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A REVIEW ON BEHAVIOUR OF SELF COMPACTING CONCRETE USING GLASS FIBRE AND CERAMIC TILES WASTE

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Abstract — *The use of agro-industrial waste materials in concrete is common solution for waste disposal as well as economy purpose .Various research studies have been conducted on the use of agro-industrial waste as an innovative material to produce good quality of concrete whether it is plain concrete or self compacting concrete. The present paper explores the recent innovations in self compacting concrete containing ceramic tile waste. SCC is a special type of highly flowable concrete that does not require vibration for placing and compaction. Innovative materials are generally used for partial replacement of cement or sand or aggregate or combination of two or more. They may be used as additional filler to enhance the physical and mechanical properties of the SCC. The goal that expected from the paper is to compile the use of ceramic tile waste in SCC, study their effect on the properties of SCC.*

Keywords- *Self Compacting Concrete(SCC), Admixtures, Ceramic Tile Waste, Super-plasticizers, Viscosity modifying Agent(VMA), Compressive Strength, Split Tensile Strength*

I. INTRODUCTION

Development of self-compacting concrete (SCC) is a desirable achievement in the construction industry in order to overcome problems associated with cast-in-place concrete. Self-compacting concrete is not affected by the skills of workers, the shape and amount of reinforcing bars or the arrangement of a structure and, due to its high-fluidity and resistance to segregation it can be pumped longer distances (Bartos, 2000). The concept of self-compacting concrete was proposed in 1986 by professor Hajime Okamura (1997), but the prototype was first developed in 1988 in Japan, by professor Ozawa (1989) at the University of Tokyo. Self-compacting concrete was developed at that time to improve the durability of concrete structures. Since then, various investigations have been carried out and SCC has been used in practical structures in Japan, mainly by large construction companies. Investigations for establishing a rational mix-design method and self-compactability testing methods have been carried out from the viewpoint of making it a standard concrete. Self-compacting concrete is cast so that no additional inner or outer vibration is necessary for the compaction. It flows like "honey" and has a very smooth surface level after placing. With regard to its composition, self-compacting concrete consists of the same components as conventionally vibrated concrete, which are cement, aggregates, and water, with the addition of chemical and mineral admixtures in different proportions. Usually, the chemical admixtures used are high-range water reducers (super plasticizers) and viscosity-modifying agents, which change the rheological properties of concrete. Mineral admixtures are used as an extra fine material, besides cement, and in some cases, they replace cement. In this study, the cement content was partially replaced with mineral admixtures, e.g. fly ash, slag cement, and silica fume, admixtures that improve the flowing and strengthening characteristics of the concrete.

Concrete is a vital ingredient in infrastructure development with its versatile and extensive applications. It is the most widely used construction material because of its mouldability into any required structural form and shape due to its fluid behaviour at early ages. However, there is a limit to the fluid behaviour of normal fresh concrete. Thorough compaction, using vibration, is normally essential for achieving the required strength and durability of concrete. Inadequate compaction of concrete results in large number of voids, affecting performance and long-term durability of structures. Self compacting concrete (SCC) provides a solution to these problems. As the use of concrete becomes more widespread the specifications of concrete like durability, quality, and compactness of concrete becomes more important.

Self -Compacting Concrete is recently developed concept in which the ingredients of the concrete mix are proportioned in such a way that it can flow under its own weight to completely fill the formwork and passes through the congested reinforcement without segregation and self consolidate without any mechanical vibration. Self – Compacting Concrete (SCC) is a very fluid concreter and a homogeneous mixture that solves most of the problems related to ordinary concrete. This specification helps the execution of construction components under high compression of reinforcement.
SCC can be a good alternative to ordinary concrete placed in situ or for pre-cast production. The early strength gain of SCC which is due to the Superplasticizer, guarantees the quick removal of forms for multiple uses.
In contrast to ordinary concrete, SCC for the full frame, or a large part of the structure, can be cast in one pour through an appropriate timber or steel mould sealed and bolted, instead of the beams and column being shuttered independently where joints are usually developed which weak the structure.

Because of these advantages and maybe others, literature showed that SCC is gradually replacing much conventional concrete. However, the higher the initial cost of SCC concrete over conventional concrete has hindered its wider

application to the general construction. So that the cost needs to be reduced to an acceptable limit; the key factor is to produce SCC concrete, having similar properties, with alternative low-cost materials.

