



AN EXPERIMENTAL INVESTIGATION OF PARTIAL REPLACEMENT OF CEMENT BY MARBLE POWDER IN CONCRETE

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ABSTRACT

Concrete is the mostly used construction material throughout the world the advantage of it being is it can be mould in to any shape and can be made to take required compressive strength in addition to compressive strength by increasing flexural strength, the load bearing capacity can be increased approximately. The ingredients for making concrete are coarse aggregate, cement, fine aggregate and water. Sometimes creative additives are added to it to improve or some properties making concrete is an art which one has to be perfectly through otherwise that will end up with worst concrete. Hence as a civil engineer one should

be through with the entire factor of concrete from which he can produce a good concrete. Sandstone has been commonly used as a building material since the ancient times. The industries disposal of the marble material, consisting of very fine powder, today constitutes one of the environmental problems surround the world. Marble stones are cut into slighter blocks in order to give them the desired smooth shape. During the cutting process 25% of the unique marble mass is lost in the form of dust. The marble dust is settled by sedimentation and then dumped away results in environmental pollution, in addition to forming dust in



summer and threatening both agriculture and public health. Consequently, utilization of the marble dust in various industrial sectors especially the structure, gardening, glass and paper industries would help to guard the environment. As well as marble powder, silica fume, fly ash, pumice powder and ground crushed blast furnace slag are widely used in the construction sector as a mineral admixtures instead of cement in Fibre Reinforced Concrete.

INTRODUCTION

WASTE MARBLE POWDER

The marble mud was obtained in wet form as an industrial by product directly from the deposits of marble factories, which forms during the sawing, influential and polishing processes of marble fabrication. The wet marble sludge was dried up aforementioned to the preparation of the samples. The dried material was sieved through a 90 micron sieve and to conclude the marble dust was obtained to be used in the experiments as cement.

LITERATURE STUDIES

BOUZIANI TAYEB et al They investigated the effect of marble powder content (MP) on the properties of the sand concrete (SCSC) at spanking new and hardened states. The properties of the fresh prepared mixes tested are the mini-slump flow, the V-funnel pour time and viscosity. At the hardened state, the

parameter which has been determined is the 28-day compressive strength. The obtained test consequences show that the increase of MP content in SCSC, from 150 kg/m³ to 350 kg/m³, improves the properties at fresh status by decreasing v-funnel pour time (from 5s to 1.5s) and increasing the mini-cone slump (from 28cm to 34cm). In the midst of the use of 250 kg/m³ of MP we can reach the highest initial viscosity while retaining superior fluidity at high rotational speeds, compared to the MP contents of 150 kg/m³ and 350 kg/m³. In other hand, the 28-days compressive strength falls with an raise of MP content.

HANIFI BINICI et al some mechanical properties of concrete containing marble dusts (MD) and mineral dusts (LD) were investigated. Seven concrete mixtures was produced in three series with control mixes having 400 kg cement content. These control mixes were modified to 5, 10 and 15 % MD and LD in place of fine sand aggregate. The compressive strengths of concrete was measured for 7, 28, 90 and 360 sunlight hours and sodium sulphate resistance were for 12 months. Also, abrasion confrontation and water penetration of concretes were investigated. Results indicate that MD and LD fine aggregate concrete has good workability and abrasion resistance is comparable to that of conventional concrete. They also showed that maximum scuff rate is obtained from control specimen, while minimum



abrasion rate is obtained from MD3 specimens. scuff resistance is increased as the rate of fine MD and LD is increased. Furthermore, the results indicated that the increase in the dust content caused a important increase in the sodium sulphate confrontation of the concretes. consequently, the studied MD and LD can be used for more durable concrete production.

BAHAR DEMIREL Experimentally studied, the effects of using waste marble dust (WMD) as a fine material on the mechanical properties of the concrete have been investigated. For this purpose four different series of concrete-mixtures were prepared by replacing the fine sand (passing 0.25 mm sieve) with WMD at scope of 0, 25, 50 and 100% by weight. With the purpose of determine the effect of the WMD on the compressive strength with deference to the curing age, compressive strengths of the samples be recorded at the curing ages of 3, 7, 28 and 90 days into the bargain, the porosity values, ultrasonic pulse velocity (UPV), dynamic modulus of elasticity and the unit weights of the succession were determined and all data were compared with each other. Marble grime is a offshoot of marble production facilities and also creates large scale environmental effluence. consequently, it could be possible to prevent the environmental pollution especially in the regions with excessive marble production and to consume

less natural possessions as well throughits exploitation in normal strength concretes as a substitute for the very fine aggregate.

V.M.SHELKE et all In this project their main objective is to cram the influence of partial replacement of cement with marble powder, and to compare it with the compressive strength of ordinary M30 concrete. We are also trying to find the percentage of marble crush & silica stink replaced in concrete that makes the strength of the concrete maximum. Now a day's marble powder has become a pollutant. So, by partially replacing cement with marble powder, we are proposing a method that can be of great use in reducing pollution to a great extent. In this investigation a series of compression tests were conducted on 150mm, cube and 150mm x 300mm, cylindrical specimens via a modified test method that gave the entire compressive strength, using silica fume of constant 8% with and without marble powder of volume fractions 0, 8, 12, & 16% on Ordinary Portland cement material The optimum result of compressive strength of cube is found at 8% silica fume and 8% marble powder amid replacement of OPC cement in concrete that is 1.64%, 3.92% at 7 & 28 days of curing. The finest result of compressive strength of cylinder is found at 8% silica fume and 8% marble powder with substitution of OPC cement in concrete that is 2.79%, 1.78% at 7 & 28 days of curing.



