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Comparative Study on Use of Waste Marble Powder as Partial Replacement in Concrete Mix

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Abstract: ***Concrete is the most widely used construction material in civil engineering industry because of its high structural strength and stability, where the fine aggregate is generally natural sand. Marble is one of the important materials used which has been widely used in structures since ancient times. Most of the monuments and ancient sculptures were built with the help of marbles. Nowadays, marble are used for decoration function, which increase its demand in the market. Marble powder creates environmental problems. Due to environmental problems, it has a great impact on human health as well as on nature. To control its effect we have to use this waste. In this study, we gather the waste marble powder from the industry and investigate its effects along the cement, sand mix in different proportions and also compare the compressive, flexural and split tensile strength of the cement sand mixture. The main objective of this study is to develop a useful, concrete mix using waste marble powder as partial replacement of cement and sand.***

Keyword: Ancient, Sculptures, Investigate, Stability, Demand.

I. INTRODUCTION

The time period during which concrete was first invented depends on how one interprets the term “concrete.” Ancient materials were crude cements made by crushing and burning gypsum or limestone. Lime also refers to crushed, burned limestone. When sand and water were added to these cements, they became mortar, which was a plaster-like material used to adhere stones to each other. Over thousands of years, these materials were improved upon, combined with other materials and ultimately, morphed into modern concrete. Today’s concrete is made using Portland cement, coarse and fine aggregates of stone and sand, and water. Admixtures are chemicals added to the concrete mix to control its setting properties and are used primarily when placing concrete during environmental extremes, such as high or low temperatures, windy conditions, etc. The precursor to concrete was invented in about 1300 BC when Middle Eastern builders found that when they coated the outsides of their pounded-clay fortresses and home walls with a thin.

II. OBJECTIVE OF THIS STUDY

The following targets were identified in the present experimental investigation

A. To research the possibility of utilization of waste marble powder for the production of concrete
B. To look into the issue of replacement of cement and sand by waste marble dust in different percentages on compressive strength of concrete
C. To look into the issue of replacement of cement and sand by waste marble dust in different percentages on compressive strength of concrete
D. To look into the issue of replacement of cement and sand by waste marble dust in different percentages on split tensile strength of concrete
E. To look into the issue of replacement of cement and sand by waste marble dust in different percentages on flexural strength of concrete
F. To investigate the effect of replacement f cement and sand by waste marble powder in different percentages on durability of concrete
G. To investigate and compare the composition of control mix and marble powder mix

III. LITERATURE REVIEW

G.Latha et. Al. (2015) in their paper they done their study on concrete with WMP and explained tha concrete is a construction material consisting of cementitious material, fine aggregate, coarse aggregate and water. Now a days the cost of these materials are

increased so, we need to look at a way to reduce the cost of building materials especially cement. One of the recent advancement in construction industry is replacement of materials in concrete.

Gulden Cagin Ulubeyli et. Al. (2015) studied that Marble is industrially processed by being cut, polished, and used for decorative purposes, and thus, economically valuable. In marble quarries, stones are cut as blocks through different methods. During the cutting process, 20- 30% of a marble block becomes waste marble powder. Marble powder is a waste material generated in considerable amounts in the world.

Rohit Kumar and Er. Jitender Dhaka (2016) did the utilization of the solid waste in cement manufacturing company will help in conservation of natural resources like limestone. The use of marble powder as a partial replacement of Cement can reduce the production cost of cement and may be control the emission of harmful gases into the environment and proved Eco friendly to the environment.

Talah et. Al. (2015) in their paper reports an experimental study of the influence of marble powder used as partial substitute for Portland cement (PC) on the mechanical properties and durability of high performance concretes. The analysis of the experimental results on concrete at 15% content of marble powder with a fineness modulus of 11500 cm2/g, in a chloride environment, showed that it contributes positively to the perfection of its mechanical characteristics, its durability with respect to migration of chloride ions and oxygen permeability.

