A Review on Comparative Study of Concrete Blocks Using Foundry Waste Sand

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Abstract -- This paper deals with the comparative study of concrete blocks by replacing the natural fine aggregate by foundry waste sand. There is less availability of the natural sand so there is need to find the replacement of the natural sand. Day by day the cost of natural sand is increasing. The waste of the industries is becoming a major problem and the deposing cost the waste is also high and very much difficult. Metal foundries use large amounts of sand as part of the metal casting process. When the sand cannot be reused in the foundry, it is removed from the foundry and is called as "waste foundry sand." so that, we decided that using the foundry waste as a replacement to the natural aggregate is much needed for the environment and making the construction cost lesser by using it

I. INTRODUCTION

Economy of the world depends upon the magnitude of available natural resources. Hence sustainable development can be achieved by optimum utilization of these resources, solid waste generation and its management. The waste generated from the industries cause environmental problems hence the reuse of this waste material can be emphasized. Foundry sand is high quality silica sand that is a byproduct from the production of both ferrous and non-ferrous metal casting industries. Foundry sand is available in huge amount. Metal industries use foundry sand which is of uniform size than the normal sand which is used in metal casting process. The burnt sand after the casting process of metal is reused for many times but when it cannot be further used it is removed from foundry as a waste for disposal known as foundry waste.

Sustainable development can only be achieved by conserving the natural resources and reducing the impact on environment. The production of fresh natural aggregates involves a lot of quarrying and consumption of energy. Developing an awareness regarding optimum use of available natural resources and recycling of the available natural resources in the form of recycled water can be an effective alternative. Concrete is a material which is composed of coarse aggregate, fine aggregate, cement, admixtures and water. Each material in concrete contributes in its strength and durability, so by partial or percentage replacing of material affects different properties of concrete. Using such waste material which harms the environment can be used for the development of low cost and Eco -friendly structural materials. In this study an experimental investigation will be carried out by varying percentage of fine aggregate, and water with used foundry waste, treated waste water to produce low cost and Eco-friendly concrete.

II. LITERATURE REVIEW

A. Amitkumar D. Raval et al. (2015)

studied in this research to replace OPC cement with ceramic waste powder accordingly in the range of 0%, 10%, 20%, 30% 40%, & 50% by weight for M-25 grade concrete. He concluded that the Compressive Strength of M25 grade concrete increases when the replacement of cement with ceramic waste up to 30% by weight of cement and further replacement of cement with ceramic powder decreases the compressive strength. Concrete on 30% replacement of cement with ceramic waste, compressive strength obtained is 26.77 N/mm2 and vice versa the cost of the concrete is reduced up to 13.27% in M-25 grade and hence it becomes more economical without compromising concrete strength than the standard concrete.

B. Shyam Mak wana and Prof. Yashwantsinh Zala (2015)

studied the physical and chemical properties of ceramic waste and foundry sand. They made a review on utilization of ceramic waste and foundry sand in civil engineering practice. In the world, there are large amounts of calcined-clay wastes and waste foundry

sand produce from the industry each year. So, these wastes are use in landfills. Reusing these wastes in concrete can be very beneficial situation for society. Therefore, at one side, we can solve the problems of industries and at the other side, they can make more sustainable concrete by reducing nonrenewable resources like cement, aggregates and also solve the environmental problems related to land fill wastes. They determine the proportion of SiO2 is about 60-70% and in foundry sand is 80-90% which is responsible to improve the strength and durability of concrete. So, it can be used in concrete to improve the properties of concrete and reduce disposal problems on land and environmental problem.

C. Dr. B. Kameshwari et al. (2014)

Studied the use of waste foundry sand in concrete causes a systematic decrease in strength at certain end point of addition. At 30% and 40% replacement of sand with waste foundry sand concrete has gained full strength at the end of 7 days. However, an acceptable concrete strength can be achieving using foundry sand. A suitable recycling of the discarded foundry sand as building construction material could be suggested. Recycling not only helps to reduce the disposal cost but it will help to conserve the natural resources and it provides technical and economic benefits. Environmental effects of waste and disposal problems of waste can be reduced through this research. This experimental investigation performed to evaluate the strength of concrete, in which natural sand are partially replace with waste foundry sand. Natural sand replaced with various percentages (10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% and 100%) of waste foundry sand weight. Compressive strength test were for all replacement level of foundry sand for M-20 grade concrete.

D. Dr. Pradeep Kumar et al. (2014)

Investigated the recycle materials can be use effectively in architectural and civil engineering fields. They can stand close to the concept of green concrete which is in compatible with the environment. Foundry sand from casting industries is a waste material which is dumped extensively and in this study an attempt has made to evaluate the usage of this waste material in concrete. In this study, effect of foundry sand over fine aggregate replacement the compressive strength and split tensile strength of concrete with a mix proportion of 1: 1.28: 2.56: 0.45 investigated at different curing periods (7 days and 28 days). The percentage of foundry sand used for replacement were 10%, 20%, 30%, 40%, 50%, 75% and 100% by weight of fine aggregate. They determined the compressive strength and split tensile strength of concrete specimens increased, with increase in fine aggregate replacement by foundry sand, providing maximum strength at 50 % replacement and after that the strength parameters shows a decline in their respective values. The replacement of natural sand with used foundry sand up to 50 % is desirable, cost effective, reduces the amount of virgin fine aggregate, reduces land fill problems and preserves nature.

