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USE OF RED MUD IN CONCRETE

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I. INTRODUCTION

Red mud is basically the main waste generated in the production of aluminium and alumina through Bayer process from bauxite ore. The world's production of bauxitein2009 was noted 205 million tons, and the main producing nations were Australia, China,Brazil, Guinea, India and Jamaica. Red mud is solid waste originated in the processing ofbauxite into aluminum. The process is named as 'Bayer process' and it has four mainprocedures:digestion,clarification,precipitationandcalcinations.Redmudisdischargedin the form of highly alkaline slurry (pH 10-13.5) with 15-40% solids, which is thenpumped away for disposal. The search for an economically and environmentally alternativehas led to the study of red mud for various applications, such as alternative constructionmaterialanadsorbentforremovalofheavymetalsfromaqueoussolution,buildingmaterials such as concrete, bricks, ceramics as well as tiles, ceramic glazes and iron richcement. Other researchers found out that the hydration reaction of Portland cement is alsofavored by a highly alkaline environment, which is one of the characteristic of red mud.**Physical Properties of red mud -:** Redmudhasa bulkspecific gravity around2.609 g/cm3. The red mud specific surface area normally lies between the range of 20–30m2/g . Nearly 85% of red mud particles have a diameter of the range of 0.4 µm to 60 µm,and nearly 20% correlate to the clay fraction (<2 µm) and 65% to silt fraction (2 µm to 60µm) as soil. Only 15% of the particles have the size in the range from 60 µm to 200 µm,characteristic of the fine sand. Therefore, since about 70% of the grains that constitute inthe red mud have a particle size of less than 20 µm, itis possible that the part of theleftoverusedin the composition of bitumen mixtures isincorporated into the binder,changing its rheological properties as well as improving the strength of the bituminoushighways to deformations. When applied to road construction the red mud can also be usedas a filler in the bituminous mixtures or in the pavement based layers.It has also beenfoundthatRedmudcanalsobeeffectivelyusedasamaterialforcementandthereplacementenables thelargeutilizationofwaste product.

II. LITERATUREREVIEW

1) **P. Ashok and MP Suresh Kumar, AnnaUniversity , ISSN 2278-1684PP 31,32**experimented on the topic "Concrete utilising Red mud as a partial replacement ofcement"It has been found out from their experimental study that after testing of 5blended samples of cement (5% to 25 % replacement of theCement by NeutralisedRed mud) the optimum use of the NRM is 15% as a partial replacement of thecementinM30gradeconcrete.

>It has also been found out that Red mud can be effectively used as a material forcementand replacementalsoenablesthelargeutilizationofwasteproduct.

>Red mud did not effect the cement properties, rather it improved the quality ofcementbywayreducing the setting time & improvedcompressivestrength.

2) **KiranK.Shetty(AssociateProfessor)andGopinathaNayaka(AssociateProfessor) ISSN 2321-7308** worked on "The effect of Red Mud and Iron Oretailings on the Strength Of Self Compacting Concrete" In their Experimental study17 concrete mix proportions were build. The 1st mix was a controlled mix (withoutred mud and IOT) and the rest 16 mixtures contained the red mud and IOT. ThecontrolledSCCmix was designedforM25grade.Cementiousmaterialin themixture was replaced by red mud at1%, 2%, 3% and 4%. For each red mudreplacement level, 10%, 20%, 30% and 40% of fine aggregate (regular sand) wasreplacedwithIronOretailings.

After conductingvarious strength tests on concrete cube,ithasbeen concludedfrom their Experimental study that the compressive strength achieved for all theconcreteismorethanthe controlledmix.

3) **Satayanarayana-Part ISRN Materials Science 11 2: production of clay basedceramics," Journal of the European Ceramic Society, vol. 20, no. 3, pp. 245–252, 2000.** studied red mud stabilized with 2, 4, 6, 8,10 and 12 percentages of limeand unconfined compressive strength, Split tensile strength and California bearingratiotestswereconductedat1,3,7and28dayscuringperiodsrespectively.Fromthe experimental findings it has

been found out that 10% lime has shown highervalues compared to other percentages. At 28 days it has shown maximum valuesthan other curing periods for all percentages of lime. The CBR value obtained for10% lime at 28 days is 25%, hence it can also be used as subgrade and sub basematerialinroadconstruction.

III. METHODOLOGY

Specimensize: Forthistestmainly150mmx150mm x150mmcubesareused.

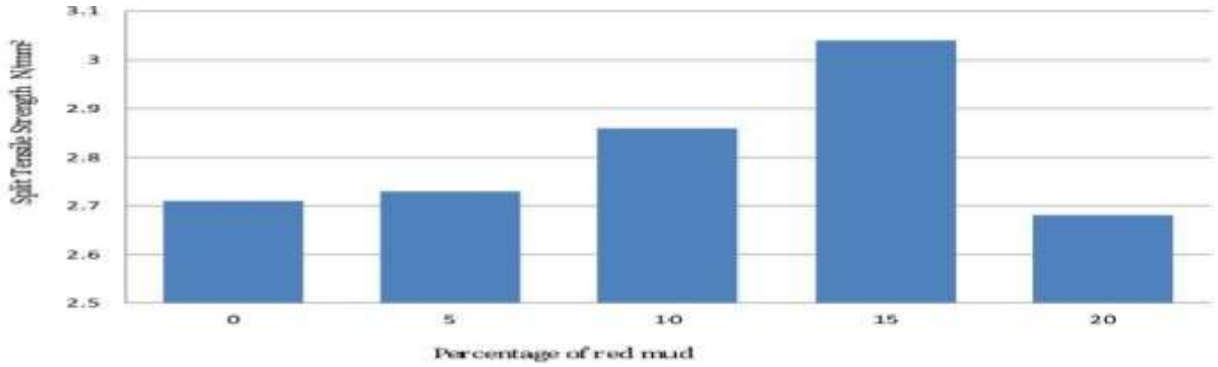
1. Cleanthemould properlyandapplytheoilinsidetheframeofthecube.
2. Filltheconcreteinsidethe mouldsinthreelayersapproximately50mmthick.
3. Compaction:- Compact each layer with at least 35 strokes per layer using a tamping rod (steelbar16mmdiameterand600mmlong).
4. Levelthetopsurface ofthemouldandsmoothenitwithatrowel.

