

A REVIEW ON STUDY OF CONCRETE STRENGTH PARAMETERS USING RED MUD AS PARTIAL REPLACEMENT OF CEMENT WITH FLY ASH

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ABSTRACT

Abstract: Red mud could even be a waste generated by the Bayer process widely used to produce alumina from bauxite throughout the world. ash could even be a by-product of coal-fired electric generating plants. Coal is put into a burning chamber for fast combustion and is blown. The aim of this paper is to research the likelihood of replacing the cement by Red Mud and ash. due to storing issues, the waste negatively affects the environment. to unravel this problem, cement is partially replaced with red mud and ash in small percentage, at an interval of 10% starting from 0 to 40% (20% red mud & 10% fly ash) by weight of cement. And evaluating its characteristic strength (i.e., workability, compressive strength & tensile strength) of red mud & ash concrete. This study examines the results of red mud on the properties of hardened concrete. Cement mortar is an intimate mixture of cement, sand and water. The strength of mortar depends on the proportion of sand and cement mixed. Cement mortar is applied to tie stones, brick-like masonry blocks and plaster slabs and walls. It is used to give clean finishes to walls, concrete surfaces and joints for masonry. Red mud could even be a by-product during the manufacturing of the Aluminum. Aluminum is produced from the Bauxite ore. the two main processes for extraction of Aluminum from the Bauxite are; 1) Sinter Process, 2) Bayer Process. Among the two methods Bayer Process is that the foremost generally used method for manufacturing of Aluminum.

Keyword: - Red Mud, Fly Ash, Bayer Process

1. INTRODUCTION

Red mud is hazardous waste generated within the Bayer process alumina production (Al_2O_3) from bauxite ore which contains high levels of residual alkalinity and toxic heavy metal. Therefore, red mud may be a hazardous waste of alumina industry. In Bayer process the sodium hydroxide is added to the powdered bauxite ore. During this process sodium aluminate solution and un-dissolved bauxite residue are formed. This bauxite residue contains silicon, iron and titanium and other materials. This Bauxite residue which is very caustic in nature is named as Red Mud. the quantity of red mud which generated within the alumina processing plant depends on the standard of crude Bauxite ore, could also be greater than the quantity of alumina 1-1.5 times. Alumina processing plants typically eliminate liquid red soil in reservoirs, which pose a serious environmental pollution threat to the lowland. A pozzolan is defined as a siliceous and aluminous material that in itself has little or no cemented value, but which maintains the presence of moisture during a microscopically divided form, chemically the properties of cement. Reacts chemically with lime at ordinary temperatures to make. Red mud means it's a waste bi-product generated by

Bayer process during the assembly of alumina from the bauxite ore at a temperature about 150 to 230°C struggling with the presence of caustic soda. Hence red mud is additionally referred as Bayer process residue. About 1 to 2 plenty of residues of red mud that are of dry weight are made per ton of aluminum produced. Globally 75 million tons in per annum red mud is being created. Storage of red mud takes a huge area of useable land. thanks to the presence of sodium hydroxide the pH value of red mud ranges from 10.5 to 13. So, it's highly alkaline in nature. Red mud contains heavy metals like aluminum, silica, calcium, iron and Titanium and alongside minor constituents like Na, Pb, Ba, Zn, Cr, Cu, Ni, Mn, K (Summers et al., 1996). So, it causes significant issue for soil contamination and spring water pollution and hence it can't be useful for construction purposes and vegetation growth. the color of red mud is in red because iron compounds are present in it.

