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SUITABILITY OF SELF COMPACTING CONCRETE BY USING PLASTIC WASTE AS FINE AGGREGATES ALCCCOFINE MATERIAL AS CEMENT

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Abstract *Self compacting concrete is the one in which has ability to flow under its own weight. The compaction process of self compacting process is done without any external vibrations. Generally strength values for SCC is higher than normal concrete mix due to its mix proportions. The concrete material is made with composition of materials like cement, sand, coarse aggregates and water. Strength and workability are the important properties of the concrete before construction any structure, basically strength of the concrete member depends upon the amount of the load which comes to the concrete member. As the world moves forward with technological advancements, it has seen a paradigm shift towards more sustainable growth. Many studies even promote zero wastage by recycling and reusing most of the by-products. Now a waste plastic is increasing due to increasing the population in the world that will affect the environmental parameters which pollutes the earth, air and water if that happens the total earth will polluted. To decrease this effect we have to reduce the generation of waste materials but in practical it is not possible to decrease the waste materials with this current population of the word. Alccofine is a new generation material that will increases the strength of self compacting concrete. Alccofine is finer material than hydraulic materials like cement, fly ash etc, the alccofine is developed in control conditions with specified equipments to get make finer particles.*

In the present paper an experimental investigation was conducted to study the workability and strength properties of concrete by using plastic waste and alccofine as replacement materials for cement. The percentage of plastic waste used as 0%, 2.5%, 5%, 7.5% and 10% of cement and alccofine used is 5% for all mixes for M35 grade of concrete mix. The comparison of results like workability and strength was made with and without using alccofine.

1. Introduction

In fact, concrete is the most commonly absorbed building material for homes. During placement, the achievement of engineered concrete strength and longevity primarily depends on sufficient compaction. Insufficient compaction will significantly lower the performance of mature concrete in situ. In order to ensure sufficient compaction and homogeneity of the cast concrete and to promote its positioning, in particular in congested reinforcement structures and restricted areas, self-compacting concrete has therefore been introduced.

It all started around 1988 at Tokyo University, when Okamura et al. created the basic concept of SCC (1998). The development of self-compacting concrete (SCC) dates back to the late 1980s. SCC principles were originally considered to be a tool for improving the long-term stability of systems with congested reinforcement members. It has created tremendous interest since its launch. It has been known as the biggest development in concrete production for many decades due to the improved performance and working climate.

SCC is a self-compacting concrete that without any external effort occupies all the space in the shell (in the form of mechanical vibration, floating, poking etc.). In order for the concrete to occupy the full space, flowing through the shell, without any external effort, it must have a suitable degree of passing capability, filling ability and consistency. Because of the heterogeneous nature of concrete, its high fluidity

and the fact that it contains materials of different specific gravities, cohesiveness becomes a problem, as it is very difficult to keep its constituents in a cohesive form where higher mass particles tend to settle down.Nevertheless, adding higher amounts of finer content will solve this problem. Because of its excellent user-friendly characteristics, SCC is today a highly desirable choice in the traditional construction industry.

Waste plastic

Waste Plastic (WP) is an emerging global environmental concern, or more generally referred to as plastic waste, that is rapidly gaining popularity. This rising issue is due to the rapid increase in the amount of plastic waste, a trend that is expected to continue for some time due to the rapid emergence of new technology and cheap electrical and electronic products (Agamuthu& Dennis, 2013; Bowcock, 2011). Rapid innovation in consumer electronics coupled with minimal incentives for designs that would increase 3R (reduce, reuse, recycle) opportunities suggests that electronic products are increasingly obsolete and discarded more often (Bowcock, 2011).

The waste produced from discarded electronics is an increasing concern due to the hazardous substances they contain, i.e. lead, nickel, cadmium, copper, beryllium chromium, lithium, mercury etc. Thus, unsound handling of plastic waste can affect both human health and the environment because of its highly toxic elements (Herat and Agamuthu, 2012; Lundgren, 2012).Waste meanings are diverse. The Basel Action Network (BAN) refers to plastic waste as 'a wide and changing range of electronic devices ranging from large household appliances such as refrigerators, air conditioners, mobile phones, stereo systems and consumables to computers discarded by their users' (Basel Action Network, 2010; Gaidajis et al., 2010). According to United States.

Alcofine

Alccofine is a micro-fine material of a new age, much finer in particle size than other hydraulic materials produced in India, such as cement, fly ash, silica, etc. Alccofine has unique features to improve 'concrete efficiency' in fresh and hardened phases due to its optimised particle size distribution. As it does not have too coarse, not too fine, ideal distribution of particle size according to the results obtained, it can be used as a practical substitute for Silica Fume. It is manufactured in controlled conditions with special equipment to create an optimum particle size distribution, which is its unique property.

