

Evaluation of Properties of Concrete Prepared Using Single Layer Plastic

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Abstract—Plastic was one of the biggest innovation of the 20th century as human cannot imagine life without plastic. We start producing it in a bulk which gave rise to the problem of plastic waste and its decomposition. There have in many innovative ways we discover for decomposition of plastic with an aim of decrease its carbon foot print over the planet earth. One of such way was including it in the construction work as well as Highway pavement design. The production of concrete as well as its cost of production has increased over the decade.

An attempt has been made in order to meet the above demand, utilization of plastic waste either single layer or multi layer has been done in production of concrete of grade M30 was carried out.

Index Terms— concrete grade M30, single use plastic, compression test value, slump test value

I. INTRODUCTION

Plastic was one of the most innovative material discovered in 20th century leaving a footprint of about many decade over human life. A record breaking growth in the consumption of plastic is observed all over the world in recent years as human cannot imagine their life without plastic as material, which ultimately leads to generation of plastic-related waste in huge amount. The generated plastic converted into waste is now a serious environmental threat to planet earth. The composition of plastic has several toxic chemicals, and therefore plastic pollutes soil, air and water. Also plastic is a non-biodegradable material due to which it cannot be used as land-filling using plastic that would mean preserving the harmful material forever in the soil for thousand of year. The hazards that plastics pose are countless. They have resulted in blockage of the drainage system of a city

which serves as excellent breeding grounds for disease-causing mosquitoes and water borne diseases besides causing flooding. Plastic garbage generated can reduce the rate of rain water infiltration and deteriorate the soil fertility if it is mixed with soil. Plastic waste released into rivers, streams and seas contaminates the water and marine life. We have seen the result as Aquatic animal consume plastic waste, which can damage their health as well the health of the human which consume them. Some aquatic animals have been found with plastic fragments in the stomachs and plastic molecules in their muscles. Dumping of the plastic either single layer or double layer is one of the biggest problem the world at present is facing. Being cheaper plastic have replaced many other materials such tin box etc in the house hold item. Package industries are mostly relying on plastic material and on unpacking the item it serve as the biggest waste produce.

The research aimed at utilization of plastic in any form in the construction industry and to contribute in the biggest problem of plastic waste i.e. dumping by using it as a replacement of fine aggregate in the manufacturing of concrete of grade M30.

II. MATERIAL AND METHODS

The various type of material used in casting process of concrete are: fine aggregate, course aggregate, cement, water and low density polyethylene (LDPE) plastics i.e. single layer plastic.

Firstly, we have to cast conventional concrete i.e. CM₁, after it samples for SLP₁, SLP₂, SLP₃, SLP₄, SLP₅, SLP₆, SLP₇ as per their proportioning were casted and tested at the curing period of 7, 14 and 28 days for all the strength test as shown in table 1:

Table 1: Proportion of Material Used

MIX	Waste plastic(%)	Weight plastic (Kg)	Cement (Kg)	water	Admixture (Kg)	Coarse Aggregate (Kg)		Fine Aggregate Kg
						20mm	10mm	
CM ₁	0	0	390	148	5.46	565	691	675
SLP ₁	0.1	3.9	390	148	5.46	565	691	675
SLP ₂	0.2	7.8	390	148	5.46	565	691	675
SLP ₃	0.3	11.7	390	148	5.46	565	691	675
SLP ₄	0.4	15.6	390	148	5.46	565	691	675
SLP ₅	0.5	19.5	390	148	5.46	565	691	675
SLP ₆	0.75	29.25	390	148	5.46	565	691	675
SLP ₇	1.0	39	390	148	5.46	565	691	675

III. RESULT AND DISCUSSION

1. SLUMP TEST: The slump test was carried out and following observation was carried with varying the %age of single layer waster plastic:

Table 2: Slump Test value

MIX	CM ₁	SLP ₁	SLP ₂	SLP ₃	SLP ₄	SLP ₅	SLP ₆	SLP ₇
Waste plastic(%)	0	0.10	0.20	0.30	0.40	0.50	0.75	1.0
Slump Value (mm)	49	49	50	46	41	39	38	32

