EXPERIMENTAL STUDY ONMECHANICAL PROPERTIES OF CONCRETE BY USING M-SAND WITH ADDITION OF WASTE MARBLE POWDER

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Abstract:*Concrete is the most important component used in the construction industry throughout the world.The uses of river sand in construction activities results in the excessive mining.Due to excessive mining ,natural resources are getting exhausted ,results in increase of scour depth and sometimes flood possibility.Thus, it is becoming inevitable to use alternative material in concrete, So where the fine aggregate is M-sand is used.In a filler material of the concrete is using by the waste marble powder for increasing the mechanical properties of the concrete.Marble powder is produced from sawing, cutting, polishing of marble blocks.During the cutting process,20-30% of a marble block become waste marble powder.Marble powder is a waste material generated in considerable amounts in the world.Marble powder creates environmental problems, it has a great impact on human health as well as on nature.To control the effects we have to use this waste.Therefore , the use of waste marble powder in the concrete production as an admixtures material has increasing its strength.We are also trying to find the percentage of marble powder adding (0%,5%,10%,15%)in concrete that makes the strength to the concrete maximum.*

Keywords: Waste Marble powder,compressive strength,Tensile strength,Flexural strength.

INTRODUCTION:

Marble is a metamorphic rock resulting from the transformation of a pure limestone. The purity of the marble is responsible for its color and appearance it is white if the limestone is composed solely of calcite (100% CaCO3). Marble is used for construction and decoration; marble is durable, has a noble appearance, and is consequently in great demand. Chemically, marbles are crystalline rocks composed predominantly of calcite, dolomite or serpentine minerals. The other mineral constituents vary from origin to origin.

A large quantity of powder is generated during the cutting process. The result is that the mass of marble waste which is 20 - 25% of total marble quarried has reached as high as millions of tons. Leaving these waste materials to the environment directly can cause environmental problem. The advancement of concrete technology can reduce the consumption of natural resources and energy sources which in turn further lessen the burden of pollutants on the environment. Presently, large amount of marble dust are generated in natural stone processing plants with an important impact on the environment and humans.Marble powder can be used as a filler in concrete and paving materials and helps to reduce total void content in concrete. Marble powder can be used as an admixture in concrete, so that strength of the concrete can be increased. Marble dust is mixed with concrete, cement or synthetic resins to make counters, building stones, sculptures, floors and many other objects

COARSE AGGREGATE:-

It is the important component of the concrete. The material whose particles are of such size as are retained on I.S. Sieve4.75mm is termed as coarse aggregates. Coarse aggregates, like fine aggregates, must consists of sound durable inert particles to make the concrete strong and weather resistant.It should be free chemicals or coating or clay or other fine material that may affect bonding of cement paste. The size of the coarse aggregates used depends upon the nature of work. Crushed hard stone and gravel are the common materials used as coarse aggregates for structural concrete. Coarse aggregates are usually obtained by crushing granite, gneiss, crystalline lime stone and good variety of sand stone etc. As far as possible flaky and elongated pieces of stone should be avoided

Table 1 : Sieve Analysis Test for Coarse Aggregate

S.NO	IS	Weight	% of	Cumulative	Cumulative
	Sieve	Retained	weight	% of	% of
(mm)	(kg)	retained	Weight		Passing
Retained					
1	53	0	0	100	0
2	45	0	0	100	0
3	22.4	0.224	22.4	77.6	22.4
4	20	0.242	24.2	75.8	46.6
5	13.2	0.500	50.0	50	96.6
6	11.2	0.034	3.4	96.6	100
7	10	0	0	100	100
8	5.6	0	0	0	100
9	4.75	0	0	0	100

FINE AGGREGATE:

The fine aggregate used in the project is M-Sand(Manufacturing Sand) is a substitute of river sand for the concrete mix. M-Sand is produced from hard granite stone by crushing, It acts as a filler material to the concrete, which fills the voids left by the coarse aggregates. It gives the superior strength and its cubical shape ensures significant reduction in the cement used in the concrete