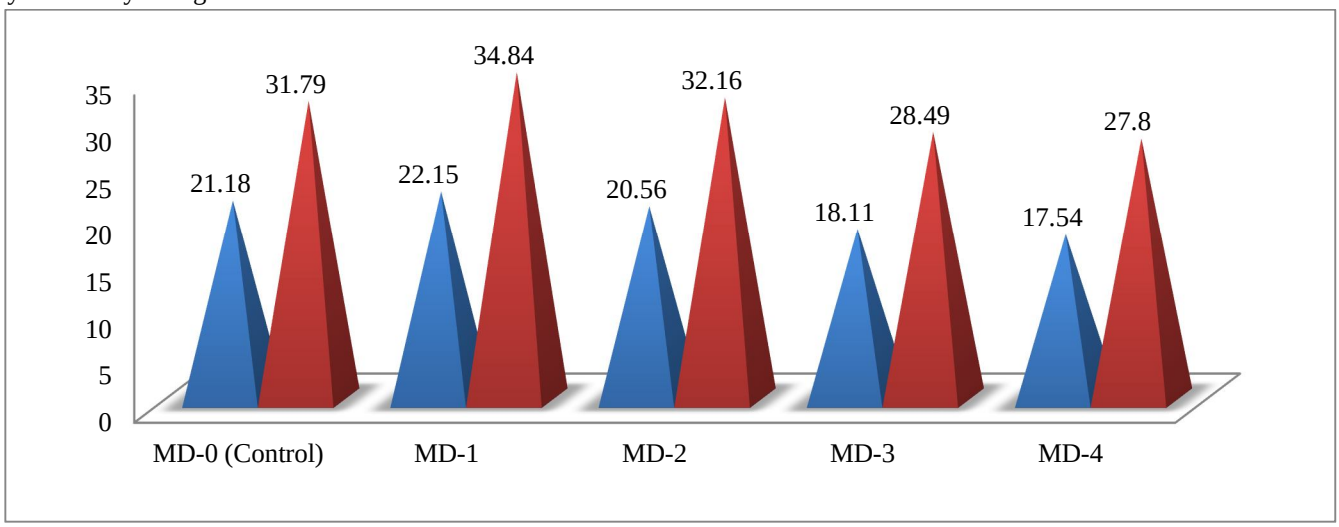
T. Subramani and D. Latha (2015) did their study on sustainability in Concrete Production can be achieved by innovations in substitutions of materials used. Use of a Marble Waste Powder is not very usual though it has no behavioral problem and there has been little research work done on the waste. Marble waste is a solid waste material generated from the marble processing and can be used either as a filler material in cement or fine aggregates while preparing concrete.

Vijaya Kumar YM et. Al. (2016) studied on the leaving of the waste materials to the environment directly can cause environmental problem. Hence the reuse of waste material has been emphasized... 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.

IV. EXPERIMENTAL PROGRAM

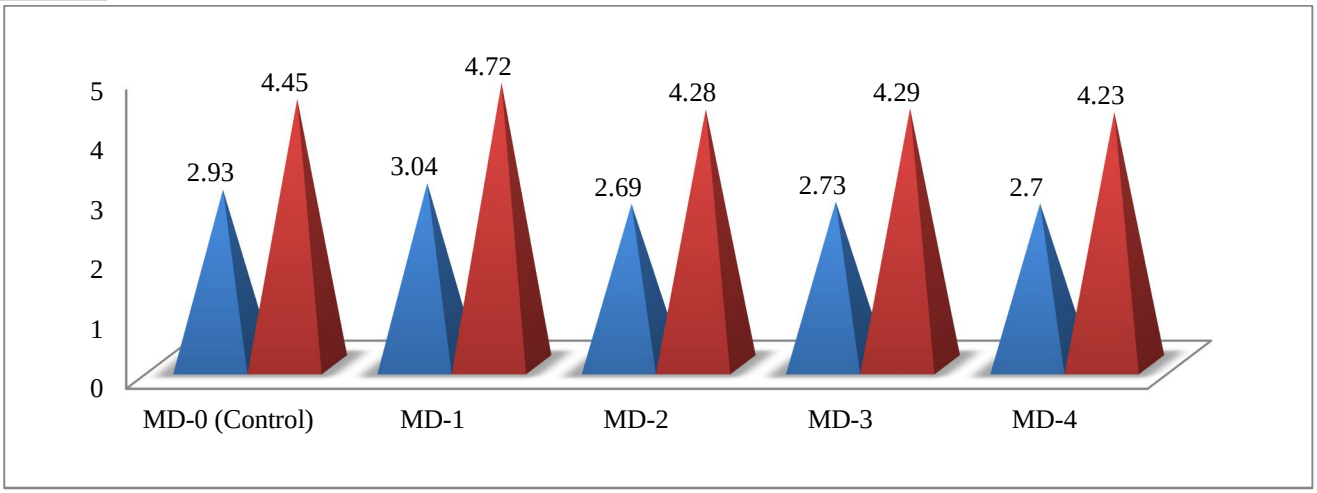
A. *Compressive Strength Test*

The test method covers determination of compressive strength of cubic concrete specimens. Test specimens of size 150mm x 150mm x 150mm were prepared for testing the compressive strength. In this study, the mix was done manually. The interior surface of the moulds and the base plate were highly oiled before concrete was placed. Test results of compressive strength test at the age of 7 days & 28 days are given



