A review on effective use of Waste Marble Dust (WMD) and fly ashin concrete

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***Abstract*— Marblehas been commonly used as a building material since the ancient times. The industry's disposal of the marble powder material, consisting of very fine powder, today constitutes one of the environmental problems around the world. In most of the construction concrete is use enormously, in which material like coarse aggregate, FA, cement as material and water is used. FA is usual as natural sand and which is used excessively in construction. Sand is natural resources which are easily available by mining but it is objectionable. As the construction are increasing day by day in world the natural sources like sand are getting vanished, so we have carried out our study to replace natural sand by waste marble dust and fly ash in concrete. The aim of our study is to use WMD as the substitute for sand as FA.25% of Marble powder is being produced from processing plants during the sawing and polishing of marble blocks and the main problem in marble powder is disposing which is a major environment problem. So we are using WMD in concrete .To solve environmental problems we are using fly ash in concrete by substitution of cement. to make economical and effective strength concrete we are using fly ash in concrete by substitution of cement. Water cement ratio will be increase with addition of 35% fly ash.**

***Index Terms*— WMD, fineaggregate, coarseaggregate, checking, analysis**

I. INTRODUCTION

As per the study on marble dust replacement with sand, we found out that as the WMD produced from cutting and sawing of marble as major problem in disposing because it cause environmental problems likeland pollution and harmful to land. By this Research we concluded that crushed Marble powder can be effective used to replace natural sand without reduction in strength of concrete at replacement level up to 40% (pofale and Quadori, 2013) compressive strength of concrete (M25, M30) made using crusher dust increased at all the replacement level between 30%-60% at an interval of 10% however maximum increased strength is observed at replacement level of 40%. So in concrete marble dust can be used as substitute to FA and in results it has good binding property and has enough strength to concrete. Durability is an important factor in construction. so the use of fly ash should be done which gives more durability.As compare to other material fly ash gives better water/cement ratio and 7day's compressive strength as the result by addition of 35% and 25% fly ash.

II. CONSTITUTE MATERIALS

A. Cement:

Cement can be defined as material having adhesive and cohesive properties which make it capable of bonding material fragments into a compact mass. Cement is the most important ingredient in concrete. Different brands of cement have been found to possess different strength development characteristics and rheological behaviour due to the variations in the compound composition and fineness. For the present investigation, ordinary Portland cement (chettinad) of 53 grade conforming to IS 12269-1987 was used.

B. Coarse Aggregate:

The coarse aggregate used in the investigation is crushed stone aggregate passing through 16mm sieve. The aggregate occupy 70%-80% of the total volume normal concrete. But self-compacting concrete have only 50% of total volume of concrete. Coarse aggregate shall comply with the requirement of IS 383.

C. Fine Aggregate:

The fine aggregate used in the investigation is clean river sand and conforming to zone II. The sand was first sieved through 4.75mm sieve to remove any particles greater than 4.75mm. Fine aggregates shall conform to the required of IS 383.

D. Admixture:

The most important admixtures are the super plasticizers (high range water reducers), used with a water reduction greater than 20%.Admixture conforming to IS 9103.

E. Mixing Water:

Water conforming to Standards should be used in SCC mixes. Where recycled water, recovered from processes in the concrete industry, is used but should conform the specifications.

F. Fly Ash:

Fly ash is a fine inorganic material with pozzolanic properties, which can be added to SCC to improve its properties. However the dimensional stability may be affected and should be checked. Fly ash conforming to IS 3812.

G. Marble Powder:

The advancement of concrete technology can reduce the consumption of natural resource and energy source and lessen the burden of pollution on environment .Presently Large amounts of marble dust are generated in natural stone processing plants with an important impact on environment and humans. This project describes the feasibility of using the marble dust in concrete production as partial replacement of cement. In INDIA, the marble and granite stone processing is one of the most thriving industry the effects if varying marble dust content on the physical and mechanical properties of fresh and hardened concrete have been investigated.

III. OBJECTIVES

1. To use waste marble dust and fly ash for its best use in concrete.
2. To study effect of waste marble dust and fly ash in concrete.
3. To establish the alternatives for sand and cement with partial use of WMD and fly ash in concrete.
4. To check the feasibility of both materials which use in concrete.
5. To compare the compressive strength, flexural strength, tensile strength of WMD and fly ash with other material.

IV. PREVIOUS RESEARCH REVIEW ON USE OF WASTE MARBLE DUST AND FLY ASH IN CONCRETE

1. Demirel et al. (2010) found that the unit weight of the concrete was increased as a result of the fact that certain proportions of WMD were added to concrete as FA substitute. This gave an expected out come due to high specific gravity of WMD and also filler effect of marble dust because it has finer particles then FA. With increase of percentages of marble dust compressive strength of concrete was also increased.
2. Sakalkale et al. (2014) researched on use of waste marble dust in concrete and Authors conclude that up to 50% flexural strength of beam is also increased. The test performer found that the optimum percentage for replacement of sand with WMP in concrete is almost 50%.
3. A.S.E. Belaidi1 and L.Azzouz2 was investigated examine the effect of substitution of cement with natural pozzolana and marble powder on the rheological and mechanical properties of self-compacting mortar (SCM) and self - compacting concrete (SCC). Ordinary Portland Cement (OPC) was partially replaced by different percentages of pozzolana and marble powder (10–40%). The results indicate an improvement in the workability of SCC with the use of pozzolana and marble powder.
4. Devesh et al. (2015) Studied on an optimum marble dust as replacement with sand. Large amount of marble slurry is produced after cutting & sawing of marble. This slurry makes land polluted which is harmful for land. So Authors had use marble slurry as the substitute of FA in construction of road.
5. Karthiket. al.(2015) author used bacteria to the substitute for concrete and cement because they are known for the production of CO2 which is the main cause of global warming. For this bacteria name bacillus sphaericus is chosen.
6. Chowdary et al. (2015) found that by mixing 15% marble dust with concrete we observe maximum optimum compressive strength at 15%.Marble dust of 20% mixed with FA gives high strength. Marble dust of 10% mixed with FA also gives somewhat more strength when as compared to normal mix.
7. Pala et al. (2015) suggested that by substituting cement with marble powder and fly ash we found that cement has no negative effect on workability of Self compacted concrete. Slump flow is caused by increasing of marble powder in Self Compacted Concrete. Passing ability is increased by increasing marble powder in Self Compacted Concrete. The Author had found some positive effect of marble powder 10% and fly ash 25% by substitute cement in binder material in SCC.
8. Kumar et al. (2015) researched for concrete mix with addition of 25% fly ash has maximum 7day's compressive strength compare to other mix. Water cement ratio also increases with addition of 35% fly ash. To solve environmental problems we can use fly ash, marble dust, stone dust in concrete mix which reduces use of cement in large quantity of cement.

V. CONCLUSION

1. The Use of marble powder and fly ash by substitution to cement has no negative effect of workability of SCC.
2. Increase in water cement ratio with addition of 25% fly ash as compared to control mix in diverse mixes(M1,M2,M3,M4,M5,M6) (shown above table.)
3. The 7 days compressive strength of cube is maximum for concrete mix M3 with addition of 25% fly ash as compared to other diverse concrete mixes via M1, M2, M4, M5, and M6 shown in above table. It is very much near to the control mix. This shows it is a better side to use such material.
4. Water cement ratio also increases with addition of 35%.
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.

6. The flexural strength of beams is also increased with addition of waste marble powder up to 50% sand replacement and then gradually decreases.
7. Thus, we found out the optimum percentage for replacement of sand with marble powder in concrete is almost 50%.

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