

Performance Comparison and Analysis of a Designed Temperature Controller for a CSTR model

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Abstract- Concrete is the most extensively used and adaptable building material which is generally used to resist compressive forces. Since the use of Sand and production of Sand creates much more environmental issues and is costlier also. The Sand is produced in a natural way. Mining of sand in Narmada River due to natural calamities there is a danger. In the coming time so we have to be ready to deal with this problem. So we are looking from marble dust. Marble Dust is a developing composite material that will allow the concrete industry to optimize material use, generate economic benefits and build structures that will be strong, durable and sensitive to the environment. The potential use of Marble Dust can be an ideal choice for substituting in a cement binder as the reactivity efficiency increases due to the presence of lime.

Keywords- Cement, Concrete, Marble Dust, Partial Replacement, Durability, Compressive Strength, Flexural Strength, Split Tensile Strength.

I. INTRODUCTION

The use of marble dust or waste has been used since ancient times as a Building Material. The industries dispose of marble powder material, material of marble powder consisting of very fine powder. Which is the cause of environmental problems in around the world? Marble big blocks are cut into smaller blocks in order to give them the desired smooth shape. During the cutting process about 25% the original marble mass is lost in the form of dust. Now a day's marble waste is one of the causes of environmental problems around the world. Therefore, maximum utilization of marble waste in various industrial sectors, especially the construction, agriculture, glass and paper industries would help to protect the environment.

Concrete is the most widely used construction material in the civil construction work because of its high structural strength and stability. Concrete is a heterogeneous mix of cement, coarse aggregate, fine aggregate (Sand) and water. Aggregate can not only limit the strength of concrete but also affect the durability and performance of concrete. The

advancement of concrete technology can reduce the consumption of natural resources and energy sources which in turn further decreases the burden of pollutants on the environment. One of the logical means for reduction of the waste marble masses is by utilizing them in building construction. Waste Marble powder can be used to improve the mechanical and physical properties of the conventional concrete. The possibility of utilizing waste marble powder as cementitious material in the production of concrete will also induce a relief on waste disposal issues.

In addition to marble powder (dust), silica fume, fly ash and ground granulated blast furnace slag are widely used in the construction sector as mineral admixtures instead of cement. Marble dust can be used either to produce new products or as an admixture so that the natural sources are used more efficiently and the environment is saved from dumpsites of marble waste. Therefore, the aim of this current study is both to avoid the environmental pollution and to investigate the usability of the marble dust.

II. MARBLE DUST

Marble has been commonly used for various purposes like flooring, cladding etc. 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 India, marble dust is settled by sedimentation and then dumped away which results in environmental pollution, in addition to forming dust in summer and threatening both agriculture and public health.

Therefore, utilization of the marble dust in various industrial sectors especially the construction, agriculture, glass and paper industries would help to protect the environment. Some attempts have been made to find and assess the possibilities of using waste marble powder in mortars and concretes and results about strength and workability were compared with control samples of conventional cement sand concrete. The use of the replacement materials offer cost

reduction, energy savings, arguably superior products, and fewer hazards in the environment. These materials participate in the hydraulic reactions, contributing significantly to the composition and microstructure of hydrated product.



Fig: Marble Dust

The advancement of concrete technology can reduce the consumption of natural resources and energy sources and lessen the burden of pollutants on environment. Presently large amounts of marble dust are generated in natural stone processing plants with an important impact on environment and humans. In India, the marble processing is one of the most thriving industry the effects of varying marble dust contents on the properties of fresh and hardened concrete have been investigated. Slump and air content of fresh concrete and absorption and compressive strength of hardened concrete were also investigated. The compressive strength of concrete was measured for 7 and 28 days. In order to evaluate the effects of marble dust behavior, many different concrete mixes were tested.

III. PROPERTIES OF MARBLE DUST

Following are the properties that are been observed in various research results for marble dust:

1. Due to marble dust, it is proved to be very effective in assuring very good cohesiveness of mortar and concrete.
2. From the studies, it is concluded that marble dust can be used as a replacement material for cement and 5% replacement of marble dust gives an excellent in results in strength aspect and quality aspect.
3. The various research results shows that the substitution of 5% of cement content by marble dust induced higher compressive strength and properties related to durability.
4. Tests results shows that this industrial waste is capable of improving hardened concrete performance enhancing fresh concrete behavior and can be used as plain concrete.

