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Utilization of Hypo Sludge With Jute Fiber & Marble Dust as Partial Replacement of Cement in Concrete

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ABSTRACT

Concrete is the most important material for construction work but day by day use of cement, sand, fine and coarse aggregates, and water, are creating a big issues for our environment and also a big problems in construction industry are the production of cement which emits large amount of carbon dioxide to the atmosphere. So we are partially replacing cement by using of industrial wastes like Marble powder, hypo sludge and Jute fibre up to 5 to15%. The paper mill waste like sludge from paper mills is produced in huge amount of waste in our industrial areas. The paper sludge makes up 0.6% to 0.7% of the whole amount of municipal garbage produced in India. Jute is a huge fibre that is used for dismissal, burlap, and cord as a backing material for tufted carpets. Marble by its variety of products has been widely used in structures since ancient times and with the increase in production of marbles it increases the waste during quarrying by means of cutting, sawing, shaping and finishing processes. Once paper fibers have been reused a certain number of times, it becomes far too weak or small to produce a high-quality composite. It means the low-quality, broken paper fiber are sent out to be processed into garbage.

These was contains heavy metals which makes the water unfit for use and also creates environmental problem shaving great impact on human health as well as on nature. Waste management of the marble powder is planned and tried to investigate the effect of utilizing it for partial replacement of cement in concrete. Percentage replacement of cement with hypo sludge, jute fibre and marble powder is replaced at 0-15% in a mixture of M30 grade of concrete. The strength of compressive strength to be found at 7 and 28 days.

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KEYWORDS: *Paper sludge waste, waste marble powder, Jute fibre, compressive strength, design mix.*

INTRODUCTION

Concrete of the essence edifice matter that commonly worked construction of different infrastructure buildings, bridges, highways, canal and many more. The production of ordinary Portland cement produces 5 to7 percent more or less of the total green house gas emitted to the atmosphere. The waste marble powder is generally made during cutting of marble. The waste material as something like range of 10 to15 percent of the total marble handled. The paper mill waste like sludge from paper mills is produced in huge amount of waste in our industrial areas. The paper sludge makes up 0.6% to 0.7% of the whole amount of municipal garbage produced in India. Year by year, in the Europe countries generates more than 1.5million tons of waste paper sludge.

In newly developing countries like India it is very necessary to well make use of the wastes generating from different industries so that they do not cause pollution in the environment. Jute is a huge fibre that is used for dismissal, burlap, and cord as a backing material for tufted carpets. It is an elongated, yielding, glossy fibre that can be twist into coarse, strong threads. It is one of the cheapest natural fibres. It is composed primarily of the plant materials fibre, lignin, and pectin. Both the fibre and the plant from which it comes are generally called jute.

METHODOLOGY

Compressive Strength of Concrete by Mix Design

The concrete mix design was proposed by using IS: 10262. Grade of concrete used is M30 with water cement ratio 0.45. The mix proportion used in the laboratory for experimentation is shown in the table below.

Compressive Strength Test

The strength developed is assessed by maturity testing, an effective way of assessing the strength of concrete at specified period in days. In the present work strength of concrete were evaluated for different replacement level of cement by Paper Sludge Ash (5%, 10%) for different curingperiodsi.e.7and 28days. The strength of these mixes for 7 and 28days were tested.