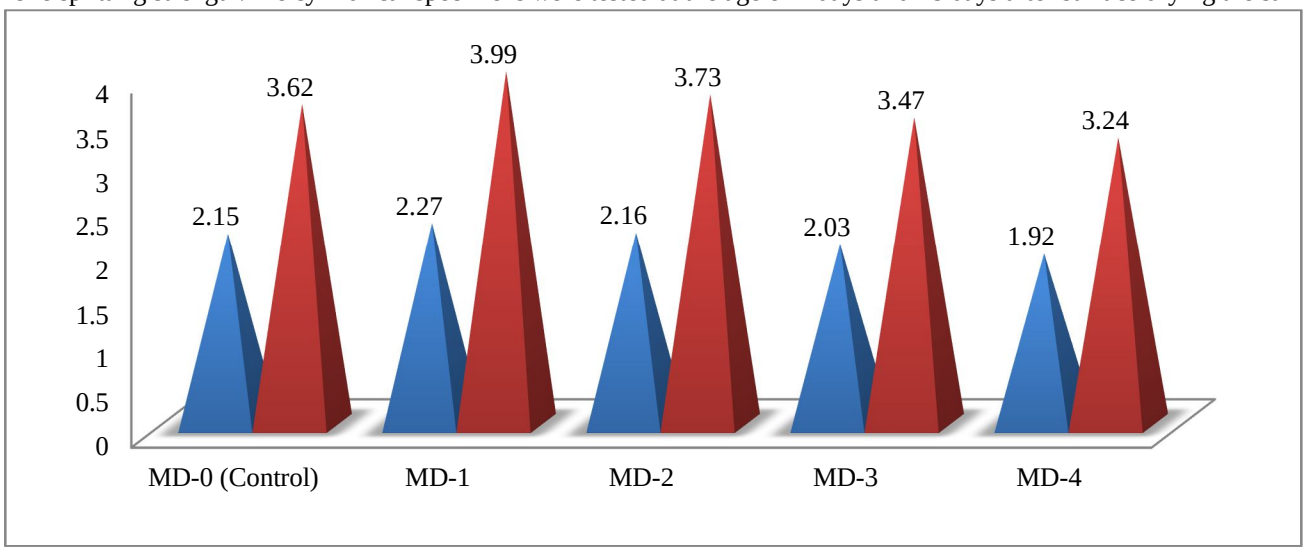
B. *Flexural Strength Test*

Test specimens of beam size 100 mm x 100 mm x 500 mm were prepared for testing the flexural strength of unreinforced beams. After this the specimens were removed from the moulds and placed in clean fresh water for 28 days curing.The distance between the centres of two rollers was kept 20cm. Test results of compressive strength test at the age of 7 days & 28 days.



C. Plit Tensile Strength Test

Cylindrical concrete specimens of size 150mm diameter × 300mm long were moulded and stored in water for 28 days before testing for tensile splitting strength.The cylindrical specimens were tested at the age of 7 days and 28 days after surface drying the same.



V. CONCLUSION

A. The experimental investigation shows that utilization of waste marble powder as a construction material can be done up to a limit for the production of concrete to address the waste disposal problems.

B. Increasing the amount of marble powder decreases the workability of concrete.

C. The increase in compressive strength due to replacement of cement by waste marble powder at the constant cement content is attributed to the contribution of marble dust to the hydration procedure and therefore enhancing the compressive strength of concrete.

D. The flexural strength of concrete for M25 grades of concrete increases with addition of waste marble powder up to 10% replacement by weight of cement and furthers any addition of waste marble powder there was slight decrease in strength as compared to conventional concrete.

