

A REVIEW- ON EXPERIMENTAL ANALYSIS OF CONCRETE WITH USE ALCCOFINE POWDER

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ABSTRACT:

In the construction Industry, the utmost utilized commodity is Concrete. Concrete has excessive strength and stability. While construction, huge amount of waste is generated. This waste can be used as admixtures, or can form a complete different product altogether. By excessive and mass production of these waste products, a hazardous effect can transpire on the environment. Hence we need to observe keenly and perceive a way to reduce or reuse this waste to create something prime and non-perilous for the environment. The all-inclusive performance of Reinforced Concrete Composite material is pretentious i.e affected than the individual performance of the concrete itself, due to which a new material was explored. This paper reviews that how concrete can behaves when cement can be replaced by various products like the GGBS (Ground granulated blast furnace slag), foundry slag fly ash etc.in different proportions some time these materials were used at an replacement level of 50%, which has lower heat of hydration, higher durability when compared with normal Ordinary concrete. Many a times used at a replacement level of 50%, which has lower heat of hydration, higher durability when compared with normal Ordinary concrete. This paper will reviews different properties of concrete when Alccofine material of used as cementitious material. Results were indicates that use of alccofine powder will enhance different properties of concrete.

KEYWORDS- *Alccofine, Compressive strength, Flexural strength, Fine aggregates, Marble dust, Split tensile strength.*

INTRODUCTION-

General

Many investigations lately consider blended cements based on the partial replacement of Portland cement clinker (PC) by wastes as an essential topic and performing a research on this. By making use of the replacement materials is beneficial as it furnishes cost reduction, superior- quality products, economizing energy and reduce hazard on the environment [5]. It has become essential to generate standard concrete in present time not only to attain strength but also to make a long lasting good effect on the environment. [2] All these materials engage and participate in the hydraulic reactions, contributing significantly to the composition and the micro structure of the

hydrated product.

Huge scale of land area has sand quarrying from riverbed areas and causes problems of ground water decreased level and eventually shortage. Higher strength concrete is used in large number in today's world and has low WC ratio. [11] Concrete has excessive strength and stability. While construction, huge amount of waste is generated. This waste can be used as admixtures, or can form a complete different product altogether. By excessive and mass production of these waste products, a hazardous effect can transpire on the environment.

Hence we need to observe keenly and perceive a way to reduce or reuse this waste to create something prime and non-perilous for the environment. The all-inclusive performance of Reinforced Concrete Composite material is pretentious i.e affected than the individual performance of the concrete itself, due to which a new material was explored. This paper reviews that how concrete can behaves when cement can by replaced by various products like the GGBS (Ground granulated blast furnace slag), foundry slag fly ash etc.in different proportions some time these materials were used at an replacement level of 50%, which has lower heat of hydration, higher durability when compared with normal Ordinary concrete. Many a times used at a replacement level of 50%, which has lower heat of hydration, higher durability when compared with normal Ordinary concrete. This paper will reviews different properties of concrete when Alccofine material of used as cementitious material. Results were indicates that use of alccofine powder will enhance different properties of concrete.

Background of Marble dust and Alccofine -

Marble Dust -

The materials used in construction are labelled for their ecological characteristics due to the continual depletion of quarry aggregates. In India, a huge amount of marble waste is generated while construction from the industries and also unscientific methods of quarrying marble. As the marble cutting industry constantly generates immense volume of waste, there is a direct exposure of this material with the environment which causes consequential environmental dilemma.

Alccofine -

Alccofine is used as a substitute to micro silica/ silica fumes and is an absolute material content.

Alccofine when tested was observed that it does not increase water demand in spite of its high fineness at the dosage range of 5 to 15 percentage of normal OPC in general.

LITERATURE REVIEW

D.Sharma et.al (2016)[4] did an investigation by conducting an experiment about improving the concrete's strength by application of foundry slag as an better option for standard fine aggregates and alccofine as an substitute for cement. Results were indicates that exceptionally excessive

strength of concrete can be achieved by replacing fine aggregate with 10% to 45% of foundry slag and substituting cement with around 15% of alccofine. K.Gayathri, K.R chandran et.al (2016)[6] executed research on the performance of alccofine substituting the cement in concrete in percentage of 5%, 10%, 15% and 20%. After conducting these experiment researchers was observed that 15% replacement of the cement by alccofine yields perpetual strength when collated to various other percentages and apart from this it was observed that alccofine increases the cementing efficiency at initial stages of concrete.