Figure: Testing of Specimens in Universal Testing Machine

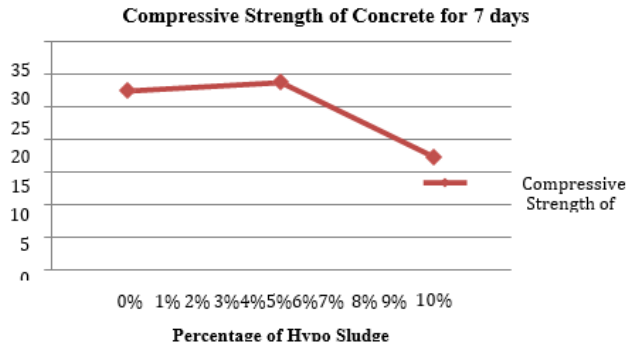
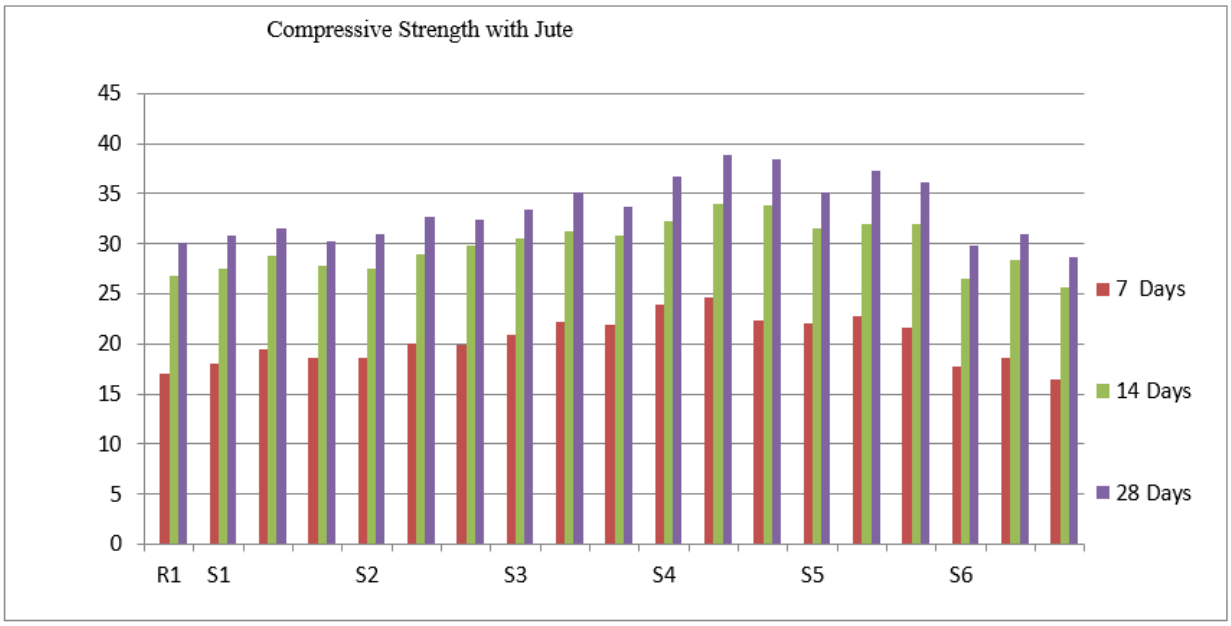


TABLE 1 compressive Strength of Different Hypo sludge Mixed For 7, 14 And 28 Days Sample

S. No	Sample Name	Compressive strength N/mm2 (7 Days)	Compressive strength N/mm2 (14 Days)	Compressive strength N/mm2 (28 Days)
1	R1	16.99	26.8	30.1
2	S1	17.99	27.5	30.8
		19.54	28.85	31.5
		18.54	27.8	30.2
3	S2	18.68	27.5	30.9
		20.09	29	32.7
		19.89	29.8	32.4
4	S3	20.85	30.6	33.45
		22.13	31.2	35.2
		21.89	30.8	33.7
5	S4	23.92	32.2	36.7
		24.71	34	38.8
		22.3	33.8	38.4
6	S5	22.06	31.5	35.2
		22.75	32	37.3
		21.57	32	36.2
7	S6	17.71	26.5	29.8
		18.64	28.45	31
		16.47	25.7	28.7



