UTILIZATION OF PLASTIC WASTE AS COARSE AGGREGATES IN M35 GRADE SELF COMPACTING CONCRETE

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Abstract *Self compacting concrete (SCC) is presently a developing procedure in the field of concrete innovation. SCC is an inventive plan to handle the issue of cementing through thick reinforcement. SCC is novel, due to its properties, similar to fill capacity, stream capacity, pump capacity, and make creation of concrete more industrialized. The utilization cementations its material like fly ash makes the concrete practical. It become important to build up a compaction free creation system consequently decreasing the general expense of the venture; improve the nature of work, and giving wellbeing in workplace. The expansion of filaments into the concrete has been found to improve a few of its properties like tensile strength, cracking resistance, impact, ductility, wear and tear etc. The use of plastic is increasing day by day, although steps were taken to reduce its consumption. This creates substantial garbage every day which is much unhealthy. A healthy and sustainable reuse of plastics offers a host of advantages. The suitability of recycled plastics as coarse aggregate in concrete and its advantages are discussed here. The initial questions arising of the bond strength and the heat of hydration regarding plastic aggregate were solved. Tests were conducted to determine the properties of plastic aggregate such as density, specific gravity and aggregate crushing value.*

In the present study an experimental investigation was conducted on M35 grade self compacting concrete by using plastic waste as coarse aggreagtes . The percentage of plastic waste aggregates used in the proportion like 0%PW, 5%PW, 10%PW, 15%PW and 20%PW. The results like compressive strength and tensile strength values are studied along with this strength values durability is also studied for M35 self compacting concrete

Key words : *Self compacting concrete, plastic waste, compessive strength, Split tensile strength*

1. INTRODUCTION

Self-compacting concrete (SCC) become first brought in Japan at some point of 1980's, given that then it has been the trouble to a few examinations in order to achieve the favored homes of concrete structures. Simultaneously the makers of parts have created more noteworthy and more prominent advanced plasticizers and stabilizers custom-made for the precast and the equipped mix industry. Self compacting concrete (SCC) has created as a progressive time, equipped for achieving the notoriety of being a spectacular advancement inside the field of concrete time. No vibration is crucial for SCC which could stream around obstacles, exemplify the reinforcement and top off the system totally under its own one of a kind self weight. Making concrete system without vibration were executed inside the past. For example, placement of concrete submerged is performed by means of the utilization of tremie without vibration.

Plastic as coarse aggregates

Plastic needs no introduction as it is the widely used material now a days on our Earth. Due to its properties like strength, durability and easy processing it can be used for many purposes. Studies shows that plastic is nearly inert that is it get very less affected by the chemicals and have higher durability. Disposal of plastic waste is a huge problem as due to absence of

organic compounds, it is non decomposable material and proves to be a threat to our environment as it has many health hazards. As decomposition of plastic is a serious problem as it takes very long time and adversely affection the environment in many ways. So we can use it in construction, where we need life of structure to be improved and use of waste plastic after small processing can help us to reduce the waste in the environment which is new motto of civil engineering.

Objectives of the study

The main objective of this research is to explore the possibility of using waste plastics in concrete as concrete aggregate and reduce the problems associated to plastic wastes disposal as well as the extraction of natural aggregates from the environment. Other objectives of the research are as follows:

1. To compare the compressive strength and Density of Recycled Plastics used as Coarse Aggregate for Constructional self compacting Concrete with the Conventional concrete.
2. To know its applications in construction industry for self compacting concrete.
3. To reduce the pressure on naturally availability materials by replacing it with Recycled plastic aggregate in self compacting concrete.
4. To compare the physical characteristics of natural aggregate with Plastic recycled aggregate in self compacting concrete.
5. To study the behavior of fresh and hardened concrete with plastic waste coarse aggregate and compare its properties to those of conventional concrete.
6. To produce self compacting concrete made with plastic waste concrete for multi-purpose use It represents an environmental friendly and economical viable solution, for utilization of waste plastic.

2. MATERIALS USED FOR THE STUDY

For this experimental study initially we have collect the necessary materials to make self compacting concrete the details of materials collection and specification are discussed in the below

2.1 Cement

Ordinary Portland cement of 53 grade was utilized in this experimentation adjusting to I.S. – 12269-1987. For the current examination I was gathered ultra tech cement of 53 grade from local area Hyderabad. The example cement bag utilized in this investigation is appeared in the below figure 1

