NOVATEUR PUBLICATIONS
International Journal of Innovations in Engineering Research and Technology [IJIERT], ISSN: 2394-3696
Conference Proceedings of i - Mechanical Engineering Students Conference 2018 (i – MESCON 18)
28th December, 2018

PAPER ID – MP10

REVIEW ON EXPERIMENTAL STUDY ON CONCRETE WITH WASTE GRANITE POWDER AS AN ADMIXTURE

Faras Asif
Dept. of Mechanical Sandwich Engineering,
Indira College Of Engineering & Management, Pune, India
asif.faras990@gmail.com
Prof. Nitin Ulmek
Dept. of Mechanical Sandwich Engineering,
Indira College Of Engineering & Management, Pune, India

***Abstract*—**

Granite fines which are the byproduct produced in granite factories while cutting huge granite rocks to the desired shapes. Granite fines are used as a filler material in the concrete, replacing the fine aggregate which will help in filling up the pores in the concrete. Filling up of the pores by granite fines increase the strength of the concrete and also a material which is abundantly to investigate the strength behavior of concrete with use of granite fines as an additive. So it can be concluded that when locally available granite is a good partial substitute to concrete and improves compressive, tensile and flexure characteristics of concrete, while simultaneously offsetting the overall cost of concrete substantially.

Keywords—concrete,admixture,granite powder,waste.

I. INTRODUCTION

In India, the marble and granite stone processing is one of the most thriving the effects if varying marble dust contents on the physical and mechanical properties of fresh and hardened concrete have been investigated. Concrete technology can be reducing the consumption of natural and energy resources for burden pollutants on environment. Now a day the cost of construction materials is increasing incrementally. In India the cost of cement during 1995 was Rs. 1.25per kg but in 2012 the price is increased nearly 5 times. Due to these reason only I have replaced the granite powder in place of cement. By adding the waste material also we have decreased a lot of environmental problem.

The granite waste generated by the industry has accumulated over years, and it has been dumped unscrupulously resulting in environmental problem. Hence we are using granite waste as a cement replacement in different percentages and we have determined the compressive strength, split tensile strength and flexural strength of concrete.

With the enormous increase in the quantity of waste needing disposal, acute shortage of dumping sites, sharp increase in the transportation and dumping costs affecting the environment, prevents sustainable development. The waste disposal problem is becoming serious. As it is a fine material, it will be easily carried away by the air and will cause nuisance causing health problems and environmental pollution. The major effect of air pollution are lung diseases, inhaling problems, the people who are living in and around are suffering from these problems. The waste disposal problem is becoming serious. In this present work, it is aimed at developing a new building material from the granite scrap, an industrial waste as a replacement material of Granite powder partial replacement of cement. By doing so, the objective of reduction of cost construction can be met and it will help to overcome the environmental problem associated with its disposal including the environmental problems of the region.

II. REVIEW OF LITERATURE

Several industrial wastes, such as flyash , quarry dust waste, recycled aggregate, used soft drink bottle caps as fibre reinforced concrete have been tried by various researches. The results have been encouragingly increased in terms of improvement in strength parameters like compressive strength, split tensile strength and flexural strength.

B.Vidivelli et.al., [2] had studied on fly ash concrete using SEM analysis as partial replacement to cement and had reported a significant increase of 20% compressive strength respectively.

LalitGamashtaet.al., [3] developed the concrete strength by using masonry waste material in concrete mix in construction to minimize the environmental damages due to quarrying. It is highly desirable that the waste materials of concrete and bricks are further reutilized after the demolition of old structures in an effective manner especially realizing that it will help in reducing the environmental damages caused by excessive reckless quarrying for earth materials and stones. Secondly, this will reduce pressure on finding new dumping ground for these wastes, thus further saving the natural environment and eco-systems. Durability, reliability and adequate in service performance of these reused waste materials over the stipulated design life of designed structures are of paramount importance to Structural Designers. This paper critically examines such properties in reused concrete and brick masonry waste materials and suggests suitable recommendations for further enhancing life of such structures, thereby resulting in sufficient economy to the cost of buildings.

M.L.V. Prasad et.al., [4] had studied mechanical properties of fiber reinforced concretes produced from building demolished waste and observed that target mean strength

had been achieved in 100% recycled concrete aggregate replacement.

