An Innovative approach for Alternative Solution in Concrete Blocks by Using Dolomite Waste

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***Abstract*: Dolomite block is the most important stable refractory under the working conditions of Argon Oxygen De-carbonization (AOD). For AOD applications, the Dolomite blocks should have positive Permanent Linear Change (PLC) on re-heating. A positive PLC dolomite brick has higher life and most suitable for joint less refractory lining with no cobble stoning defect. Therefore, the development of dolomite bricks having positive PLC during applications is a challenge for refractory manufacturing industry. In the present investigation, dolomite refractory bricks were prepared by varying different additive with an intention to get the positive PLC of the brick. It is well known that Iron Oxide is a good additive for dolomite brick sintering.**

Dolomite is a sedimentary rock resulting from the deposition of river or sea takes millions of years. The quarry waste from dolomite production had been used to replace sand in order to study the performance of modified brick sand. The objectives of this research are to determine the density, water absorption rate, and compressive strength of the new dolomite brick (d-brick) and to find out the optimum percentage of sand replacement with the dolomite waste. The bricks sample are then be tested using physical and mechanical approach. The percent of sand replacement is 25%, 50%, 75%, and 100% by weight. The optimum percentage mix of the modified sand brick using dolomite is D50 based on the density, water absorption, and compressive strength test of the sand

***Keywords*: Dolomite, PLC, Iron oxide, cobble, concrete.**

INTRODUCTION

Dolomite is generally used as a repairing material rather than as a direct refractory because of its defects like shrinkage, softness, and porosity. However, stabilized dolomites are used in open hearth furnaces, electric furnaces, and Bessemer converters etc., it is cheap and substitute for magnesia bricks. Dolomite mineral has very few uses. However, dolomite stone has a wide range of uses because it occurs in deposits that are large enough to mine. The most common use for dolomite stone is in the construction industry. It is crushed and sized for use as a base material for road, railroad ballast, an aggregate in concrete and asphalt, rip-rap or fill. It is also calcined in the production of cement and cut into blocks of specific size known as "dimension stone". Dolomite's reaction with acid also makes it useful. It is used for acid neutralization in the chemical industry, in stream restoration projects and as a soil conditioner.

Dolomite serves as the host rock for many lead, zinc and copper deposits. When heated these deposits form acidic hydrothermal solutions move upward from depth through a fracture system that encounter a dolomite rock unit. These solutions react with the dolomite, which causes a reduction in pH that starts the precipitation of metals from solution. Dolomite is also used as an oil and gas reservoir rock. During the conversion of calcite to dolomite a reduction in volume occurs.

EXPERIMENTAL STUDIES-

Raw materials used for this study: Calcined Dolomite, Fused magnesia large crystal (FMLC), Chrome Oxide green, Mill Scale, Zirconia, Nano Iron Oxide, Wax and Stearic Acid.

Table 1: Experimental conditions batch size 1 KG	**GRAIN HEATING**
DIMENSION Ht: 50MM Dia : 50MM	AMOUNT OF MIXTURE FOR PRESSING ~300 gm
PRESSING 1.8 T/cm2	FIRING 1650 ± 10 ° C
SOAKING – 2 HOURS	
BATCH SIZE 1 KG	GRAIN HEATING Yes
DIMENSION Ht: 50MM Dia : 50MM	AMOUNT OF MIXTURE FOR PRESSING ~300 gm

Calcined Dolomite: Dolomite is an anhydrous carbonate mineral made out of calcium magnesium carbonate CaMg(CO3)2. The word dolomite is additionally used to portray the sedimentary carbonate rock, which is made overwhelmingly out of the mineral dolomite likewise (otherwise called dolostone).Solid arrangement exists between dolomite, iron rich ankerite and the manganese rich kutnohorite.

Chrome Oxide: Cr2O3 embraces the corundum structure, comprising of a hexagonal close stuffed cluster of oxide anions with 2/3 of the octahedral gaps involved by chromium. Like corundum, Cr2O3 is a hard, fragile material (Mohr hardness 8-8.5). It is against ferromagnetic up to 307 K, the Neel temperature. It isn't promptly assaulted by acids or bases. It turns darker when warmed, however returns to its dull green shading when cooled.

