Utilisation of Industrial Waste in Self Compacting Concrete

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***Abstract*- The issue in modern construction is the generated industrial waste and its disposals. The using industrial wastes as the replacement of cement in the concrete are the good way to use the industrial waste, which is eco-friendly & good for economy.**

The project is conducted by red mud, foundry waste & fly ash as the replacement of cement in the self-compacting concrete. Various research have been conducted on self-compacting concrete by having industrial material as the partial replacement of cement in the concrete mix which yields good comprehensive strength in concrete. This papers aims to improve the strength of SCC by using different proportion of replacement of cement. Using waste combination. The paper also describes the different effects of admixtures & super plasticrs on self-compacting concrete. The effect of different waste materials on fresh & hardened properties of self-compacting concrete & also compared with the 100% cement

INTRODUCTION

The development of New-technology in the material science is progressing rapidly. There are researchers carried out throughout the world to upgrade the effectuation of concrete in terms of strength & durability. Concrete as become a Engineers play tool to make trail & errors methods of different material in concrete rather than using cement, aggregate, and water only. Growing use of concrete in construction industry for different architectural configuration, closely spaced reinforcing bars have made it necessary to manufacture concrete that ensures proper filling ability, Good structural performance & adequate durability.

This concrete was first developed in Japan in late 80's to overcome the problems of concrete quality due to lack of skilled labours along with the problems at the corners regarding the homogeneity and compaction of casting place concrete mainly with the complex structures so as to improve the durability of concrete & structures.

Self-compacting concrete is a concrete which is capable of flowing into the form work without segregate to fill uniformly & completely every corner of the form work by its own weight without any external compaction. There is no standard design for self-compacting concrete therefore each self-compacting concrete has to be designed particularly for the structures to be constructed.

The ingredients used for partial replacement of cement are red mud, foundry waste and fly ash.

Red mud is a waste material generated by the BAYER's process of Alumina production.

Presently 3 tons of red mud is generated annually which is not being disposed or recycled. The material for this research is produced from "JINPAL Steel and power Limited" Bangalore.

Foundry waste sand is a by-product of ferrous and non-ferrous metal casting industries. Foundries successfully recycle and reuse the sand many times in a foundry, when the sand can no longer be used in the foundry, It is removed from the foundry and is termed as waste foundry sand. The material for this research is procured from "RK Building material Suppliers".

Fly ash produced in small dark flecks by the burning of powdered coal or other material and carried into the air.

OBJECTIVES

The basic idea of this research is to find out the most cost effective, durable & environmental friendly. It must be resource saving and easily available waste material which can be used in self-compacting concrete or free flow concrete as a partial replacement of cement which can maximize its efficiency.

METHODOLOGY

Mix proportion of the self-compacting concrete. The cement, sand, coarse aggregates, Industrial waste (red

mud & foundry wastes) will be weighed according to the mix proportion. The fry mix the required quantity of red mud was added & homogenously mixed, to this dry mix water was added & thoroughly mixed. To this hyper plasticer was added at the rate of 700ml/100kg cementious material & the entire mix was thoroughly mixed.

At this stage fresh concrete tests such as slump come test, V-funnel test, L-Box test and U-Box test, and Orimate test were conducted. After conducting the tests on fresh concrete the mix was poured into moulds of size 150mm x 150mm required for the strength examination. There is no vibration given either by vibrators or through hand compaction. Specimens were demoulded after 24hours and transferred to the 7 days and 28 3days curing tank.

Compressive strength test was conducted on specimen after 7 days and 28 days of curing. The procedure is adopted for 100% cement.

Mix Proportion for kg/0.003m3

Component	100% Cement	48%C+2%FS+2%RM+50%FA	48%C+2%RM+50%FA	48%C+2%FS+50%FA
Cement (kg)	11.4	5.472	5.586	5.586
Aggregates(20mm)	5.07	5.070	5.070	5.070
Aggregates(12mm)	21.492	21.492	21.492	21.492
M-sand	28.183	27.790	27.790	27.790
Water	5.85	6.243	6.243	6.243
Admixture (Grace8705) 0.55%	0.0627	0.0627	0.0627	0.0627
Red Mud (kg)	_	0.114	0.114	_
Foundry Sand	_	0.114	_	0.114
Fly ash	_	5.700	5.700	5.700

Sl. NO		Initial flow dia (mm)	1 hr flow dia (mm)	2 hr flow dia (mm)	3 hr flow dia (mm)
1	100% Cement	600	440	_	_
2	48%C+2%FS+2%RM+50%FA	620	590	560	510
3	48%C+2%RM+50%FA	640	610	570	530
4	48%C+2%FS+50%FA	650	620	580	540

100% Cement

Sl. No	Grade	Weight (kgs)	Age at Test (days)	C/S Area (mm²)	Max Load (Kn)	Compressive strength(Mpa)
1.	M 25	8.850	7	22500	916.4	40.72
2.	M 25	8.660	7	22500	886.3	39.39
3.	M 25	8.620	7	22500	901.2	40.05
4.	M 25	8.4	28	22500	788.1	35.02
5.	M 25	8.59	28	22500	754.2	33.52
6.	M 25	8.55	28	22500	691.3	30.72

48%C+2%RM+50%FA

Sl. No	Grade	Weight (kgs)	Age at Test (days)	C/S Area (mm²)	Max Load (Kn)	Compressive strength (Mpa)
1.	M 25		7	22500	322.8	14.34
2.	M 25	8.150	7	22500	352.8	15.68
3.	M 25	8.320	7	22500	352.4	15.66
4.	M 25	8.140	28	22500	536.4	23.84
5.	M 25	8.060	28	22500	628.4	27.92
6.	M 25	8.240	28	22500	630.2	28.00

