

ABSTRACT

The most efficient Solution of marble slurry pollution is utilization in Bulk. The only industry which can consume marble slurry at so large level is only the construction industry. Different properties of marble slurry determined in the laboratory. Sp. gravity 2.61, Fineness modulus was found to be 0.91 and Utilization of marble slurry in Cement Mortar replacing Sand is 30% which shows equal strength as of Control i.e. 1:3 Cement Mortar 0% Marble slurry. Marble slurry can be easily utilized in construction industry in preparing Cement mortar.

KEYWORDS: Marble slurry, Specific gravity, Cement Concrete, Cement Mortar and Fineness modulus.

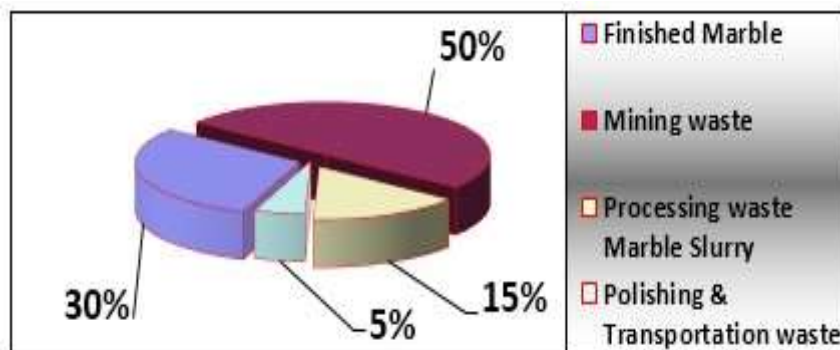
INTRODUCTION

Marble Slurry is a suspension of marble fines in water, generated during processing and polishing, etc. It comes in form of cake after drying and in powder form after grinding. Making different kind of environmental hazards. It is shaping to major threat of the Environment in the state by mining and processing activities. Nearly one thousand Gang saws and thousands of cutters are producing 15-20 lac tons of marble slurry waste which is indestructible waste and harm to general Public. Some of effects of the marble slurry may be listed as under: -

1. The waste is indestructible.
2. The sites which can be used as dumping ground are limited and give repulsive dirty look.
3. Contamination of top fertile soil cover.
4. Contamination of the rivers and other water bodies there by adversely affect irrigation and drinking water resources.
5. Contamination of air

Public resistance, Law & order and prevention (Banning) can give a deathblow to the growth of the marble industry. It is therefore a social responsibility of Public & scientific & engineering responsibility of government and industry to solve the problem of marble slurry pollution. According to references given below marble slurry can be utilized in preparing cement mortar up to some extent. In our experiments results and discussion given below:

FRACTION OF TOTAL MARBLE PRODUCTION



However, the development of country is only possible by sustainable and balanced industrialization.
Conservation of Natural Resources.

The valuable national wealth and Natural resources are getting wasted mainly due to lack of management and technology.

- i) Using upgraded technology slurry production may be reduced.
- ii) 4000,000 tons of water can be separated and reused.
- iii) 5000,000 tons of this waste, if used, can change perhaps the entire scenario of the industry.

Environmental Hazards.

- i) Air Pollution.
- ii) Water Pollution.
- iii) Contamination of soil Cover.
- iv) Loss of flora and fauna.
- v) Breaking Eco-system.
- vi) Health hazards Human being as well as Animals.

AIMS AND OBJECTIVES

Slurry production will not stop even after latest technology it will be minimized only. Utilization of the Marble slurry is the only complete solution of the Marble slurry Pollution. For this purpose the most useful steps can be:

- (A) Re-utilization of water after separating the Marble slurry.
- (B) Utilization of Marble slurry.
- (A) Re-utilization of water after separating the Marble slurry.

Proper separation of water is essential. 50,00,000 tons slurry is generated annually which contains 40,00,000 tons of water. Hence an effort should be made to get the maximum possible water out of it and slurry be converted in the form of cakes. These cakes can far more easily be transported for utilization at distance sites. This will help in saving the natural resources of water and also the sand lowering the damage to eco-system.

(B) Utilization of marble slurry:-

Even minimizing waste/slurry production the problem could only be partially solved. Therefore it is needed to develop modes of utilization of waste/slurry. Since other applications cannot consume such a bulk amount of slurry, efforts are being made to utilize slurry for different civil works. It is essential to explore possibilities of alternative uses. To arrive at technically sound and financially viable technologies to utilize marble slurry / waste and also work out a framework for long term waste management in Industrial Areas.

The areas where the utilization of marble waste and marble slurry needs to be explored as a substitute for conventional raw materials are as follows:

1. As a filler material for roads and embankments
(As per Khadi Board Item No 31 from sr. no. 1to 9 of this chapter)
2. For manufacture of bricks
Central Brick Research Institute (CBRI), Roorkee.
3. Manufacture of Portland cement
4. Manufacture of Ceramic Tiles
5. Manufacture of Thermo set Resin Composites
The Macro molecular Research Centre at Jabalpur.
6. Manufacture of lime
7. Manufacture of Activated Calcium Carbonate
8. Hollow Blocks and Wall Tiles
9. Manufacture of Ground Calcium Carbonate
10. Making Cement mortar (Partially replacing sand).

