

Performance of Concrete by Partial Replacement of Alccofine and Fly Ash

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Abstract: *The concrete used for the construction of a building is a mixture of cement, sand, fine aggregate, solid aggregate and water. Sometimes it is necessary to modify concrete structures according to need. In the mix it is used to change structures. Alccofine is a substance added to a concrete mixture in or immediately before mixing. There are many benefits from the use of alccofine such as improved quality, greater concrete strength, cracking control, acceleration and reduction setup, lower density and improved performance. The effect of alccofine varies generally with cement type, mixing rate and volume. Its output is known for displaying viscosity conversion features. In this particular study of alccofine and fly ash, the effectiveness of concrete is investigated. This study provides a detailed study of the impact of alccofine and fly ash for these purposes. Alccofine and fly ash material are readily available at a reasonable price. By mixing alccofine and flying ash at different percentages, tests should be performed to assess its effect on concrete materials including set time, performance, compressive strength and lightweight concrete.*

Keywords: Alccofine, Fly Ash, cement, Coarse Aggregate, Fine

I. INTRODUCTION

Concrete cement is probably the most used building material in the world. The reason for its widespread use is that it provides efficient performance and can be adapted to any situation. Plain concrete is the most used material in the construction of various structures. However, it suffers from many obstacles, such as strong low strength, durability, unstable crack propagation and low crack resistance, etc. Researchers, scientists and specialists of all ages have worked to develop knowledge. Researchers develop a concept and use it for our benefit or to meet a specific need and develop appropriate equipment, materials or technology. A concrete field is no different. In the last 30 years, there have been rapid developments in cement, concrete technologies and admixtures such as pozzolanic admixture etc. which can improve the performance of concrete, hence the construction industry needs the right type and quality of concrete. Suitable application where the strength of the structure can be improved. Concrete meets working conditions that can be defined in terms of strength, durability, accessibility, crunch, etc. Alccofine can be built into a concrete or concrete mixing machine where concrete is produced. Concrete materials are powders of fine minerals. Alccofine is a new generation, micro fine particle size material and is much finer than other underground materials like cement, fly ash, silk etc. produced in India. Due to the dispersed size of the prepared particles, Alccofine has unique properties for improving "concrete performance" in new and stronger phases. Alccofine 1203 is a specially formulated slag-based product with a high glass content and high efficiency reconstituted by a controlled granulation process. Alccofine 1203 is a specially formulated slag-based product with a high glass content and high efficiency reconstituted by a controlled granulation process. Due to its unique chemical composition and excellent particle size, Alccofine 1203 provides a reduced water requirement for the performance provided as a concrete performance requirement. Alccofine 1203 and Alccofine 1101 are two types of Alccofine with a low calcium silicate content and a high calcium silicate content. Alccofine 1203 is an ultra-fine slag-based additive that can distribute particle size. The mixing performance is improved with Alccofine 1203 and the flow capacity of the mixture is increased. It also helps reduce separation and lower the hydration temperature of the mixture. Alccofine 1203 is used to increase compressive strength or as an effective flow aid. Alccofine 1203 is known for the production of high strength concrete and is used in two different ways such as cement replacement, cement reduction and as an adjunct to improve concrete structures. It has been found that the use of ultrafine slag not only improves the

compressive strength of concrete but also improves the performance and fluidity of the mixture. It also demonstrates durability and improves the reliability and durability of reinforced concrete structures. The study also showed the effect of alcofin changes on the effects of packing, overload and instant energy recovery properties that will be evaluated in this work. Minor adjustments with alcofin cement will be made as 2.5%, 5% and 7.5% by weight of cement in the concrete mix. Tests will be carried out on standard concrete samples and concrete based on Alcofin to compare and study the effect of Alcofin. Due to industrial growth, the use of construction materials is increasing, which is causing daily depletion of natural resources. It creates environmental inequality and therefore needs to find other alternatives, such as industrial waste, which can be completely or partially replaced by building materials.

1.1 Objectives

1. To check and evaluate the properties of fresh and harden concrete workability, compressive strength, tensile strength with mixing of Alccofine at various percentage 0, 9.25, 9.50, 9.75, 9.85, with 10, 10.5% of fly ash at 7, 28 days.
2. To economical analysis of normal concrete with mixing Alccofine and fly ash.

II. BOOK RESEARCH

1. P. R. Kalyana Chakravarthy, (1990) had studied the main goal of this work focused on the compressive strength of concrete by converting part of the cement with Alccofine. The project focuses on concrete testing research by replacing Alccofine with cement by various percentages. 0%, 4%, 8%, 16%, 17%, 20%, and 25%, 7 and 28 days. The design component used throughout the study was M25. An increase in the percentage of compression force for 7 days and 28 days of healing was found to be large at a 16% change showing a value of 50.95% and 60.95% compared to normal.

2. S. Kavitha and T. Felix Kala (1992) et al described the use of alccofine within the SCC as an energy enhancer. They found improvements in energy structures with an increase in alccofine content and the results of their research confirmed that alccofine could be used as an energy booster within the SCC.

