Study on effects of Use of Dolamite Powder in Concrete by Raplacing Cement

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***Abstract*- Concreteis the most extremely used construction material within the world, which always uses natural resources like lime, aggregates and water. The production of cement in world has increased greatly, due to this cement production emission of CO2 gas has been increased tremendously, ultimately environmental pollution increased to very large extent. This affect to environment has been reduced by cement has been replaced by some supplementary materials like Dolamite Powder or Fly ash or GGBS &so on. Dolamite. Powder was conducted detailed study and lots of research work has been made on other waste materials and it is found there is a great future scope for research on Dolamite Powder as a replacement to cement, sand or both. Now in our case, cement has been replaced partially with in varying proportions likewise from 0% to 20% and its effect has been analysed on the standard consistency, soundness, setting times of cement and compressive strength of cement mortar mixes. The cubes and cylinders of concrete were casted for variable content of dolomite powder.**

***Index Terms*- Dolamite Powder, Conventional Concrete, Compressive strength test, Split Tensile Test.**

1.INTRODUCTION

Cement is one of the notable ingredients of concrete, since it is having a chattel that it binds the aggregates and resists the distinctive action. The generating process of cement is includes calcining argillaceous and calcareous materials at a high temperature. During conduction of this process, very large amount of CO2 has been releasing into the atmosphere. It is estimated that in the production of one ton of cement results the emission of 0.8 ton CO2. The various report use of replacement materials such as Dolamite powder, fly ash and limestone in Portland cement has much attention in recent years. The utilization of fly ash is one of the great & most popular methods to reduce expansion of concrete because of alkali–silica reactivity. Dolomite is a carbonate material which ismade upof calcium magnesium carbonateCaMg (CO3)2. Dolomite is rock forming mineral created attention for its exceptional wettability and dispersibility. Dolomite has higher weathering resistance. Dolomite is a preferred as construction material due toit's higher surface area, hardness and density. Dolomite used as a filler material due to its higher strength and hardness. By the effective utilization of dolomite powder as aconstruction material, the objective in reduction of construction cost can be acheived. An attempt was attained to explore the possibility of using dolomite as a replacement material for cement M30 grade concrete and its specimens were made by replacing 0, 5, 10 & 20% of cement by dolomite powder. The Compressive, Split tensile and Flexural strength of the specimens were found on the 7th and 28th days. Optimal replacement percentage of dolomite was determined.

2. LITURATURE REVIEW

2.1 Author: N. Kohila& M. Elangovan
Author studied the characteristic of concrete by using the combination of partial replacement of cement by dolomite powder and partial replacement of fine aggregate by copper slag. The dolomite is an anhydrous carbonate mineral made out of calcium magnesium carbonate and it is likewise used to

portray as sedimentary carbonate shake. Dolomite is also known as dolomite. The dolomite powder is the crushed mineral from dolomite. Copper slag is a rough impacting coarseness made of granulated slag from metal refining procedures and it is likewise called as iron silicate. The replacement percentages of cement by dolomite powder is 10%, 20% & 30% and fine aggregate by copper slag is 25% by the weight of M25 grade concrete. The dolomite powder and copper slag is mixed with natural cement and fine aggregate in the grade of M25 with the mix proportion of 1:1:2.

The use of dolomite powder and copper slag increased the compressive and tensile strength of concrete The compressive strength for M25 grade concrete is 27 and it is increased by replacement of 25% copper slag and dolomite 10%, 20% & 30%.

2.2 Authors: S. Muthukumaran

Author determined the advanced concrete engineering properties viz. Compressive Strength, Tensile Strength, Flow Ability, Durability and Water Absorption Capacity of the partially replacement of river sand and ordinary Portland cement. This paper deals the fresh and hardening property of concrete made with m-sand as sand and dolomite powder as cement replacement in different percentage of amounts and also the experimental studies on physical and micro structural properties of manufactured sand are presented in this paper. While comparing the properties of natural sand (spherical particles), the manufactured sand (angular particles) gives better interlocking between the particles. Hence, enhancement in strength and durability characteristics may be obtained.