Experiments:

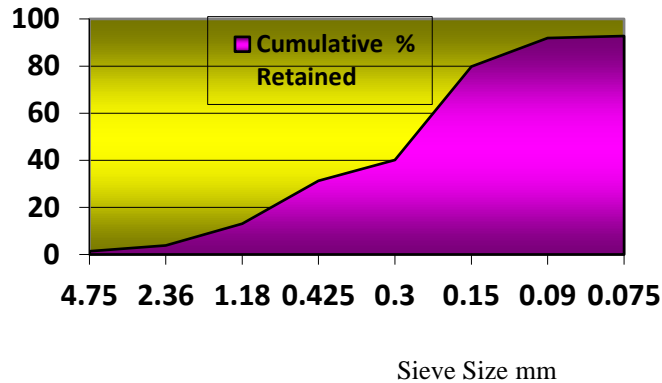
Properties of marble slurry:

- | | |
|------------|---------|
| a. Color | White. |
| b. Texture | Powder. |
| c. Taste | None |

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IC™ Value: 3.00

d. Particle Size	4.75mm-75micron
e. Fineness Modulus	0.91
f. Natural moisture content	0% (if under roof)
g. Solubility in Water.	Totally insoluble
h. Densification (Compare to Cement)	Lesser
i. Specific gravity	2.56
Fineness Modulus of Marble Slurry	
% Cumulative retained	



Fineness Modulus = $(1.41+2.42+9.27+18.15+8.87+39.72+12.10)/100 = 0.9194$
 Fineness Modulus = 0.91

Marble Slurry is Cohesion less.

These both of properties allow marble slurry to be used as an ingredient or a filler material to be added to Cement mortar.

Optimum quantity of Marble slurry for same strength as of Control for 1:3 Cement Mortar.

Compression Testing Average values for 1:3 Cement Mortar cube slurry mixed 28 days test:-

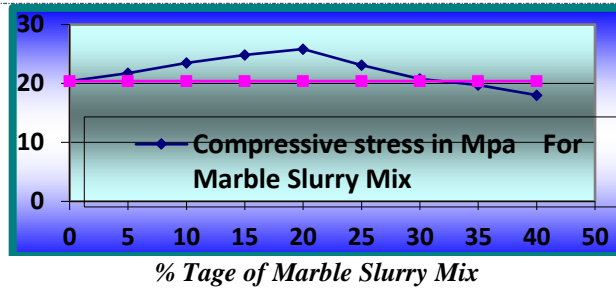
S.No.	Specimen/ Design Mix	Table no.1	Table no.2	Table no.3	Average value (1+2+3)/3
1	0% Slurry mix	20.41	21.43	19.39	20.41
2	5% Slurry mix	21.43	22.45	21.43	21.77
3	10% Slurry mix	23.47	24.49	22.45	23.47
4	15% Slurry mix	24.49	25.51	24.49	24.83
5	20% Slurry mix	25.51	25.51	26.53	25.85
6	25% Slurry mix	21.43	24.49	23.47	23.13
7	30% Slurry mix	19.39	21.43	21.43	20.75
8	35% Slurry mix	18.37	20.41	20.41	19.73
9	40% Slurry mix	16.33	18.37	19.39	18.03

Compressive Strength Cement Sand mortar:

After 28 days curing
Strength in M Pa

Compressive Strength Cement Sand mortar:

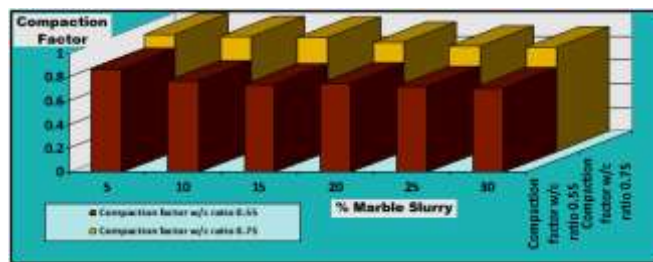
After 28 days curing
Strength in M Pa



Compaction Factor:

Sl. No.	Water-Cement ratio	% Slurry replacing Sand	Mass of Partially compacted concrete W2-W1Gms	Mass of fully Compact Concrete W3-W1	C.F.= W2-W1 /W3-W1
1	0.75	5	11485	11816	0.97
2	0.75	10	11330	11920	0.95
3	0.75	15	11134	11844	0.94
4	0.75	20	11004	11928	0.92
5	0.75	25	10908	12008	0.91
6	0.75	30	10788	12030	0.90