3. K. Gayathri, K. R. Chandran and J. Saravanan (1998) et al He had learned that he was conducting research on the efficacy of alccofine instead of cement in concrete at 5%, 10%, 15% and 20%. It has been found that 15% alloy of aluminium cement replacement provides better strength compared to other percentages and alccofine increases cement efficiency in pre-concrete years.

4. Mehta and Aitein (2002) had learned that “in the practical application of this type of concrete the emphasis in most cases has gradually shifted from compressive strength to other aspects of the object, such as high elasticity module, high density, low penetration and resistance to other types of attack”.

5. Lim (2015) et al. He studied the effect of Alccofine on concrete by compressing the strength, flexibility, and the flexibility modulus (w/c) of 0.35 & 0.28 and Alccofine 30%. It also found that the average increase in compression strength was 23% in 3, 7, 28, 56 & 90 days. -40% to 60% of w/c 0.28.

6. Upadhyay (2018) et al. found that concrete using Alccofine 10% and Fly Ash 30% in M60 concrete has a high compression strength and as the w/c ratio range from 0.45 to 0.5 a small difference was observed in compressive strength

III. ITEMS AND PROCESS

Cement

Type of cement: Common Portland

Cement Level: 53

Cement mark: Aditya Birla Super Cement

Cement is a bond, a building material that sets, strengthens, and adheres to other materials in order to hold it together. Cement is rarely used alone, but rather mixing sand and stones (aggregate) together. Cement mixed with good-quality concrete produces building mud, or with sand and stones, produces concrete. Concrete is the most widely used material and is only behind water as the most widely used planets.

Ratings

The fine river sand was used as a fine layer of sand. The essentials whose particles are sized as stored in I.S Sieve No.480 (4.75mm) are called wage aggregate. The magnitude of the solid aggregate depends on the type of activity. The rough value used in this investigation is 20mm of crushed angular size. Aggregates are dust-free before being applied to concrete.

Alccofine

Alccofine is a new generation, micro fine material particle size much thinner than other underground materials such as cement, fly ash, silica etc. made in India. Alccofine has unique features for improving 'concrete performance' in new and durable phases due to the dispersed size of the prepared particles. It can be used instead of the effective Silica Fume as it has a very well-dispersed particle size and not rough, it is not very corrosive according to the results obtained by Counto Micro fine products Pvt. Ltd (A joint venture with ambuja cement developers and Alcon developers). It is produced under controlled conditions with special equipment to produce a dispersed particle size distribution which is its unique location. Alccofine 1203 is a specially formulated product based on slag of high glass content and high performance reconstituted by controlled granulation process. Alccofine with low calcium silicate. The Alccofine 1200 series is a series of 1201, 1202, 1203 representing the sizes of fine, thin, and ultrafine particles respectively.

Table 3.1.1 Physical parameters of Alccofine 1203

List of Physical Reviews	Range
Bulk density	600-700 kg/m ³
Area over	12000 cm ² /gm
Particle shape	unusual

Table 3.1.2 - Chemical parameters of Alccofine 1203

Chemical analysis	Weight %
CaO	32-34
Al ₂ O ₃	18-20
Fe ₂ O ₃	1.8-2
SO ₃	0.3-0.7
MgO	8-10
SiO ₂	33-35

IV. CASTING PROCEDURE

As in the literature review I have chosen the Alccofine for making the concrete mix and I have select the different proportions of Alccofine for obtaining the strength variation at 0%, 9.25%, 9.50%, 9.75%, 9.85%, 10%, 10.5%.

1. Identifying the specification of material to be selected.
2. Collection of materials.
3. Identifying the properties of collected materials. We will do various tests on cement, fine aggregate, coarse aggregate.
4. Selection of concrete grade.
5. Mix Design: The mix design for M20 concrete cubes is done and the ratio of 1:1.81:3.07 is fixed for testing of cubes. Water absorption, Specific gravity Tests were conducted on fine aggregate and coarse aggregate and the mix design was determined.
6. Cubes were casted with control mix using natural aggregate.
7. Preparation of test specimens by adding 0, 9.85, and 10.5% of Alccofine in concrete.
8. Workability tests, compressive strength, and concrete were conducted.
9. Optimum percentage of Alccofine addition in concrete will be determined.

4.1 Journey of Work

To make the PPFRC we need the different things described below.

A. Mixing

In order to mix building materials, both mechanical and manual methods are well-designed. In the manual mixing process, all values are calculated and the asset is measured accordingly. In a large pan, first, the ingredients are mixed in a dry state. Then water is added three times to take twice and the concrete is well mixed.

B. Completion of Shapes

Filling of the mold should begin as soon as the mixing is complete. The inner surface of the mold should be sufficiently lubricated before filling. Proper tamping is done with the help of a tamping rod while filling the mold with concrete.

C. Congestion

Once the cubes have been cast, the cube mold should be filled with 3-layer concrete samples. Make sure each layer is covered using vibration or manually. Also, each layer containing concrete should be covered with about 35 lashes using a tamping bar.

