International Journal For Technological Research In Engineering
Volume 4, Issue 10, June-2017 *ISSN (Online): 2347 - 4718*

EXPERIMENTAL INVESTIGATION OF APPLYING POLYTHENE IN CONCRETE MIX

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Abstract: Polythene are one of the most widely used material currently in the world for various materials. Polythene or plastic bags are largely used for packaging; big industries to small scale industries including shopkeepers are dependent upon polythene for packaging. Overall population is using polythene bags and these bags classified under various head, but majorly low density polythene are used for local purpose. The polythene used are of few types low density polythene and high density polythene. The advantage of high density polythene can be re-used or recycled but low density polythene can't be recycled. In this Paper we use these low density polythene bags in the concrete to study the properties of concrete like compressive strength and flexural strength. These polythene bags are added to concrete up to 0.2, 0.4, 0.6, 0.8 and 1% by cement.

I. INTRODUCTION

The consumption of polythene has grown substantially all over the world in recent years and this has created huge quantities of polythene based waste. In India, Polythene waste is now a serious environmental threat to the modern way of Living. Post-consumer packaging accounts for almost 40% of total domestic waste and it is therefore an important source for the recycled materials market. Polythene aggregate is produced by mechanically separating and processing plastic waste. A life cycle analysis of mixed household polythene shows that mechanical recycling provides a higher net positive environmental impact than the recovery of energy or landfilling.Different types of polythene waste have been used as aggregate, filler or fiber in cement mortar and concrete after mechanical treatment.

II. LITERATURE

Various experiments have already been conducted on the use of Polythene or Plastic by various authors. As YoucefGhernouti, studies 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 followed by cooling of liquid waste which was then cooled and crushed to obtained plastic sand having finesse modulus of 4.7.Praveen Mathew have investigated the suitability of recycled plastic as partial replacement to coarse aggregate in concrete mix to study effect on compressive strength, modulus of elasticity, split tensile strength and flexural strength properties of concrete. R L Ramesh et al. Have used waste plastic of low density poly ethylene as replacement to coarse aggregate to determine its viable application in construction industry and to study the behavior of fresh and harden concrete properties. Zainab Z. Ismail et al. [2007] have conducted comprehensive study based on large number of experiments and tests in order to determine the feasibility of reusing plastic sand as partial replacement of fine aggregate in concrete. They conducted tests on concrete samples for dry/fresh density, slump, compressive and flexural strength and finally toughness indices on room temperature P. Suganthy et al.[2013] investigated the application of pulverized fine crushed plastic (produce from melting and crushing of high density polyethylene) as replacement of fine aggregate in concrete with varying known percentages. Their main focus was on optimum replacement of natural sand by pulverized plastic sand. Five concrete mixes were produced from specified concrete materials having replacement of fine aggregate (sand) by 0, 25, 50, 75 and 100% respectively to study the test graph results of various concrete properties.

III. MATERIALS USED

Cement: Locally available Khyber 43 Grade cement was used. The specific gravity of the cement was 3.15.

Plastic Bottles: The plastic waste used as aggregate was collected from a plastic recycling plant Pampore Industrial Area Srinagar, J&K India. The plant mainly recycles postconsumerPET bottles collected as compressed bales that come from urbanand industrial collection sites.

Corse Aggregates: Calcareous natural coarse aggregates of three different size ranges were used. The Specific gravity of coarse aggregate is 2.74.

Fine Aggregate: Quartzite natural fine aggregates of two different size ranges were used throughout. The Specific gravity of coarse aggregate is 2.7

Compressive strength of concrete with various percentage of replacement of natural aggregates (NA) by plastic aggregates.

%--of substitution	Type of aggregate	7DAYS f_{cm} (Mpa)	7DAYS S_{dv} (Mpa)	7DAYS A_{dv} (Mpa)	28DAYS f_{cm} (Mpa)	28DAYS S_{dv} (Mpa)	28DAYS A_{dv} (Mpa)	91DAYS f_{cm} (Mpa)	91DAYS S_{dv} (Mpa)	91DAYS A_{dv} (Mpa)
0	Normal	33.18	0.269	0.204	43.07	0.091	0.066	46.19	0.198	0.136
5	PC	24.73	0.481	0.349	31.34	0.253	0.187	33.98	0.479	0.361
	PF	31.48	1.085	0.740	36.11	0.204	0.156	40.63	0.446	0.338
	PP	31.95	0.785	0.532	37.82	1.06	0.779	40.88	0.694	0.521
10	PC	18.25	0.802	0.615	22.42	0.964	0.724	25.01	0.830	0.569
	PF	26.32	0.825	0.593	30.79	0.994	0.674	33.87	0.301	0.214
	PP	31.81	0.703	0.482	36.86	0.498	0.342	38.93	0.318	0.237
15	PC	11.20	1.081	0.823	15.10	1.070	0.821	17.88	0.845	0.595
	PF	22.47	0.962	0.738	25.33	0.798	0.561	29.59	0.927	0.630
	PP	29.43	0.695	0.478	33.41	0.610	0.419	35.40	0.819	0.562

Ref ; reference concrete : PC > coarse plastic aggregate ; PF > fine plastic aggregate ; PP > pellet shaped plastic aggregate

The Resulted Compressive Strength after 7 days is 5%, 28 days is 10% and after 91 days is 15%

The Compressive strength has been conducted as per IS CODE 456-2000.

Compressive test machine

Flexural strength test:

Flexural strength test

Splitting tensile strength (TS) and flexural strength (FS) to compressive strength (CS) ratios.

Concrete type	TS/CS	FS/CS
Ref	0.081	0.110
PC5	0.088	0.124
PC10	0.102	0.138
PC15	0.121	0.158
PF5	0.085	0.118
PF10	0.092	0.122
PF15	0.090	0.118
PP5	0.085	0.120
PP10	0.085	0.115
PP15	0.086	0.198

IV. CONCLUSIONS

The results of this investigation can be summarized as:

- The development of compressive strength of concrete containing all types of PET-aggregates is similar to conventional concrete, though this incorporation significantly lowers the compressive strength of the resulting concrete;
- The early compressive strength gain (0 to 7 days) relative to the strength determined after 91 days of curing for most of the concretes containing PET-aggregates is higher than that observed for conventional concrete;
- The incorporation of PET-aggregate in concrete increases the toughness behaviour. For a given amount of PET addition, this order is: PC > PF > PP, which indicates that adding large-flake PET-aggregate can have more effect on the improvement of the toughness behaviour of resulting concrete than the two other fractions;

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