Review On Powder Type Self Compacting Concrete Or Infrastructure

[1]Mr. Tushar Harihar Sonawane, [2]Prof. Sachin U. Pagar

[1]PG Student, [2]Assistant Professor, Civil Engineering Department, L. G. N. Sapkal college of Engineering, Nashik, MH, India.

Abstract:

This review aims to study Self compacting concrete for infrastructure purpose. A Self compacting concrete is an innovative concrete that does not require vibration for placing and compaction. It is considered as 'Most revolutionary development in concrete construction for several decades' This concrete is able to flow under its own weight, completely filling of formwork and *achieving full compaction even in the presence of congested reinforcement. The uses of SCC in the construction of rigid pavements are now seen in major areas. The fly ash added in appropriate quantity as replacement. The addition of fly ash imparts properties. Current problems associated with on site concrete manufacturing, specific properties, compaction equipments and vibration machineries and their costings is a big concern. Properties like heat of hydration, Flexural Strength are considered. Considering infrastructure projects with large variation and huge demand now a day, efforts are made to succeed in creating durable and reliable structures with less maintenance so that SCC will change from Special to standard concrete.*

Key Words – Self Compacting Concrete, SCC, Fly Ash, heat of hydration, flexural strength, Special Concrete

I. General Introduction

Self-compacting concrete is defined as a concrete which is capable of self-consolidating without any external efforts like vibration, floating, poking etc. under its own weight. The mix is therefore required to have ability of passing, ability of filling and ability of being stable. SCC is been already used in precast industry and in some commercial constructions. Compared to conventional concrete SCC can be economical for large concreting works with high materials cost but less operational cost. Large no. of research papers have been published till date related to Self Compacting concrete. Researchers used different mixes for analysis but very few researchers went for high powder content. Imparting cementacious substances like Fly ash can enhance the properties of SCC which can overcome problems associated with infrastructure works.

II. LITERATURE REVIEW

BertilPersson et al 2000 [2], This is an experimental and numerical study on mechanical properties, such as strength, elastic modulus, creep and shrinkage, of self-compacting concrete (SCC) and the corresponding properties of normal compacting concrete (NC) is outlined in this article. The study included eight mix proportions of sealed or air-cured specimens with water ± binder ratio (w/b) varying between 0.24 and 0.80. Half of the mixes studied were based on NC. The age at loading of the concretes in the creep studies varied between 2 and 90 days. Four different stresses to strength levels were studied. Parallel studies were performed on strength (fc) and relative humidity (RH). The results show that elastic modulus, creep and shrinkage of SCC did not differ significantly from the corresponding properties of NC. The ongoing study was started in 1997.

D. SaradhiBabu et al (2004) [3] showed that Lightweight concretes can be produced by replacing the normal aggregates in concrete or mortar either partially or fully, depending upon the requirements of density and strength levels. The present study covers the use of expanded polystyrene (EPS) beads as lightweight aggregate, both in concrete and mortar. The main aim of this programme is to study the mechanical properties of EPS concretes containing fly ash and compare the results with these in literature on concretes containing OPC alone as the binder. The effects of EPS aggregate on the green and hardened state characteristics of concretes containing fly ash were evaluated. The compressive strength of the EPS concretes containing fly ash show a continuous gain even up to 90 days, unlike that reported for OPC in literature. It was also found that the failure of these concretes both in compression and split tension was gradual as was observed earlier for the concretes containing plastic shredded aggregates. The stress–strain relations and the corresponding elastic modulus were also investigated.

J.M. Khatib et al 2007 [4], the influence of including fly ash (FA) on the properties of self-compacting concrete (SCC) is investigated. Portland cement (PC) was partially replaced with 0–80% FA. The water to binder ratio was maintained at 0.36 for all mixes. Properties included workability, compressive strength, ultrasonic pulse velocity (V), absorption and shrinkage. The results indicate that high volume FA can be used in SCC to produce high strength and low shrinkage. Replacing 40% of PC with FA resulted in strength of more than 65 N/mm2at 56 days. High absorption values are obtained with increasing amount of F.A., however, all FA concrete exhibits absorption of less than 2%. There is a systematic reduction in shrinkage as the FA content increases and at 80% FA content, the shrinkage at 56 days reduced by two third compared with the control. A linear relationship exists between the 56 day shrinkage and FA content. Increasing the admixture content beyond a certain level leads to a reduction in strength and increase in absorption. The correlation between strength and absorption indicates that there is sharp decrease in strength as absorption increases from 1 to 2%. After 2% absorption, the strength reduces at a much slower rate.

