

# Study and investigation On Utilization OF FLY ASH, MARBLE DUST AND STONE DUST IN OPC CONCRETE

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**Abstract:** Fly Ash is being generated in enormous amount which is affecting environment. If it is used in concrete, it will assimilate it and will be a boon for environment also. The properties and strength characteristics are analyzed in this paper and findings are published.

**Keywords:** Fly ash, Concrete, OPC, Marble Dust, Stone Dust

## 1. INTRODUCTION

In India large amount of fly ash is generated in thermal power plant with a significant effect on environmental and living organism. The use of fly ash, marble dust & stone dust in concrete can reduce the consumption of natural resources and also diminishes the effect of pollutant in environment. Fly ash is one of the residues generated in the combustion of coal.

Cement, sand and aggregate are such element which is used for any types of construction in construction industry. Concrete cannot gain good strength without mixing natural sand in concrete. There is shortage of natural sand due to more use in construction work. Therefore, the construction industry is facing various problems and failing to complete their project on time within given duration. Hence there is a need to find the new alternative material to replace the river sand, such that excess river erosion and harm to environment is prevented. Many researchers are finding different materials to replace sand and one of the major materials is marble dust and quarry stone dust. Using different proportion of these marble dust and quarry dust along with sand the required concrete mix can be obtained.

Since last few years marble is considered one of the most important decorative building materials. Marble powder is one of the materials which affect the environment and health problems. It is produced from sawing, shaping, and polishing process. The main variable taken into consideration is the percentage of marble dust as partial replacement of sand content in concrete mixes.

Marble stone industry generates both solid waste and stone slurry. Whereas solid waste results from the rejects at the mine sites or at the processing units, Stone slurry is a semi liquid substance consisting of particles originating from the sawing and the polishing processes and water used to cool and lubricate the sawing and polishing machines. Stone slurry generated during processing corresponds to around 40% of the final product from stone industry. In this situation research began for inexpensive and easily available alternative material to natural sand.

## 2 Objectives and scope of present study

1. The main objective of the present investigation is to evaluate the suitability of Fly ash (FA) produced as by product of burnt coal from the Thermal power plants burning as partial replacement for cement in concrete. And also, partial replacement of natural sand by marble dust, stone dust. This investigation target to determine the performance of concrete for 35%, 25%, 22.5% and 20% replacement of cement by Fly ash and 30%, 40% natural sand by marble dust, stone dust.
2. To investigate the properties compaction factor and workability of fresh concrete mixes.
3. To investigate the strength properties compressive strength at different ages of hardened concrete.



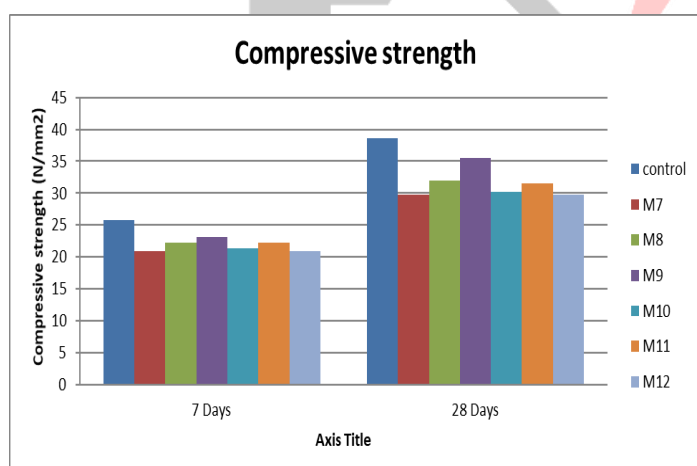
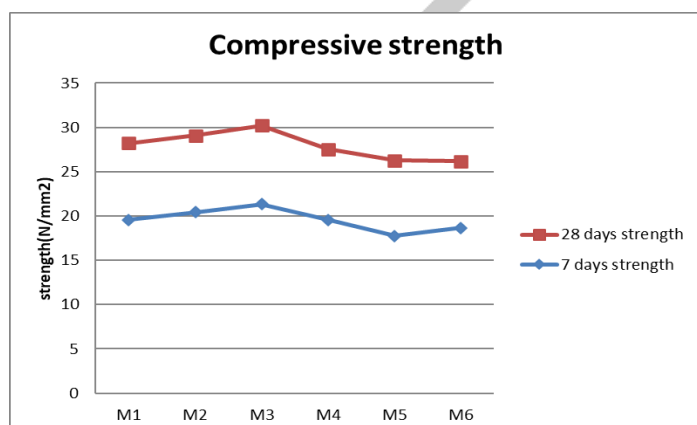
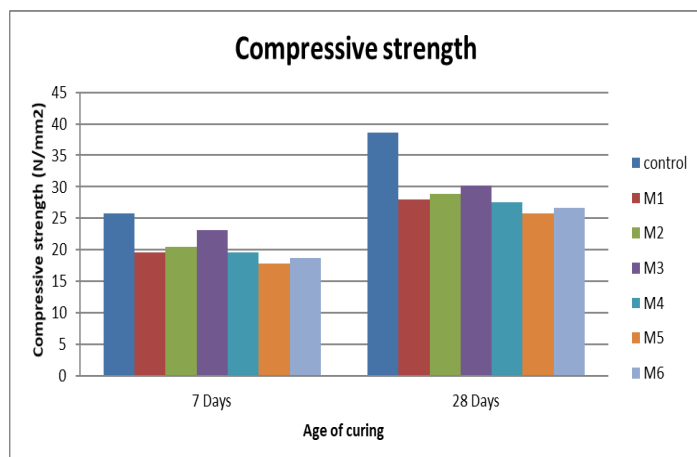
Fly Ash raw material