2. Literature studies

Sheelan M. Hama, Nahla N. Hilal, et al.,(2017) The motivation behind this examination was to research the impact on new highlights of self-compacting concrete of the utilization of plastic waste as a halfway replacement of fine total (SSC). The highlights of the usefulness of self-compacting concrete blends have been distinguished. This examination reasoned that droop stream measurements running somewhere in the range of 675 and 710 mm were acquired for the self-compacting plastic waste concrete. The utilization of plastic waste expanded both T50 droop stream and V-pipe stream times as a fractional replacement of fine total. The consistency and size of the plastic waste being utilized likewise influenced the stature proportion of the L-box.

YoucefGhernouti, , Bahia Rabehi, et al.,(2015) This paper investigates the new and solidified properties of self-compacting concrete (SCC) containing plastic pack waste strands (PBWF). From this investigation, it was presumed that the outcomes acquired are intriguing, proposing that the presence of these filaments in concrete postponing the area of miniature breaks is a likely utilization of PBWF for SCC primary reinforcement.

Kshama Shukla, Akansha Tiwari, et al.,(2017) As the name presents, Self Compacting Concrete is not much, yet it is only the utilization of admixtures and

different amounts of composite materials that cause SCC to carry on as unmistakable when contrasted with ordinary materials. This examination presumed that SCC quickens development, lessens the work costs required, affirms compaction, completes and clears out ecological contamination factors. For retrofitting, the SCC is utilized, particularly in constrainment, where vibration is hard to utilize.

Abdul Sami Kohistani and Khushpreet Singh, et al.,(2018) The reason for this examination was to research the properties of Self Compacting Concrete (Fresh and Hardened Properties) by utilizing Alccofine and PET strands to supplant cement and fine totals, separately, to upgrade the functionality and strength of SCC. It was found from the test outcomes that the utilization of 1 percent plastic waste and 10% Alccofine has the best presentation in the functionality and strength of self-compacting concrete and improves the sturdiness of SCC.

3. Materials used and mix ratios

Cement

Cement is a binding materials generally used for all the construction it is important to chose good quality of cement to get maximum strength. For the present study we are used OPC 53 Grade cement.

OPC 53 Grade Cement

Coarse aggregates

Coarse aggregates are the materials which are retained on IS 4.75mm sieve. The coarse aggregates which are passing through 12.5mm sieve and retained on 10mm IS sieve are used to make self compacting concrete mixture.

Coarse aggregates

Fine aggregates

Fine aggregates are the materials which are passing through 4.75mm sieve. The fine aggregates used in this present study is shown in below fig 3. The fine aggregates (Sand) which is having particles size less than 1.18mm size is used in this current study to make self compacting concrete mixture as per mix design of M35 grade concrete.

Fine aggregates

Waste plastic

The waste plastic is the material which is consisting things that we use in our daily life plastic bottles, packaging, appliances which comes from our homes, schools, hospitals, and businesses. After collecting plastic materials we have to crush them in crushing machine to get finer particles. The crushed material is again sieved in IS 1.18 mm sieve to get particle sizes approximately equal to that of the fine aggregates sizes.

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Waste plastic

Super plasticizer

Now a day's most of the people are using super plasticizer to increase the strength of the concrete. In the present study I was used BetanPolymix PCE 3000 admixture which is 1% of cement content as per the mix design of the self compacting concrete (SCC) is concern.

Super plasticizer

Final mix proportion of M35 grade concrete

W	Cement	FA	CA	Admixture
220.5	551.25	865.43	793.753	2.205 liters
0.4	1	1.57	1.44	-

Mix ratios used in the study

S. No	Mix Type	% Plastic waste	% Plastic waste+ %Alccofine
1	Mix 1	0%	0%+5%
2	Mix 2	2.5%	2.5%+5%
3	Mix 3	5%	5%+5%
4	Mix 4	7.5%	7.5%+5%
5	Mix 5	10%	10%+5%

4. Experimental study

Casting of cubes and cylinders

Casting of concrete shapes and barrels as improved the situation M30 review concrete, the blend extent is for which we are throwing 3D cubes for ordinary cement, with the incomplete substitution

Compacting with compacting bar

150 mm molds ought to be filled in three around break even with layers (50 mm profound). A compacting bar is accommodated compacting the solid. It is a 380 mm long steel bar, weighs 1.8 kg and has a 25 mm square end for smashing. Amid the compaction of each layer with the compacting bar, the strokes ought to be disseminated in a uniform way finished the surface of the solid and each layer ought to be compacted to its full profundity.

