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Study of Concrete by Recycling Material for Sustainable Development

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Abstract: ***Concrete's excellent structural strength and stability make it the most often utilised building material in the civil engineering sector. Directly releasing garbage into the environment might have negative effects on the environment. To use natural resources more effectively and preserve the environment from waste deposits, waste can be used to create new goods or used as admixtures. The importance of recycling waste has thus been highlighted. The performance of the concrete itself has less of an impact on the reinforced concrete composite material as a whole. This prompted the quest for fresh content. In this study, the mechanical characteristics of concrete are examined with the addition of aluminium fines and lithium salt in varying weight proportions to cement. the sector of concrete****.*

Keywords: Alccofine Compressive strength, Split tensile strength, Flexural strength, Coarse Aggregate, Fine aggregate.

I. INTRODUCTION

Alccofine is a high-performance supplemental cementitious material (SCM) that can be added to concrete to improve its qualities or used as a substitute for regular cement in the building sector. It is made by finely grinding Alccofine, a powdered substance that is produced as a by-product in coal-fired thermal power plants. Alccofine has exceptional pozzolanic characteristics since it is made of highly reactive amorphous silica and alumina. When water is present, pozzolanic substances like Alccofine combine with calcium hydroxide, a result of cement hydration, to create more calcium silicate hydrate (C-S-H) gel. Concrete is strengthened, made to last longer, and is more resistant to chemicals thanks to this C-S-H gel Alco fine's strong reactivity is one of its main benefits since it makes it possible to employ cement in concrete mixtures more effectively. It is feasible to achieve comparable or even superior performance in terms of strength and durability while reducing the overall cement content by substituting a portion of the cement with Alccofine. This aids in lowering carbon dioxide emissions linked to cement manufacture in addition to improving the sustainability of the construction sector. Alccofine can be added to concrete mixtures for a number of reasons. Fresh concrete becomes more cohesive and workable, which facilitates handling and placement. Additionally, it enhances early strength development, resulting in accelerated building times. Additionally, Alccofine makes concrete denser by lowering its permeability.

II. OBJECTIVES

1) Study the effect of Alccofine on concrete for different proportions with respect to Portland cement.
2) Study the effect of Lithium ion salt recovered from dead Lithium ion battery on concrete at constant proportion of ions i.e. Li/Na+K = 0.74 moles.
3) Study the effect of Alccofine + Lithium on concrete for different proportions.
4) To find out the mix proportion this can give same or better properties of concrete as compared to that of Portland cement concrete.

A. Alccofine

Alccofine is a ground-breaking substance that is utilised in place of micro silica and silica fumes. A new generation of supplementary cementations material (SCM) with high tech component is called Alccofine. Despite its great fineness, it does not generally increase water demand at dosages of 5 to 15% of regular OPC. In fact, the reduced void content that results from the compact packing of cementations material is shown to improve concrete slump. Alccofine usage causes the hydrated cement matrix to have very small pores. The initial rate of strength growth is discovered to be higher if the benefits of Alccofine are noted in the concrete mix design. Alccofine yields better results in a durability test that measures water permeability. Alccofine is a ground-breaking substance that is utilised in place of micro silica and silica fumes. A new generation of supplementary cementations material (SCM) with high tech component is called Alccofine. Despite its great fineness, it does not generally increase water demand at dosages of 5 to 15% of regular OPC.

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B. Types of Alccofine

1) *Alccofine 1203*: 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.
2) *Alccofine 1203*: Is a slag based SCM having ultra-fineness with optimized particle size distribution. Alccofine 1203 provides reduced water demand for a given workability, even up to 70% replacement level as per requirement of concrete performance
3) *Alccofine 1101*: It is an Alccofine with high calcium silicate. It is a micro finer cementations grouting material for soil stabilization and rock anchoring. The performance of Alccofine is superior to all other admixtures used in India. Due to high calcium oxide (Cao) content

C. Scope of Project

The scope of this research work is limited to the development of the samples prepared on by addition of Alccofine with 5%7.5%,10%,12% by weight of concrete.