Curing:-The concrete cubes are generally removed from the moulds between 16 to 72 hours,normally this doneafter24hours.

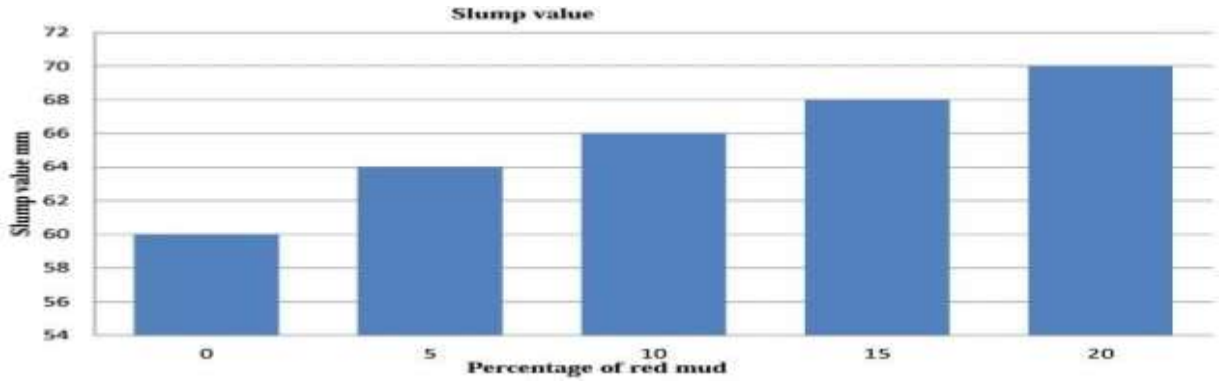
Varioustestsareperformed overcasted concrete cube to check itscompressive strength,tensilestrength,durability,workability.Someofthetestsareasfollows:-

SplitTensileStrength,Slumptest,Compressivestrengthtest.

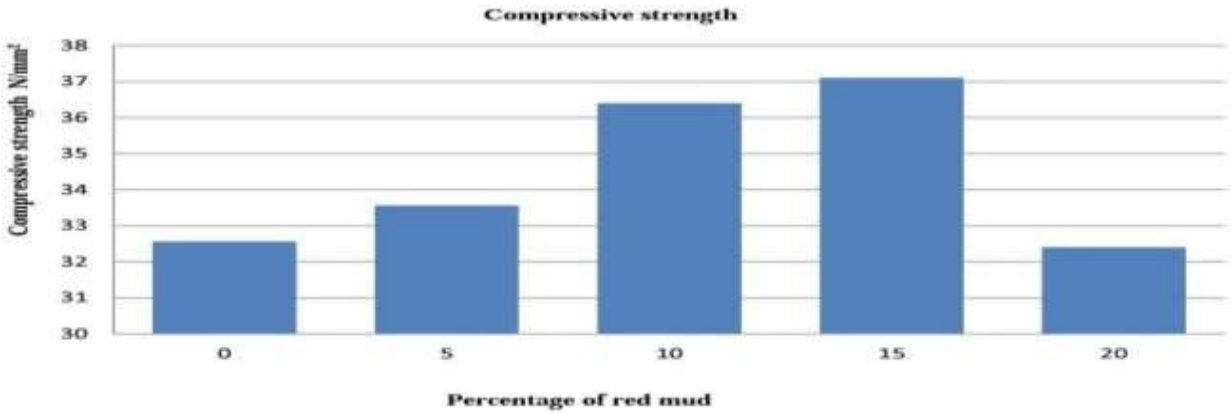
SplitTensileTest-:



SlumpTest-:



CompressiveTest-:



IV. RESULTORCONCLUSION

-: The Strength of the Concrete decreases with increase in the red mud in a certain percentage.Ithasbeenseenthattheinitialadditionofredmudincreasesthestrengthandthenitdecreases continuously.

-:Theoptimum percentage of the replacement ofcement by redmud is calculated to be 15%.Atwhichthestrengthoftheredmud concreteisfoundequaltothecontrolledconcrete.

-:The Slump value of controlled concrete at 28 days is recorded to be at 60 mm , while of redmudconcreteis calculatedtobe64mmat15%replacement.

-:The compressive strength of the controlled concrete at 28 days is calculated to be 32.56N/mm^2,whileoftheredmudconcreteisfoundtobe37.1N/mm^2.

-:SplittingTensilestrengthofthecontrolledconcreteat28daysisfoundtobe2.71N/mm^2

.whileofthered mudconcreteisrecordedtobe3.04N/mm^2.

-:Redmudusedinconcreteisadvantageoustotheconstructionindustryandhelpsinmaintainingtheenvironmental aswellas economicalbalance.

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