II. LITERATURE REVIEW

A. Experimental Methods on Glass Fiber Reinforced Self Compaction Concrete; *JOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE)* ISSN: 2278 – 1684, Volume-11, Issue-2, April 2014

A. Deepak Raj, M. Mergin Benize, J. Esther Daisy, M. Sri Nikhil; In this study, the investigation of workability and mechanical properties of plain SCC and GFRSCC. The laboratory testing included slump flow test, L-Box test, sieve segregation resistance test, density test, ultrasonic pulse velocity (UPV) test, compressive strength test, splitting tensile strength test, and flexural strength test. The dosage of super plasticizer required increased as fibre content increased. From the study they concluded that the addition of S-glass fibres does not affect the filling ability, passing ability and segregation resistance of the SCC. They conducted the workability test on 12 trial mixes of GFRSCC by varying the length of the glass and the amount of glass fibres added to the mix. They also observed that the flow ability of GFRSCC is directly proportional to its length and quantity added (i.e.) the result comes under the range of recommended values when the quantity and length of the glass fibre added is maximum. 1% of Glass fibre in all sizes (1.2 mm, ,1.8 mm, and 2.4 mm) is more flow able than 0.25% of glass fibre in all sizes. They noticed that the 1% of 2.4 mm size glass fibre results were well within the ranges of the recommended values by EFNARC.

B. Properties of Normal Concrete, Self compacting concrete and Glass fibre reinforced concrete: An Experiemental Study, ScienceDirect, Procedia Engineering 173 (2017) 807 - 813

Subhan Ahmad, Arshad Umar, Amjad Masood; They studied that The hardened properties of normal concrete and self compacting concrete were compared. Also influence of glass fibres on fresh and hardened properties of SCC was investigated. Three concrete mixtures(normal concrete, SCC and SCC with glass fibre) were prepared with water ratio of 0.35. It was found that addition of glass fibres slightly reduced the workability properties of SCC. Compressive strength and splitting tensile strength of SCC were found slightly higher than normal concrete. They also noticed that modulus of rupture and modulus of elasticity of SCC was lower than normal concrete. Addition of glass fibres in SCC had limited effect on compressive strength and modulus of elasticity but increased modulus of rupture and splitting tensile strength significantly.

C. Characterization of ceramic waste aggregate concrete, HBRC Journal (2016)

Paul O. Awoyera, Julius M. Ndambuki, Joseph O. Akinmusuru, David O. Omole; The purpose of study to focus on the mechanical characterization of waste ceramic wall and floor tiles aggregate concrete. Ceramic wastes sourced from construction and demolition wastes were separated from other debris and crushed using a quarry metal hammer. Ceramic tiles were sieved into fine and coarse aggregates in line with standards.

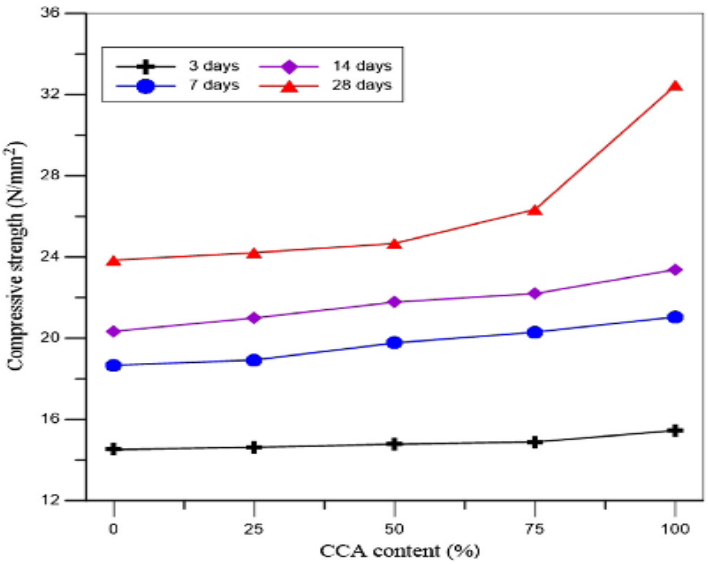

Figure:1 - Compressive Strength development for ceramic coarse aggregate replacements

