

A Study on Utilization of Fly Ash, Marble Dust and Stone Dust In OPC Concrete- A Review

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Abstract – Concrete has become an imperative construction material and it is now used in huge quantities than any other materials. In present time durability, economy, strength and sustainable development are the key issues for the development. Due to huge consumption of concrete in the world there is the shortage of natural sand and materials. It is the cause failure of project on given time period.

For the fulfillment of the requirements of the natural sand is partially or fully replacement by fly ash, marble dust and stone dust in concrete.

Fly ash a waste produced by the thermal power plant is as such major environmental concern.

In India fly ash generated in huge amount of quantity, so it can be easily available and economical and eco-friendly.

Keyword: fly ash, marble dust, stone dust, compressive strength, eco-friendly.

I. INTRODUCTION

In India large amount of fly ash is generated in thermal power plant with insignificant 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.

II. ENVIRONMENTAL PROBLEMS

The environmental problems associated with the disposal of industrial wastes are summarized below:

Problems associated with open dumps

- Direct influence by rain, such as leaching.
- Inaccessibility to the area and the surroundings.
- Lack of aesthetics.
- Chemical degradation.
- Breeding of Insects etc. causing health problems.
- When wet dumps get dried up, entrainment of dust in the air.

Problems associated with Covered Dumps

Buried wastes are subject to:

- Influence by rain through seepage.
- Pollution of nearby water sources.
- Long term alteration in solid stability, strength etc in the region.

Problems associated with River/Ocean Dumping

This has adverse effect on:

- Marine life
- Downstream users of river water
- Change in nature of silt/deposition on river beds leading to soil erosion

III. 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.
4. To examine the feasibility of using unprocessed fly ash and by product of burnt coal to reduce the amount of cement.

IV. LITERATURE REVIEW

Various studies have been carried out to investigate the properties of fresh and hardened concrete like slump flow test, compaction factor test, compressive strength test, split tensile test, flexural test etc by partially or fully replacing the cement by Fly ash, marble dust. Also natural sand is replaced by marble dust, stone dust is proven to be a cost effective and environmental friendly alternative to the natural fine aggregates. Fly ash is generated every year in India as a by-product of coal consumed in the thermal power plants. The crusher dust poses many environmental problems such as air pollution, dumping etc. Crusher dust on the other hand is very cheap in India as compared to natural sand and it can be used as a partial or full replacement of natural sand without affecting the required characteristics of concrete.

Some of the previous research works on utilization of Fly ash, marble dust and Stone dust have been discussed briefly below.

Many studies have been carried out in different countries (including Egypt) to use natural stone waste in mortar and concrete. Most of these researches used marble, granite and lime stone waste as a replacement of cement or sand in concrete mix in order to investigate their effects on the physical and mechanical properties of concrete. Most of these researchers used marble waste as experimental data showed that the addition of these wastes improves the physical and mechanical properties due to its high fineness of the waste particles.

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