P.R.Kalyana et.al (2017) [7] assembled a project which mainly pivots on the experimental investigation on concrete by switching cement with Alccofine in various varying percentages as 0%,4%, 8%, 16%, 17%, 20%, 25%, 50%, 75% and 100%

for 7 and 28 days. Results showed that the compressive strength was observed to be the maximum at 16% replacement revealing the value of 50.95% and 60.95% when compared with conventional. Alccofine acts as a filler material which decreasing permeability and upgrading workability. Another experiment investigation by Malvika Guatam, et.al (2017) [10] was done to evaluate the strength, high performance of concrete accommodating supplementary cementitious materials like alccofine. From the experimental results noted that the use of alccofine increased the strength to a huge extent, near about 10% substitution level of cement. After 7 days of observing they can be concluded that approximate 10% alccofine shows an upgrade of 25.5%. Ansari

U.S et.al (2017) [1] partial replaced cement by alccofine and fly ash in M70 concrete grade in their experimental work. An observation indicates that the concrete's strength increases 20%. Alccofine is cheaper than cement so this can actually be used as a substitution and will be able to play a big role in protecting the environment and economy. Further Yatin H Patel et.al (2014) [14] examined the durability of high performance concrete with Alccofine and fly ash. The substances used as a replacement were volcanic pumice, pulverized fuel ash, blast slag, silica fume, fly ash, volcanic ash instead of cement. The compressive strengths were calculated on the 7th day which showed out to be extremely well, the strength between 7 and 28 days turned out to be comparatively low and between 28 to 56 days the strength was observed to be high again due to fly ash M30 proportion.

Rajesh Kumar S, et.al (2017)[11] studied mechanical properties of alccofine based high grade concrete. This paper states that alccofine increases compressive strength and flexural strength at substitution of 10%. It was observed that the flexural strength was increased by 27.6% after 28 days period and 25.5 % after 7 days period. This offers good workability.

An additional research by Revati P Sawant, et.al (2019) [12] investigated about the partial substitution of cement with the combination of Alccofine and Marble Dust for the development of sustainable concrete. It was noticed that a total of 32% increase in compressive strength is seen with 15% of alccofine and 15% marble dust powder with M40 grade of concrete. These 15% each of alccofine and marble dust powder give satisfactory results in the split tensile strength and flexural strength for this altered concrete. The MDP results in less increase having 20%, 25%, and 30% mix proportion. Study done by MS Pawar, et.al in 2013 performed a detail experiment

on self-Compacting Concrete by using Alccofine. The experiment was conducted in 4 groups including control concrete without Alccofine, concrete with 5% of alccofine, concrete with 10% of alccofine, concrete with 15% of alccofine which were tested for fresh and harden properties. The conclusion was that the fresh properties and harden properties of SCC along with alccofine was magnified than compared to that of without alccofine.

Nista Lama et.al in (2019)[9] did a comprehensive study on the Behaviour of concrete with partial replacement of cement by alccofine 1203 and studied that the use of alccofine in the concrete sums up in initial strength gain and alccofine 1203 boosts the compressive strength. The alccofine increases in percentage of workability, increases durability, resistance to chemical attack /corrosion and improves its flowability and decreases segregation in concrete. After the optimum percentage i.e 20% the strength gain is stopped and alccofine acts as a filler material. Saurabh Gupta, et.al (2013)[13] studied the types of Alccofine and enlighten. They also evaluate the importance of alccofine as supplementary cementitious material (SCM). They concluded that alccofine can increase the initial strength of the concrete and increase the rate of workability, lower the water binding ratio and concrete when prepared with alccofine is cheaper than the concrete prepared without alccofine.

A detailed study by Bansari Navinchandra Dave, et.al (2016) [3] flashed on effects of alccofine on concrete to design a rigid pavement. According to the experiment results the compressive strength of 58.65MPa can be achieved by substituting 15% cement with alccofine at 28 days and attained a flexural strength of 7.35MPa by substituting 15% cement with alccofine with modulus elasticity 3.83×10000 noted at 28 days.

Furthermore by K Ashwini, et.al (2020)[5] studied that alccofine has high surface area and a consistent mix is possible, reduces permeability, is able to refine and fill pores during transition zone of concrete, lowers water demand, improves strength and durability, results in fast settling, improves package density of paste etc.

Observing and noting down an experimental analysis by B. Kaviya, et.al in (2017) [2] on partial replacement of cement using alccofine by 5%, 10%, 15% for 7 and 28 days indicates that alccofine when added shows early strength gain and compressive strength is achieved by using 15% alccofine, it was also observed that alccofine increased the self-compatibility characteristics like filling ability, passing ability and increases its ability of resisting to segregation.

RESULT/ DISCUSSION-

The Concrete cubes were formed and were tested in CTM after 7 days and 28 days. It was observed that the combination of OPC+ PFA+ Alccofine after 7 days and 28 days shows a compressive strength of 53.90 and 81.13N/mm² respectively and nominal density of 2512 and 1212.8 KG/m³ respectively. The Pure OPC at great M70 mix shows compressive strength in the range of 58 to 60N/mm² and 75 - 76 N/mm² respectively and nominal density in the range of 1380 to 1410 KG/m³ and 1710 to 1721KG/m³.