The target despicable of M25 grade concrete is 31.6 N/mm2. The optimal replacement percentage of cement with dolomite powder 10% and sand with m-sand 40%, when the compressive strength is 40.64 N/mm2. The optimal replacement percentage of cement with dolomite powder 10% and sand with m-sand 40%, when the Split tensile strength is 4.93 N/mm2. The optimal replacement percentage of cement with dolomite powder 10% and sand with m-sand 40%, when the Flexural strength is 9.69 N/mm2.

2.3 Authors: B.Durga

Author done experimental study of the effects of silica sand when used as a partial replacement to fine aggregate (natural sand). Natural sand in and everywhere in river bed plays an important ecological. The worldwide depletion of natural sand has become very high due to excessive use of concrete. Hence the role, it acts as a giant aquifer and habitat for species. As a result of urbanization and increase in construction projects and activities, the available sources of natural sand is getting depleted. Mandate for natural sand has become high and there is deficiency of good quality natural sand. This research deals with the use of an alternate material, silica sand as partial replacement of natural sand. Silica sand is by-product obtained as a outcome of cement manufactured by wet process. Silica sand performances as a filler material that is inert but increases the process of hydration by physical action. Due to the micro filling chattels of silica sand, the pores in concrete are reduced which improves moisture resistivity of concrete.

The closer to optimal replacement percentage arrived in case of compressive strength was 60% and in case of split tensile strength it was 40% at 28 days. It was found that the compressive strength increases by 32% on 60% replacement and tensile strength increases by 13% on 40% replacement at 28 days. SEM analysis was also conceded out to study the particle size of silica sand by amplifying it to different ranges. As it is found as crystalline in nature it can be used as filler material.

2.4 Authors: APARAJITA MALLICK

Author done experimental study on the possibility of replacing the conventional ingredients of concrete like cement and fine aggregate by sustainable materials. In this work M20 grade of concrete is engaged for study and the fine aggregate is partly replaced by dolomite silica a by-product of cement manufacturing plant by 50% weight of fine aggregate and then cement is replaced with Class C fly ash at 10%, 20%, 30%, 40% and 50% in weight of cement. The specimen is casted in favors of testing compressive, flexural, split tensile strength and water absorption. The workability result shows that replacement of fine aggregate by dolomite silica and cement by fly ash always increases, but in the presence of super plasticizer. The results shows that when the fine aggregate is replaced by dolomite silica by 50% and cement is replacement by fly ash by 30% the compressive strength increased by 21.35% than

conventional concrete and split tensile strength results indicate that 24% increase in strength is achieved and flexural strength also improved 20.48% then conventional concrete.

In the cement manufacturing processes greenhouse gases are emitted which results in global warming. So, there is a need for an alternative to replace this conventional concrete ingredient. In this project work, dolomite silica is used as a replacement of fine aggregate and also cement was partly replaced by class fly ash. The main idea of this project was to find whether, concrete with the replaced dolomite silica and class c fly ash in case of fine aggregate and cement respectively had better strength and durability characteristics.

2.5 Authors: Mr. R. Udhayasakthi

Author done experimental study on use of fibers in concrete for improving its properties such as strength and ductility. Amid many different kinds of fibers available today, glass fiber is a recent overview in the field of concrete technology. The addition of these fibers into concrete mass dramatically increase the compressive strength , split tensile strength , flexural strength and impact strength of concrete. Built on the lab testing on Fiber Reinforced Concrete cube, cylinder and beam specimens have been designed with Glass Fiber Reinforced Concrete containing glass fibers of 0.5% volume fraction. Replacement of cement with a more environment friendly will help to reduce the emission of carbon dioxide gas into the atmosphere.

Diverse aspects of various authors on glass fiber reinforced concrete and partial replacement by dolomite powder was discussed. This gives the theoretical information about the consumption of dolomite powder and glass fibers into the conventional concrete.

2.6 Authors: OlesiaMikhailova

Author done experimental study on possibility of use of dolomite powder as an partial replacement material to cement. The some partial replacement percentages in experimental study were 0%, 5%, 10%, 15%, & 20% by weight of cement. The compressive, split tensile & flexural strengths of M20 concrete was conducted with dolomite powder were compared with those of reference specimens. It is found use of replacement of cement with dolomite powder to improve the strength of concrete is successful.