E. Sohail Md et al. (2013)

Investigated the foundry sand can be used as a partial replacement of cement or fine aggregates or total replacement of fine aggregate as a supplementary addition to achieve different properties of concrete. In the present study, effect of foundry sand over fine aggregate replacement on the compressive strength, split tensile strength and flexural strength having mix proportions of M-30 has determined. Fine aggregates replaced with eleven percentages of foundry sand. The percentages of replacements were 0,10, 20, 30,40, 60,70,80,90 &100 % by weight of fine aggregate. Tests has performed for compressive strength, split tensile strength and flexural strength tests for all replacement levels of foundry sand at different curing period (7 days, 28 days & 56 days).

F. Gurpreet Singh and Rafat Siddique (2011)

Carried out an experimental investigation to evaluate the strength and durability properties of concrete mixtures, in which natural sand is partially replace with (WFS). Natural sand is replace with five percentage (0%, 5%, 10%, 15%, and 20%) of WFS by weight. Compression test and splitting tensile strength test are carried out to evaluate the strength properties of concrete at the age of 7, 28 and 91 days. Test results indicate a marginal increase in strength properties of

plain concrete by inclusion of WFS as a partial replacement of fine aggregate

G. Eknath P.Salokhe and D.B.Desai (2014)

Investigated the comparative study of the properties of fresh & hardened concrete containing ferrous & non-ferrous foundry waste sand replaced with four (0%, 10%, 20% and 30%) percentage by weight of fine aggregate & tests were performed for M20 grade concrete. Result showed that (i) addition of both foundry sand gives low slump mainly due to the presence of very fine binders; (ii) Compressive strength at 7 days of both ferrous & nonferrous mixtures increases and maximum increase was observed with 20% WFS of both types of sand, at 28 days 30% addition of ferrous WFS & 10% addition of nonferrous WFS gives same strength as ordinary concrete and goes on.

H. Smt. M. Kacha, Abhay V. Nakum, Ankur C. Bhogayata (2014)

Investigated the development in the field of utilization of used foundry sand in cementations concrete. The paper reviews the utilization of foundry sand as the concrete constituent and the noticeable findings from the experimental works of various researchers. It was observed that the positive changes and Improvement in strength and durability properties of the conventional cementitious concrete due to the addition or replacement of fine sand with used foundry sand in different proportions. This paper works concluded that utilizing of the used foundry sand holds a great potential towards the development of environment friendly and sustainable cementitious concretes.It could be concluded that all researchers gave their findings with concrete up to 30-40% replacement of fine aggregate with foundry sand in which compressive and tensile strength is increased up to 20% whereas not much change occurs in modulus of elasticity, but very few researchers go up to 100% replacement where strength and durability criteria needed to be studied further effectively in future.

I. Pathariya Saraswati, Rana Jaykrushna K, Shah Palas, Mehta Jay G (2013)

Suggested a low-cost and eco-friendly concrete and demonstrates the use of waste foundry sand as partial replacement by fine aggregate in concrete. An experimental investigation is carried out on a concrete containing waste foundry sand in the range of 0%, 20%, 40%, and 60% by weight for M-25 grade concrete (PPC). Material was produced, tested and compared with conventional concrete in terms of workability and strength. These tests were carried out on standard cube of 150*150*150* mm for 7, 14 and 28 days to determine the mechanical properties of concrete. Throughexperimental result they concluded that the compressive strength increases with increase in partial replacement of waste foundry sand and split tensile strength decreases with increases in percentage of waste foundry sand. In this study, maximum compressive strength is obtained at 60% replacement of fine aggregate by waste foundry sand. Split tensile strength decrease on increase in percentage of waste foundry sand. The result of percentage cost change reduces up to 3.5 for 60% replacement of waste foundry sand. This shows that the concrete produced economical.

J. KEWAL, SANJAY K. SHARMA AND HIMMI GUPTA

Concluded that Paver Block achieved very early high compressive strength of 66 MPa. The Compressive strength of Geopolymer Paver Block was found to be dcreasing with replacement of foundry sand. Upto 60% replacement of fine sand by foundry sand gives slightly high compressive strength was found tobe optimum. Complete replacement by foundry sand decreasing slight compressive strength, lesser value is 41 MPa which can be used for manufacturing of paver blocks for 40 MPa. Maximum strength of Paver block was found at 78 MPa at 0% replacement, which is very high, can be used for very heavy traffic. Water absorbption of Geopolymer paver blocks 4-5%, which is satisfying permissible limits of IS :15658-2006.

K. Mr.S.S.Jadhav Dr.S.N.Tande Mr.A.C.Dubal

Observed that use of foundary sand upto 30% to replace cement for making of concrete blocks is feasible.

L. Saif ali, Rajat Saxena, Sumit yadav, Satyam Bhati, Nitin Kumar

Observed that by increasing the content of foundry sand, compressive strength of concrete mixture increases, It is founded that use of foundry sand could be very conventionally used in making good quality concrete and construction materials Increase in the compressive strength was achieved when the replacement of foundry sand is between 10-20%. We can say that for $1m^3$ M20 grade of concrete consumption of fine aggregate is 538.45 kg. Here in specimen M-4 we replace fine aggregate by 162 kg of foundry sand for $1m^3$ M20 grades of concrete. So, we can say that up to 30% foundry sand utilized for economical and sustainable development of concrete. Uses of foundry sand in concrete can save the metal industry disposal costs and produce a 'greener' concrete for construction. An innovative supplementary Construction Material is formed through this study.

III. CONCLUSION

So we conclude that, the foundry waste sand can be used as a construction material as a replacement of the fine aggregate. That will help making Eco-friendly concrete from recycled materials saves energy and conserves resources which lead to a safe sustainable and economic environment. As per the research papers we will further cast the paving blocks with 20% and 40% replacement of fine aggregate by foundry waste sand and testing the same after curing period of 3days, 7days and 28days.

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