Fresh properties exams for SCC

There are no suited tests, which could immediately degree the workability as definedearlier. The following techniques supply a degree of workability in a roundabout way. In truth, these strategieshave found normal attractiveness and their values are because of their simplicity and theirability to detect the versions in the uniformity of a mix.

Therefore take a look at equipments had been fabricated for judging the following characteristics:-

- Filling ability: This is the capacity of the concrete to waft beneath its personal weight both horizontally and vertically upwards with out honeycombing around any shape.
- Passing potential: This is the potential of the concrete to float freely through dense reinforcement without blockading.
- Resistance to segregation: This is the capacity of SCC to keep a homogenous mix throughout and after placement, without separation of combination from the paste, or water from solids

Many one of a kind check techniques have been developed to signify the properties of SCC.

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Compressive strength

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.

Split tensile strength

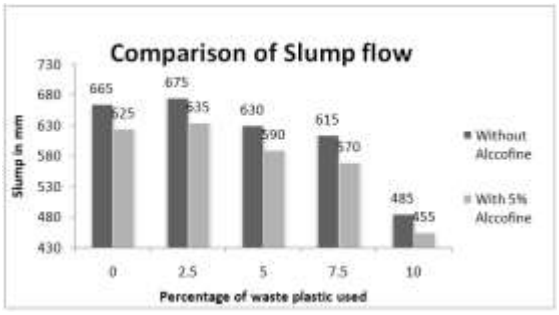
Split tensile strength of concrete is determined for M35 grade concrete with the help of cylinder specimens for various mix trials from trial 1 to trail. The dimension of the cylinder was taken as 150mm diameter and 300mm length.

Flexural strength of concrete

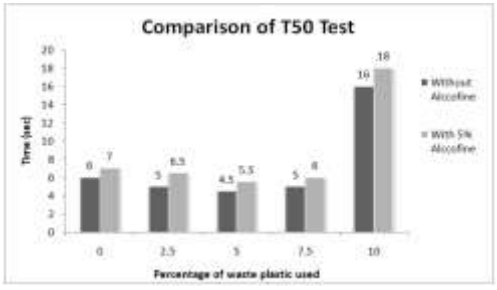
Generally flexural strength of concrete is determined for prism specimens of 150mmX150mmX700mm dimensions. The flexural strength of prism specimens is determined for trials 1 to trails 5 for M35 grade concrete