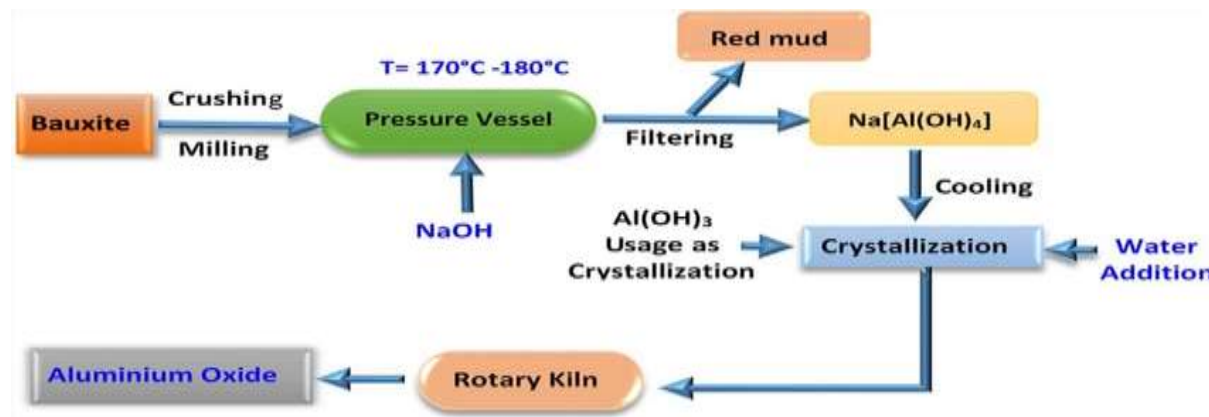


Figure 1: Bayer Process

Fly ash may be a by-product of coal-fired electric generating plants. Coal is put into a burning chamber for fast combustion and is blown. Heavier ash particle (lower ash or slag) falls under the rock of the burning chamber and thus lighter ash particles (fly ash) exit with exhaust gas, thus ash ash. Within the past, ash was generally released into the atmosphere, but pollution control standards now require that it's captured before release by fitting pollution control equipment. The ash is typically stored in coal power plants or kept in landfills. About 43% is recycled, often went to supply hydraulic cement or hydraulic plaster, and for the replacement or partial replacement of Portland cement within the production of concrete. Fozolans make sure the installation of concrete and plaster and provide concrete with greater protection from wet conditions and chemical attack. . counting on the source and composition of the coal to be burned, ash components vary considerably, but all ash contains substantial amounts of silica (SiO_2) (both amorphous and crystalline), alumina (Al_2O_3) and quicklime (CaO), Compounds in most mineral coal-bearing rock. Ash is that the most ordinarily used pozzolanic substance within the whole world. it had been first used extensively within the construction of the Hungry Horse Dam at Ashery within the US within an estimated amount of 30 percent by weight of cement. After this it had been utilized in canyon and ferry dams etc. About 15 percent of the ash in India was utilized in the development of the Rihand Dam in situ of cement.

2. LITERATURE REVIEW

Indraratna et al. (2019) have studied the comparison between the intercept of cohesion and angle of shearing resistance of dry and fly ash specimens. He reported that there's 100% loss of cohesion mainly to dry specimen with no change is resistant shearing angle. His study also emphasized on the replacement of cement by ash in 5%, 10%, 15%, 20% ratios. Without using any admixtures, their experiment concluded that 10% ash content gives more strength than other ratios. Increase in ash content leads to lesser strength and more water requirement. They also conducted a test to work out the rheological properties of concrete. it had been acknowledged that each one the

properties satisfied the standards for 50% and 55% of replacement. Further increase in ash caused reduction in flow of concrete. Therefore, it are often said that SCC of low cost are often developed by using ash.

Singh et al. (2018) studied that the replacement of cement by ash in 5%, 10%, 15%, 20% ratios, without using any admixtures, their experiment concluded that 10% ash content gives more strength than other ratios. Increase in ash content leads to lesser strength and more water requirement. His paper deals with all the hardening properties also because the flexible strength and versatile strength of HVFAC through prisms and cubes with 35%, 50% and 75% substitution. Their result was that fifty of replacements often occur with an overall 12. cost overruns.

Akarsh. N. K (2017) studied that the likelihood of supplanting cement by red mud. As a results of putting away issue, the waste contrarily influences the world. To affect this issue, cement was pressed into the red soil by 40% by weight of cement. The proprietary concrete, like the compressive, tensile, and ductile strength of clay concrete, was evaluated. This study shows that the addition of clay enhances the properties of concrete.

