

Study of Variation of Compressive Strength for different proportion of Red mud replaced with cement with Age

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ABSTRACT

Red mud is a by product or maybe a misuse generated after bauxite break down of food with sodium hydroxide at elevated pressure and temperature by the Bayer procedure within the aluminium industry and primarily made up of coarse sand plus fine particle. It's disposed as slurry with a good focus within the assortment of ten - thirty %, pH in the number of thirteen and substantial ionic strength.

Determined by the raw material prepared, 1 2.5 lots of reddish mud is produced per load of alumina produced. In India, approximately 4.71 million tons/annum of reddish mud is created which is 6.25 % of world's total digestion with sodium hydroxide at temperature that is elevated plus pressure. It is a combination of ingredients originally contained in the parent mineral bauxite plus of compounds produced and also created during the Bayer cycle. It's disposed as slurry with a good focus within the assortment of 10 30 %, pH in the number of 10 13 plus high ionic strength. Red mud is a major pollutant of the planet simultaneously by its chemical structure also it's categorized because of its complicated character into the waste unsuitable for disposal and therapy. Red mud have the potential for large scale program in the generation of cement mixture.

1. Experimental Data

The specimens were tested at the age of 7, 28 and 90 days. The cubes were tested on universal testing machine after drying at room temperature according to IS 516-1959. Three cubes were tested for each proportion and find out the compressive strength.

Table 1 : Compressive Strength of 7 days for different proportion of red mud (W/C=0.48)

S. No.	Mix	W/C	Age (Days)	Compressive Strength (MPa)
1.	M0	0.48	7	31.98
2.	M6	0.48	7	32.48
3.	M7	0.48	7	37.14
4.	M8	0.48	7	36.78
5.	M9	0.48	7	35.29
6.	M10	0.48	7	34.59

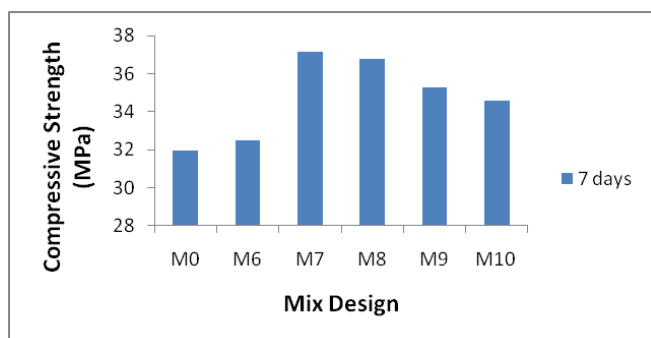


Figure 1 Compressive strength vs. Mix Design of replaced red mud for 7 days W/C=0.48

Table 2 Compressive Strength of 28 days for different proportion of red mud (W/C=0.48)

S. No.	Mix	W/C	Age (Days)	Compressive Strength (MPa)
1.	M0	0.48	28	39.83
2.	M6	0.48	28	40.48
3.	M7	0.48	28	48.15
4.	M8	0.48	28	47.16
5.	M9	0.48	28	44.56
6.	M10	0.48	28	42.34

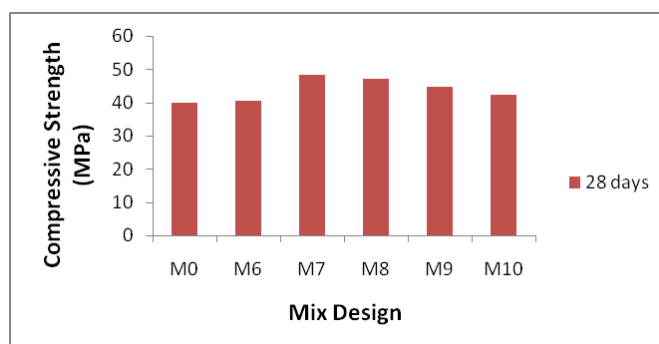


Figure 2 Compressive strength vs. Mix Design of replaced red mud for 28 days W/C=0.48

Table 3 Compressive Strength of 90 days for different proportion of red mud (W/C=0.48)