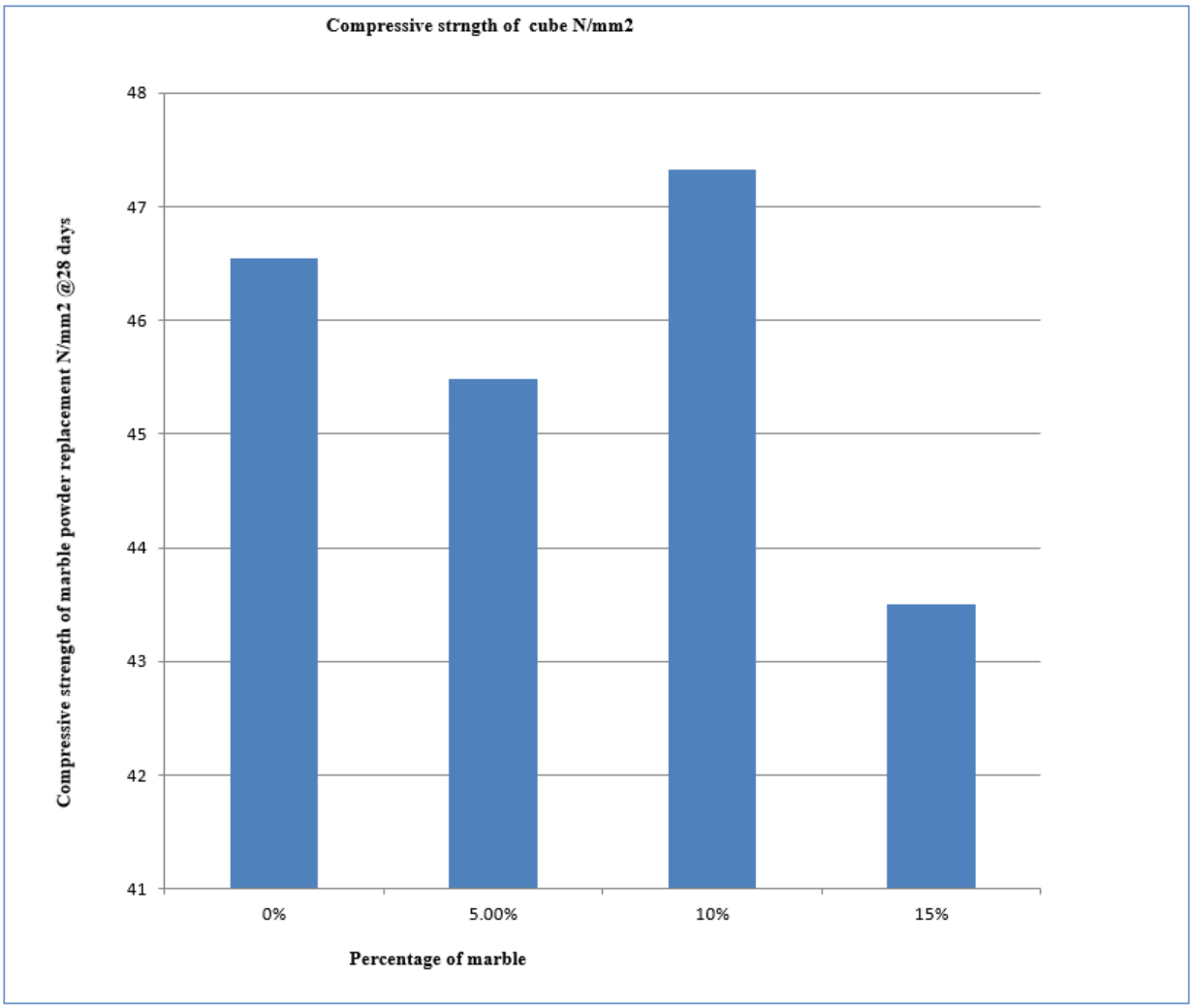


Table-2 Compressive strength marble powder Replacement N/mm2@28days

Percentage % of marble	Compressive strength marble powder Replacement N/mm2@28days
0% marble powder	46.55
5% marble powder	45.48
10% marble powder	47.33
15% marble powder	43.50

Table no 3 Compressive strength of marble powder

No. of days	0%	10%	20%	30%
7 days	23.4 MPa	24.38 MPa	28.4 Mpa	23.49 MPa
14 days	32.4 Mpa	33.76 Mpa	36.94 Mpa	32.52 Mpa
28 days	36 Mpa	37.32 Mpa	46.21 Mpa	36.14 Mpa

