

ENERGY EFFICIENCY AND VALUE ENGINEERING WITH INDUSTRIAL WASTE “MARBLE SLURRY”

***Singh Kushwah RP¹ and Ishwar Chand Sharma²**

¹SGVU Jaipur, VGU Jaipur

²Arya College of Engineering Kookas, Jaipur

**Author for Correspondence*

ABSTRACT

The marble waste is rarely degradable. So it is a wider environmental hazard. The water bodies and the rivers are also contaminated by flowing of marble slurry with rain water. This contaminated water effects the irrigation and also the drinking water sources. Due to the presence of fine particles in marble slurry air is also polluted. Fines of marble slurry flew with air blows creating serious health problem by breathing. Fine particles of marble slurry deposit over leaves, vegetation, plants and trees creating aesthetic problem. Due to deposition of marble dust over leafs the vegetation, plants as well as trees die, hence loss of flora and fauna. The most efficient solution of marble slurry problem is the utilization in lot. The properties of marble slurry are worked out in the laboratory and given here in the average of three repetitions. Fineness modulus was found to be 0.91 and it's cohesion less material. According to this Marble slurry can be utilized in finishing work as Marble paste and White wash. This can reduce up to 4⁰C temperature inside the premises. Hence saving of electricity (a precious national resource)

Keywords: *Marble Slurry, Marble Paste, and White Wash and Fineness Modulus*

INTRODUCTION

Marble occur abundant in nature. It is used and mined many places in the world since early time. Around 90% of the world's production of marble comes from India and approx 85% of India's production is received from Rajasthan and almost all mining and processing activities are concentrated around Makrana, where the proposed study is planned to undertake. Rajasthan has around 4000 marble mines and about 1100 marble gang saws (processing units). Rajsamand, Udaipur, Ajmer, Nagaur (Makrana), Alwar, Banswara, Chittorgarh, Sirohi, Jaipur districts etc are known for mining of marble. At the same time it leads to growth of many processing units in respective areas. These two activities in Rajasthan have been extended in 20-25 years and have played important role in the economy of the state providing direct and indirect employment to majority of people and therefore also raising their living standard.

The industry involves mining and processing units for the production of tiles for walls and floors, articles, waste production and other ancillary works. The marble mining and the industry as a whole are different from other industries to the very fact that, the marble is a "Dimensional Product", which means the Marble is sold by size not by weight (In other words in sqm not by tones). Since the selling price increases manifolds with size, all the operations involving mining and processing are aimed to get slabs as big as possible.

Marble Slurry Generation

□ □ Marble Slurry is a suspension of marble fines in water, generated during processing and polishing, etc.

Environmental Hazards due to Waste

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 lack 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. Top fertile soil cover is destroyed.

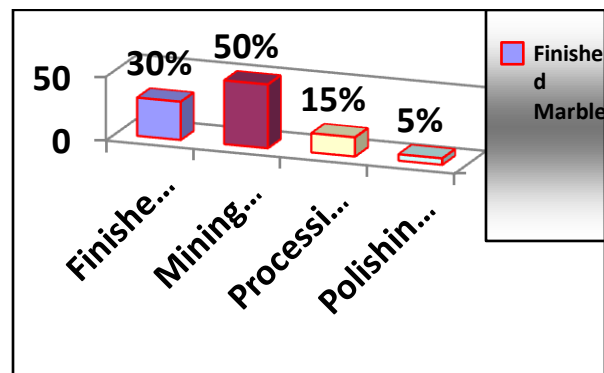
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4. Rivers and other water bodies are contaminating there by adversely affecting drinking water resources.

5. Air pollution by slurry fines

Public outcry, jurisdiction and intervention could deal deathblow to the growth of the marble industry. It is therefore a social and legal responsibility of government and industry to solve the problem of marble slurry pollution. **As per Rajasthan High Court Petition No.2150/2004, it is violation of the provision of water prevention and control of pollution act 1974.**

Marble Production



However, the development of country is only possible by sustainable balanced industrialization.

(a) Conservation of Natural Resources.

The valuable national wealth is getting wasted mainly due to lack of management and technology. This waste, if used, can change perhaps the entire scenario of the industry.

(b) Air pollution.

This is the most hazardous impact of the marble industry. It is clear from the table 1, slurry is produced at almost every operation and it is a great problem. When it gets dry, it causes air pollution and related problems.

(c) Water pollution.

Like any other industry, the marble industry needs water in its different operations for cutting, cooling and flushing. In these operations water gets contaminated by marble slurry.

(d) Visual impacts.

Abandoned mines, dumping sites, slurry waste sites, deposition of dried slurry over almost every structure in surrounding areas gives a very bad, dirty look and aesthetic problem.

(e) Accidents due to unscientific dumping.

1. Due to dumping of mine waste and marble slurry on road side causing dust in air (polluting air) and creating less visibility, due to less visibility number of accidents occurs (refer figure no.2).
- 2.



Figure 2: Dry slurry fogging

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(f) Accidents due to slippery roads.

In rainy season marble slurry flows over roads, due to marble slurry road becomes slippery and many accidents take place (Refer figure no.2&3).



Figure 3: Road side dumping (Slippery Road)

(g) Loss to flora & fauna

Already grown trees and bushes die out and new ones do not grow due to deposition of marble slurry. Animals also suffer for their food and shelter (refer figure no.4).