Figure 1: Ultra Tech OPC 53 Grade cement Bag

2.2 Plastic waste

The plastic aggregates were produced mainly from waste PET bottles (Figure 1). The plastic bottles were crushed and cut into small pieces using a crushing machine. The plastic aggregates were washed properly to make them clean and to ensure that no other dust particles were present there (Figure 2). Polyethylene terephthalate (PET) is thermoplastic polyester with tensile and flexural modulus of elasticity of about 2.9 and 2.4GPa, respectively, tensile strength up to 60 MPa and excellent chemical resistance. It is a semi-crystalline polymer, with a melting point of about 260°C and a glass transition temperature ranging from 70 to 80°C, in

relation to the amount of crystalline region enclosed in the amorphous phase. The specific gravity is around 1.3-1.4 g/cm3 (Van Krevelen, 1990). In this study, the specific gravity of plastic aggregate used was found to be 1.4 g/cm3 . The sizes of plastic aggregate were taken between 4.75 to 9.5 mm.

Plastic aggregates

2.3 Fine Aggregates

Locally open sand zone II with specific gravity 2.65, water absorption 2% and fineness modulus 2.92, changing as per I.S. – 383-1970. It is the aggregate the a lot of which passes 4.75 mm IS sifter and contains basically such an unprecedented proportion of coarser as is allowed by detail.

Figure 5: Fine aggregates

2.4 Coarse Aggregates

Coarse aggregates are those stones which are held on IS4.75 strainer number squashed stone mix of 20mm size is incorporated from near to quarry. Aggregates of length more critical than 20mm size are secluded by using sieving. The underneath figure shows the example of Coarse totals which are utilized in this investigation.

Figure 6: Coarse aggregates

2.5 Mix Design And Trials Used For The Study

The mix design used for this study is 1:1.58:1.44 for M35 grade design mix as per the materials properties

For this study of experimentation I was taken five trials to get the optimum value of strength and durability values which are shown in the below discussions

1. 0% plastic waste : Mix 1
2. 5% plastic waste : Mix 2
3. 10% plastic waste: Mix 3
4. 15% plastic waste: Mix 4
5. 20% plastic waste : Mix 5

3. METHODOLOGY

In order to test the strength and durability of self compacting concrete using steel fibers and corn fibers for M35 grade concrete we need to cast the cubes, cylinders and prism specimens for compressive strength, split tensile strength, flexural strength and durability of various curing periods. Along with those strength tests workability is also studied for various trial mixes. For this project the following methodology is used

3.1 Batching

Batching is the process of taking the quantity of materials required for the project. Generally

measuring the material quantity is done by two methods one is weight batching, second is volume batching. In the present study I was taken weight batching to measure the materials quantity.

3.2 Mixing Of The Concrete

After measuring the materials quantity I mixed the materials as per the trails. Firstly we have to mix coarse aggregates, fine aggregates, steel fibers and coir fibers for some time to get uniform mix after that add cement and silica fume to the mixture again mix for some more time to get same mix throughout the material. Now add the water as per the calculations from the mix design to make freshly prepared concrete for M35 grade concrete.

3.3 Casting Of Specimens

After mixing the concrete materials we have to cast the specimens like cubes, cylinders, prisms to check the strength and durability. For this study we have to cast 45 cubes, 45 cylinder and 45 prisms to check the compressive strength, split tensile strength and flexural strength at 7days, 14 days and 28 days curing period along with these strength we have to cast 15 cubes for the durability of concrete for these five trial mixes.

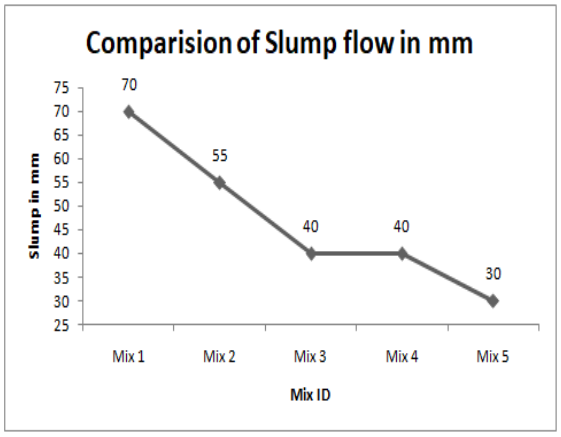
3.4 Curing Of The Specimens

In case of compressive strength, split tensile and flexural strength studies we have to cure the specimens for 7 days, 14 days and 28 days of curing periods with all five trial mixes. While in case of durability we have to cure the specimens to at least for acid attack and alkaline attack tests.