Research confirmed that finely ground dolomite limestone in fact used as cementitious material to produce cement with dolomite limestone. Incorporation of 5 wt. % and more than 25 wt. percentage dolomite limestone into cement at all times reduces compressive strengths after 14 and 28 days. Specimens containing 25% dolomite limestone powder by weight have the maximal compressive strengths

3. OBJECTIVE

- To reduce cost in production of concrete.
- To find an alternative for the cement.
- Ultimately to save energy by using cheaper raw materials in the production of concrete.
- To Reduce Shrinkage Of Concrete.
- To save cost in the production of cement.

4. SCOPE OF WORK

- There is scope to study for the higher grade of concrete by using Dolamite Powder.
- Scope for comparative study for various grades of Concrete with dolomite Powder & other materials.
- Dolamite Powder develop as a fillar material that will allow the concrete industry to optimize materiel use.
- Scope to produce economy concrete cost and construct structures that will be strong, durable and sensitive to the environment.

4. METHODOLOGY

Material

Cement: Ambuja Fifty Three grade cement which is confirming to IS 12269:2013 used throughout the work. The cement used were fresh, lump free& dry. All possible external content was uncontaminated while storing cement. Some properties of cement was found which are shown in following table I.

TABLE I

Physical properties of cement Properties	Results
Fineness	7%
Specific gravity	3.16
Initial setting	150min.
Final setting	270min.

Fine Aggregate: The most important property of fine aggregate is to assist in producing workability and uniformity in the concrete mixture. The fine aggregate is also allows the cement paste to hold and binding coarse aggregate particle in suspension. This action promotes plasticity in the whole mixture and prevents the possible segregation of paste and coarse aggregate. It should be durable, clean and be free from organic matters. River sand were used as anfine aggregate. The specific gravity of sand is found to be2.56.

Coarse Aggregate: The coarse aggregate is largest ingredient of concrete. In the presence of coarse aggregate in concrete reduces the drying, shrinkage and other dimensional changes occurring on account of movement of moisture. In this hard broken stone used as coarse aggregate in concrete. Here Size of coarse aggregate used in the Experiment was 20mm. The specific gravity of the coarse aggregate found to be 2.68.

Table II

Properties	Coarse Aggregate
Specific gravity	2.67
Bulk density	1558.5kg/m3

Dolomite: Dolomite is a carbonaceous or carbonate material which is composed of calcium magnesium. Carbonate CaMg (CO3)2. The term carbonate itself used to define the sedimentary carbonate rockDolostone (Dolomite Rock) it is composed predominantly of mineral dolomite with stoichiometric ratio of 50% or greater content of magnesium replacing calcium, often as a result of digenesis. Dolomite is a rock forming mineral which is noted for remarkable Wettability and dispersibility as well as moderate oil and plasticizers absorption.

Dolamite Powder

Table III

S. No	Property	Dolomite Powder
1.	Formula	$CaMg(CO3)_2$.
2.	Sp. Gravity	2.85
3.	Color.	White, Off White
4.	Tenacity	Brittle
5.	Mosisturecontant (%)	Nil
6.	Crystal system	Trignal

Water: Water is an important ingredient in concrete as it is actively participates in the chemical reaction along with cement. The water which is used for making concrete should be clean and free from impurities like organics, oil, alkalis, acids etc. Water which was used for making concrete should have a pH between 6 to 8. Locally available drinking water used in this work.

5. DETAILS OF CONCRETE MIX

In this grade of concrete is choosen as M30 and the mix design were done as per IS: 10262 - 2009 & IS: 456-2000 for different percentage of dolomite powder replacing cement partly. Mixtures were prepared at room temperature. Test specimens of prescribed mix designs are prepared and permitted to cure in water for 7and 28day at room temperature. Finally, tests are conducted for Compressive Strength, Split Tensile Strength on 7th and 28thday respectively.

Four concrete mixes was designated as Mix-1(Control Mix), Mix-2(5% Dolomite), Mix-3(10% Dolomite), Mix-4(20% Dolomite).