Figure 4: Loss of vegetation

Aims and Objectives

Utilization and scientific disposal of marble slurry on a properly selected dumping sight may be better solution of the problem. But Now a day's production increasing day by day the Utilization is the only solution of the problem. For this purpose the most useful steps can be:

Utilization of Marble Slurry in Construction Industry

Even minimizing slurry production the problem could only be partially solved. Therefore it is the need to develop modes of utilization of slurry. Since other applications cannot consume such a bulk amount of slurry, efforts are being made to utilize slurry for different civil works.

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Feasible Uses of Marble Waste

The areas where the utilization of 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.
2. For manufacture of bricks
3. Manufacture of Portland cement
4. Manufacture of Ceramic Tiles
5. Manufacture of Thermo set Resin Composites
6. Manufacture of lime
7. Manufacture of Activated Calcium Carbonate
8. Hollow Blocks and Wall Tiles
9. Manufacture of Ground Calcium Carbonate
10. As Asphalt filler
11. As a mineral filler for putty and chalking compounds based on linseed oil or plastic.
12. In filter beds as a screened mineral aggregate.
13. As a filler for Cement Mortar and Cement Concrete replacing Sand.
14. Curing with Marble Slurry.
15. As finishing material Marble Paste replacing Wall putty which has less strength & Costly.
16. White washing with 50-50 Lime and Marble slurry.

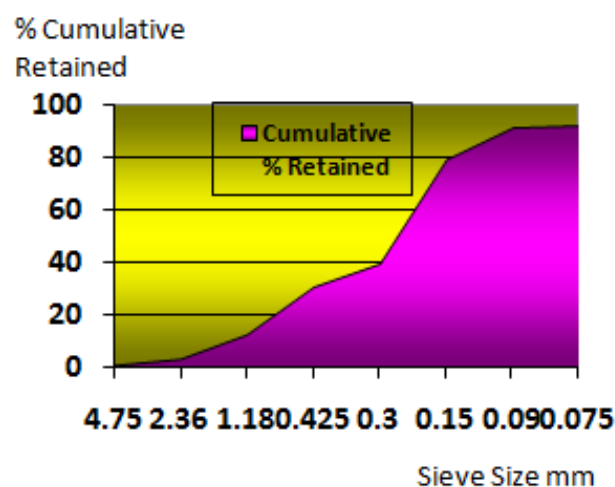
CONCLUSION

As Finishing material Marble Paste is better than wall putty. Which has more strength & cheaper. Marble paste is mixture of slurry powder with white cement and slacked or hydrated lime along with gluing agent. After application of Marble paste on walls and also on roof top maximum of Sun heat will be reflected away from the building.

Thus a Temperature difference of minimum 4⁰ C. may be achieved saving electricity and hence money, having very good impact on environment. Saved energy and money may be used anywhere else for development of nation.

Properties

1. Fineness Modulus of Marble Slurry:-



$$\text{Fineness Modulus} = (1.41 + 2.42 + 9.27 + 18.15 + 8.87 + 39.72 + 12.10) / 100$$

$$= 0.9194$$

$$\text{Fineness Modulus} = 0.91$$

2. Marble Slurry is Cohesion less.

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These both of properties allow marble slurry to be used as a finishing material and due to its white color it's a good heat repellent.

Study on Marble Paste Composition

(1) Designed Mix first:- The first sample prepared for testing was made with proportions as (1 : 1 : 1) White Cement : Lime : Marble Slurry.

(2) Designed Mix Second:- The second sample prepared for testing was made with proportions as (1 : 1 : 2) White Cement : Lime : Marble Slurry.

(3) Designed Mix Third:- The third sample prepared for testing was made with proportions as (1 : 1 : 3) White Cement : Lime : Marble Slurry.

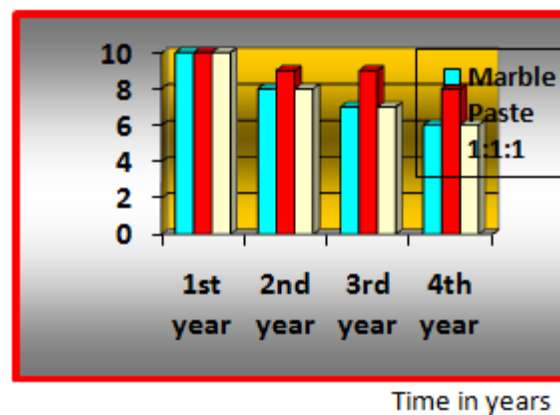
All these three samples were tested for Smoothness, toughness, Moisture transmission and Shrinkage Cracks on surface.

The second sample shown appropriate results, we used it on interior as well as exterior surfaces.

Results of proportion of marble slurry mix in Lime showing grades for graphical presentation of mix results with time.

GRADES					
S.NO.	BEST	BETTER	GOOD	DULL	BAD
1.	10	9	8	7	6

Grades



Conclusion

1. In Marble Paste due to use of marble slurry with lime and white Cement Cost reduces up to 40% and also more durable & dense in comparison to Putty .

2. Maximum of Sun light reflected away the Building will make a difference of minimum 4° C.(Inside to outside) saving electricity a national resource.

Marble Slurry may be used as Marble paste a finishing material and also keeping building cool naturally.

ACKNOWLEDGEMENT

This paper is a knowledge by Prof.(Dr.) PBL Chaurasia V.C. ICFAI University Jaipur and dedicated to Late. Prof (Dr.) N.C. Saxena my Guruji, my Godfather.

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