5. Results and analysis

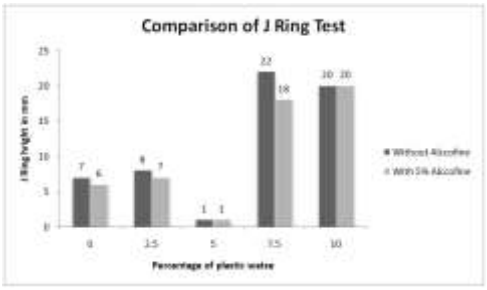
Workability of concrete



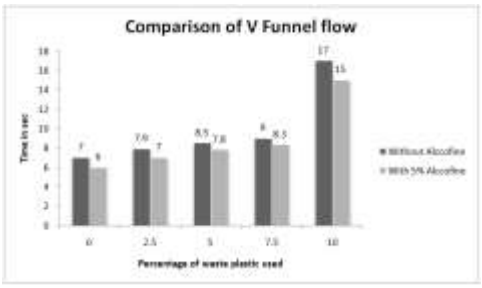
Comparison of Slump flow values



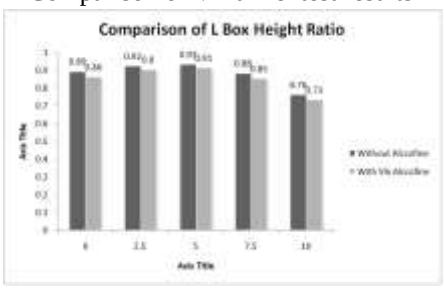
Comparison of T50 test results



Comparison of J Ring test results

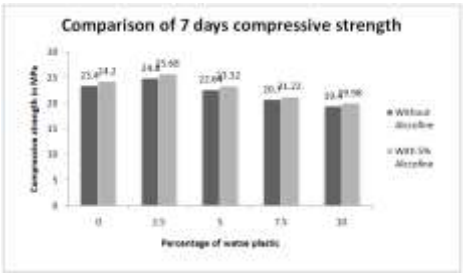


Comparison of V Funnel test results



Comparison of L Box height ratio test

Compressive strength



Comparison of 7days compressive strength

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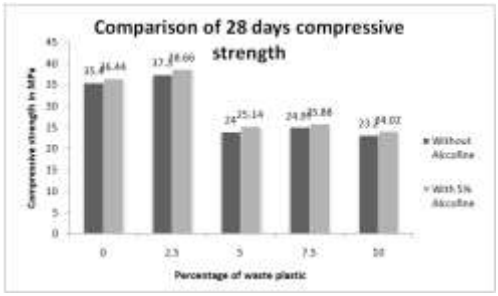
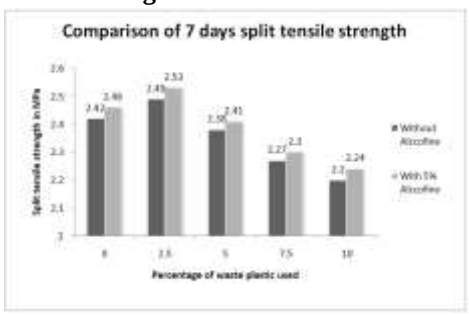
Comparison of 14days compressive strength

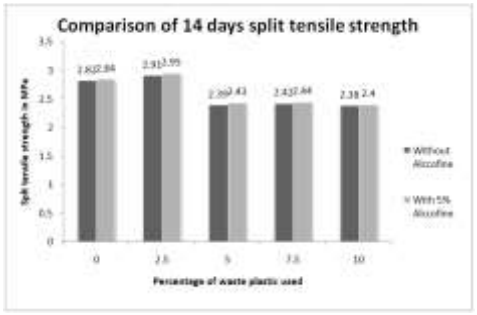


Comparison of 28days compressive strength

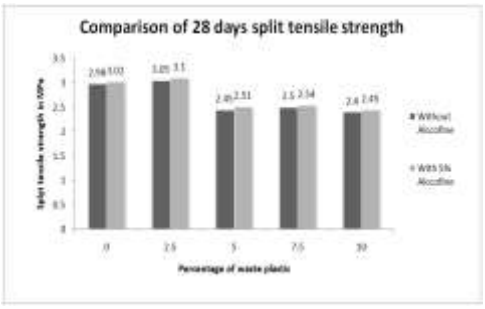
Split tensile strength of concrete



Comparison of 7days split tensile strength

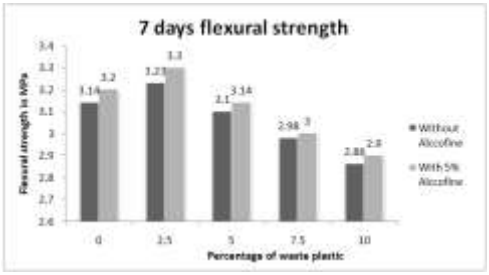


Comparison of 14days split tensile strength

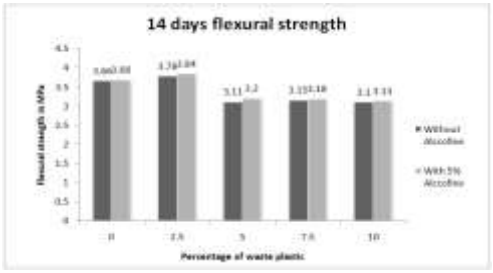


Comparison of 28days split tensile strength

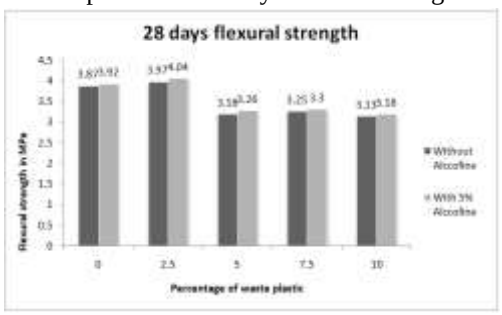
Flexural strength of concrete



Comparison of 7 days flexural strength



Comparison of 14 days flexural strength



Comparison of 28 days flexural strength

6. Conclusions

Eco friendly, Green Concrete has been promoted worldwide to encourage Sustainable Development in the field of Construction where huge amount of concreting works are carried out. Utilizing plastic Waste Ash as a partial replacement for fine

aggregates provides a significant role in its disposal due to its adversarial effects. When investigated for partial replacement the following highlights were noted:

1. The slump value is decreases with increasing the percentage of plastic waste from 0% to 10% the slump value is also increases by adding alccofine.
2. The T50 test value increases if we alccofine, J Ring value , V funnel and L box test value has higher value for without alccofine case
3. The optimum value of compressive strength at 7 days, 14 days and 28 days is obtained at 2.5% plastic waste case. If we add alccofine in concrete we can increase the compressive strength values
4. The optimum value of split tensile strength at 7 days, 14 days and 28 days is obtained at 2.5% plastic waste case.
5. The optimum value of flexural strength at 7 days, 14 days and 28 days is obtained at 2.5% plastic waste case.

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