M. Mageswari et.al., [5] using the combination of waste Sheet Glass Powder (SGP) as fine aggregate and Portland cement with 20% optimum replacement of fly ash as cementations binder offers an economically viable technology for high value utilization of industrial waste. Using of SGP in concrete is an interesting possibility for economy on waste disposal sites and conservation of natural resources. Natural sand was partially replaced (10%, 20%, 30%, 40% and 50%) with SGP and 20% optimum replacement of fly ash in Portland cement. Compressive strength, Tensile strength (cubes and cylinders) and Flexural strength up to 180 days of age were compared with those of concrete made with natural fine aggregates. Fineness modulus, Specific gravity, Moisture content, Water absorption, Bulk density, Percentage of voids, Percentage of porosity (loose and compact) state for sand and SGP were also studied. The test results indicate that it is possible to manufacture low cost concrete containing SGP with characteristics similar to those of natural sand aggregate concrete provided that the percentage of SGP as fine aggregate up to 30% along with fly ash 20% optimum in cement replacement can be used respectively.

Ustev.Jet.al., [6] determined the performance of concrete made with coconut shell as a replacement of cement. Cement was replaced with coconut shell in steps of 0%, 10%, 15%, 20%, 25% and 30%. The results obtained for compressive strength was increased from 12.45 N/mm2 at 7days to31.28 N/mm2 at 28 days curing and it met the requirement for use in both heavy weight and light weight concreting.

Amitkumar D. Ravalet.al., [7] explained the compressive strength by replacing cement with ceramic waste and utilizing the same in construction industry. Dr. G.Vijayakumaret.al., [8] had found that use of glass powder as partial replacement to cement was effective. AnkitNileshchandra Patel et.al., [9] examined the possibility of using stone waste as replacement of Pozzolana Portland Cement in the range of 5%, 10%, 30%, 40% and 50% by weight of M 25 grade concrete. They reported that stone waste of marginal quantity as partial replacement to the cement had beneficial effect on the mechanical properties such as compressive strength values for 7, 14, 28 days were less than the ppc cement.

VenkataSairam Kumar et.al., [10] investigated the effect of using quarry dust as a possible substitute for cement in concrete. Partial replacement of cement with varying percentage of quarry dust (0%, 10%, 15%, 20%, 25%, 30%, 35%, 40%) by weight of M 20, M 30 and M 40 grade of concrete cubes were made for conducting compressive strength. From the experimental studies 25% partial replacement of cement with quarry dust showed improvement in hardened of concrete.

Jayeshkumaret.al., [11] studied the performance of fly ash as partial replacement of cement. The values of compressive strength and split tensile strength are found by partial replacement of cement with varying percentage of 0%, 10%, 20%, 30% and 40% by weight of cement of M 25 and M 40 mix. The compressive strength of the samples was recorded at the curing age of 7, 14, 28 days and for split tensile strength of the sample were conducted test on age of 56 days. It was observed that the compressive strength was better on age of 14 days than the other proportions of cement.

DebarataPradhanet.al., [12] determined the compressive strength of concrete in which cement was partially replaced with silica fume (0%, 5%, 10%, 15%, and 20%). The compressive strength test was conducted on age of 24 hours, 7 days and 28 days for 100 mm and 150 mm cubes. The results indicated that the compressive strength of concrete increased with additional of silica fume up to 20% replaced by weight of cement further addition of silica fume was found that the compressive strength may increase or decrease.

Amudhavalliet.al., [13] examined the performance of concrete made with silica fume as the partial replacement of cement. Cement was replaced with silica fume in steps of 0%, 5%, 10%, 15% and 20% by weight by M 35 mix. The reported from this percentage mixes in compressive strength, split tensile strength and flexural strength at age of 7 days and 28 days. The results indicated that use of silica fume in concrete has improved the performance of concrete in strength and durability aspects.

MdMoinul Islam et.al., [14] investigated the usage of fly ash as substitutes for the cement was replaced with fly ash in steps of 10%, 20%, 30%, 40%, 50% and 60%. Compressive strength and tensile strength were determined at 3, 7, 14, 28, 60 and 90 days. The reported from this paper sows the results that strength increased with increased of fly ash up to an optimum value, beyond which the strength value starts decrease from with further addition of fly ash. The six fly ash motors, the amount of optimum amount of cement replacement in motors is about 40% higher compressive strength and 8% higher tensile strength as compared to Ordinary Portland Cement mortar.

D.Gowsika et.al., [15] investigated the usage of eggshell powder from egg production industry as partial replacement for Ordinary Portland Cement in cement mortar of mix proportions 1:3 in which cement is partially replaced with egg shell powder as 5%, 10%, 15%, 20%, 25% and 30% by weight of cement. The compressive strength was determined at curing ages 28 days. There was a sharp decrease in compressive strength beyond 5% egg shell powder substitution. The admixtures used are Saw Dust ash, Fly Ash and Micro silica to enhance the strength of the concrete mix with 5% egg shell powder as partial replacement for cement. In this direction, an experimental investigation of compressive strength, split tensile strength, and Flexural strength was undertaken to use egg shell powder and admixtures as partial replacement for cement in concrete.