D. Treatment

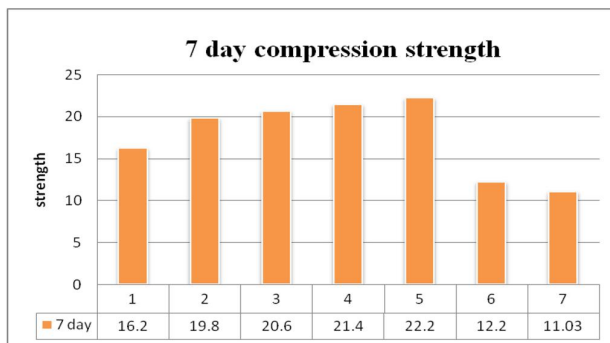
Removing the concrete cubes is done after 18-24 hours. The image is then stored for complete immersion in water. Concrete curing is defined as providing adequate moisture, temperature, and time to allow the concrete to achieve the desired properties for its intended use. To make the PPFRC we need the different things described below

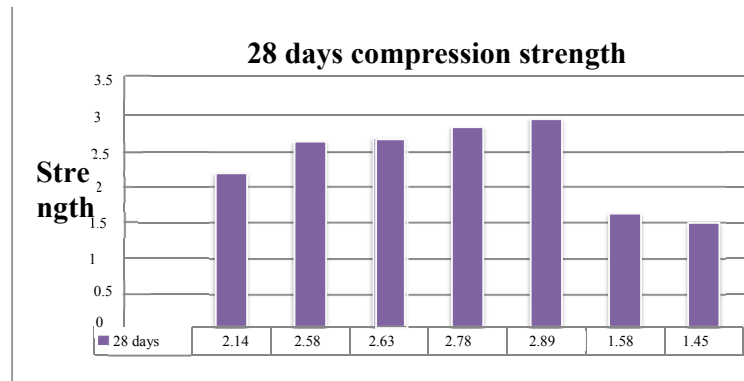
V. RESULT

Results of Compressive Strength of Concrete:

The cubes both conventional and with Alcocofine are undergone compressive strength test on CTM (Compression Testing Machine) after 7,28 days and the behaviour of those cube with respect to compressive force acting on them .

Percentage Replacement	Average Strength(N/mm ²) 7 days	Average Strength (N/mm ²)28 days
Minimum compressive strength required (N/mm ²)	14	20
0 %	16.2	27.2
9.25%	19.8	29.32
9.50 %	20.6	30.44
9.75 %	21.4	31.56
9.85 %	22.2	32.68
10 %	12.2	18.68
10.5 %	11.3	17.04





Comparison between Compressive Strength

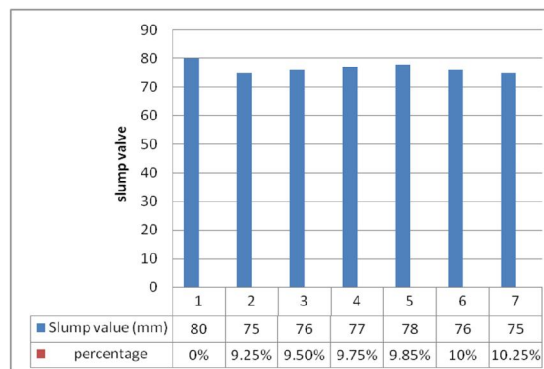
The Values of Compressive Strength of Concrete Cubes with Alccofine and Without Alccofine are given in the above Graph.

- With 0% on the 7th day & 28th day average value of compressive strength without Alccofine is 16.2 and 27.2 respectively.
- With 9.50% on the 7th day & 28th average value of compressive strength with Alccofine is 20.6 and 30.44 respectively.
- With 9.75% on the 7th day & 28th average value of compressive strength with Alccofine 21.4 and 31.56 respectively.
- With 9.85% on the 7th day & 28th average value of compressive strength with Alccofine is 22.2 and 32.68 respectively.

Results on Workability Test

Concrete	Slump value (mm)
0%	80
9.25%	75
9.50%	76
9.75%	77
9.85%	78
10 %	76
10.5%	75

Workability Test:



- A. Conventional concrete is 80 mm slump is highest slump in other
- B. In 9.50% addition of Alccofine in cube the less slump than conventional concrete is 76.
- C. In 9.75 % addition of Alccofine in cube the less slump than conventional concrete is 77.
- D. In 9.85% addition of Alccofine in cube the less slump than conventional concrete is 78.
- E. The additional of more percentage Alccofine the slump is less due to air voids

VI. CONCLUSION

1. Through the analysis of the results obtained in this study, the optimum dosage of Alccofine replacement is decided as 9.85 %, by considering the strength, economy, and other properties of fresh as well as hardened concrete.
2. The 9.85 % replacement with alccofine, gives more than 30% increase in the 28 day compressive strength of M20 grade concrete.
3. As the dosage of alccofine is increased, workability of concrete also increases; hence the w/c ratio can be reduced to a small extent, however, after a certain limit higher replacements do not lead in higher strength.
4. Other development seen in the alccofine is the early strength gain which gives the minimum desired strength at 7 days, which may further lead to early completion of projects on field.
5. The alccofine concrete gives a formation of dense and smooth surface finished concrete with no cracking or honeycombing in the concrete.

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