Table 2 : Sieve Analysis Test for Fine Aggregate

S.NO	IS	Weight	% of	Cumulative	Cumulative
	Sieve	Retained	weight	% of	% of
(mm)	(kg)	retained	Weight		passing
Retained					
1	4.75	12	1.2	98.8	1.2
2	2.36	54	5.4	94.6	6.6
3	1.18	160	16.0	84	22.6
4	1	45	4.5	95.5	27.1
5	850	123	12.3	87.7	39.4
6	600	176	17.6	82.4	57
7	500	107	10.7	89.3	67.7
8	425	208	20.8	79.2	88.5

CEMENT:-

Cement is the binding material used to bind the aggregates. Its properties like fineness etc. In the most general sense of world, cement is a binder, substance which sets and hardness independently and can bind other materials together. The volcanic ash and pulverized brick additives which were added to the burnt lime to obtain a hydraulic binder were later referred as cementum, cimentum and cement. Cements used in the concrete are characterized as hydraulic or non hydraulic.

Table 3: Composition of Ordinary Cement

INGREDIENT	PERCENTAGE(%)	RANGE
Lime(CaO)	62	62-67
Silica(SiO2)	22	17-25
Alumina(Al2O3)	5	3-8
Calcium Sulphate(CaSO4)	4	3-4
Iron Oxide(Fe2O3)	3	3-4
Magnesium(MgO)	2	0.1-3

Marble Powder:-

Marble is a metamorphic rock resulting from the transformation of a pure limestone. The purity of the marble is responsible for its colour and appearance,it is white if the limestone is composed solely of calcite (100% CaCO3). Marble is used for construction and decoration; marble is durable, has a noble appearance, and is consequently in great demand. A large quantity of powder is generated during the cutting process. The result is that the mass of marble waste which is 20-25% of total marble quarried has reached as high as millions of tons.

WATER:-

Water is an important ingredient of concrete as it strengthens cement gel, the quantity and quality of water is required to be looked into very carefully.Water is used for mixing and curing process and it should be clean and free from amount of oils, acids, alkalis, salts, sugar, organic materials or other substances that may be deleterious for mixing concrete or steel. Portable water is generally considered satisfactory for mixing concrete. In this project, drinkable ground water from the local source is used.