C.M. Tam et al 2011 [5], focused on RPC. Reactive powder concrete (RPC) is coarse aggregate-free which differs from that of the ordinary concrete. Instead, fine powders such as quartz sand and crushed quartz, with particle sizes ranging from 45 to 600 lm are used. In fact, it is rather a mortar than a concrete mixture because of the lack of coarse aggregate. The mechanical property performance of RPC has been investigated by the previous researchers. However, the performance on drying shrinkage and water permeability is of paucity in the literatures. This paper examines the influences of water-to-binder ratio and Superplasticizer dosage on the drying shrinkage and water permeability of RPC. Recommendations for reducing drying shrinkage and water permeability of RPC are also discussed.

Lino Maia et al (2012) [6] **,**The age of loading and the stress level are important parameters in the precast/pre-stress industry as they are related to the time of each production cycle, as well as to the concrete deformation. For this reason, a study about the influence of the age of loading and the stress level on the deformation of a self-compacting concrete with a mix composition typically used in the prefabrication of pre-stressed bridge girders was performed. This concrete develops 60 MPa within 24 h. Its deformation was evaluated at the stress-to strength ratio of 30% for six stages of loading at the ages of 12, 16, 20, 24, 48 and 72 h. At the age of12 and 24 h, deformation was also evaluated at the stress-to-strength ratios of 20% and 40%. Loaded specimens were kept under constant stress during at least 600 days in a climatic chamber with a temperature and a relative humidity of 20 _C and 50%, respectively. Deformation in non-loaded specimens was also measured to determine shrinkage and calculate creep deformation. Results are compared with the predictions provided by the Eurocode 2.

AntoniosKanellopoulos et al 2012 [7] although self-compacting concrete (SCC) is currently used in many countries, there is a fundamental lack of the intrinsic durability of the material itself. This article presents the outcomes from a research program on principal indicators that define the durability of SCC (porosity and chloride ion permeability)and compares these indicators with the corresponding parameters of conventional concrete. The results show, for the first time, that there is a correlation between the various durability indicators for the specific filler additives used in the mix designs incorporated in this paper. Such a correlation maybe used to assess the durability of SCC without the need to rely on time consuming artificial weathering experimental procedures.

PetrHunka et al (2013) [10]**,**This article is summarizing technological and test influences on modulus of elasticity of concrete and presents in more detail results of experimental measuring of following test influences: shape and dimension of test piece, method of finishing of pressing surface, level of load. Not just its durability but also deformative characteristics of concrete have been coming to fore of experts' interest during last few years. One of deformable characteristics of each concrete type is modulus of elasticity of concrete. Modulus of elasticity is part of many static calculations and has close relation to other physical and mechanical characteristics of concrete as are creeping, shrinking, frost resistance etc. Final value of modulus of elasticity of concrete depends on many influences. These influences can be basically classified as test influences and technological influences.

Her-Yung Wang et al (2013) [11]**,** This study examined the properties of freshly poured self-compacting concrete with a fixed water–cement ratio of 0.37 in which a portion of the cement was replaced by furnace slag in weight ratios of 0%, 15% and 30%. The fresh and various engineering properties are discussed. The results showed that the slump flow varied with the replacement ratio of furnace slag for Portland cement. The slump flow for the 15% furnace slag sample was within the design value of 550–700 mm. The compressive strength of the 15% furnace slag replacement sample was higher than that of the control group. The shrinkage increased as the amount of slag added increased. The cores were drilled from upper, middle and lower layers of the field MOCK-UP model specimen, and the appearance was noted. It was obvious that the SCHSC specimen had no bleeding pores or aggregate segregation. When concrete containing furnace slag is used in self-compacting concrete structures, the fresh and engineering properties can be improved, and the waste resource can be reused. The results of laboratory test are comparable with mock-up tests.

Abhijeet A. Ulagadde et al (2013) [12]**,** in this experimental work, SCC of M60 grade is tried to be developed by using Nan Su method of mix design and by incorporating different mineral admixtures of FA, SF and GGBFS with appropriate dosage of Superplasticizer (SP) at different replacement levels of FA and GGBFS at 15%, 20% and 25% and SF at 5%, 10% and 15% (by weight of cement) in the form of quaternary blends to study workability and 28 days compressive strength properties. 45% of total replacement (i.e. FA15%, SF15% & GGBFS15%) gave good results for both fresh and hardened properties.

BathamGeeta et al (2013) [13]**,** Present paper explores the recent innovations in self-compacting concrete containing agro-industrial waste materials. 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 use of agro-industrial waste materials in concrete is common solution for waste disposal as well as economy purpose. The paper 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 are discussed here. 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 recent innovations in SCC, study their effect on the properties of SCC and establish an international benchmarking for further research work in this regard.

