Strength Studies on Bentonite Concrete For M30

1P.AnanthaNaga Sai, 2Dr.K.Chandramouli, 3J.Sree Naga Chaitanya, 4Dr.N.Pannirselvam, 5D.Srinivasareddy
1Assistant Professor, 2Professor & HOD, 3Assistant Professor, 4Associate Professor, 5UG Student
1NRI Institute of Technology

Abstract - **World is developing rapidly and the construction of buildings takes vital role in this development and leads to depletion of natural resources. In order to save our natural resources, replacing bentonite in partial replacement of cement with different percentages are 0, 5, 10, 15 and 20%. The test results were obtained with compressive strength, split tensile strength test the highest 28-days strength improvement of concrete can be expected at partial replacements in the 15-20% range. The combined use of bentonite and a quarry dust allowed by 15% replacement of bentonite in cement and 50% replacement of normal sand with quarry dust.**

keywords - **Bentonite, Compressive Strength, Quarry Dust, Split Tensile Strength.**

I. INTRODUCTION

Bentonite is an earth created every now and again from the modification of volcanic fiery remains, composed dominatingly of smectite minerals, usually montmorillonite. Bentonite presents solid colloidal properties and its volume builds a few circumstances when coming into contact with water, making a coagulated and gooey liquid. Compressive strength is generally watched for comparative aggregate fastener substances. The slower quality pick up is because of relatively gradually happening hydration responses in nearness of fly fiery debris, slag, bentonite or some other pozzolanic material.

Concrete is prime material for structures and used for various other applications. It is a composite material consisting of cement, coarse aggregate, fine aggregate and water.Use of cement generate large amounts of carbon dioxide which results in global warming and ozone layer depletion. Calcium Bentonite is the largest naturally available material whose production cost is very less compared to Ordinary Portland Cement (OPC). The growing demand of sand results in their non-availability especially in India. Due to industrialization the waste products are tremendously increasing that cause ecological imbalance. Using the industrial wastes in concrete not only solves the disposal problem of wastes but also reduces the cost of concrete. The waste products such as steel slag can be crushed and used effectively in the form of fine aggregate for concrete production.

The construction industry has taken considerable strides forward over the last two or three decades with regard to trials in the use of one or another cementitious material generally identified as pozzolans, for the compounding of various cement-based products. This has notonly resulted in improving the compressive strength value attained thereby but also in qualities like ability to set and harden under water. Among these, coal fly-ash, blast furnace slag, rice hull ash, silica fume, or metakaolin are the most common ones. Others like gypsum, gypsum fines, Portland cement, cement kiln dust, lime dust, stone dust, and calcined clay are also in use, due to economic and environmental concerns. One method to achieve the goal of reducing carbon dioxide emissions and greenhouse gases is to formulate cements using a lower portion of calcined material, thereby reducing carbon dioxide emissions per unit of product. Another approach is that of including a lower percentage of cement and or gypsum than it is common with standard cement or gypsum and to ensure an increased compressive strength and or flexural strength is obtained thereby. This is one which is durable, and suitable for all types of applications, and also benefits the environment. Additionally, a need exists for improved cement and gypsum products that permit the use of less expensive aggregates to reduce the cost of the cement product.

II. OBJECTIVES

I. To study the effect of bentonite powder as a partial replacement for cement with 50% quarry dust.
II. To study the optimize of bentonite powder
III. MATERIALS

3.1 Cement:
Cement is a material that has cohesive and adhesive properties in the presence of water. Such cements are called hydraulic cements. These consist primarily of silicates and aluminates of lime obtained from limestone and clay.
3.2 Aggregate:
Aggregate properties greatly influence the behavior of concrete, since they occupy about 80% of the total volume of concrete.
3.3 Water:
The potable water used in the manufacturing of concrete.

3.4 Bentonite:

Bentonite is one of the most important materials used in constructing plastic concrete which act as a stabilizing agent. It is from clay materials having high water absorption and swelling of 300% properties even after contacting with water.

3.5 Quarry dust:

Quarry dust is a byproduct of the crushing process which is a concentrated material use as aggregates for concreting purpose, especially as fine aggregates. In quarrying activities, the rock has been crushed into various sizes, during the process the dust generated is called Quarry dust and it is formed as waste.

IV. EXPERIMENTAL RESULTS

4.1 Compressive strength

The compressive strength conducted in compression testing machine for the cast and cured specimens and the results are furnished in Table 3.

Table 3: Compressive strength of concrete with bentonite and quarry dust

Mix indication	Compressive Strength, N/mm^2	
	7 Days	28 Days
M1(0%BENTONITE+0%QD)	26.76	38.24
M2(5% BENTONITE+50% QD)	31.31	44.47
M3(10% BENTONITE+50% QD)	33.61	46.81
M4(15% BENTONITE+50% QD)	35.65	49.66
M5(20% BENTONITE+50% QD)	32.21	47.29

4.2 Split tensile strength results

The split tensile strength conducted in flexural testing machine for the cast and cured specimens and the results are furnished in Table 4.

Table 4: Split tensile strength of concrete with bentonite and quarry dust

Mix indication	Split tensile strength, N/mm^2	
	7 Days	28 Days
M1(0%BENTONITE+0%QD)	2.40	3.51
M2(5% BENTONITE+50% QD)	2.81	4.09
M3(10% BENTONITE+50% QD)	3.02	4.30
M4(15% BENTONITE+50% QD)	3.20	4.56
M5(20% BENTONITE+50% QD)	2.89	4.35

V. CONCLUSION

1. Compressive strength achieved at 15% bentonite + 50% QD are 33.65 and 49.66N/mm^2 at 7 and 28 days.
2. The percentage increase of compressive strength with 15% bentonite + 50% QD is 29.86%.
3. Split tensile strength achieved at 15% bentonite + 50% QD are 3.20 and 4.56N/mm^2 at 7 and 28 days.
4. The percentage increase of split tensile strength with 15% bentonite + 50% QD is 29.94%.

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