4. RESULTS AND ANALYSIS

4.1 Workability Of Concrete

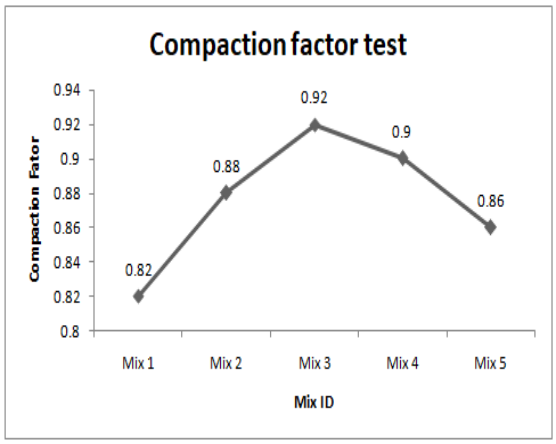
Workability is one of the most important property of the freshly prepared concrete mixtures in the present study workability of concrete mix is find out with the help of the slump cone test and compaction factor tests the below graph shows the slump cone comparison for various mixes



Graph 1: Comparison of slump cone test

4.2 Compaction Factor

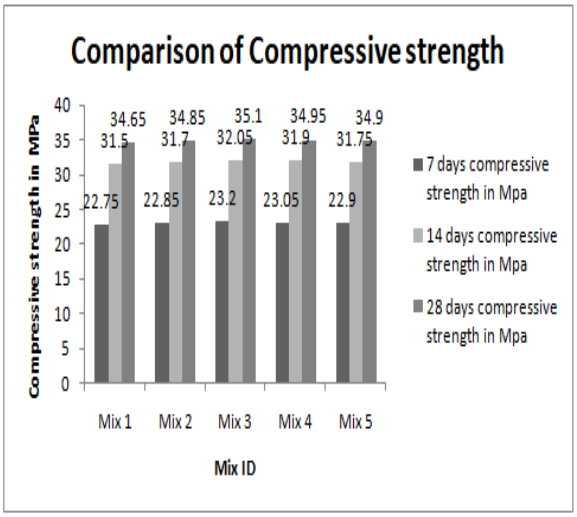
Compaction factor is the weight of partially compacted concrete to the weight of full compacted concrete. For the present study compaction factor is determined with the help of mix trials from mix trial 1 to mix trial 5 the below graph shows the compaction factor test results.



Graph 2: Comparison of compaction factor

4.3 Compressive Strength Of Concrete

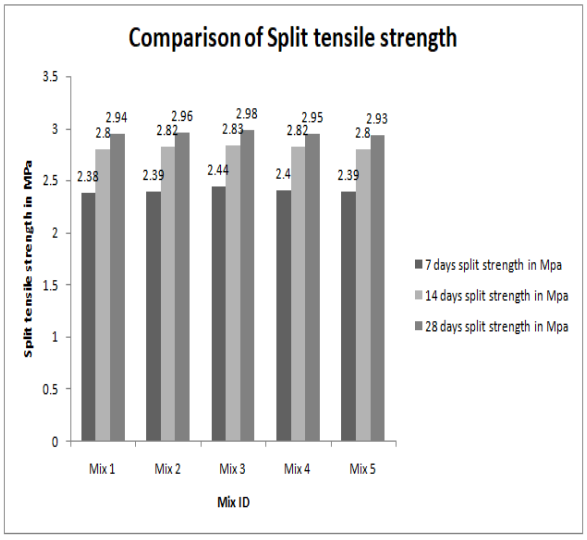
After curing cubes the compressive strength of concrete is resolved with the assistance of universal testing machine (UTM) for trial 1 to trial 5. The below figure shows the compressive strength of concrete for 7 days, 14 days and 28 days curing.



Graph 3: Comparison of Compressive strength

4.4 Split Tensile Strength

Split tensile strength of concrete is determined for M35 grade concrete with the help of cylinder specimens for various mix trials from trial 1 to trail. The dimension of the cylinder was taken as 150mm diameter and 300mm length. The below graph shows the split tensile strength for 7days, 14 days and 28 days.



Graph 4: Comparison of Tensile strength

5. CONCLUSIONS

1. Self compacting concrete is made with the help of the various mineral admixtures.
2. The self compacting concrete can be compacted with vibrations by its own weight. The strength of self compacting concrete is higher than the normal concrete mixture.
3. Plastic needs no introduction as it is the widely used material now days on our Earth. Due to its properties like strength, durability and easy processing it can be used for many purposes.
4. By using plastic waste the cracking effect of concrete will be reduces and it is also helps to increase the strength values related to compressive and split tensile strength.
5. The determination of slump cone esteem diminishes from trial 1 to trial 5. The most extreme estimation of compaction factor was seen at mix 3 for10% plastic waste.
6. The most extreme estimation of compressive and tensile strength were observed at mix 3 which is 10% plastic waste.
7. As per the strength characteristics the maximum strength is obtained at trial 3 10% plastic waste.

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