S. No.	Mix	W/C	Age (Days)	Compressive Strength (MPa)
1.	M0	0.48	90	43.44
2.	M6	0.48	90	44.07
3.	M7	0.48	90	51.19

4.	M8	0.48	90	50.73
5.	M9	0.48	90	47.71
6.	M10	0.48	90	44.88

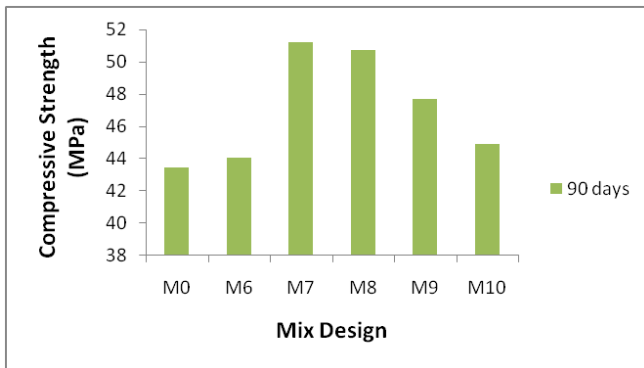


Figure 3 Compressive strength vs. Mix Design of replaced red mud for 90 days W/C=0.48

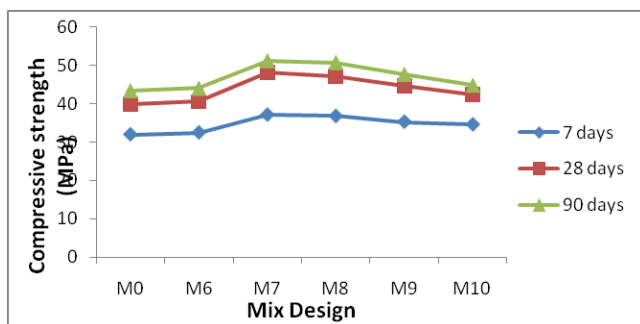


Figure 4 Compressive strength vs. Mix Design of replaced red mud for 7, 28 and 90 days W/C=0.48

Figure shows that compressive strength of cement replaced by red mud with different proportions at 7, 28 and 90 days curing samples. The compressive strength of 100% ordinary cement is 31.98 MPa for 7 days curing , 39.83 MPa for 28 curing and 43.44 MPa for 90 curing samples where as higher compressive strength was achieved by replacing cement by 20% red mud and compressive strength was increased 16.13%,20.88% and 17.84% after 7,28 and days curing samples. The compressive strength of the samples is 37.14 MPa, 48.15MPa and 51.19 MPa for 7, 28 and 90 days curing sample respectively. The maximum value of compressive strength was achieved by the sample of 80% (Ordinary Portland cement) +20 % (red mud) samples.

Table 4 Compressive Strength of 7 days for different proportion of red mud and foundry sand (W/C=0.48)

S. No.	Mix	W/C	Age (Days)	Compressive Strength (MPa)
1.	M0	0.48	7	31.98
2.	M11	0.48	7	32.44
3.	M12	0.48	7	39.15
4.	M13	0.48	7	37.21
5.	M14	0.48	7	37.16
6.	M15	0.48	7	36.79

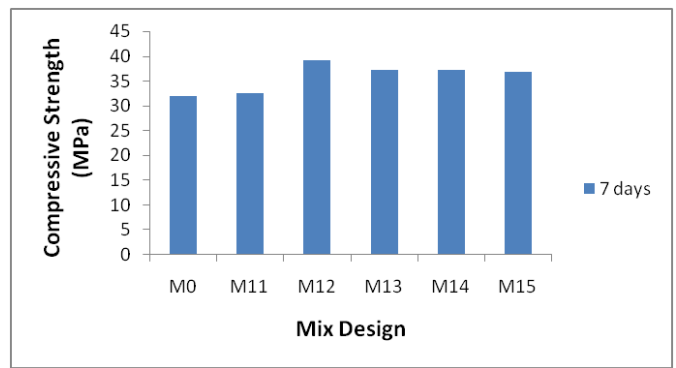


Figure 5 Compressive strength vs. Mix Design of replaced red mud and foundry sand for 7 days W/C=0.48

Table 5 Compressive Strength of 28 days for different proportion of red mud and foundry sand (W/C=0.48)

