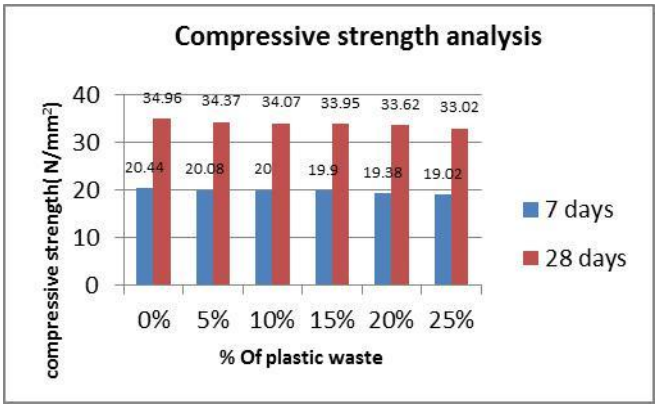
4.2.5. FLEXURAL STRENGTH TEST

Table 4.6 : Flexural strength test for 7 days

S.No	% of plastic waste	Avg. Flexural strength
1.	0	2.45
2.	5	2.56
3.	10	2.69
4.	15	2.82
5.	20	2.67
6.	25	2.58

Table 4.7 : Flexural strength test for 28 days

S.No	% of plastic waste	Avg. Flexural strength
1.	0	4.27
2.	5	4.62
3.	10	4.81
4.	15	5.00
5.	20	4.92
6.	25	4.68



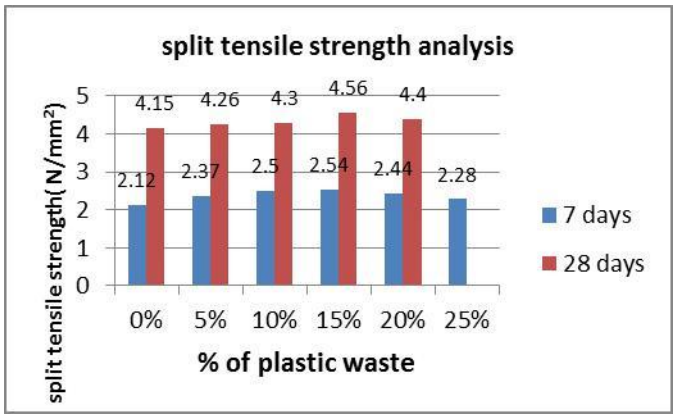


Chart-2 : split tensile strength analysis

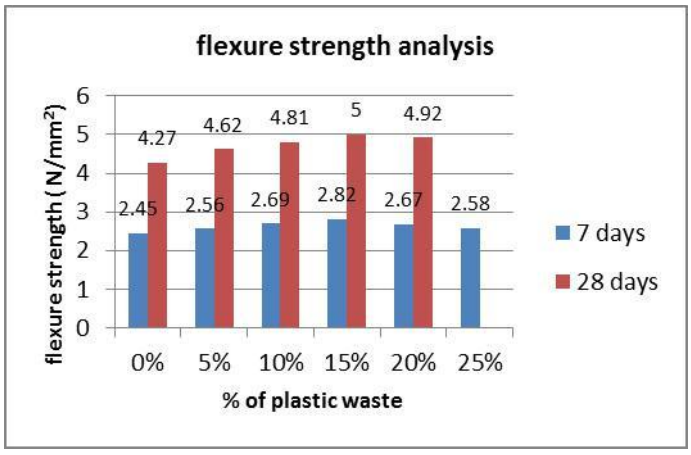


Chart-3 : flexural strength analysis

3. CONCLUSION

1. When the plastic coarse aggregate recycling for natural coarse aggregate with various percentage then we got compressive strength almost decreasing with adding increasing percentage of plastic coarse aggregate. While split tensile strength and flexure strength increasing up to 15% with increasing number of recycling plastic coarse aggregate, and then decreasing.
2. From this experimental study we conclude that adding 25% plastic waste as coarse aggregate in concrete almost equal and suitable for concrete.
3. Mechanical and Durability properties of concrete of the following mix was taken as optimum.

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