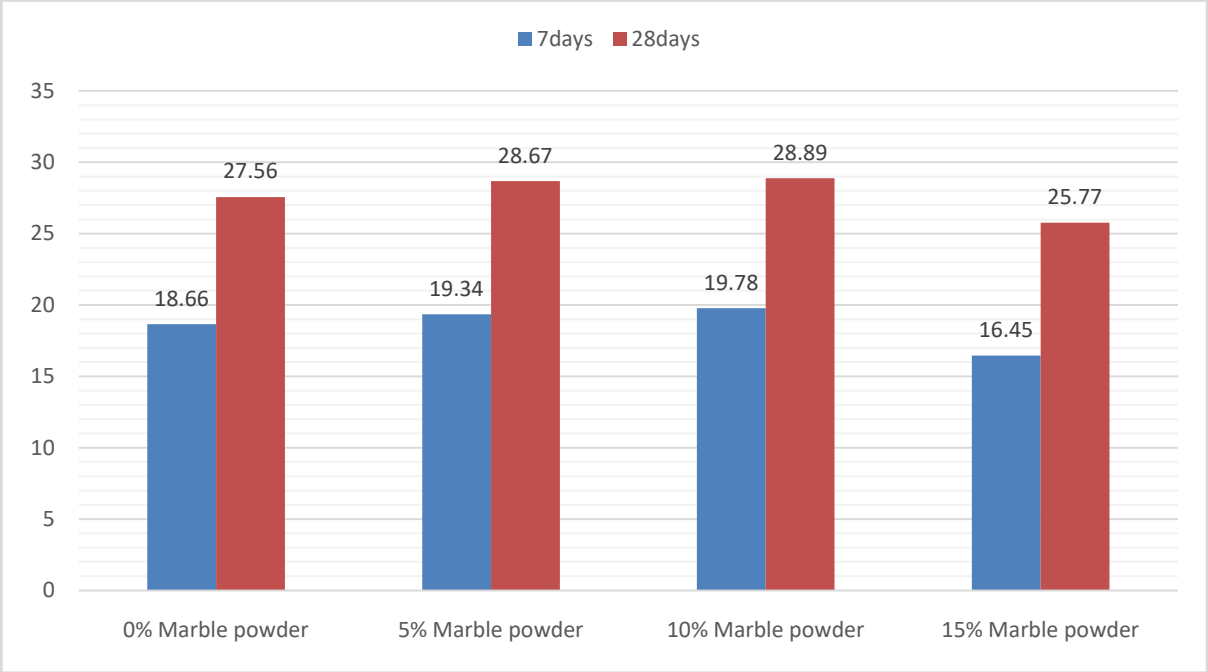
DISCUSSION OF RESULTS

1. COMPRESSIVE STRENGTH TEST RESULT:-

Table 1 : Compressive Strength of Concrete at 7 Days and 28 Days

S.No	% of adding Marble powder to the concrete (N/mm^2)	Compression Strength Test 7Days (N/mm^2)	Compression Strength Test 28Days
1	0%	18.66	27.56
2	5%	19.34	28.67
3	10%	19.78	28.89
4	15%	16.45	25.77

Graph 1 : Compressive Strength of Concrete at 7 Days and 28 Days

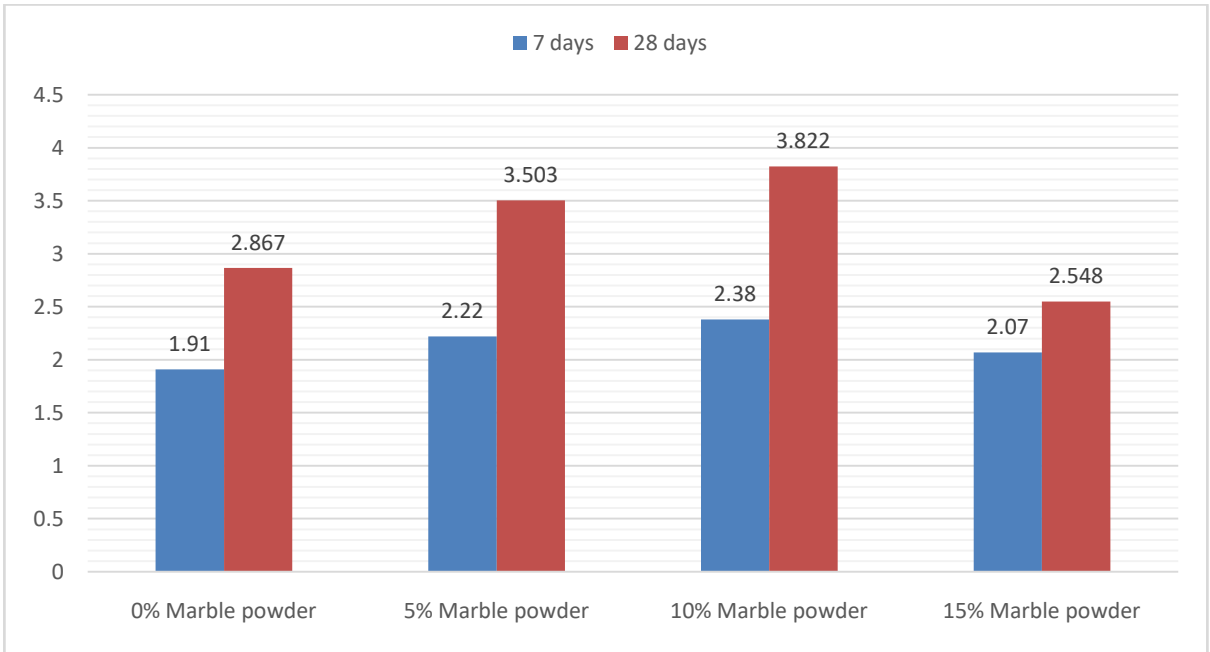


2.SPLIT TENSILE STRENGTH TEST RESULT:-

Table 2 : Split Tensile Strength of Concrete at 7 Days and 28 Days

S.No	% of adding Marble powder to the concrete (N/mm2)	Split Tensile Strength Test 7Days	Split Tensile Strength Test 28Days
1	0%	1.91	2.867
2	5%	2.22	3.503
3	10%	2.38	3.822
4	15%	2.07	2.548