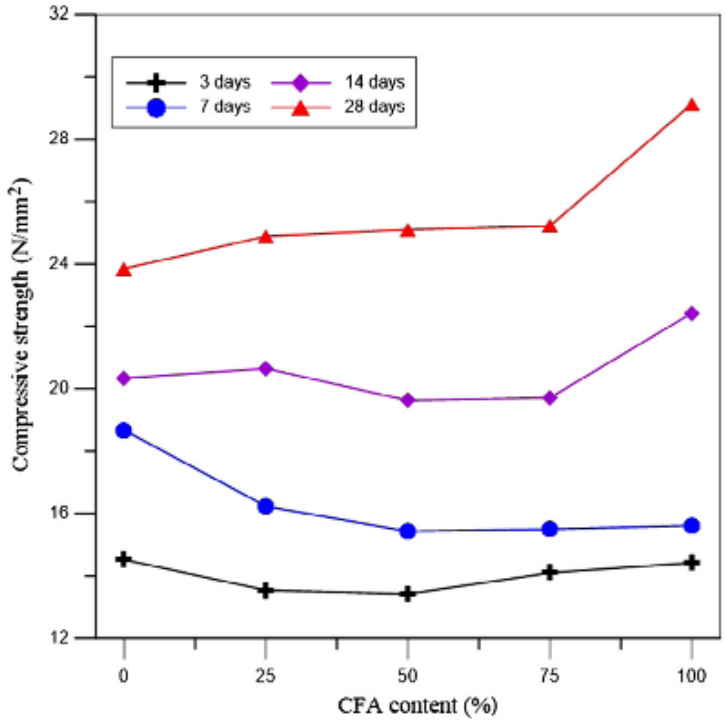

Figure 2: - Compressive Strength development for ceramic fine Aggregate replacements

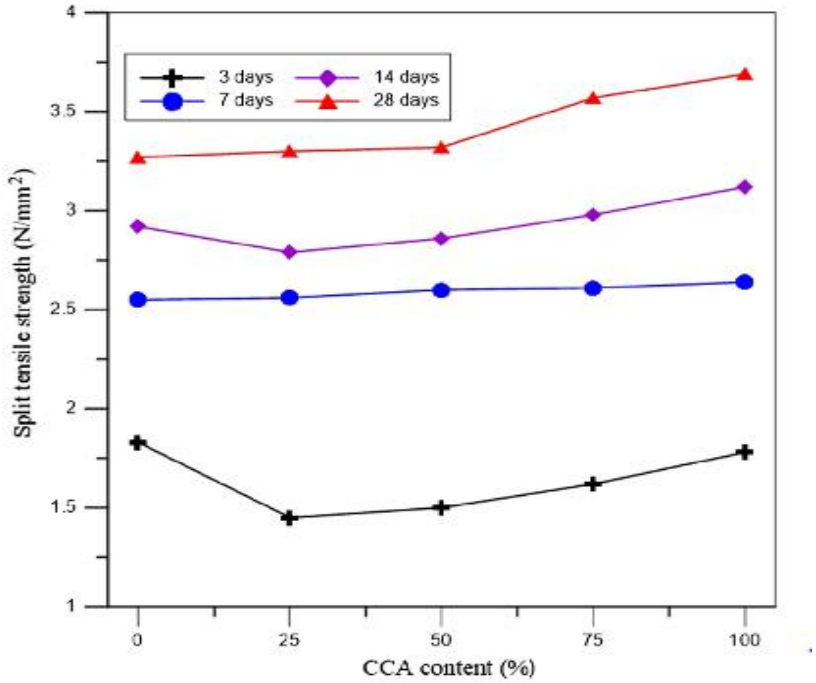

Figure 3: - Split Tensile Strength development for ceramic coarse aggregate replacements

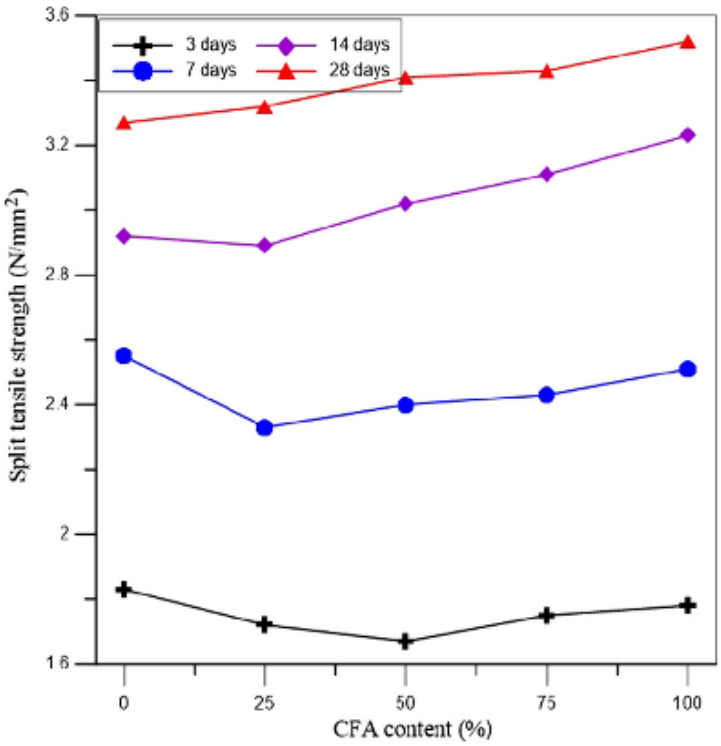

Figure 4: - Split Tensile Strength development for ceramic fine aggregate replacements