In Slump (mm), the initial with reference to mix silica fume is 180 and with sample mix alccofine 1203 it is 210. After 30 minutes it shows 150 and 210 mm respectively, after 60 minutes it can be noted as 110 and 150 mm respectively, after 90 minutes it shows 90 and 120 mm respectively and after 120 minutes. It is observed to be 60 mm and 95 mm respectively. The compressive strength (MPa) at day 1 with reference to mix silica fume and sample mix alccofine shows almost no difference, 20.4 and 20.58 MPa respectively. At 7 days it can be observed to be 49.83 and 55.72 MPa respectively and at 28 days it is noted to be 64.17 MPa and 67.44 MPa respectively.

After 7 days, the compressive strength of concrete shows max increase up to 16% substitution of alccofine and then reduces. The max strength is observed to be 38.9 MPa and a 50 % increase.

After 28 days, the compressive strength of concrete shows max increase up to 16% substitution of alccofine and then reduces. The max strength is observed to be 45.1 MPa and 60.95 % increase.

CONCLUSION -

The results were observed to be satisfactory at 7.5%, 10% when alccofine and marble dust were substituted. The concrete block test results were satisfactory in various testes like split tensile test, compressive strength test and four point bending test. Use of alccofine improves workability when alccofine is replaced. When alccofine is replaced it is observed that it increases the durability, it upgrades its resistance to chemical attack

/corrosion and improves its flowability and decreases segregation in concrete. It can be acts as filler material and decreases permeability.

It was also concluded that the fresh properties and harden properties of SCC along with alccofine was magnified than compared to that of without alccofine. It is proved that alccofine is also cheaper than cement so this can actually be used as a substitution and will be able to play a big role in protecting the environment and will be safe for the surrounding.

The replacement of the cement by alccofine gives perpetual strength when collated to various other percentages and apart from this it was observed that alccofine increases the cementing efficiency at initial stages of concrete.

REFERENCES

- [1] Ansari U.S, Ghuge NP, Phatangre RR, “High performance concrete with partial replacement of cement by Alccofine and fly ash”, *Indian Research Transaction*, vol 5, issue 2, 2015.
- [2] B.Kaviya, K Rohith, Soniya Kindo , Manoj KumarJ, Divya P, “Experimental study on partial replacement of concrete using alccofine”, *International journal of pure and applied mathematics*, vol 116, no 13, 399-405, 2017.
- [3] Bansari Navinchandra Dave, Nikhil G Raval, Nilesh Hapaliya, Dr Jayeshkumar Pitroda, on “A

study on effect of alccofine on the performance of the concrete for rigid pavement design and analysis by using Kenpave software”, *International journal of advance engineering and research development*, vol 3, issue 1, Jan 2016.

- [4] D.Sharma, S Sharma, Ajay Goyal, “Comparative studies on Mechanical properties of high strength concrete using foundry slag and alccofine”, *Concrete Research Letters*, vol 7 (1) ,2016.
- [5] K Ashwini, P Srinivasa Rao on a research article on Alccofine concrete, *IJITEE*, vol 9, issue 5, March 2020.
- [6] K.Gayathri, K.R Chandran, and J.Saravanan , “Partial replacement of cement with combination of alccofine and marble dust for development of sustainable concrete”, *International journal of recent technology and engineering*, 8(4), Nov 2019.
- [7] Malvika Guatam, Dr Hemant Sood, “Effects of alccofine on strength characteristics of concrete of different grades-A Review”. *International Research Journal of Engineering and Technology (IRJET)*.vol 04, issue 05, 2017.
- [8] M.S Pawar, A.C Saoji , “Effect of Alccofine on self-compacting concrete”, *The International journal of engineering and science* , vol 2, issue 6,2013.
- [9] Nista Lama Ghising, Vijay Kumar, A comprehensive study on the behaviour of concrete with partial replacement of cement by Alccofine 1203-A review, *International research journal of engineering and technology*, vol 6, issue 12, Dec 2019.
- [10] P.R Kalyana Chakravarthy and Rathan Raj, “Analysis on compressive strength of concrete with partial replacement of cement with alccofine”, *ARPJN Journal of Engineering and applied sciences*, vol 12, issue 8, 2017.
- [11] RajeshKumarS , Amiya K Samanta, Dilip K Singha Roy, “An experimental study on the mechanical properties of Alccofine based high grade concrete”, *Intr. I JIMulti.Research Develp*, 2(10),218-224, 2017.
- [12] Revati P Sawant,Sudhanshu Pathak, Sachin more, “Partial replacement of cement with combination of alccofine and marble dust for developing of sustainable concrete”, *International journal of recent technology and engineering*, vol 4,issue 4, 2277-3878, Nov 2019.
- [13] Saurabh Gupta, Dr Sanjay Sharma, Er Devinder Sharma , A review on alccofine: “A supplementary cementitious material”, *Intr, JI of Modern Trends in Eng. Res.*, 3(2), 148-153, 2013.
- [14] Yatin H Patel, PJ Patel, Prof. Jignesh M Patel, “Study on Durability of high performance concrete with alccofine and fly ash”, *Intr. JI of Inno.Res.Develp*, 3(2),124-128, 2014.