Graph 2 :Split Tensile Strength of Concrete at 7 Days and 28 Days

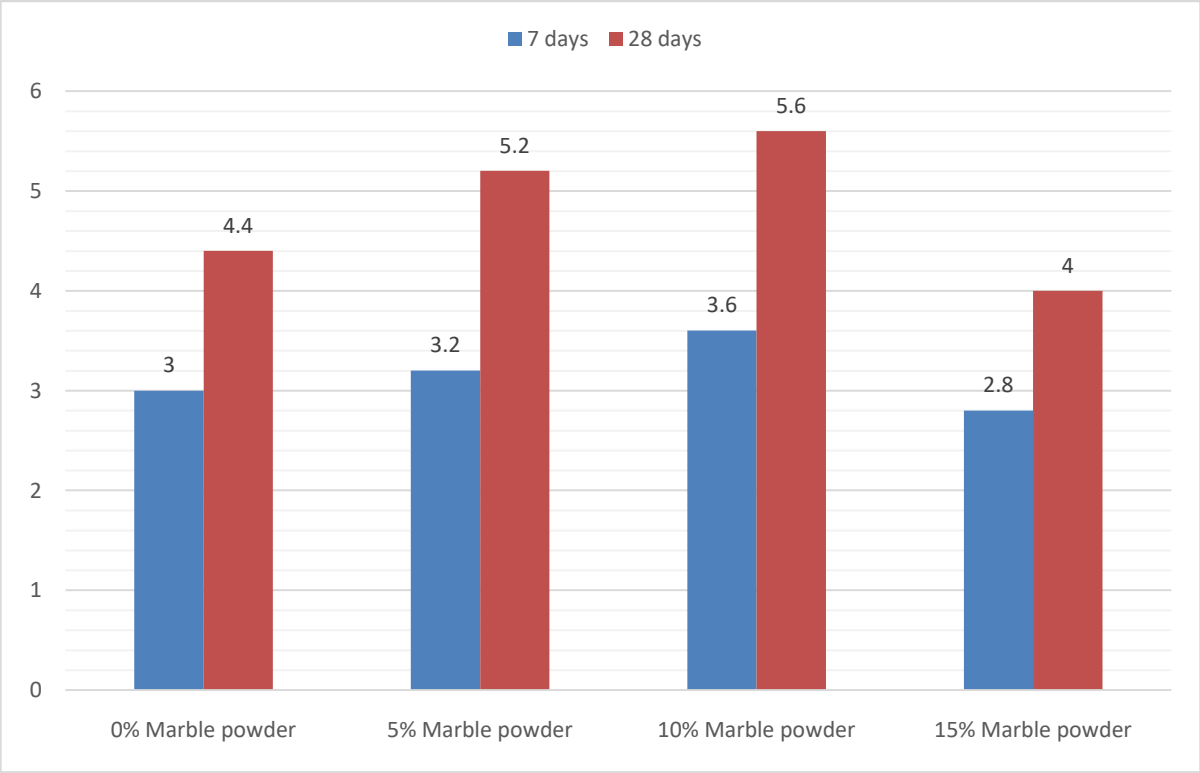


3.FLEXURAL STRENGTH

Table 7.3 : Flexural Strength of Concrete at 7 Days and 28 Days

Trial no	% add Marble Powder (N/mm2)	Average Prism Flexural 7th day test	Average Prism Flexural 28th day test
1	0%	3.0	4.4
2	5%	3.2	5.2
3	10%	3.6	5.6
4	15%	2.8	4.0

Graph3 :FlexuralStrength of Concrete at 7 Days and 28 Day



CONCLUSIONS

The following conclusions can be drawn from the experimental investigation carried out,

- Mechanical properties of concrete increase by use marble sludge powder.
- The Highest compressive strength of concrete is 28.89 N/mm2 by using 10% of marble powder when compared to conventional concrete.

- The Highest split tensile strength of concrete is 3.822 N/mm2 by using 10% of marble powder when compared to conventional concrete..

- The Highest flexural strength of concrete is 5.6 N/mm2 by using 10% of marble powder when compared to conventional concrete.It can be concluded that marble sludge powder using for concrete is to be increase the mechanical properties of concrete.

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