Compaction Factor v/s water cement ratio 0.55 & 0.75

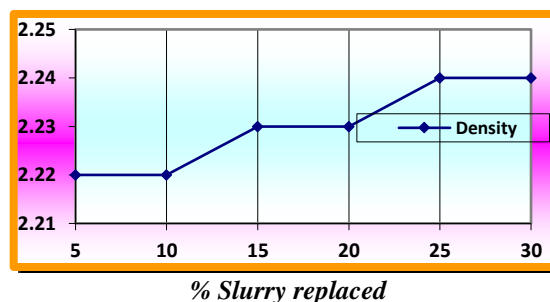


Observation Table for Compaction Factor and Density for Water Cement Ratio 0.55 Compaction Factor/Density

S.No.	% of Slurry Mix	Compaction Factor	Compacted Weight	Density
1	5	0.87	12285	2.22
2	10	0.77	12286	2.22
3	15	0.74	12330	2.23
4	20	0.75	12365	2.23
5	25	0.72	12385	2.24
6	30	0.71	12375	2.24

Graphical presentation

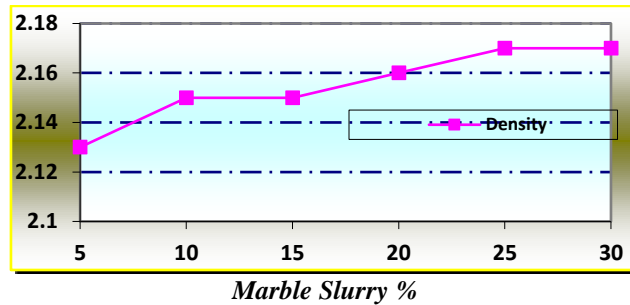
Density gm/cm³



Observation Table for relation between Compaction Factor and Density for Water Cement Ratio 0.75 Cmpaction Factor/Density

S.No.	% of Slurry Mix	Compaction Factor	Compacted Weight	Density
1	5	0.96	11816	2.13
2	10	0.95	11920	2.15
3	15	0.94	11904	2.15
4	20	0.92	11928	2.16
5	25	0.91	12008	2.17
6	30	0.9	12030	2.17

Graphical presentation
Density gm/cm³



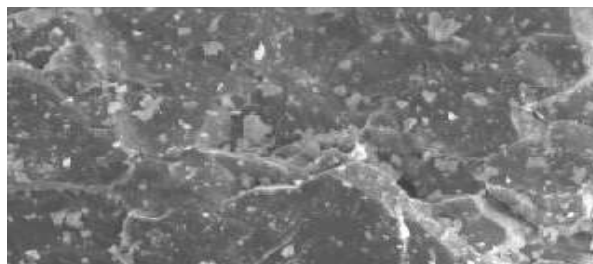
At water cement ratio 0.55 density of cement concrete for different % of marble slurry is more than water cement ratio 0.75 for similar % of marble slurry. But the mix at 0.55 w/c ratio is not workable while mix at 0.75 w/c ratio is workable showing good amount of density.

As density is more the strength of cement concrete is more. As shown in figures of brocken cubes. Cube (B) is more workable than cube (A) as seen in photographs

(A) Brocken cube 0.55 w/c ratio less workable.



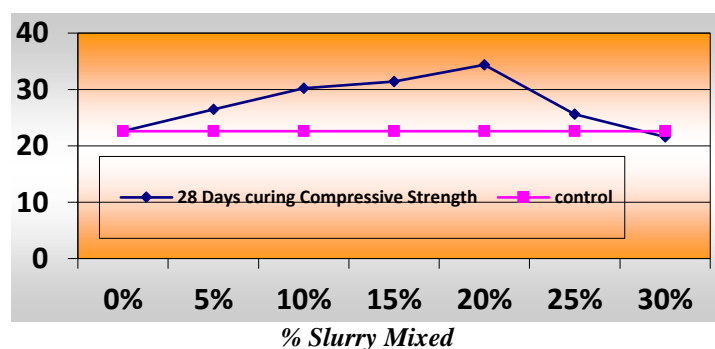
(B) Brocken cube 0.75 w/c ratio more workable.



Compressive strength 28 days curing strength for Cement Concrete 1:2:4 Slurry Mix 28 days curing:

S.No	Specimen/ Design Mix	Table no.1	Table no.2	Table no.3	Average value (1+2+3)/3 Strength N/mm ²
1	0% Slurry mix	22.67	22.44	22.67	22.59
2	5% Slurry mix	26.67	26.44	26.22	26.44
3	10% Slurry mix	30.22	30	30.44	30.22
4	15% Slurry mix	31.12	31.29	31.77	31.39
5	20% Slurry mix	34.44	34	34.67	34.37
6	25% Slurry mix	25.28	25.41	26.11	25.60
7	30% Slurry mix	21.34	21.39	22	21.58

Compressive Strength
28 Days Curing



CONCLUSION BASED ON EXAMINATION

Based on all above properties this is clear that marble slurry can be utilized as an ingredient to prepare cement mortar replacing fine aggregate. Marble slurry shows a good and acceptable strength when added in Cement Mortar. (Replacing sand) It can be used as a filler material (up to 30% replacing sand) showing same strength as of control.

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