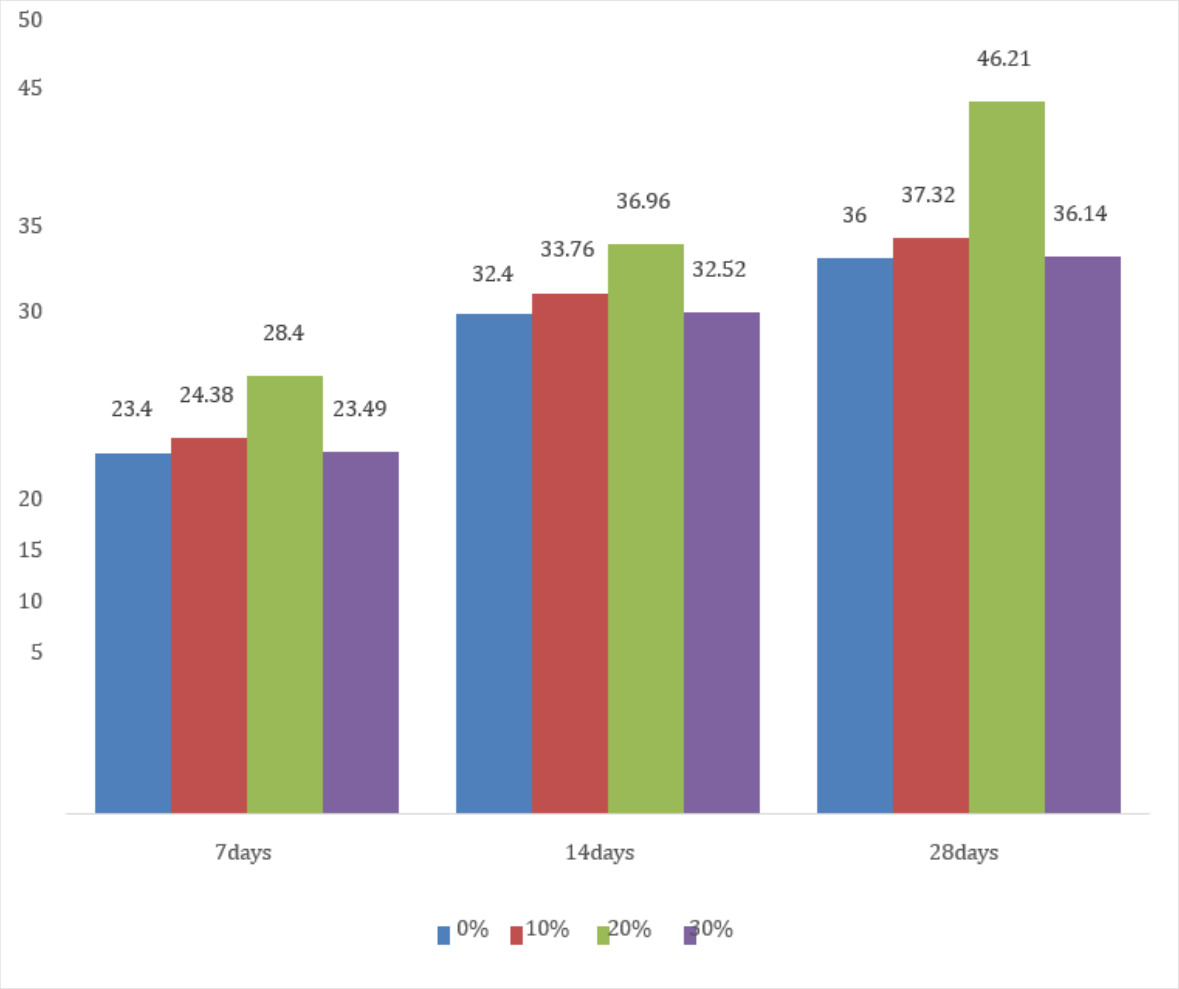


Table-4 Percentages of marble power & Compressive strength

Sr. No.	Percentage % of Marble	Compressive Strength Marble Powder Replacement N/Mm2@28days
1	0%	46.55
2	5%	45.48
3	10%	47.33
4	15%	43.50

CONCLUSION

- 5% replacement of cement by hypo sludge has shown 7.1% increase in compressive strength at 28 days of curing.
- With increase in percentage of Hypo sludge the compressive strength and tensile strength of concrete starts decreasing.
- At 5% replacement we attain maximum strength and further increase in percentage of hypo sluge decreases the strength. .
- By using Hypo sludge we can decrease the production cost of concrete as hypo sludge is cheaply available in the market.
- The maximum compressive strength value Is 46.21 MPa on 1.0% jute fiber and 15% hypo sludge content while the minimum compressive strength value is 28.70 MPa on 1.5% jute fiber and 25% hypo sludge content.
- The maximum gain in compressive strength is 28% with compared to standard concrete.

The maximum gain in compressive strength is 20% with compared to standard concrete.

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