D. Methodology

The project study involved two stages. The primary data was gathered through a Literature survey targeted by web searches and review of eBooks, manuals, codes and journal papers. After review the problem statement is defined and sample preparation is taken up for detail study and analysis purposes. This project execution follows the flow chart given below:

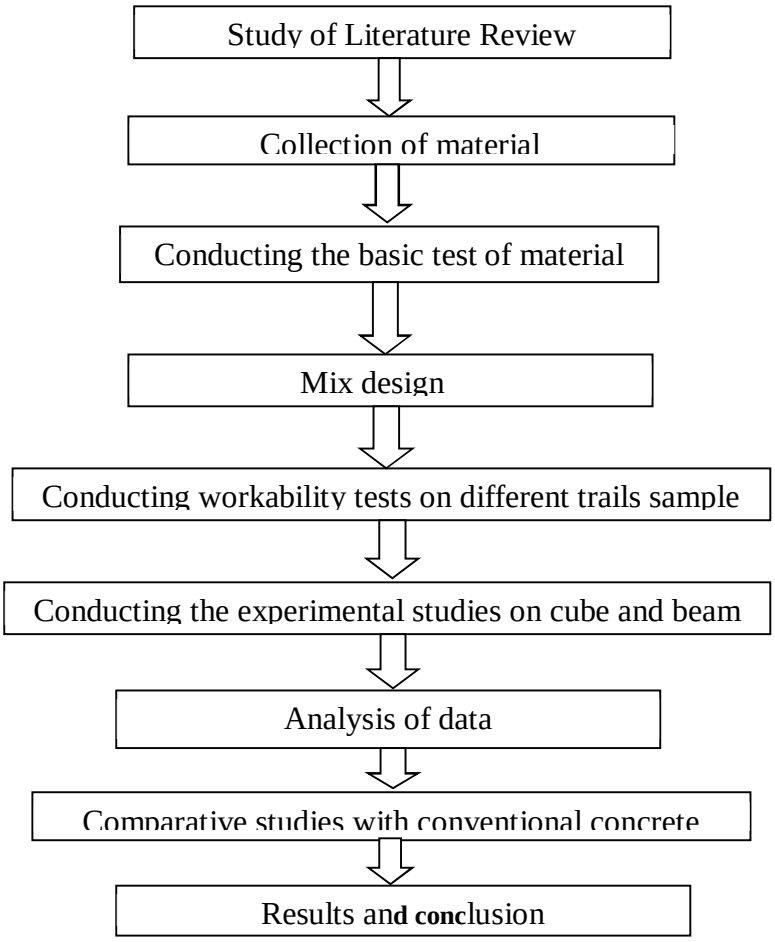

Figure 1 Methodology

III. MATERIAL USED IN CONCRETE

The materials used in the study are:

1) Portland Pozzolona cement (PPC): Shankar cements.
2) M-Sand: Clean River sand purchased from Siddeheshwar transport
3) Waste powder; procured from Jain battery Industries (Established in the year 2017, Maharashtra) which is in Ambegaon Budruk, Pune is a top company in the category battery Dealers, also known for e-vehicle, e-rickshaw Dealers
4) Water: Collected from local fresh water sources
5) Coarse aggregate: Aggregates passing through 20mm IS sieve
6) Lithium salt: Counto Micro Fine Products Private Limited Mumbai, Maharashtra.

