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A Review on Utilization of Brick Dust and Alccofine on a Fly Ash Based Self Compacting Concrete

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Abstract
In areas where compaction and placing are difficult self compacting concrete is a well substitute than conventional concrete. In fresh state, it fill up the voids spaces and passes through any obstruction by its own weight and does not need outside vibration. On the other hand, in hardened state, self compacting concrete shows homogeneity, reliable and has better engineering properties than conventional concrete. So proper selection and proportion of constituents can attain economical production of self compacting concrete. Alccofine is a new generation, micro fine material whose particle size is greatly finer than other hydraulic materials like cement, fly ash, silica fume etc. Alccofine in place of cement shall be very economical, help in the utility of industrial wastes and in maintaining the ecological balance thus reducing the consumption of cement. Likewise, brick dust is the powder from brick klin which is available in tones. The work is aimed at the utilization of Brick dust which indirectly facilitates waste reduction, maintaining the ecological balance and thus reduces the consumption of fine aggregates.
Keywords: *Self compacting concrete, Alccofine, Brick dust, Fly ash*

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I. INTRODUCTION

Self compacting concrete is an advanced type of concrete that can flow through congested geometrical configurations under its own weight without vibration or segregation. It is skillfully accepted that self compacting concrete increases the construction productivity, work protection and hardened state properties. It necessity of this type of concrete was proposed by Okamura in 1986.

However the material price for self compacting concrete is overpriced than conventionally placed concrete. So proper selection and proportion of constituents can attain inexpensive production of self compacting concrete. Supplementary cementitious materials (SCM) are finely crushed solid materials that are used to replace apportion of the cement in a concrete mixture. These supplementary materials may be man made waste type or naturally take place. Hence, the supplementary cementitious particles which can completely or fully replace the fine aggregate and cement without affecting the property of self compacting concrete would be desirable.

Alccofine is ultrafine size particle and which reduces heat of hydration and increases strength at all stages. It has unique characteristics to enhance performance of concrete in both fresh as well as hardened state due to its optimized particle size distribution. It can be added directly with cement and easy to handle and also provides smooth surface finish. The most important advantages of alccofine is its strength, greater penetration, high rate of setting. In the present day the scarcity of river sand and increasing cost of M-sand are causing an hindrance in construction activity. In this situation, utilization other materials as replacement for fine aggregate is essential. Brick dust is a waste product acquired from different brick kilns and tile factories. There is numerous brick kiln which have grown over the decades in an unplanned way in different part of the country. Brick dust are profusely available in Kerala. More over use of brick dust as aggregate gives a solution to the problems come across with the quarrying of natural aggregate. The use of brick dust as a natural aggregate substitute in concrete is a comparatively recent concept. One of the first significant reviews on the use of brick dust in concrete focused on the advantages and financial benefits of such use, besides their physical and mechanical properties.

II. LITERATURE REVIEW

In recent years, many studies were conducted by various researchers on environmental friendly concrete materials. Brick dust and alccofine are two such materials that can be used in the construction industry. The aim which is expected from the paper is to study the properties of concrete with brick dust and alccofine to make strong and durable low cost and eco-friendly concrete.

George Mathew et al. [1], has conducted study about mix design methodology for laterized self compacting concrete and its behaviour at elevated temperature. Its gives a simple mix design procedure proposed for medium strength (M20 to M40) laterized self compacting concrete. Itis said that self compactibility can be largely affected by the characteristics of materials and the mix proportion .Trial mixes have been made for strength ranging from M20 TO M40 using the materials collected. Based on the observations made such as filling ability, stability , and strength properties , a mix design methodology is arrived for LSCC. In general, the fly ash content in SCC ranges from 8% to 60% of the total powder content and is one of the important ingredients in SCC to ensure proper flow characteristics. For the proposed mix design methodology of LSCC, the total powder content comesin the range of 670kg to 812kg with fly ash content varying from 46% to 50%.The properties of self compacting concrete is assessed by the flow ability and flow rate of LSCC in the absence of any obstruction were assessed by slump flow and T500 time tests, the viscosity and filling ability were measured using V-funnel and L-box tests respectively. In this project they arrived at certain conclusions which includes a simple mix design procedure for medium strength (M20-M40).

Mini K.M et al [2], study of self-compacting concrete (SCC) denotes a field of exploration that shows a strong possibility of development due to its specific properties. The cost related with the utilization of vast volumes of concrete and synthetic admixtures is one of the significant disadvantages of SCC which can be redressed by the utilization of supplementary cementitious materials (SCM). Experimental investigation on the fresh and mechanical properties of SCC replacing cement with SCM such as silica fume and ultra-fine GGBS in 0%, 5%, 10% and 15% individually is carried out in this paper. SCC mix was obtained by fixing the water binder ratio and changing super plasticizer dosage with respect to total cementitious content. Incorporation of silica fume in 10% gave the best result in mechanical properties than any other combination with or without SCM.