5. Physically, marble is re-crystallized hard, compact, fine to very fine metamorphosed rocks capable of taking shining polish. All limestone are crystalline but with varying crystal sizes and crystal arrangements.

IV. LITERATURE REVIEW

[1] **Deepanshu Patel**, “TO STUDY THE PROPERTIES OF CONCRETE AS A REPLACEMENT OF CEMENT WITH THE MARBLE DUST POWDER” International Journal of Civil Engineering and Technology (IJCIET) Volume 7, Issue 4, July-August 2016, pp. 199–207 Article ID: IJCIET_07_04_016:

Investigation was done that there are several wastes being released from the industries which leads to many environmental and health problems and so it becomes necessary to find an appropriate solution to the emission of these wastes. Marble powder is an inert material which is procured as an industrial by-product during sawing, grinding, and polishing of marble is a cause to various environmental problems. These wastes can be used as the constituents of concrete by partially replacing the cement which makes it economical and also conserves our natural resources. The main objective of this research is to examine whether there is any possibility of utilizing marble powder in concrete production. This study includes different types of concrete mixes of M25 by replacing the cement with marble powder in various proportions (0%, 5%, 10% & 15%) by weight to determine the optimum percentage of replacement.

[2] **Vijaya Kumar YM1| Shruti D2**, “Partial Replacement of Cement to Concrete by Marble Dust Powder” Volume: 2 | Issue: 05 | May 2016 | ISSN: 2455-3778 IJMTST:

Leaving the waste materials to the environment directly can cause environmental problem. Hence the reuse of waste material has been emphasized. Partial replacement of cement by varying percentage of marble dust Powder reveals that increased waste marble dust powder ratio result in increased workability and compressive strengths of the concrete Marble Dust Powder is settled by sedimentation and then dumped away, which results in environmental contamination, in addition to forming dust in summer and threatening both agriculture and public wellness.

In this research work, Marble Dust Powder has replaced the (OPC & PPC) cement accordingly in the reach of 0%, 5%, 10%, 15% 20%, & 25% by weight of M-20 grade concrete. Concrete mixtures were developed, tested and

compared in terms of compressive strength to the conventional concrete. The purpose of the investigation is to analyze the behavior of concrete while replacing the Marble Dust Powder with Different proportions in concrete.

[3] **Ramya Raju, 2Geetha K. Jayaraj, 3Abuzar Aftab Shaikh**, “Study of Partial Replacement of Cement by Marble Powder” International Journal of Recent Advances in Engineering & Technology (IJRAET) ISSN (Online): 2347 - 2812, Volume-4, Issue -4, 2016:

This paper presents the study of concrete mix design using marble powder. The disposal of marble powder from the marble industry is one of the environmental problems today. The places where marble is used for various purposes, the use of marble powder can be included for construction purpose. Marble powder is produced from processing plant during the sawing and polishing of marble blocks and about 20 – 25% of the processed marble is turned into powder form. Disposal of the marble powder material from the marble industry is one of the environmental problems worldwide today. The replacement is done partially in various proportions and its effect on properties of concrete is studied.

Based on the study the following conclusions are drawn:

- The compressive strength is increases at 0.4 w/c ratio, but decreases the tensile strength.
- The partial replacement of cement by marble powder is used up to M25 grade concrete.
- The strength decreases beyond the use of M 25 grade, but shall be improved on the addition of super plasticizer.
- As per the comparative study on use of super plasticizer the strength is increased by 2% for M30 in 28 days, whereas by using only marble powder the strength increases by 9% for M25 with 0.4 w/c ratio in both the cases.
- Use of super plasticizer with marble powder as a partial replacement of cement in higher grades shall be useful for high rise structure to reduce the economy.

V. CONCLUSION

Compressive strength, Split Tensile strength, Bond strength and Density of concrete mixes is tested with adding certain percentage of Marble Dust at 7 & 28 days of curing. Marble Dust is used in the concrete which is replaced by 0%, 5%, 10%, 15%, and 20% by the weight of Sand, optimum Marble Dust content to be 5% (by weight of Sand) is taken in our work and different properties of concrete is examined.

After performing all the tests and analyzing their result, the following conclusions can be derived:

1. Maximum increase in compressive strength of concrete occurred when 10% sand (mix-03) replacement was done with Marble Dust.
2. Maximum increase in bond strength of concrete occurred when 10% sand (mix-03) replacement was done with Marble Dust.
3. Split tensile strength is maximum when 15% Sand replacement was done with Marble Dust by weight of Sand.

REFERENCES

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