Dhruvkumar H. Patel et al [14] Suggests concrete is a family of binding material, fine aggregate, coarse aggregate and water. Concrete is normally used in the frame structure. But there is some limitation like self compaction, surface finishes, maintains strength at congested area. Due to this limitation we are trying to make self- compacting concrete with the use of mineral admixture. SCC is concrete that can be placed and compacted under its own weight without any vibration effort, assuring complete filling of formwork even when access is hindered by narrow gaps between reinforcement bars. The primary objective of this study is to make use of Ground granulated blast furnace slag (GGBS) as a replacement of cement and understand its effects on the fresh properties, compressive strength weathering. The study also intended to quantify the amount of Ground granulated

blast furnace slag (GGBS) to be added to the concrete according to the value of concrete properties Measured. The workability of self-compacted concrete is increased as content of GGBS increased. Compressive strength of SCC with GGBS is increased up to 10% replacement of cement with GGBS.
Subhan Ahmad[1], Arshad Umar[2,] Amjad Masood[3] (2016) [15], their research comprises of comparison between hardened properties of normal concrete (NC) and Self compacting concrete (SCC) and experimental study on influence of glass fibres on fresh and hardened properties of SCC is investigated. They suggest that the compressive strength and split tensile strength of SCC were found to be slightly higher than NC.

Thus, above literature shows large no. of research papers have been published till date related to Self Compacting concrete. Researchers used different mixes for analysis but very few researchers went for high powder content. Considering few limitations we can surely use some technical advancements and use this type of self compacting concrete for mass concrete work as well. Hence, it is important that researchers need to think for use of Powder type Self compacting concrete in infrastructure works, especially more than 550 kg/m².

III. CONCLUDING REMARKS

From the literature review, we can say that as compared to traditional concrete SCC have improved properties. Compressive strength of SCC with GGBS, fly ash or other filling materials can be increased. These properties of concrete at hardened state are important considering infrastructure projects. Hence, rather than traditional concrete SCC can be used to achieve economy in structures where no special load conditions are susceptible with large variation and huge demand. Now a day, efforts are made to succeed in creating durable and reliable structures with less maintenance so that SCC will change from Special to standard concrete.

REFERENCES

Lars – GoranTviksta, task 8.4 quality control, guide lines, Brite-Eu Ram project No.Be96-3801/contract BRPR-CT96-0366, Non-confidential information, 2000

BertilPersson et al*'A Comparison between Mechanical Properties of Self-Compacting Concrete and The Corresponding Properties Of Normal Concrete'* Cement and Concrete Research 31 (2001) 193±198 4 December 2000

D. SaradhiBabu et al 'Properties of Lightweight Expanded Polystyrene Aggregate Concretes Containing Fly Ash' Cement and Concrete Research 35 (2005) 1218–122323 January 2004

J.M. Khatib et al*'Performance of Self-Compacting Concrete Containing Fly Ash*' Construction and Building Materials 22 (2008) 1963–1971 24 September 2007

C.M. Tam et al*'Assessing Drying Shrinkage and Water Permeability of Reactive Powder Concrete Produced in Hong Kong'* Construction and Building Materials 26 (2012) 79–8923 May 2011

Lino Maia et al *'Early-Age Creep Deformation of A High Strength Self-Compacting Concrete'* Construction and Building Materials 34 (2012) 602–610 11 May 2012

AntoniosKanellopoulos et al*'Durability Performance of Self-Compacting Concrete'* Construction and Building Materials 37 (2012) 320–325 3 September 2012

Chris G. Karayannis, Constantin et al*'DesignOf Partially Prestressed Concrete Beams Based On The Cracking control Provisions'*Engineering Structures 48 (2013) 402–416 18 September 2012

RomualdRwamamara& Peter Simonsson (2012) *Self-compacting concrete use for construction work environment sustainability*, Journal of Civil Engineering and Management

PetrHunka et al*'Test and Technological Influences on Modulus of Elasticity of Concrete-Recapitulation'* Procedia Engineering 65 (2013) 266 – 272

Her-Yung Wang et al *'A Study of Fresh and Engineering Properties of Self-Compacting High Slag Concrete (SCHSC)'* Construction and Building Materials 42 (2013) 132–136, 21 February 2013

Abhijeet A. Ulagadde et al*'Development of M60 grade Self Compacting Concrete using Mineral Admixture in Quaternary Blends'* W J Engg. Sci., 2013; 1(4): 64-75 08 Aug 2013

BathamGeeta et al*'A Review: Recent Innovations in Self Compacting Concrete'* International Journal of Scientific & Engineering Research, Volume 4, Issue 11, November-2013

Dhruvkumar H. Patel et al*'Literature Review on Self Compacting Concrete'* International Journal for Technological Research in Engineering Volume 1, Issue 9, May-2014

Subhan Ahmad[1], Arshad Umar[2,] Amjad Masood[3], "Properties of Normal concrete, Self compacting concrete and Glass Fibre reinforced Self-Compacting concrete: An Experimental Study" 11th International Symposium on plasticity and Impact Mechanics, Implast 2016

Ioan Pop, Geert De Schutter, Pieter Desnerck , TraianOnet, Magnel, — *Bond between powder type self-compacting concrete and steel reinforcement*, Laboratory for Concrete Research, Department of Structural Engineering, Ghent University, Gent 9052, Belgium