6. DETAILS OF EXPERIMENTAL STUDY

1. Compressive Strength Test:

For this experiment 150 mm × 150 mm × 150 mm cubes of concrete were casting using M30 grade of concrete. Specimens made using cocrete with ordinary Portland cement (OPC) and it was replaced with dolomite powder at 5%, 10%, and 20%, levels were casting was done. After 24 hours specimens were removed from mould and they are placed for water curing for 7 and 28 days. After curing, the specimens tested for compressive strength using compression testing machine.

2. Split Tensile Strength Test:

The tensile strength of concrete is one of basic and important property of the concrete. The split tensile strength test was conductedon concrete cylinder is method for determining the tensile strength of

concrete. The split Tensile strength is tested on cylinders at different percentage of dolamite powder Content in concrete. The strength of concrete has been tested on cylinder at 7 days and 28 days curing 7days test has been conducted to check the gain in initial strength of concrete 28 days test gives the data relating to final strength of concrete at 28 days curing. It is found and can be seen that dolamite powder improves the compressive and split tensile strengths of concrete. As the percentage of replacement of cement partially with dolamite powder increases the compressive & split tensile strengths increases.

7. RESULTS

1. Compressive Strength of Concrete

Table IV

Mix	Compressive Strength (7 DAYS) (N/mm^2)	Compressive Strength (28 DAYS) (N/mm^2)
Mix 1	17.13	28.50
Mix 2	23.55	42.53
Mix 3	27.12	46.39
Mix 4	26.31	38.25

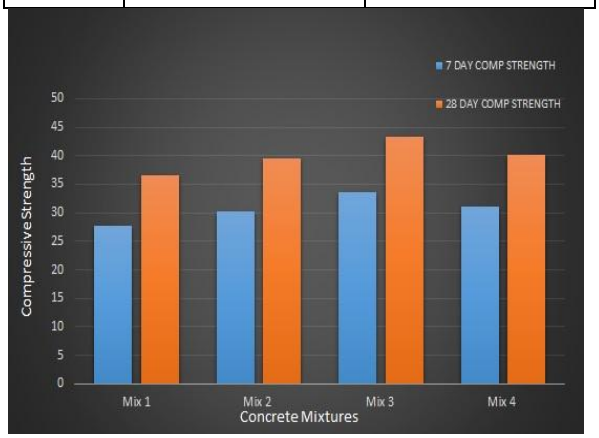

Chart1.Compressive Strength of Concrete at 7th & 28th Days

2. Split Tensile Strength of Concrete:

The split tensile strength of concrete was determined from Cylindrical Specimen of diameter 150 mm and height 300 mm.

Table V

Mix	7 Days (N/mm2)	28 Days(N/mm2)
Mix 1	2.36	3.22
Mix 2	2.44	3.30
Mix 3	2.61	3.53
Mix 4	2.40	3.38

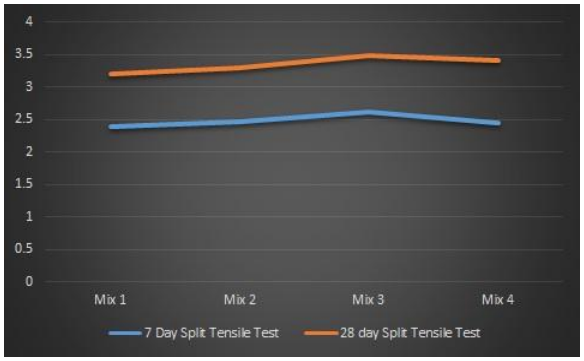

Chart 2. Split tensile Test at 7th & 28th day

8. CONCLUSION

The Compressive strength of Cubes are increased with addition of dolomite powder up to 10% replaced by weight of cement & further any addition of dolomite powder the compressive strength decreases. The Split Tensile strength of Cylinders are increased in the addition of dolomite powder up to 10 % replaced partially by weight of cement and further any addition of dolomite powder resulted the Split Tensile strength decreases. We have been found out the optimum replacement percentage of dolomite powder with cement and it is 10% of cement for both cubes and cylinders. We have put forth a simple step to minimize the costs for construction with usage of dolomite powder which is much more cheaply available. We have also stepped in into a realm the environmental pollution by cement production & make use of cheaper material to get required quality of construction it has been our main objective as a Civil Engineers.

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