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Review Paper on Strength Properties of M25 Fiber Reinforced Concrete, Partial Replacement of Cement by Red Mud

Kuldeep Singh [1], Pushpendra Kumar Kushwaha[2], Mithun Kumar Rana[3]

[1]M. Tech. Research Scholar, Civil Department, RKDF College of Engineering, Bhopal (M. P.),402026 India
[2]Assistant Professor, Civil Department, RKDF College of Engineering, Bhopal (M. P.), 402026 India
[3]Assistant Professor, Civil Department, RKDF College of Engineering, Bhopal (M. P.), 402026 India

ABTRACT

Concrete technologists throughout the world are making constant efforts to find innovative materials which can partially or fully replace the extensively used energy consuming building material, cement. To avoid the environmental and ecological damages caused by quarrying and exploitation of the raw materials for the manufacture of cement apart from the carbon foot prints in the manufacturing process. To overcome this problem, it is very much essential to utilize the industrial waste materials and byproducts generated, in manufacturing of cement and in concrete construction, The result concludes, compared to the replacement of red mud with the percentage of 0to 25 % the concrete mix with replacement of red mud with 15% gives greater strength and more durable. In second stage cement replace by Red mud & Polypropylene Fiber & Hydrated Lime to check the increase of mechanical properties of concrete

Keywords: - Red mud , Super plasticizer, Compressive Strength , split tensile test, flexural testing and rapid chloride penetration test. Polypropylene Fiber & Hydrated Lime

1. 1 Introduction

Red Mud

Red mud consists of a mixture of stable and steel oxide-bearing impurities, and gives one of the aluminium organizations most quintessential disposal problems. The red shade is due to the fact of the oxidized iron gift, which may want to make up to 60% of the mass of the red mud.

Hydrated Lime Pure hydrated lime energy is popularly known as calcium hydroxide or slaked lime. The managed slacking of quicklime with water provides us white dry energy then they launched warmth of response is captured and the more slaking water is evaporated.

1. 2 Literature survey & background

According to Maneesh Singh et al. (1997), red mud, lime, gypsum, and bauxite may be used to create iron-rich cement that has a 28-day strength. Additionally, it has been noted that significant phases such as C4(A,F)3 S-, C4AF, and C2F develop when the gypsum percentage is about 7.5%, while large crystalline phases such as C4(A,F)3 and CT occur when it is increased to 12.5%. Additionally, the OPC cement raised the temperature by 1300 C, improving strength, and it should be noted that incipient fusion occurs at 1350 C. Titania will boost the strength of cement paste if it is present in C4A3 S.

Kalkan (2006) investigated the impact of red mud on the hydraulic conductivity, swelling percentage, and unconfined compressive strength of compacted clay liners. The test findings revealed that, in comparison to natural clay samples, compacted clay samples with red mud and cement-red mud additions had a high compressive strength and decreased hydraulic conductivity and swelling %. The soil groups were converted from the high-plasticity soil group (CH) to the low-plasticity soil group (MH) by the addition of these chemicals. As a result, it was determined that materials made of red mud and cement-red mud may be utilised to stabilise clay liners in geotechnical applications. Red mud was successfully used by Desai and Herkal (2010) to create burnt and unburnt bricks under pressed and undressed settings. Red mud bricks of 6mm and 12mm length that had additions like lime, sand, and recronfibres were made and tested. Recron bricks (6mm & 12mm) that aren't pressed still have good strength, however pressing the bricks just enough to increase their density nearly doubles that strength. 12mm recronfibres may be economical depending on the ideal fibre proportion and price. Red mud brick burning does not result in any increased strength. In order to build inexpensive homes and interior filled walls, unburnt pressed red mud bricks with 10 percent sand or with 12mm recronfibres can be utilised. High performance concrete with GGBS and robo sand, Venu Malagavelliet et al. 2010, 9 The optimal situation for waste reuse was explored by Ribeiro et al. (2011) utilising non-calcined red mud, which needs less time, energy, and money. Red mud was used as a cement replacement in this study's mortars, which resulted in greater hardened product strengths. The pozzolanic activity index was