BABOO RAI et al In this project the achieve of using marble powder and granules as constituents of fines in mortar or material by partially falling quantities of cement as well as other predictable fines has been studied in terms of the relative workability & compressive as well as flexural strengths. Partial replacement of cement and usual fine aggregates by unreliable percentage of marble powder and marble crumbs reveals that increased waste marble powder (WMP) or waste marble granule (WMG) ratio result in increased workability and compressive strengths of the mortar and concrete.

TEST RESULTS

MIX DESIGN

In this experimental investigation, 0%, 5%, 10%, 15% and 20% of marble powder is used in M25 mix.

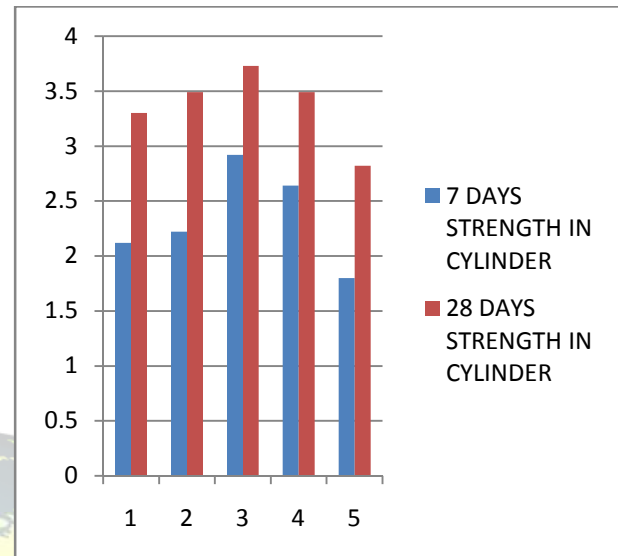
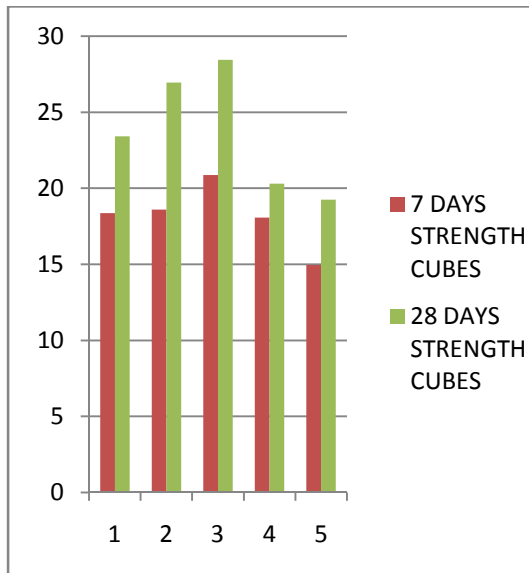
FINENESS MODULUS

Sample	Fineness modulus
Sand	2.31
Natural Aggregate	4.88

PERCENTAGE OF MARBLE POWDER	7 DAYS STRENGTH IN CUBES	28 DAYS STRENGTH IN CUBES
0%	18.36	23.41
5%	18.59	26.96
10%	20.88	28.44
15%	18.07	20.30
20%	14.96	19.25

	W/C	Cement	Fine aggregate	Coarse aggregate
Ratio	0.45	1	1.34	2.83
Kg/m ³	186	414	552	1173

COMPRESSIVE STRENGTH RESULTS



TENSILE STRENGTH RESULTS

PERCENTAGE OF MARBLE POWDER	7 DAYS STRENGTH IN CYLINDER	28 DAYS STRENGTH IN CYLINDER
0%	2.12	3.30
5%	2.22	3.49
10%	2.92	3.73
15%	2.64	3.49
20%	1.80	2.82

DISCUSSION

- With the inclusion of marble powder the slump value of concrete gradually increasing from the beginning itself.
- With the insertion of marble powder the strength of concrete gradually increases equipped a certain limit but the gradually decreases.
- At 10% replacement of cement by marble crush there is 12.5% increase in compressive strength for 28 days.
- The compressive strength gradually decreases from 10% of replacement

SCOPE OF THE WORK

This exertion relates to the usage of the marble powder, a waste shameful material used in the cement concrete mixtures. The experimental results obtained show that the partial surrogate of cement by marble powder in fibre reinforced concrete



gives improved results compared with the usual cement concrete. Hence, it is a better loom in using the powder as a replacement for cement. The exploit of marble powder partially as an alternative of cement and also as cement reduces the cost of making cement, as it is a waste available in abundance. Thus, economy in construction can be achieved ultimately.

CONCLUSION

- The Compressive strength of Cubes were increased with accumulation of waste marble powder up to 10% replace by weight of cement and more any addition of waste marble powder the compressive strength decreases.
- Thus we originate out the optimum percentage for substitution of marble powder with cement and it is almost 10% cement for cubes.
- We have put out a simple step to diminish the costs for construction with usage of marble powder which is freely or cheaply available; more importantly.
- We have also stepped into a dominion of saving the environmental pollution by bolster production; being our main objective as Civil Engineers.

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