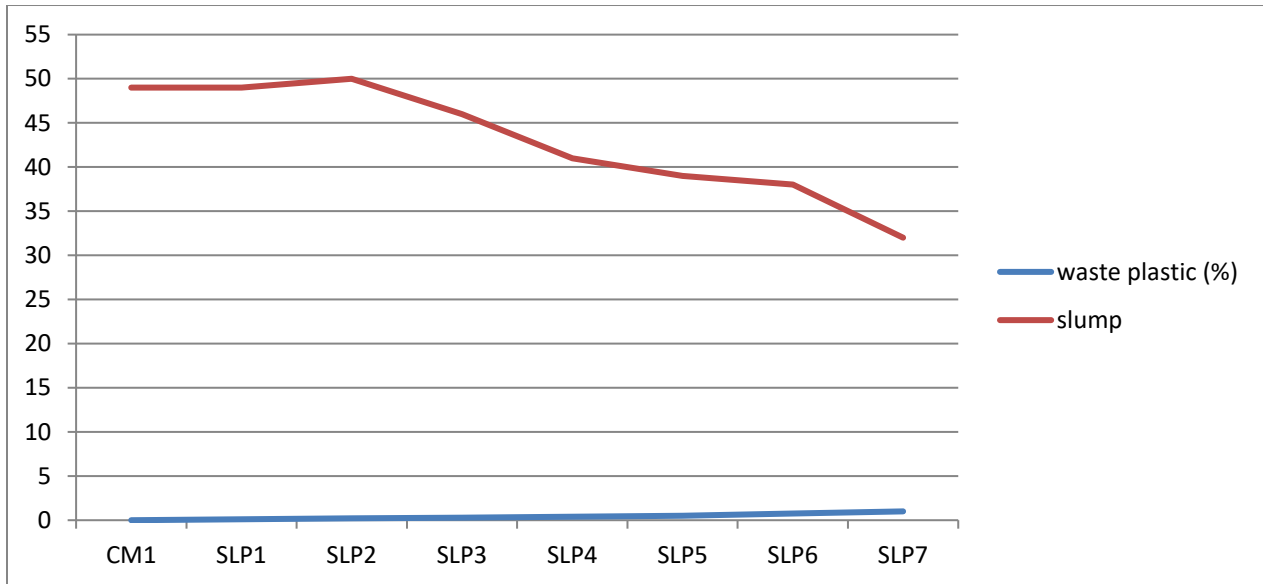


Figure 1: Relation of Slump value with varying Plastic waste

2. COMPRESSIVE STRENGTH TEST:

The compressive strength on various sample prepared were crushed under CTM at different crushing ages are shown in table:

Table 3: Compressive Test Result

MIX	Waste plastic(%)	Compressive Strength N/mm ² (Days)		
		7	14	28
CM ₁	0	32.64	36.935	42.11

SLP ₁	0.1	30.41	33.55	39.51
SLP ₂	0.2	29.86	32.52	38
SLP ₃	0.3	28.465	31.50	36.510
SLP ₄	0.4	25.065	29.528	35.90
SLP ₅	0.5	24.100	28.150	35.50
SLP ₆	0.75	23.75	27.13	34.95
SLP ₇	1.0	23.00	24.22	34.10

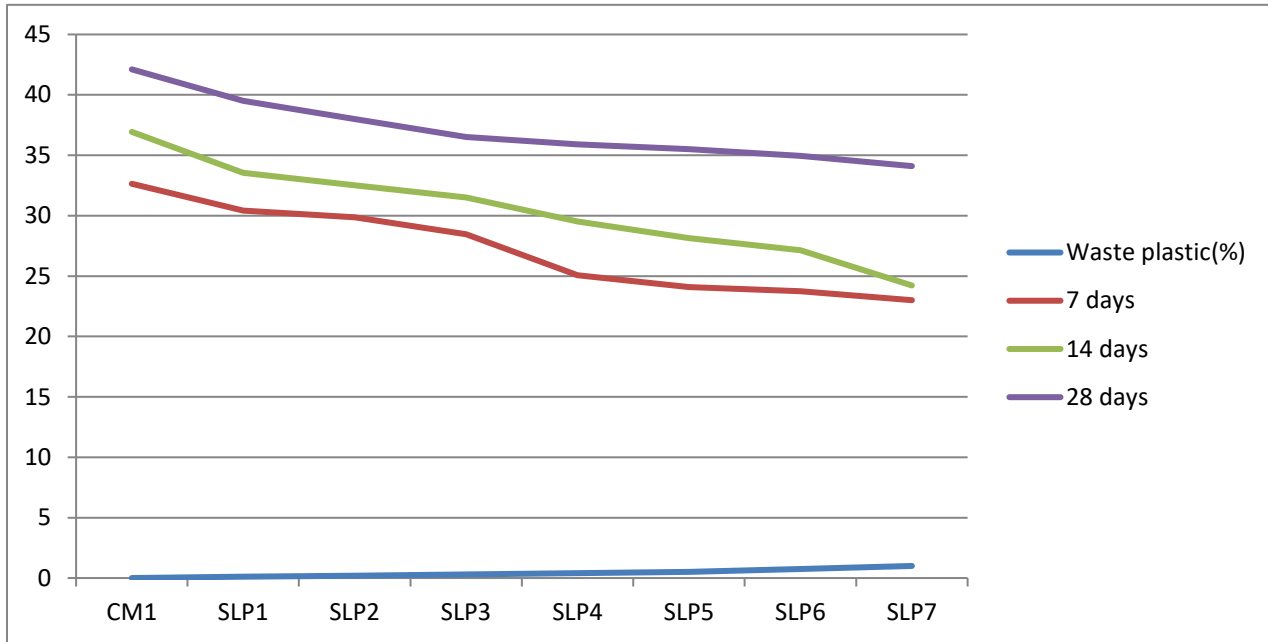


Figure 1: Relation of Compression Test after 7, 14, 28 days with varying Plastic waste

IV. CONCLUSION

1. From the test results it shows that up to 0.1% waste plastic single layer there is little change in the compressive strength. But after 0.1% the compressive strength starts falling and with 1% waste plastic the decrease in compressive strength is 19% and the compressive strength starts decreasing rapidly after with 0.2% waste plastic.
2. Factors responsible for low compressive strength could be the hydrophobic nature of plastic waste which can inhibits cements hydration reaction by restricting of water movement.

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