IV. LITERATURE REVIEW

1) Linju issac et,al. This auther is express about comparison of self compacting concrete accommodate alccofine as a partial replacement of cement. The different percentage of alccofine are mixes with the hardened properties of self-compacting concrete. It is excessively economical, strength and the consideration of availability of resources to partially replacing cement with alccofine. Compressive strength mainly depends upon the percentage of alccofine based on this its high pozzolanic nature to form more dense of Calcium silicate hydrate (C S H) gel. Alccofine is easy to use and can be added directly with cement, ultrafine particle of Alccofine provide better and smooth surface finish. Improved workability and cohesiveness and reduced shrinkage- Having better particle size distribution compared to other supplementary cementatious materials, which provide a dense matrix pore structure resulting in better workability, cohesiveness and superior volume stability
2) Saurabh Gupta et al,The Author have studied that, Supplementary cementitious materials (SCM) are becoming popular in the construction industry as these materials are bringing technical revolution in the field of civil engineering. Alccofine is a new generation micro fine concrete material for high Strength Concrete which is important in respect of workability as well as strength. This can be used as a SCM due to its ultrafine size and high content of calcium oxide (Cao),Alccofine will be beneficial to concrete to achieve better structural performance. Alccofine being use as mineral admixture in a concrete mix increase the initial strength of the concrete than the ordinary concrete. It reduce the water/content ratio. Alccofine is easy to use and can be added directly with cement, ultrafine particle of Alccofine provide better and smooth surface finishing. Alccofine1203 is essential in terms of reducing heat of hydration, Low Calcium Silicate and strength at all stages whereas Alccofine 1101 can be used as a grouting purpose and High Calcium Silicate.
3) Manisha M. Magdum et al, Author wants to express that, the contribution of mineral admixture i.e.Alccofine-1203 to the mechanical properties of hybrid fiber reinforced concrete with high strength and workability is investigated. It reduces thermal, shrinkage cracks and increases strength as compared to conventional concrete. In this Experiments use M60 grade of concrete suggest that 7.5% replacement of cement with Alccofine-1203 and 1.5% hybrid fibers(80% steel fiber and 20% polypropylene fiber) resulted in best concrete compressive strength. Fiber volume fraction (VF) 1.5% by volume of concrete was added with Alcoffine-1203 contribution of 5%, 7.5% and 10% by weight of cement. Hybrid fibers contribute to increase the flexural strength while the Alccofine-1203 boosts the compressive strength of concrete. Recommended to use Alccofine-1203 in concrete as replacement for cement is possible.
4) P. Narasimha Reddy et al, Author have said that, In the manufacture of concrete cement have become dominant raw material. For the replacement of cement many works are being carried out throughout the world for finding out a suitable cementitious material. Have worked on an experimental investigation on high performance concrete with the replacement of sand by M- sand and partial replacement of cement by alccofine. Cement production is one of the major causes of environmental pollution due to the release of large amounts of carbon dioxide into the atmosphere from cement production plants. Recycling waste materials from industries and factories have less cost, technical, and also have environmental benefits. In recent years, the use of alccofine-1203 has been increasing in the development of different types of concrete because of its well particle packing of ultrafine particles and unique chemical composition.
5) M.S. Pawar et al, Author have observed that , Due to Self Compacting Concrete (SCC) it get Compacted by its self weight and also need of vibration get eliminate. The problems of unskilled labours also reduces. It help in stability during transport placement. The results of study that the use of alcofine powder for increasing the amount of fines and get self Compatibility. The observation finds on comparing the properties of SCC with Alcofine and flyash. The proportion is water, fine and course aggregate, plasticizer and Alcofine keeping cement. Cement related material is important for construction. This construction and engineering material have high demands. That's why we facing the problems like economy, productivity, quality, environment.

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V. FUTURE SCOPE OF STUDY

Overall, within the limits of the investigation reported, it may be concluded that the objective of this research have been achieved. The results obtained from the study are useful to be employed for the design of concrete-Alccofine Mix. The simplified numerical modelling also reasonably estimates the failure load and has provided safe predictions for the axially loaded Specimen. However, there are nevertheless various recommended for future research, which are outlined as follows:

1) There is a need to develop a good understanding of the fundamental behaviour associated with as concrete in tubular steel section. The concrete columns have a very complex material behaviour; thus, in-depth studies are necessary on the mechanical properties of as the constitutive model for core in concrete should represent major load-deformation mechanisms,
2) In these study concrete cube has been studied under axial compression.
3) Concrete cube under lateral cyclic loading also can be studied
4) Concrete cubes stress and strain analysis also can be studied
5) If Possible Software modelling of concrete columns can also be studied.

VI. CONCLUSION

1) Alccofine modified concrete was developed focusing on the workability, strength development and durability. This study showed the effect of Alccofine modification in mechanical property of Alccofine modified concrete. The main variables were Alccofine content 5% to 20%. The conclusions are as follows.
2) Alccofine addition allows w/c ratio to fall by 0.05 to 0.15 without affecting the workability in all cases studied. It is expected that such fall in w/c ratio should increase strength more appreciably in the lower w/c ratio than higher w/c ratio. But it is observed that concrete in the lower w/c ratio has reducing effect of Alccofine addition on compressive strength that the corresponding reduction in w/c ratio cannot compensate this effect.
3) The reducing effect of Alccofine addition on compressive strength of Alccofine modified concrete could be attributed to incorporation of soft rubbery material in the matrix. Maximum reduction of compressive strength 22.87% at 28 days was observed at 15% Alccofine addition in15% Mix
4) Flexural strength increased with the increase of polymer binder ratio. Maximum increase of flexural strength was 21 at 15% Alccofine addition for Mix at the age of 28 days. Flexural strength increased with the increase of polymer binder ratio.
5) Elastic modulus decreased over unmodified concrete tendency is in agreement with increased deformability of Alccofine modified concrete over unmodified concrete. The elastic modulus reduces by 20% Mix
6) Because of the water reducing effect of styrene butadiene Alccofine the porosity and effective chloride ion decreases Improved durability property of in respect of resistance to chloride ion resistance is due to Alccofine film interpenetrating into hydrated cement gel.
7) The good results will be founded by the substitution of Mix i.e. 10%, 15%.
8) To find the force of concrete, the concrete evaluated for the test of compression force of high strength concrete in which the replacement of material Alccofine and Concrete testing 7days, 28days.
9) In every trail mix of our concrete mix will be tested by compressive, flexural Test.
10) The Compressive Strength increases with the use of Alccofine material. The maximum strength achieved in concrete having 15% Alccofine, i.e., Mix 3.the strength increased 2.3% as compare to CC.
11) The Flexural-Strength(force) also shows the enhancing in concrete strength with the presence of Alccofine, The maximum strength achieved in concrete having 15% Mix, i.e., Mix4.the strength increased 1.6% as compare with the normal concrete.
12) Hence for an above experimental research has concluded that concrete with Alccofine 15% partial replacement gives an optimum good result of forces and also helps in the strength & durability improvement properties of high strength concrete.