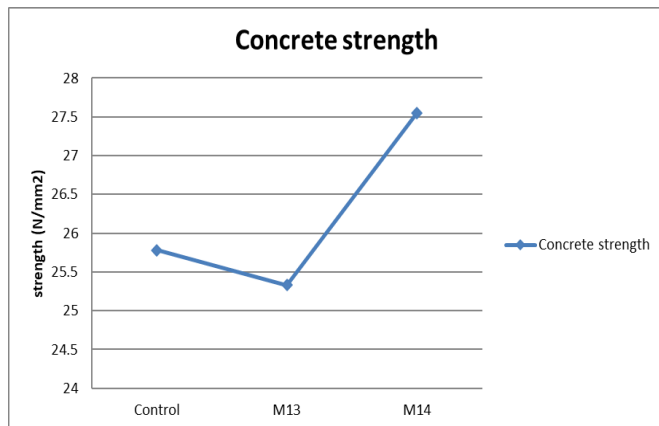
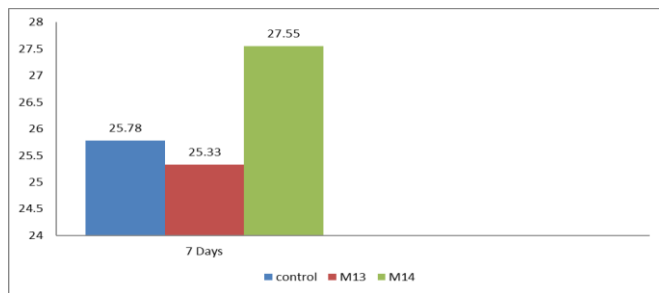
### 3 Results and Discussion

#### 3.1. Control Concrete (CC)

Table gives the test results of control concrete. The 28 days strength obtained for M30 grade control concrete is 38.66 Mpa. The strength results reported in fig. are presented in the form of graphical variation, where in the compressive strength is plotted against the curing period.

Grade of concrete	7days	28days
M30	25.78 N/mm <sup>2</sup>	38.66 N/mm <sup>2</sup>





### 3. CONCLUSIONS

The following observations were made as result of experiments.

1. Water cement ratio increased with addition of fly ash than control mix in diverse mix shown above table.
2. The maximum compressive strength was achieved in mix M14 than other diverse concrete mixes M1-M13 shown above table.
3. The maximum compressive strength was achieved about 6.86 % higher than the control concrete.
4. In concrete cement can be replaced with 20% FA with maximum increase in strength beyond starts decreases.
5. Using fly ash, marble dust and stone dust waste in concrete mix proved to be very useful to solve environmental problems and reduces to some extent the requirement of cement in large quantity. Therefore, it is recommended to re-use these wastes in concrete to move towards sustainable development in construction industry.