E. From the results obtained for the split tensile strength of concrete for M25 grades concrete, it is observed that the split tensile strength of concrete increased up to 15% replacement of cement by waste marble powder and decreased with further increase, this may be due to its filling effect and growth of hydration products in concrete.

F. Further, the cost of construction can be minimized with usage of marble powder which is freely or cheaply available and the environmental pollution can be reduced by using waste marble powder as replacement of cement in concrete.

G. Test results show that these industrial wastes are capable of improving hardened concrete performance. Green concrete enhancing fresh concrete behavior and can be used in architectural concrete mixtures containing white cement.

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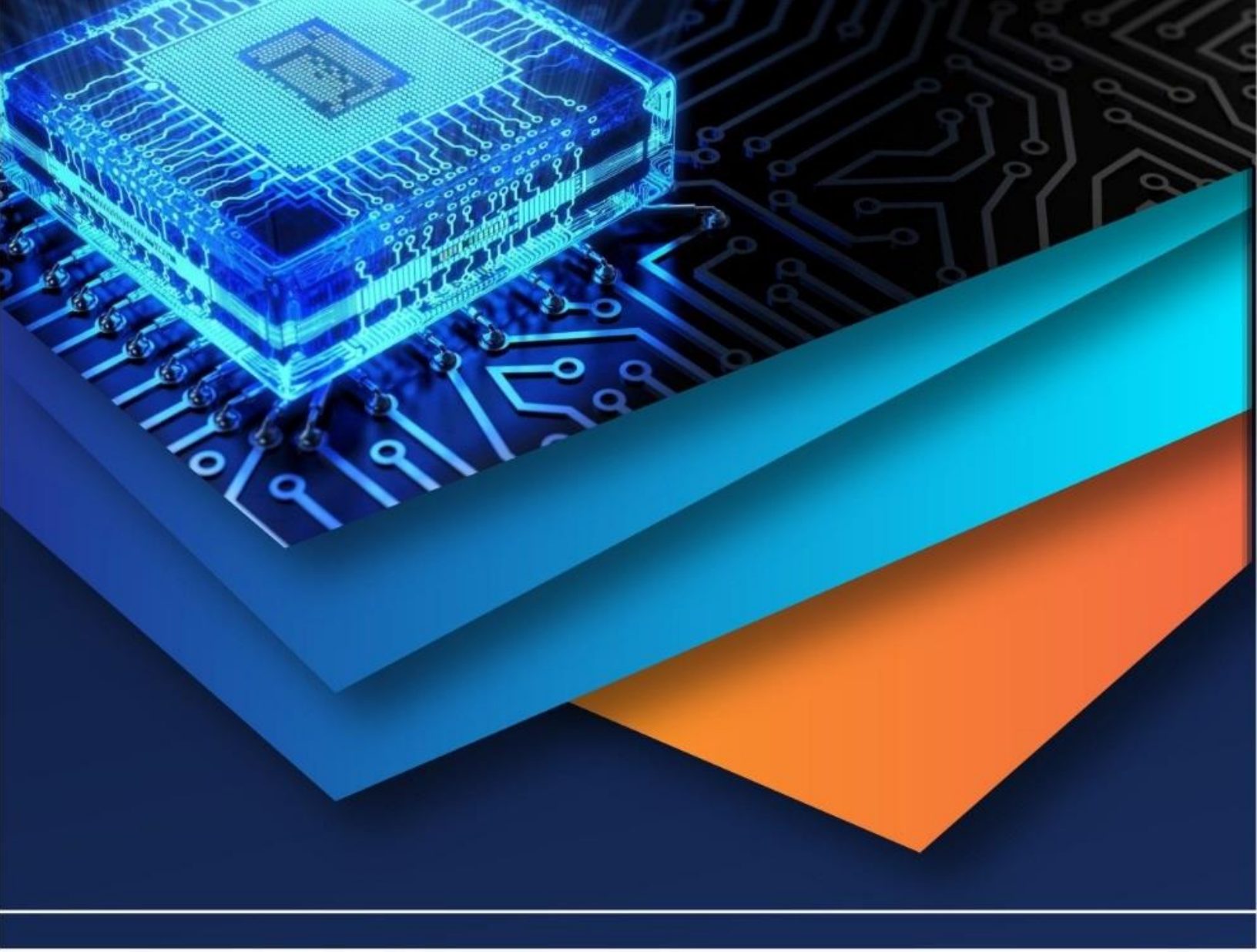

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