Zirconia: Zirconia is a white crystalline oxide of zirconium. It's most normally happening structure, with a monoclinic crystalline structure. Three stages are known: monoclinic < 1170°C, tetragonal 1170°C– 2370 °C, and cubic >2370 °C. The pattern is for higher symmetry at higher temperatures, as is typically the situation. A couple of level of the oxides of calcium or yttrium balance out the cubic stage.

RESULTS-

Compressive strength or **compression strength** is the capacity of a material or structure to withstand loads tending to reduce size, as opposed to tensile strength, which withstands loads tending to elongate. In other words, compressive strength resists compression (being pushed together), whereas tensile strength resists tension (being pulled apart).

***Table 1: Compressive Strength for 0%* Dolomite**

% of RM	Wt. of RM	Wt. of cement	Wt. of Sand	Wt. of Metal	Wt. of Fiber	Wt. of Water	7 days strength	14 days strength	28 days strength
0	0.00	3.675	7.924	13.974	12.250	1.838	17.79	22.68	26.68
5	.184	3.492	7.924	13.974	12.250	1.838	18.23	23.567	27.12
10	.368	3.308	7.924	13.974	12.250	1.838	20.1	24.90	28.10
15	.551	3.124	7.924	13.974	12.250	1.838	17.79	24.10	25.79
20	.735	2.940	7.924	13.974	12.250	1.838	18.23	22.68	27.12

***Table 2: Compressive Strength for 5%* Dolomite**

% of RM	Wt. of RM	Wt. of cement	Wt. of Sand	Wt. of Metal	Wt. of Fiber	Wt. of Water	7 days strength	14 days strength	28 days strength
0	0.00	3.675	7.528	13.974	12.250	1.838	17.34	21.79	26.23
5	.184	3.492	7.528	13.974	12.250	1.838	20.01	23.12	27.57
10	.368	3.308	7.528	13.974	12.250	1.838	21.79	24.01	29.79
15	.551	3.124	7.528	13.974	12.250	1.838	18.23	20.90	26.66
20	.735	2.940	7.528	13.974	12.250	1.838	13.34	20.43	26.23

***Table 3: Compressive Strength for 10%* Dolomite**

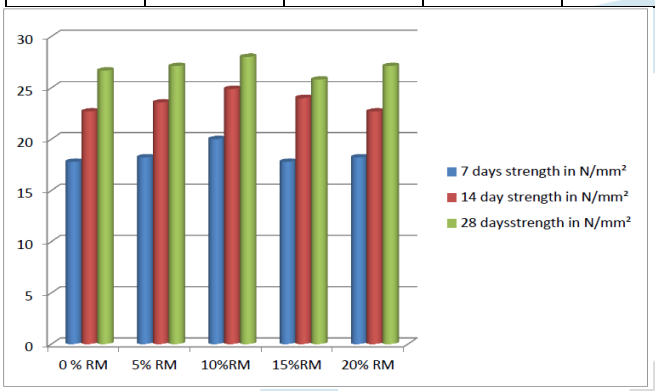
% of RM	Wt. of RM	Wt. of cement	Wt. of Sand	Wt. of Metal	Wt. of Fiber	Wt. of Water	7 days strength	14 days strength	28 days strength
0	0.00	3.675	7.132	13.974	12.250	1.838	18.21	22.02	26.43
5	.184	3.492	7.132	13.974	12.250	1.838	19.10	23.34	28.01
10	.368	3.308	7.132	13.974	12.250	1.838	20.01	24.23	30.01
15	.551	3.124	7.132	13.974	12.250	1.838	19.4	22.10	28.45
20	.735	2.940	7.132	13.974	12.250	1.838	18.66	21.32	26.68