Ghassan K. Al-Chaaret.al., [16] determined the use of natural pozzolanic cement substitute in concrete materials. By means of a test series, four mixes using three types of natural pozzolanic, as well as a Class F fly ash, are evaluated. The effectiveness of each pozzolanic in controlling alkali-silica reactions has been studied. Correlations have been revealed between the mechanical properties of the proposed mixes and a Portland cement control mix. The results are also compared with industry

standards for mortars made with fly ash and silica fume. It is findings to indicate that one type of pozzolanic may be used as a substitute for fly ash, but not for silica fume.

BirukHailu et.al., [17] investigated the usage of sugar bagasse ash is as by-product of sugar factories as a possibilities for the cement was replaced with sugar bagasse in steps of 0%, 5%, 15% and 25% of the Ordinary Portland Cement were prepared with water to cement ratio of 0.55 and cement content 350 kg/m3 for the control mix. The test results indicated that up to 10% replacement of cement by bagasse ash results in better or similar concrete properties and further environmental and economical advantages can also be exploited by using bagasse ash as a partial cement replacement material.

SeyyedehFatemehSeyyedalipouret.al., [18] investigated the usage of paper waste as a partial replacement of cement to controlling environmental aspects has become a major priority. The concrete mixes prepared with adequate amount of these wastes, cement, aggregate and water compared in terms of some tests especially strength with the conventional concrete. At the end, the advantages and disadvantages of the use of pulp and paper industry wastes in concrete formulations as an alternative to landfill disposal were discussed. The research on use of pulp and paper industry wastes can be further carried out in concrete manufacturing as a new recycled material.

Y.Yaswanth Kumar. et.al., [19] examined the usage of granite powder as a partial replacement of cement in concrete. Cement was replaced with granite powder in steps of 0%, 5%, 10%, 15% and 20%. The compressive strength and of the samples was recorded at the curing age of 7 and 28 days. The results indicated that the compressive strength of concrete increased with additional of granite powder up to 10% replaced by weight of cement further addition of granite powder was found that the compressive strength will be decreasing from 10% replacement of cement.

Prof. Vishal S. Ghutke1 et.al., [20] examined the usage of silica fume as a partial replacement of cement in concrete. It is suitable for concrete mix and improves the properties of concrete i.e., compressive strength etc. The objectives of various properties of concrete using silica fume have been evaluated. Further to determine the optimum replacement percentage comparison between the regular concrete and concrete containing silica fume is done .It has been seen that when cement is replaced by silica fume compressive strength increases up to certain percentage (10% replacement of cement by silica fume). But higher replacement of cement by silica fume gives lower strength. The effect of Silica fume on various other properties of Concrete has also been evaluated.

Dilip Kumar Singha Roy et.al., [21] investigate the strength parameters of concrete made with partial replacement of cement by Silica Fume. Very little or no work has been carried out using silica fume as a replacement of cement. Moreover, no such attempt has been made in substituting silica fume with cement for low/medium grade concretes (viz. M 20, M 25). Properties of hardened concrete viz Ultimate Compressive strength, Flexural strength, Splitting Tensile strength has been determined for different mix combinations of materials and these values are compared with the corresponding values of conventional concrete.

It has been found that utilization of recycled waste water in concrete construction have lately gained worldwide consideration and attention,

Mohamed Elchalakaniet.al., [22] explained about sustainable concrete by using recycled waste water from construction and demolition waste.

G.Murali, C.M. VivekVardhan et.al. [23] studied the influence of various effluents on concrete structures. Laboratory scale concrete blocks of M 25 grade were moulded and used for strength analysis. Effluents from automobile industry (E1), powder coating industry (E2) and chocolate factory (E3) were used for curing concrete and its strength parameters like compression, tension and flexure were tested after 28 days. It was observed that E3 enhanced the compressive strength of concrete by 3.84%, tensile strength by 2.46% and flexural strength by 1.96% compared to conventional water curing, indicating its direct applicability in concrete curing sector.

III. CONCLUSION

Compressive strength of concrete increases with replacement of granite powder waste. Also the split tensile strength and Flexural strength increases with the replacement. The dimensions of the granite fine particles are compatible with purpose of filling up the transition zone and capillary pores, thus acting as micro filler.Thus Waste was utilized and makes more environmental friendly. In this way granite powder aggregate is the best choice where there are available.

REFERENCES

[1] B.Vidivelli and M. Mageswari, Study on flyash concrete using SEM analysis, J. of Environ. Res. Develop., 5(1), 46-52, (2010).

[2] LalitGamashta and SwarnaGumashta, Reuse of concrete and masonry waste materials in construction to minimize environmental damages due to quarrying, J. of Environ. Res. Develop. 1(1), 65-67, (2006).

[3] M.L.V. Prasad and P. Rathish Kumar, Mechanical properties of fiber reinforced concretes produced from building demolished waste, J. of Environ. Res. Develop. 2(2), 180-187, (2007).