### RECOMMENDATIONS

The mix M14 showed reliable values of compressive strength. The maximum compressive strength was 6.86 % higher than the control mix M30. The partial replacements as taken in mix M14 are recommended for use in making concrete mixes.

### SCOPE OF FURTHER WORK

A small percentage that is 3% to 5% of fly ash is being used in India while in other countries the percentage of utilization is 30% to 80%. Whatever be the type of fly ash, it causes types of pollution and air borne diseases such as silicosis, fibrosis of lungs, bronchitis etc. Fly ash is being consumed (tones / day) by several organizations in production of cement, bricks, cellular blocks, asbestos sheets, filling low lying areas and construction of road.

Apart from this, use of marble dust and stone dust is much less than that of fly ash for preparing concrete of reliable strength. Usage of marble powder and stone dust needs to be studied more, so that these waste material can contribute to be a large constituent of concrete mixes which in turn will optimize the cost of the project and at the same time not compromising with strength and other properties of the concrete.

### REFERENCES

- [1] Bahar Demirel "The Effect of the using waste marble dust as fine sand on the mechanical properties of the concrete" International journal of physical Science Vol. 5(9), Pp. 1372-1380, 18 Agust,2010
- [2] A Priyanka, Jadhav, Dilip k. ,Kulkarni "Effect of replacement of natural sand by manufactured sand on properties of cement mortar" International Journal of Civil and Structural Engineering, Volume 3, No 3, ISSN 0976-4399,2011.
- [3] HanifiBinici, Hasan Kaplan and SalihYilmaz, (2007), "Influence of marble and limestone dusts as additives on some mechanical properties of concrete" Science Research and Essay, 2(9), pp 37237
- [4] Mayur M. Lohe "Utility of marble dust & Ash in different Fly grades of concrete" International Journal of Engineering Research-Online Vol. 3. , S2, 2015 ISSN: 2321-7758.

- [5] Anjali H Jamale, Urmila R Kawade “Effect of Quarry Dust and Fly Ash Mix on strength properties of M40 grade Concrete” International Journal of Engineering Research and General Science Volume 3, Issue 3, Part-2 , May-June, 2015 ISSN 2091-2730
- [6] A.Krishnamoorthi, and G. Mohan Kumar “Properties of Green Concrete Mix by Concurrent use of Fly Ash and Quarry Dust” IOSR Journal of Engineering (IOSRJEN) e-ISSN: 2250-3021, p-ISSN: 2278-8719 Vol. 3, Issue 8 (August. 2013), ||V3|| PP 48-54
- [7] M.N.Balakrishna, M.C.Nataraja “Proportioning Of Fly Ash Concrete Mixes A Comprehensive Approach” International Journal of Emerging Science and Engineering (IJESE) Volume-1, Issue-8, June 2013 ISSN: 2319–6378,
- [8] T.G.S Kiran, M.K.M.V Ratnam “Fly Ash as a Partial Replacement of Cement in Concrete and Durability Study of Fly Ash in Acidic ( $H_2SO_4$ ) Environment” International Journal of Engineering Research and Development Volume 10, Issue 12 (December 2014), PP.01-13
- [9] Suman et al, “Ash Concrete : A technical Analysis for Compressive Strength” International Journal of Advanced Engineering Research and Studies E-ISSN2249–8974
- [10] Praveen Kumar K, Radhakrishna “Strength and Workability of Cement Mortar with Manufactured Sand” International Journal of Research in Engineering and Technology eISSN: 2319-1163 pISSN: 2321-7308
- [11] Bhole S.D, Chavan P.J. “To study the behavior marble powder as supplementary cementitious material in concrete 2014”.
- [12] Soliman Nohar M. “Effect of marble powder in concrete mixes on behavior and strength of RC slab” International Journal of current Engineering and Technology 2013; 1863 – 1870 P.
- [13] Gurr Metin, Tekin Liker. “Investigated utilization of waste marble powder as an additive in cement production” Materials and design 2010; 31:4039 – 4042P.