***Table 4: Compressive Strength for 15%* Dolomite**

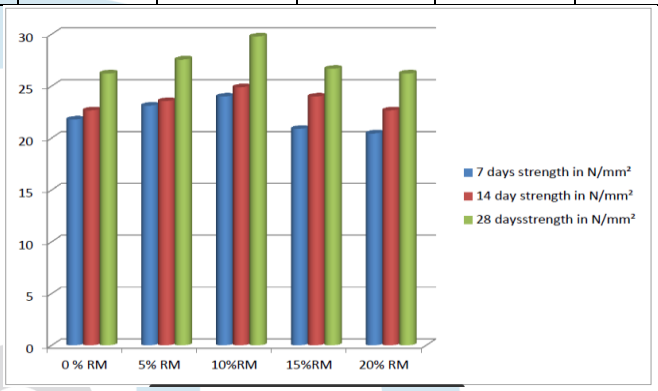
% of RM	Wt. of RM	Wt. of cement	Wt. of Sand	Wt. of Metal	Wt. of Fiber	Wt. of Water	7 days strength	14 days strength	28 days strength
0	0.00	3.675	6.736	13.974	12.250	1.838	17.17	16.88	26.01
5	.184	3.492	6.736	13.974	12.250	1.838	18.66	11.55	27.55
10	.368	3.308	6.736	13.974	12.250	1.838	19.10	14.21	29.32
15	.551	3.124	6.736	13.974	12.250	1.838	17.77	18.21	27.10
20	.735	2.940	6.736	13.974	12.250	1.838	17.32	20.88	25.77

Table 5: Compressive Strength for 20% **Dolomite**

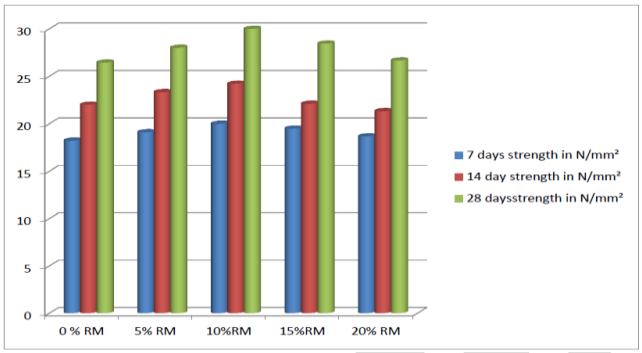
% of RM	Wt. of RM	Wt. of cement	Wt. of Sand	Wt. of Metal	Wt. of Fiber	Wt. of Water	7 days strength	14 days strength	28 days strength
0	0.00	3.675	6.340	13.974	12.250	1.838	13.34	28.88	25.34
5	.184	3.492	6.340	13.974	12.250	1.838	13.34	21.54	27.12
10	.368	3.308	6.340	13.974	12.250	1.838	21.34	23.12	28.87
15	.551	3.124	6.340	13.974	12.250	1.838	17.34	22.23	26.65
20	.735	2.940	6.340	13.974	12.250	1.838	16.45	17.79	25.56\4



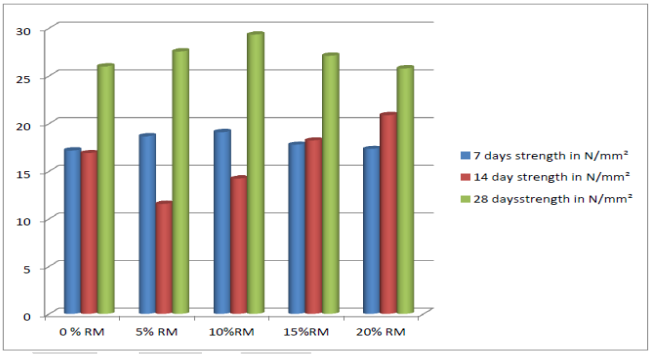
Graph 1- Compressive Strength for 0% Dolomite



Graph 2- Compressive Strength for 5% Dolomite



Graph 3: Compressive Strength for 10% Dolomite



Graph 33: Compressive Strength for 15% Dolomite

CONCLUSION

From the above tests and above graphs the following results were derived.

1. For the 0% **Dolomite**, the compressive strength of structural concrete increases from 7 to 28 days.
2. For the 10% **Dolomite** and Red mud , the optimum strength is obtained.
3. With the addition of **Dolomite** there is reduction in slump value of fresh concrete.
4. The unit weight of concrete gets reduced through the addition of **Dolomite** as replacement of fine aggregate since it has lesser specific gravity than fine aggregate .
5. The 7 days, 14 days and 28 days strength shows that the strength increases from standard concrete up to the addition of 10% replacement of fine aggregate with **Dolomite**.
6. The 7 days, 14 days and 28 days strength gets reduced on further additions of **Dolomite** as sand replacement beyond 10%
7. The strength of concrete when fine aggregate is replaced with pond ash also improves with age of concrete.

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