From this results they Concluded that concrete made with CWA as a replacement for part of the natural aggregates can be considered a suitable alternative for normal concrete. In fact, where strength is concerned, it is even more suitable than conventional concrete

D. A Review: Recent Innovations in Self Compacting Concrete, International Journal of Scientific & Engineering Research, ISSN 2229-5518, Volume 4, Issue 11, November-2013

Batham Geeta, Bhadauria S. S., Akhtar Saleem: In this study, They explores that the recent innovations in self compacting concrete containing agro-industrial waste materials. They also reviewed latest application of admixtures and their performance on SCC quality. Application of various innovative materials as ingredients in SCC and their effect on the fresh and hardened properties were discussed. They may be used as additional filler to enhance the physical and mechanical properties of the SCC. The goal that expected from the paper was to compare the recent innovations in SCC, study their effect on the properties of SCC and establish an international benchmarking for further research work in this regard. They concluded that the use of various agro-industrial wastes in SCC had positive effect on fresh and hardened properties. It is possible to produce medium strength, high strength and even ultra high strength good quality of SCC using the wastes.

III. CONCLUSION

1) From the above literature we conclude that SCC using Ceramic tile waste and their effect on fresh and hardened properties have been reviewed. In summary the use of Ceramic tile waste in SCC has positive effect on fresh and hardened properties. It is possible to produce medium strength, high strength and even ultra high strength good quality of SCC using the waste.
2) Concrete made with ceramic coarse aggregate as a replacement for part of the natural aggregates can be considered a suitable alternative for concrete.
3) The addition of glass fibers does not affect the filling ability, passing ability and segregation resistance of the SCC
4) Compressive strength and split tensile strength is increased due to partial replacement of ceramic tile waste with coarse aggregate.

REFRENCES

[1] Deepak Raj, M.Mergin Benize, “Experimental Methods on Glass Fiber Reinforced Self Compaction Concrete” IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 11, Issue 2 Ver. IV (Mar- Apr. 2014), PP 19-23
[2] S.R. Vaniya,K.B.Parikh, “A Study on Properties of Self-Compacting Concrete with manufactured Sand as Fine Aggregate: A Critical Review” IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 13, Issue 1 Ver. V(Jan. - Feb. 2016), PP 01-07

[3] K.C panda, P.K.Bal, "Properties of self compacting concrete using recycled coarse aggregate" sciVerse ScienceDirect Procedia Engineering 51 (2013) 159 – 164
[4] Subhan Ahmad, Arshad Umar "Properties of normal concrete, self compacting concrete and glass fiber reinforced self compacting concrete : An Experimental study", sciVerse ScienceDirect Procedia Engineering 173 (2017) 807 – 813
[5] Batham Geeta, Bhadauria "A Review: Recent Innovations in Self Compacting Concrete",, International Journal of Scientific & Engineering Research, Volume 4, Issue 11, November-2013 ISSN 2229-551
[6] Paul O. Awoyera, Julius M. Ndambuki, Joseph O. Akinmusuru "Characterization of ceramic waste aggregate concrete" HBRC Journal
[7] Barluenga G, Hernandez-Olivares F (2007) „Cracking Control of Concretes Modified with Short Ar-Glass Fibers at Early Age. Experimental results on standard concrete and scc", Vol .37, pp 1624–1638.
[8] F. Pacheco-Torgal, S. Jalali, Reusing ceramic wastes in concrete, Constr. Build. Mater. 24 (2010) 832–838.
[9] O. Zimbili, W. Salim, M. Ndambuki, A review on the usage of ceramic wastes in concrete production, Int. J. Civ. Arch. Struct. Constr. Eng. 8 (2014) 91–95.
[10] A. Juan, C. Medina, M. Ignacio Guerra, J. M. Morán, P. J. Aguado, M. I. Sánchez de Rojas M. Frías and O. Rodríguez, "Re-Use of Ceramic Wastes in Construction," In: Wunderlich, W. (ed.) Ceramic Materials. Rijeka, Croatia: Sciyo, 2012, pp. 197-211.

