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Experimental Investigation on Alccofine Concrete

Suganya R
PG Student,Department of civil engineering
Arunai Engineering College
Tiruvannamalai

Lathamaheswari R
Assistant Professor,Department of civil engineering
Arunai engineering College
Tiruvannamalai

***Abstract*— Conservation of natural resources and preservation of environment is the necessary for sustainable development. Here full replacement of fine aggregate by manufactured sand in view of conserving ecological balance. Alccofine 1203 is a specially processed product based on the process of controlled granulation. The presence of alccofine in the conventional concrete in optimum dosage can expected to improve the strength of concrete and provide resistance against chloride attack, sea water attack and accelerated corrosion attack. It is used as cement replacement mainly for two reasons, to stabilize the scarcity of cement and improve the properties of concrete in their life cycle. The main objective of this work focuses on the strength of concrete by the partial replacement of cement with alccofine and full replacement of sand by manufactured sand. The project focuses on the experimental investigation on concrete by replacing cement with alccofine on varying percentage such as 0%, 5%, 10%, 15%, 20% and 25% for 7, 14 and 28 days.**

Keywords-.Alccofine,Manufactured sand and Cement replacement.

I INTRODUCTION

Concrete is the most commonly used construction material on earth. When considered over its entire life cycle extraction, processing, construction, operation, demolition and recycling concrete makes a significant contribution to the triple bottom line – environmental, social and economic –of sustainable development. Concrete is a versatile construction material: it is plastic and durable when hardened. These qualities explain why concrete can be used to build skyscraper, bridges, sidewalks, highways, houses and dams.

The demand of better concrete is increasing day by day. Improved quality of concrete will only perform better if concrete improves workability, durability, flow ability & resistance to chemical attack/corrosion and reduce water cement ratio, heat of hydration & segregation mainly. For the fulfillment of above properties waste produced from the steel & other industries are used for effective & efficient strength & durability of concrete. Large scale of sand quarrying from riverbeds creates environmental problems such as shortage of ground water and changing watercourses.

Manufactured sand is produced from hard granite stone by crushing for substitute of river sand.

High strength and high performance concrete are gaining popularity day by day in the construction industry worldwide. Practically high strength is generally said to be high strength concrete having high cement content and very low water cement ratio.

Alccofine 1203 is a specially processed product based on the slag of high glass content with high reactivity obtained through the process of controlled granulation. It is an alccofine with low calcium silicate. Alccofine 1200 series is of 1201, 1202, 1203 which represents fine, micro fine, ultrafine particle size respectively.

Alccofine 1203 is a slag based supplementary cementitious materials having ultra-fineness with optimized particle size distribution. Due to its unique chemistry and ultra fine particle size Alccofine 1203 provides reduced water demand for a given workability, even up to 70% replacement level as per requirement of concrete performance and it is manufactured by Ambuja Cements Ltd. In this experiment alccofine is used partially with varied percentage of 5%, 10%, 15%, 20%, 25% by weight of cement.

II LITERATURE REVIEW

P.R.Kalyana Chakravarthy, R.Rathan Raj (2017) The main objective of this work focuses on the compressive strength of concrete with partial replacement of cement with Alccofine. The project focuses on the experimental investigation on concrete by replacing cement with Alccofine on varying percentage. 0%, 4%, 8%, 16%, 17%, 20%, 25%, 50%, 75% and 100% for 7 and 28 days. The design mix carried out throughout the experiment was M25. The increase in percentage of compressive strength for 7 days and 28 days curing was found to be maximum at 16% replacement exhibiting the value of 50.95 % and 60.95% when compared with conventional.

S. Kavitha and T. Felix Kala (2016) have explained about the use of alccofine within the SCC as the strength enhancer. They found the improvement in strength properties with increase in alccofine dosage and the results of their investigation proved that alccofine can be used as a strength enhancer within the SCC.

D.Sharma, S.Sharma and Ajay. G (2016) conducted experimental investigation about the strength improvement of concrete using foundry slag as an alternative for conventional fine aggregate and alccofine as substitute for cement. They concluded that reasonably high strength concrete can be achieved by means of substituting fine aggregate with10% to 45% of foundry slag and replacement of cement with 15% of alccofine.

M.V.Sekhar Reddy, k.A.Latha and k.Surendra (2016) had done experimental work on partial replacement of cement with fly ash and alccofine for M40 Grade concrete. The fly ash and alccofine are replaced at 5%, 10%, 15%,20% with cement. The conclusion summarizes that the addition of alccofine indicates an early strength gaining capacity and is ecofriendly to nature. Alccofine showed greater results then compared with fly ash in long term Strength Properties.