Mathur A et al. [3], studied about the performance of concrete with Alccofine 1203. They stated that the addition of Alccofine 1203 in OPC will initially increase a slump by 10% when compared to M20 grade concrete mix. The optimum value of alccofine found was 10%. The compressive strength at 10% replacement of cement with alccofine in M20 grade concrete is 41.11N/mm², which is greater than the target compressive strength of M30 grade concrete. From this it is proved that the addition of Alccofine will increase the strength properties of concrete.

Anto J., et.al. [4], investigated the properties of self compacting concrete with Micro Steel Fibers and Alccofine. In this study, properties of a normal SCC M30 mix was evaluated and then mixes with 5%, 10%, and 15% replacement of cement with Alccofine was prepared and optimum percentage was determined by studying the fresh and mechanical properties in comparison with Normal SCC mix. Optimum percentage was 10%. By studying the compressive strength of different mixes it was observed that all SCC with both Alccofine and Micro steel fibre gave high strength than normal SCC mix. When comparing the Split tensile strength, SCC with Alccofine and Micro steel fibre gave highest result. Flexural strength also gave satisfactory results.

Kala T.F et al. [5], study concluded that alccofine and GGBS combination can be used in the SCC as a strength enhancer. SCC after the addition of alccofine, produces a high performance and high strength concrete. In the experimental study of SCC, alccofine were added at 5%, 10%, 15% and 20% by volume and GGBS at 30% by weight, and the strength properties were investigated. The outcome implies that the workability of SCC with 5% and 10% alccofine by volume of concrete leads to decline of other rheological properties given by codal provisions (EFNARC). In contrast, it results in the improvement of certain properties of concrete like compressive strength from 36.6 to 42.9 N/mm^2 , splitting tensile strength from 3.8 to 7.9 N/mm^2 and flexural strength from 4.9 to 8.3 N/mm^2 at 28 days, with increase in alccofine dosage. It is observed that maximum strength for alccofine and GGBS incorporated SCC was obtained at 10% and 30% replacement. The conclusion has been drawn that alccofine and GGBS combination can be used in the SCC as the strength enhance

T K Lohani et al. [6], In this experimental work, attempt has been made to substitute natural sand (Fine Aggregate) by a mixture of brick kiln dust and marble powder (0%, 25%, 50%) to produce M30 grade of concrete with adding proper dosage of Super Plasticizer. Good hardened properties were achieved for the concretes with 25% marble powder which can be considered as the optimum content for high compressive strength. The hardened properties of the SCCs were improved at 28 days due to greater hydration of cement Brick dust and marble powder.

Piyush et al. [7], Mechanical properties of self-compacting concrete with and without using fly ash and brick dust as fine aggregate replacement. The criteria used will be based on 7days, 28-day and 56 days compressive, splitting tensile and flexure strength and of conventional and self compacting concrete for five Fly

ash & Brick dust ratios as a replacement to fine aggregate. The systematic experimental approach showed that partial replacement of cement with mineral admixture could produce self compacting concrete with low segregation.

Javaid iqba et al. [8], investigated the effect of Mechanical properties of hardened concrete will be carried out on Brick kiln dust concrete and fly ash concrete. The percentage of bricks kiln dust that partially and fully replaced the fine aggregates by weights were 0%, 5%, 8%, 10% and 12% and for fly ash the percentage for partially and fully replacement of fine aggregate by weights were 0%, 5%, 8%, 10% and 12%. The compressive strength increased with an Increase in the percentage of the Fly ash & Brick dust. An increase of about 37% strength at 7 days, 15% strength at 28 days and 8% at 56 days was observed with the increase of Fly ash & Brick dust content from 5% to 20%

Manpreet Singh et al.[9], Compare the mechanical properties of self compacting and normal concrete specimens. Based on 7, 28 and 56 days compressive, splitting tensile and flexure strength and of conventional and self-compacting concrete for five Fly ash & Brick dust ratios as a replacement to fine aggregate. SCC has achieved a density between 2400 and 2500 kg/m3, which was greater than that of normal concrete, 2370-2321 kg/m^3. Splitting tensile, flexural strength and compressive strengths are higher than those of normal vibrated concrete.

III. CONCLUSION

By the extensive evaluation of the above literature review, this paper identifies effect of brick dust and alccofine on the properties of self compacting concrete. From the literature review, it is clear that the optimum percentage of alccofine obtained as 10%. Alccofine can be a very good replacement for cement with respect to economy, strength and the considerations of availability of resources. Addition of alccofine improves workability, filling ability, passing ability, flow ability. Addition of optimum percentage of alccofine increases compressive strength, splitting tensile strength and flexural strength. Alccofine also helps to decrease segregation and bleeding due to its optimized particle size. Brick dust is a good product which increases the strength of concrete. Also helps in the reduction of usage of natural resources, disposal of wastes, prevention of environmental pollution, and also saves energy. Brick dust acts as filler and fulfilled the performance criteria for fresh properties. Its helps to increase strength parameters of self compacting concrte.

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