S. No.	Mix	W/C	Age (Days)	Compressive Strength (MPa)
1.	M0	0.48	28	39.83
2.	M11	0.48	28	40.52
3.	M12	0.48	28	49.17
4.	M13	0.48	28	46.74
5.	M14	0.48	28	46.31
6.	M15	0.48	28	45.87

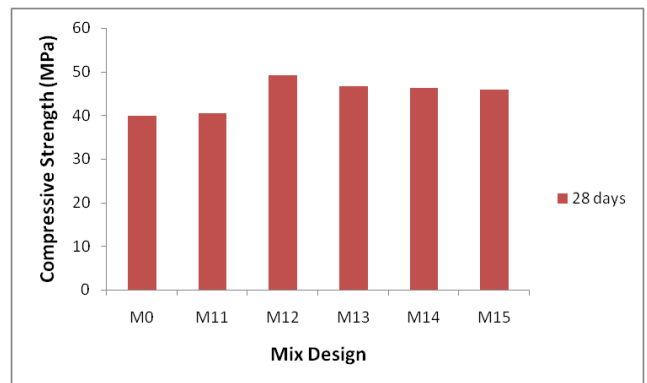


Figure 6 Compressive strength vs. Mix Design of replaced red mud and foundry sand for 28 days W/C=0.48

Table 6 Compressive Strength of 90 days for different proportion of red mud and foundry sand (W/C=0.48)

S. No.	Mix	W/C	Age (Days)	Compressive Strength (MPa)
1.	M0	0.48	90	43.44
2.	M11	0.48	90	43.96
3.	M12	0.48	90	50.46
4.	M13	0.48	90	49.37
5.	M14	0.48	90	49.03
6.	M15	0.48	90	48.31

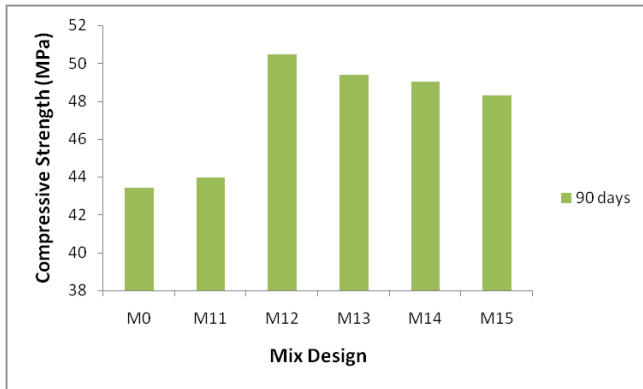


Figure 7 Compressive strength vs. Mix Design of replaced red mud and foundry sand for 90 days W/C=0.48

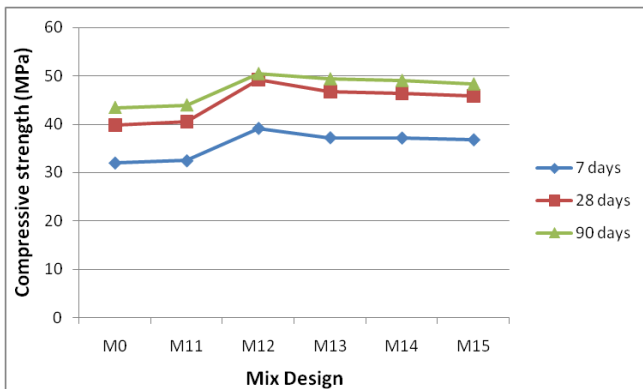


Figure 8 Compressive strength vs. Mix Design of replaced red mud and foundry sand for 7, 28 and 90 days W/C=0.48

Figure 4.12 shows that Compressive strength of red mud is higher than ordinary cement. 20 % replacement of cement by red mud and 20 % sand by foundry sand sample has Compressive strength 39.15 MPa for 7 days curing, 49.17 MPa for 28 days and 50.46 MPa for 90 days curing curing samples whereas Compressive strength of natural sand and cement is 31.98 MPa, 39.83 MPa and 43.44 MPa for 7, 28 and 90 days curing sample respectively.

2. Conclusion

RM is used for building materials production such as cement, bricks, roofing tiles and glass-ceramics. Red mud cement reduces the energy consumption of cement production and improves the early strength of cement and resistance to sulfate attack. Neutralized, dried, calcined and ground red mud is usable as pigment in the building materials industry. Red mud can be utilized as filling material in road base.

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