assessed using both a chemical analysis (European EN 196-5 standard) and physical and mechanical criteria (Brazilian NBR 5751 and NBR 5752 standards).The potential of non-calcined red mud for usage as pozzolanic additive incementitious materials is then confirmed by a comparison of the reference combination (without red mud) with the outcomes produced with red mud. Evaluation of concrete characteristics employing ground granulated blast furnace slag, Veena G. Pathan et al., 2012. The California bearing ratio test, split tensile strength test, and study of red mud stabilised with 2, 4, 6, 8, 10, and 12 percentages of lime by Satayanarayana et al. (2012) were carried out at 1, 3, 7, and 28 days after curing, respectively. According to the trial results, 10% lime displayed greater values than other percentages. For all lime percentages, it has exhibited highest values at 28 days compared to other curing times. Since 10% lime has a CBR value of 25% after 28 days, it may be utilised in road construction as subgrade and subbase material. Comparing the compositions of two different varieties of red mud—Bayer red mud and Sintering red mud—Ping Wang et al. (2012) discovered that the sintering red mud had a greater CaCO3 level than the bayer red mud. In addition, there is a higher percentage of dangerous components including As, Pb, and Hg in Bayer Red Mud. However, both types of red mud have a high radioactivity content. Additionally, they do TG analyses and analyses of hydraulic properties. In these two types of analyses, they found that Bayer red mud has a high water content value, whereas Sintering red mud has a greater hydraulic conductivity. Finally, they came to the conclusion that both types of red mud might be replaced with cement. Bayer Red Mud may be used as a mixing component in masonry mortar due of its great reusability, while sintering Red Mud can be used as the primary filling material because of its increased stability and hydraulic conductivity. High performance concrete with GGBS and robo sand, Venu Malagavelliet et al. 2010, 10 The optimal situation for waste reuse was explored by Ribeiro et al. (2011) utilising non-calcined red mud, which needs less time, energy, and money. Red mud was used as a cement replacement in this study's mortars, which resulted in greater hardened product strengths. The pozzolanic activity index was assessed using both a chemical analysis (European EN 196-5 standard) and physical and mechanical criteria (Brazilian NBR 5751 and NBR 5752 standards).The potential of non-calcined red mud for usage as pozzolanic additive incementitious materials is then confirmed by a comparison of the reference combination (without red mud) with the outcomes produced with red mud. In order to recycle bauxite waste, Arhin et al. (2013) investigated the use of red mud in the ceramic brick building business. The composition of the red mud-clay composites is 80%-20%, 70%-30%, 60%-40%, and 50%-50%, and they are burnt at 800, 900, and 1100 degrees Celsius for sintering. They discovered that at higher sintering temperatures, mechanical strength (modulus of rupture) and bulk densities rose but physical qualities like apparent porosity and water absorption decreased. In their 2013 study, Satyanarayana et al. covered the usage of red mud and bentonite as clay liners. They noticed that consistency characteristics including the liquid limit, plastic limit, and plasticity index rose as the proportion of bentonite increased. Additionally, it was shown that the red soil bentonite mixes demonstrate strong strength at increasing bentonite concentrations and become impermeable (k 10- 6cm/sec) as bentonite concentrations rise. Therefore, it was determined from the test data that a dose of 10-15% Bentonite produces good results for the use of the compositions as liner materials. To Study the Partial Replacement of Cement by GGBS & RHA and Natural Sand by Quarry Sand in Concrete, Sonali K. Gadpalliwar and R. S. Deotale (2014). Concrete's durability might considerably decrease owing to deterioration when exposed to harsh settings, according to research by Sonali K. Gadpalliwar and R. S. Deotale (2014). Corrosion-induced concrete structural degradation is a severe issue with significant economic ramifications. Vinayak Awasare and Professor M. V. Nagendra (2014), "Analysis of Strength Characteristics of GGBS Concrete". Taking those projects into 11 account, this research is being done to examine the durability and strength properties of high strength concrete with partial replacement of GGBS and fly ash in an acidic environment. P.Ashok et al. (2015) checked the outcome after replacing the cement in M30 grade concrete with red mud and hydrated lime. They are replacing 5% of the hydrated lime with cement and varying amounts of the cement with red mud. According to their experimental investigations, replacing cement with hydrated lime and 15% more red mud will significantly improve the characteristics of cement-concrete. In an experiment, red mud was mixed with polyvinyl chloride polymer by Xiaopeng Nie et al. (2015), who then compared the results with coal ash, silica fume, and calcium carbonate. The final conclusion is that red mud will aid in plasticizing polyvinyl chloride during maxing if it improves the polymer's properties. Achal Garg et al. (2015) investigated the effects of several factors on the behaviour of red mud-made interconnecting bricks. Using the suitable model of its utilisation, the author is aiming to summarise the prospective use of red mud in the construction materials business in this work. The focus is on creating a comprehensive red mud utilisation policy framework for the Indian building materials sector since it has the ability to significantly lower construction material costs and create low-cost housing options while yet protecting the environment. Based on several research papers, Vedpal Nain et al. (2015) conducted research on the use of red mud and fly ash as cementation admixtures. They discussed the properties of red mud, its chemical makeup, and how it improves the mechanical properties of concrete by increasing its compressive strength, flexural strength, and tensile strength. They also talked about the attributes of red mud bricks, including how they are affordable and how using them helps the environment. They come to the conclusion that replacing red mud with cement enhances its mechanical qualities and makes it more cost-effective. Red mud was used in lieu of cement in concrete by P. Syam Sai et al. (2017) to explore the characteristics of concrete. They substitute cement for 5% of the hydrated lime and red mud for percentages of 0%, 5%, 10%, 15%, and 20%. They employ concrete of the M40 and M50 grades. In order to get the pozzolanic properties of red mud, they added hydrated lime. In 28 days, the M40 grade's highest compressive strength was 51 kN/m2, while in the M50 grade, the maximum compressive strength was 62 kN/m2. Red mud and hydrated lime were substituted for cement in varied amounts by B.T. Sapna et al. (2018). The findings of cube compressive strength tests and cylinder split tensile tests indicate that replacing 15% of red mud with cement and 5% of hydrated lime will yield the best results. When hydrated lime is used to replace red mud concrete that has a 29% moisture content, the workability of the concrete improves

1.3 Objectives of the work

- The objective of this study is to search alternatives material which can fully or partially replaced naturally available material in construction.
- The main purpose of this study is to reduce the use of conventional material for making the concrete.

1.4 Conclusion

In the first section of the review, the characteristics of concrete including fly ash, GGBFS, RHA, and other materials have been discussed, and it has been suggested that using them to make concrete is feasible. The use of red mud as a part-time substitute for cement was highlighted in the second section.

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