[4] M. Mageswari* and B. Vidivelli, Innovative concrete using flyash and waste sheet glass, J. of Environ. Res. Develop. 4(2), 476-483, (2009).

[5] Utsev, J. T., Taku, J. K., Coconut Shell Ash As Partial Replacement of Ordinary Portland Cement In Concrete Production, Inter.l J. Scientific & Tech. Res., 1(8), 86-89, (2012).

[6] Amitkumar D. Raval, Dr.Indrajit N. Patel, Prof. JayeshkumarPitroda, Ceramic Waste: Effective Replacement Of Cement For Establishing Sustainable

Concrete, Inter. J. Engineering Trends and Tech. (IJETT), 4(6), 2324-2329, (2013).
[7] Dr. G.Vijayakumar, Ms H. Vishaliny, Dr. D. Govindarajulu, Studies on Glass Powder as Partial Replacement of Cement in Concrete Production, Inter. J. of Emerging Tech. and Advan. Engineering, 3(2), 153-157, (2013).
[8] AnkitNileshchandra Patel, JayeshkumarPitroda, Stone Waste: Effective Replacement Of Cement For Establishing Green Concrete, Inter. J. Innovative Tech. and Exploring Engineering, 2(5), 24-27, (2013).
[9] VenkataSairam Kumar N., Dr. B. PandurangaRao, Krishna Sai M.L.N., Experimental study on partial replacement of Cement with quarry dust, Inter. J. Advanced Engineering Res. and Studies, 2(3), 136-137, (2013).
[10] Prof. JayeshkumarPitroda, Dr. L.B.Zala, Dr.F.S.Umrigar, Experimental investigations on partial replacement of cement with fly ash in design mix concrete, Inter. J. of Advanced Engineering Tech., 3(4), 126-129, (2012).
[11] DebabrataPradhan, D. Dutta, Influence of Silica Fume on Normal Concrete, Int. J. of Engineering Res. and Application, 3(5), 79-82, (2013).
[12] N. K. Amudhavalli, Jeena Mathew, Effect of silica fume on strength and durability parameters of concrete, Inter. J. Engineering Sciences & Emerging Tech., 3(1), 28-35, (2012).
[13] Md. Moinul Islam and Md. Saiful Islam, Strength Behaviour of Mortar Using Fly Ash as Partial Replacement of Cement, Concrete Research Letters, 1(3), 98-106, (2010).
[14] D.Gowsika, S.Sarankokila, K.Sargunan, Experimental Investigation of Egg Shell Powder as Partial Replacement with Cement in Concrete, Inter. J. Engineering Trends and Tech., 14(2), 65-68, (2014).
[15] Ghassan K. Al-Chaar, MouinAlkadi and Panagiotis G. Asteris, Natural Pozzolan as a Partial Substitute for Cement in Concrete, The Open Construction and Building Tech. J., 7, 33-42, (2013).
[16] BirukHailu, AbebeDinku, Application of sugarcane bagasse ash as a partial cement replacement material, J. EEA, 29, 1-12, (2012).
[17] SeyyedehFatemehSeyyedalipour, DaryoshYousefiKebria, NimaRanjbarMalidarreh, GhasemNorouznejad, Study of Utilization of Pulp and Paper Industry Wastes in Production of Concrete, Int. J. Engineering Res. and Applications,4(1), 115-122, (2014).
[18] Y.Yaswanth Kumar et..al, Investigations on Granite powder As Partial Cement Replacement in Concrete, Intern. J. Engineering Res. and Applications, 5(4), 25-31, (2015)
[19] Prof. Vishal S. Ghutke, Prof. PranitaS.Bhandari, Influence of silica fume on concrete, IOSR J. Mech. and Civil Engineering, 44-47, (2014).
[20] Dilip Kumar Singha Roy1, AmitavaSil, Effect of Partial Replacement of Cement by Silica Fume on Hardened Concrete, Inter. J. Emerging Tech. and Advanced Engineering, 2(8), 472-475, (2012).
[21] Mohamed Elchalakani, ElgaaliElgaali, Sustainable concrete made of construction and demolition wastes using recycled waste water in the UAE, J. Advanced Concrete Tech., 10, 110-125, (2012).
[22] Marcia Silva and Tarun R. Naik, Sustainable Use of Resources – Recycling of Sewage Treatment Plant Water in Concrete, Coventry University and The University of Wisconsin Milwaukee Centre for By-products Utilization, Second International Conference on Sustainable Construction Materials and Technologies, (2010).
[23] G.Murali, C.M. VivekVardhan, SijiRaju, C.Mahalakshmi ,G.Srinidhi and Deepthi Susan Zachariah, Influence of various industrial effluents on concrete structures, Intern. J. Engineering Res. and Applications, 2(2), 704-709, (2012).