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K. Gayathri, K. R. chandran and J. Saravanan (2016) performed research on performance of alccofine replacing the cement in concrete at 5%, 10%, 15% and 20%. It is found that 15% replacement of cement by alccofine is yielding good strength when compared to other percentages and also alccofine increases the cementing efficiency at earlier ages of concrete.

III MATERIALS AND TESTING

CEMENT

Cement is one of the important components in concrete. Use of high grade cement gives drastic improvement in strength. In this modern world as far construction industry is concerned high grade cement offers lower energy in production, economical and improves the technical aspects of cement. The cement used for this study is ordinary Portland cement of 43-grade RAMCO.

ALCCOFINE

Alccofine 1203 is the new generation micro fine material of particle size much finer than other materials like cement, fly ash etc. The Alccofine is manufactured by Ambuja Cements Ltd was used in this experiment as a mineral admixture. The products alccofine 1203 is a supplementary cementitious material suitably replaces silica fume used in high performance concrete. It is obtained from the materials of the iron ore industry. The chemical composition of the alccofine shows higher percentage of the alumina content and silica content. It has unique characteristics to enhance the performance of concrete in fresh and hardened stages. It can be used as practical substitute for silica fume.

ALCCOFINE

FINE AGGREGATE

Manufactured sand (M-Sand) is used as a substitute of river sand.

COARSE AGGREGATE

The coarse aggregate used in the concrete varies based on their structural application. In this experimental work, locally available coarse aggregate of maximum size 20mm were used.

IV RESULT AND DISCUSSION

The specimens casted and tested for compressive strength with replacement of cement by alccofine and fine aggregate by manufactured sand

COMPRESSION STRENGTH TEST

Compression test is the one of the most important properties of concrete. Concrete cube of 150×150×150mm were casted. After 24 hours the specimen were demoulded and subjected to water curing after 7, 14, and 28 days of curing of 6 cubes were taken and tested in compression testing machine.

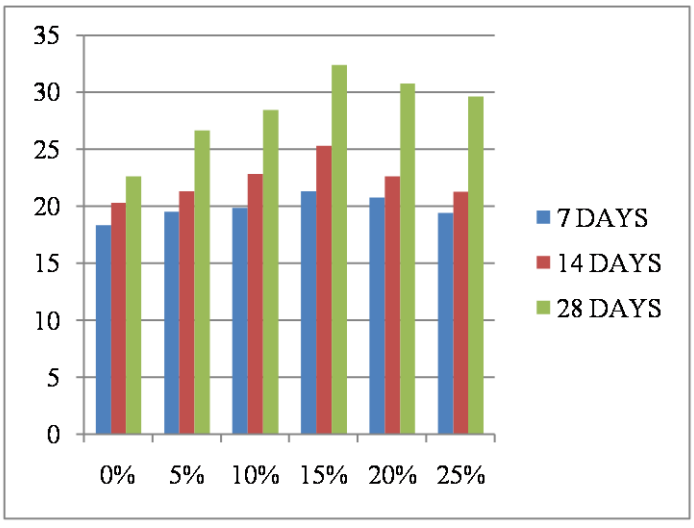
Compression test is the most common test conducted on hardened concrete because most of the desirable characteristic properties of concrete are qualitatively related to its compressive strength.

The compressive strength test is carried out on specimens cubical or cylindrical in shape. Prism is also sometimes used. Sometimes the compressive strength of concrete is determined using parts of a beam is flexure and because the beam is usually of square section, this part of the beam could be used to find out the compressive strength.

The cube specimen is of the standard size 150×150×150mm. if the largest nominal size of the aggregate does not exceed 20mm, 100mm size cubes may also be used as an alternative.

Compressive strength = load/area=P/b × d N/mm^2

CUBE	*7 days N/mm^2*	*14 days N/mm^2*	*28 days N/mm^2*
0% alccofine	*18.37*	*20.34*	*22.66*
5% alccofine	*19.56*	*21.33*	*26.67*
10% alccofine	*19.87*	*22.87*	*28.5*
15% alccofine	*21.35*	*25.33*	*32.4*
20% alccofine	*20.78*	*22.66*	*30.8*
25% alccofine	*19.44*	*21.3*	*29.65*



V CONCLUSION

Based on the above investigations shows the following results

- The compressive strength of the concrete get increased when the cement is partially replaced with

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alccofine up to 15% and gradually decreases by increasing the percentage of alccofine.

- Optimum level of replacement of cement by alccofine is found to be 15%.

- Highest compressive strength is achieved at 15% replacement of alccofine and 100% replacement of manufactured sand in concrete.
- Manufactured sand can be utilized in concrete mixtures as a good substitute for natural sand gives higher strength at full replacement

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