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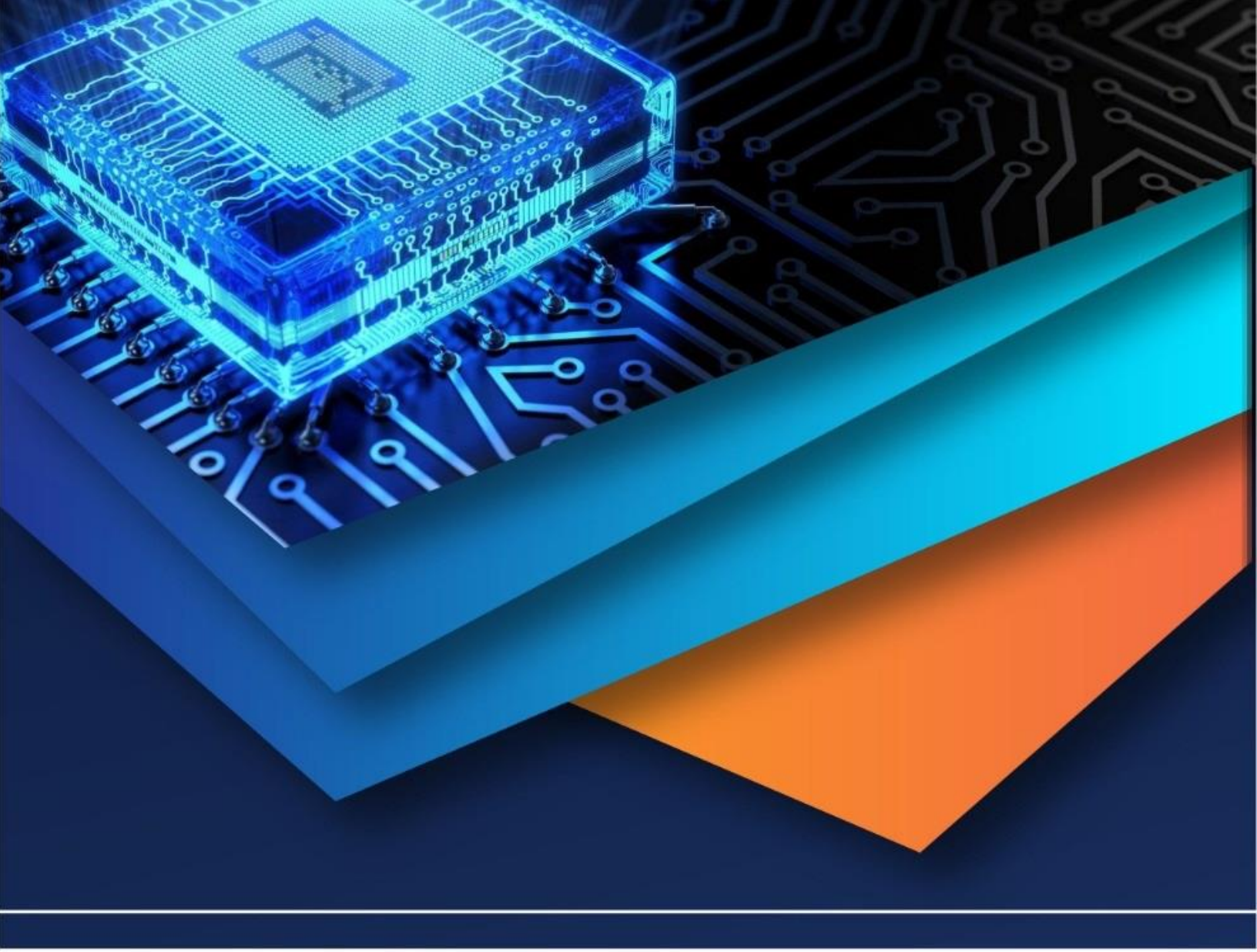

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