McLaren et al. (2016) studied that the precise gravity of ash is comparatively less than that of soils. The density of the ash fills gets reduced which may be a major advantage in terms of its use as various filler materials. Now these fillers are often utilized in spongy wall sand ridges particularly when the inspiration is weak.

Kushwaha et al. (2016) concluded that by stabilizing the red mud with lime and gypsum for using it in geo-environmental engineering work. various factors of lime (2%, 4%, 6% & 8%) is crazy gypsum (1% and 2%) by the load of dry red mud is taken. 13 no. of samples were prepared and kept for curing of 1, 3, 7 days to realize the effect of longstanding curing at temperature. CBR (soaked and unsoaked) and UCS test were conducted. They achieved that by adding 6% lime and a couple of gypsum with red mud increases the unsoaked and soaked CBR by 302.36% and 939.62% respectively. UCS is additionally increased by 193.71%, 494.41%, and 668.05 % at 1, 3, and seven days of curing period. because the curing period increased high strength achieved. The strength of red mud is thanks to the formation of C-S-H and C-A-H gel by stabilizing it with lime and gypsum.

Kusum Deelwal et al. (2015) have concluded that there's no economically viable and environmentally acceptable solution for the utilization of vast volumes of clay. there's urgent got to undertake research and studying the metal speciation and therefore the changes related to red mud reuse within the construction purpose and through the wet storage of red mud in ponds.

Rout et al. (2015) have studied the characteristics of clay for its potential use as a pavement subgrade construction product by laboratory tests and finite element analysis. For this purpose, the required geotechnical properties were investigated. Index properties and engineering properties are determined. Model footing test had also been performed in laboratory to see the steadiness of red mud as a subgrade material. FE analysis using PLAXIS is performed using Mohr-Coulomb model and therefore the laboratory model test results are compared with FE analysis results. supported experimental and numerical investigations they concluded that red mud is that the industrial waste produced during the extraction of aluminum from bauxite. Almost 75 million plenty of red mud is produced per annum.

Singh et al. (2014) concluded that with stabilizing red mud and cement kiln dust about (2, 4, 6, 8, 10 & 12%); UCS, CBR & compaction strength at addition of upper you look after cement kiln dust showed a better value up to eight and further addition doesn't play vital role in increasing strength. The agglomeration of particles is extremely good because the you look after cement kiln dust increased. Red mud replaced with 8% of cement kiln dust used well as a cloth in sub base and sub grade purpose.

A. B. Sawant et al. (2013) have studied the decrease in initial setting time at 5% and 10% could also be thanks to the sunshine weight of neutralized red mud and finer particles of mud which fills the voids of the cement by which there could also be increase within the density of the combination. Neutralized clay cement can grow quite 10% of the initial setting time thanks to a decrease within the density of the mixture. The effect of replacement of cement by neutral clay has been studied on the planning mix concrete of grade M50. consistent with the normal economic view, the value of conventional concrete around 13.7 is yet another than the value of neutral clay concrete (15% replacement). M. Nominal reduction within compressed strength of two .97 rather than the special 28-day compressive strength of fifty grade concrete.

Mr. Pravin Nemade (2013) have observed the consequences of red mud on the properties of hardened concrete. The test results show that how its compressive strength & splitting lastingness decreases with increase red mud content, it's concluded that optimum percentage of the replacement of cement by weight is found to be 25%. By this percentage replacement we will have strength is adequate to the strength of controlled concrete.

3. CONCLUSION

Optimum percentage of the replacement of cement by weight is found to be 25% by the replacement results got are nearly adequate to the results of controlled concrete. it's been noted that when the red mud and ash content is increased; the compressive strength and lastingness of the concrete decreases. Concrete prepared by using red mud is suitable in ornamental works and provides aesthetically pleasant appearance.

4. REFERENCES

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