48% Cement, 50% Flyash, 2% Foundary sand

S.NO	Grade	Weight (kgs)	Age at Test (days)	C/S Area (mm²)	Max Load (Kn)	Compressive strength (Mpa)
1.	M 25	8.610	7	22500	632.1	28.09
2.	M 25	8.520	7	22500	678.7	30.16
3.	M 25	8.490	7	22500	682.6	30.33
4.	M 25	8.600	28	22500	1256.6	55.84
5.	M 25	8.510	28	22500	1186.8	52.74
6.	M 25	8.450	28	22500	1285.9	57.15

Mix proportion= 46% Cement, 50% Flyash, 2% Red mud, 2% Foundary sand

Percentage addition of foundary waste sand (%)	Compressive strength (MPa)	Percentage increase or decrease of compressive strength w.r.t reference mix
0	50.59	-
2	55.24	+4.65
4	51.15	-4.09
6	47.70	-3.45

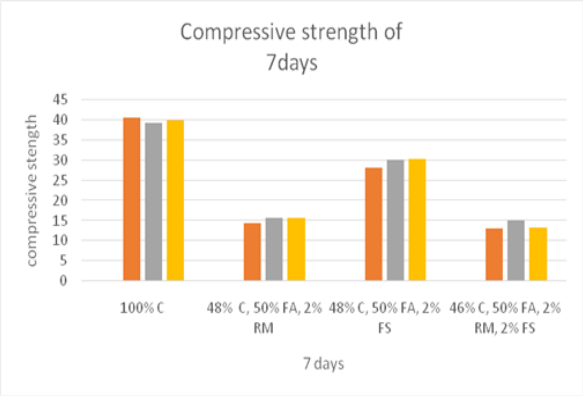
Sl. No	Grade	Weight (kgs)	Age at Test (days)	C/S Area (mm²)	Max Load (Kn)	Compressive strength(Mpa)
1.	M 25	8.010	7	22500	293.5	13.04
2.	M 25	7.810	7	22500	338.1	15.03
3.	M 25	8.010	7	22500	345.1	13.34
4.	M 25	8.070	28	22500	686.4	30.50
5.	M 25	8.220	28	22500	624.6	27.76

TRIAL MIX FOR DIFFERENT % OF FOUNDARY WASTE SAND:

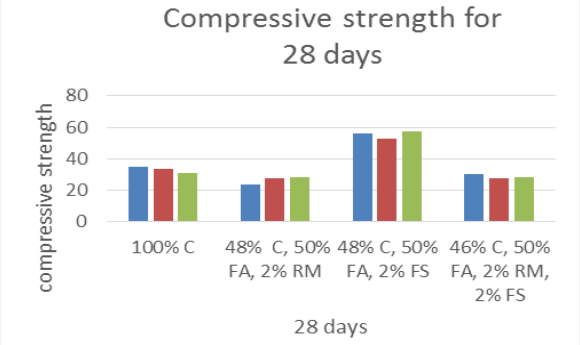
TRIAL MIX FOR DIFFERENT % OF RED MUD:

Percentage addition of red mud (%)	Compressive strength (MPa)	Percentage increase or decrease of compressive strength w.r.t reference mix
0	35.59	-
2	39.88	+4.29
4	36.67	-3.21
6	32	-4.67

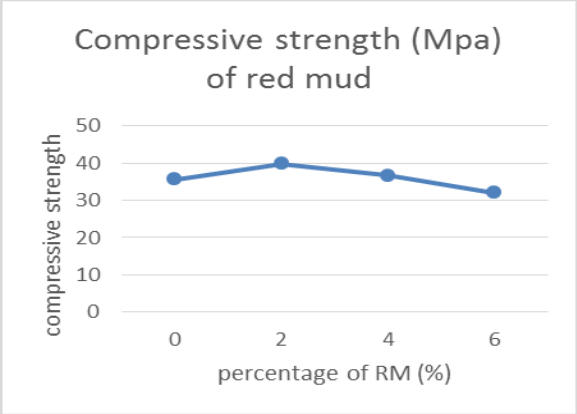
Compressive strength of cubes for 7 days:



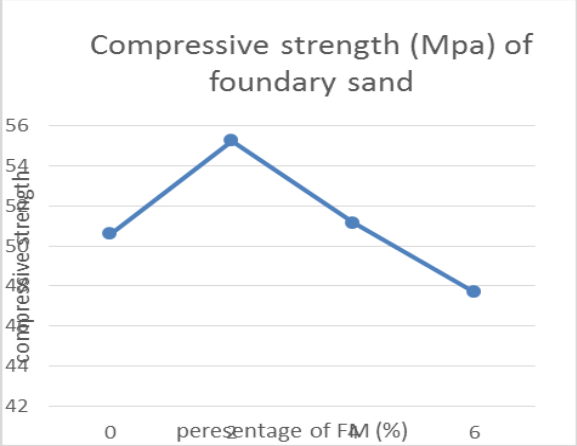
Compressive strength of cubes for 28 days



Overall results of compressive strength for red mud:



Overall results for compressive for foundary sand



CONCLUSION

In the current situation, there is a greater need for self compacting concrete due to architectural requirements, also to improve strength & durability of the structure. Conventional concrete may not be useful under different sire condition, so let us mix the concrete compacting concrete. Now due to industrialization there is a huge amount of industrial wastes produced around Bangalore, due to this there is large amount of red mud & foundry waste dumped on ground it is a threat to environment. Using this in concrete avoids that threat.

After the conduction of experiment we have come to the conclusion that compressive strength of self compacting concrete produced with the combination of admixtures goes on increasing up to 2% addition of red mud & 2% of foundry sand & more than goes on decreasing the compressive strength.

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