

RedMud as a Replacement of Cementitious Materials - A Review

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Abstract- In recent research there is a huge effort for incorporating the industrial waste material i.e., RedMud as replacement of cementitious materials (cement & GGBS). The present aim of this is to utilize the strength properties like Compressive Strength, Split Tensile Strength and Flexural Strength. As we noticed that Red Mud acts as the pozzolanic material. Red Mud is red in colour caused due to oxidized iron present in silica, aluminium, and titanium oxide. In this project we have studied red mud based on some research papers obtaining the optimum percentage replacement of cementitious materials. Super Plasticizers are included to obtain the strength and corresponding water to binder ratio. The flow properties are obtained with Slump Flow, V-Funnel. Here we compare Self-Compacting concrete with the replacement of red mud with cementitious material.

Keywords- Red Mud, Cement, GGBS, Water, Super Plasticizer.

1. INTRODUCTION

The great development for industries that may lead to generation for the large quantities of waste material obtained from industry waste bi-product. Several years ago the exploitation of mines generally decreases due to high quality of ores that leads to the extraction of high richest quantities and as a result the amount of the wastes increases. If waste material is improperly controlling their harmful substance through out surface and the undergoing water and pollutes huge area. Annually, the production of Red Mud is estimated as 1 – 2 tons of red mud produces per ton of aluminium for the production of bauxite ore through Bayer's process. The main factor for red mud leads to the Bauxite quality and the nature of aluminium acting as the hydroxide compounds and silica content. The nature of Red mud depending upon the PH value that is regarded as the hazardous material. Red mud cost is less compared to Cement and GGBS. As a replacement of Cementitious materials there is decrease in the flow as compared to Self-Compacting Concrete. This shows the outline of the red mud based up on the strength. The researches are highly concentrated in the development of special concretes like self Compacting red mud concrete. To overcome this they go through some properties like strength, durability, mechanical and fresh. This is done due to the different grades and environmental conditions produce they also add some admixtures.

2. LITERATURE REVIEW

Masahiro Ouchi and Hajime Okamura (2003), Propose a new type of concrete, which can also be compacted into

every corner of the form work purely depends by means of its own i.e., self weight. In year 1986, he has started a research project on the flowing ability and the workability of this special type of concrete, later called self compacting concrete. Ozawa K, Kunishima, Developed for the high performance concretes based on the durability Mix design of concrete structures, that proceeding second East-Asian and Pacific conference for the structural engineering and construction, has also done some research independently from Okamura, and he succeeded in developing the self-compacting concrete for the first time in 1988.

Nansu, Proposed a method for developing SCC mix design. Firstly, amount of all aggregates required is determined, next they found the paste of the binders is filled in to the voids of aggregates to ensure that the concrete obtained has the flow ability, self compatibility and other desired self compacting properties. Slump flow, V-funnel and Compressive Strength tests were also carried out for examining the performance of SCC, and showing results indicates that the proposed method could produce successful in SCC of high quality. W.C. Tang (2018), Introduces about the fly ash that is replaced with red mud which is the waste product obtained from production of alumina.

The effect of Red mud on the fresh and the hardened properties of Self compacting concrete were studied and it is also observed that there is an increase in compressive strength and elastic modulus at 50% replacement of red mud.

L. Senff (2011) He has determined that there is an application of red mud in mortars used for the replacement of cement and has reduction of compressive strength and depends on the water content and used as binder material. The rheological behaviour tells that the fresh mortars are measured with rheometer. The yield strength increases and shows the variation in plasticity Flow table values are related to rheological hardened parameters. Red mud with 20%, 30%, 40% mortars are weak so should increase the percentages to have fresh properties.

Mansour Ghalehnavi (2019) He gives the detail information about the replacement of cement as red mud. To make this need to reduce the environmental pollution and depend on the local wastes produced from the industry. Self compacting mixes are made to see the differences in red mud and cement. Many laboratory tests like slump flow, vee funnel, T500 etc are made to know the changes.

Minu Varghese (2017) Developed that red mud derived from alumina through Bayer's process refineries. This is similar to cement depend on the investigations carried from alumina industry.



Utilization of bayers process gives the minerological composition also conducts study on life cycle of neutralised seawater red mud for the treatment of acid mine drainage. In this slump flow values shows the flowability of a fresh mix and v funnel determines the filling ability of concrete with minimum 20mm size aggregates. Uses the clear spacing of 35mm.

D.V. Riberio (2012) Also states that there is high in alkalinity with the presence of alumina silicates due to the formation of compounds by the reaction with chloride ions. Has high electrical resistivity greatly reduces the solubility of hazardous spices. Physical parameters like specific surface area and the specific gravity are determined. Specimens for migration test used for cyclinder 50mm diameter and 100mm length.

3. RED MUD

3.1 Process of Red Mud

Red mud is the bulk waste obtained through Bayers process, formed as there is some reaction in between Sodium Hydroxide and also the Bauxite ores. This process is involving the separation of alumina through unwanted components like Titanium, Silica, Iron, Calcium, etc.. Here, the process of the Bauxite is heated with the Caustic soda, having the certain high pressure ~ 30 atmp that results in formation of Sodium Aluminate.

3.2 Advantages of Red Mud

- There is betterment of environment.
- Red mud is used for improving the soil quality.
- Saving in the energy requirements in the production of Ordinary Portland Cement (OPC).
- Economical advantage.

3.3 Applications

- Red Mud is applied as supplement to the source of Silica, Alumina, and Calcium that improves the setting time, quality characteristics and separation of slag.
- Red mud is the combination of kaolin used for the preparation of low cost ceramic tiles for floors.
- The cost of Red mud is low compared to cement.
- Raw material in cement production.
- It is applied in Brick Manufacturing
- Applied as corrosion inhibitor.

4. REASEARCH GAP

As previously discussed, In this the research is very essential. Until the research is done for the replacement with cement, cement mortars, flyash, GGBS. Research has done on Red mud to study the Physical, Mechanical and Durability properties.

5. REASEARCH SIGNIFICANCE

Comparing Conventional vibrated concrete with self compacting concrete (SCC), SCC usually results a better performance. By incorporating Red Mud in SCC these

properties can be improved resulting High Strength Red Mud Self Compacting Concrete (HSRMSCC).

Strength Characteristics such as Compressive strength, Split tensile strength, Flexural strength can be improved. Effect of Red Mud have great impact on structures and based on Mechanical and Physical durability characteristics of High Strength Self Compacting Concrete have been worked widely.

6. CONCLUSION

1. Replacing Red Mud with cementitious materials shows the improvement in the properties and flow characteristics. The conclusions are conclude based on the literature review.
2. Increase in red mud causes a decrease in flow i.e, filling & passing ability.
3. Red Mud percentage increases shows the result in the variation of decrease in properties and obtains the optimum replacement percentage.
4. The combination of redmud is the substance od silica, aluminium, calcium bauxite ore.
5. The physical, mechanical, durability properties of red mud indicates that utilizes the production for construction purpose and for the building materials in small proportion.
6. Showing the Workability of concrete may effect with the increase in red mud by adding super plasticizers.
7. Every small amount of red mud reduces the free water in concrete mix. Red mud absorbs more water.
8. Increase of red mud reduces linearly as road base material.
9. The red mud appears as reactive component in cement mortars.
10. The presence of red mud accelerates to hydration process due to hydraulic characteristic of red mud.

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