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Engineering Utilization of Marble Slurry as Curing Aid.

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Abstract

Around 90% of the world's production of marble comes from india and approximately 85% of the india's production is recieved from Rajasthan which has more than 4000 Marble mines and 1100 Gang saws (processing unit). Waste is generated during quarrying or mining, processing and polishing of marble. Different types of wastes produced are upper burden,beside burden, internal burden, unwanted material and under sized material along with Marble slurry.

The 70% Part of Marble is wastage in marble industry and responsible for many sevier environmental problems. Only 30% recovery of product bears the remaining 70% burden. 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 affecting 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 flews with air blows creating serious health problem by breathing. Fine particles of marble slurry deposits over leaves of vegetation, plants and trees creating aesthetic problems. Due to deposition of marble dust over leafs the vegetation, plants as well as trees dies. 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 determined in the laboratory and given here in the average of three repetitions. Bulking of marble slurry is a function of moisture content. Bulking is 42% which is maximum at 5% moisture. Fineness modulus was found to be 0.93.According to these parameters Marble slurry can be utilized in as Curing aid.

Key words: - Marble slurry, Bulking, Moisture and Fineness modulus.

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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. Contamination of top fertile soil cover.
4. Contamination of the rivers and other water bodies there by adversely affecting irrigation and drinking water resources.

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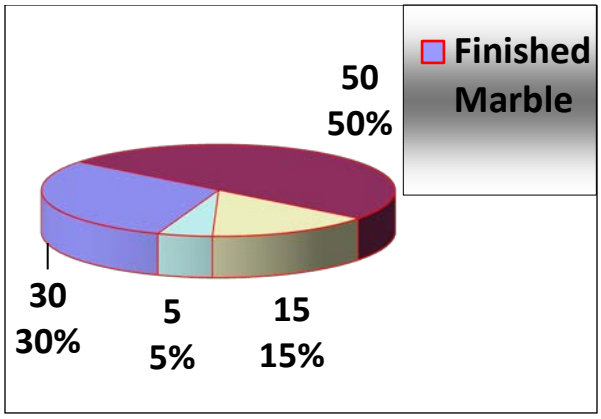
5. Contamination of air

Figure – 1: Loss of vegetation

Figure – 2: Road side dumping

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.**



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.

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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)

(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)

(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.1)

1. 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: (A)Utilization. (B) Other use.

(A) Utilization of marble slurry:-

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.

Feasible Uses of Marble Waste

It is essential to explore possibilities of alternative uses. To arrive at technically sound and financially viable technologies to utilize marble slurry and also work out a framework for long term waste management in Industrial Areas.

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 (Rajasthan PWD has refused to use Marble slurry as a filler material.)

2. For manufacture of bricks

3. Manufacture of Portland Cement

4. Manufacture of Ceramic Tiles

5. Manufacture of Thermoset Resin Composites

6. Manufacture of lime

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7. Manufacture of Activated Calcium Carbonate

8. Hollow Blocks and Wall Tiles

9. Manufacture of Ground Calcium Carbonate

(C)Other Possible Uses of Marble Slurry:-

Broadly speaking, marble slurry, due to the high percentage of limestone in it can be used as a substitute for lime stone in most of its industrial and other applications. It can have predominantly one or more materials like calcite, dolomite or serpentine.

There is a possibility of the use of marble slurry in many more industries; mainly

as a substitute for limestone in the following:

1. In production of synthetic agglomerated marble

2. In manufacture of glass

3. In chemical manufacture

a) Lime manufacture

b) Plastics manufacture

c) As dilutents and carriers of pesticides

d) In many other chemical processes as a substitute of limestone

4. Chemical and Industrial uses

a) In iron and steel metallurgy as a substitute for limestone (as flux in the

refining of metals, etc.)

b) In non-ferrous metallurgy in the manufacture of magnesium and magnesia,

uranium, alumina, nickel, tungsten, floatation of gold & silver.

5. As a neutralising agent and filler for paints, rubber etc.

6. As a concrete aggregate

7. As a railroad ballast

8. In the construction of dam spillways, docks, piers, and breakwaters in the form of irregular shaped fragments of sizes ranging from 25 – 30 cms.

9. As an Asphalt filler

10. As an insulation material in the rick wool insulation bats and pellets

11. As a mineral filler for putty and chaulking compounds based on linseed oil or plastic.

12. As a mineral feed supplement for domestic animals

13. In waste water treatment

14. For de-sulfurising stack gases from utility and industrial plants that operate coal burning boilers.

15. In the treatment of Sewage sludge to quell obnoxious fumes

16. In filter beds as a screened mineral aggregate.

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17.As curing material helping in effective curing and saving a Loss of Lot of Water.

Curing Methods:

Curing methods may be divided broadly into four categories:

a. Water curing
b. Membrane curing
c. Application of heat
d. Miscellaneous

Water Curing:

This is by far the best method of curing as it satisfies all the requirements of curing, namely, promotion of hydration, elimination of shrinkage and absorption of the heat of hydration. It is pointed out that even if the membrane method is adopted, it is desirable that a certain extent of water curing is done before the concrete is covered with membranes.

Water curing can be done in the following ways:

a. Immersion
b. Ponding
c. Spraying or Fogging
d.Wet covering
e. Spray of Marble slurry fine particles.

a. Immersion

b. Ponding

c. Spraying or Fogging

d.Wet covering

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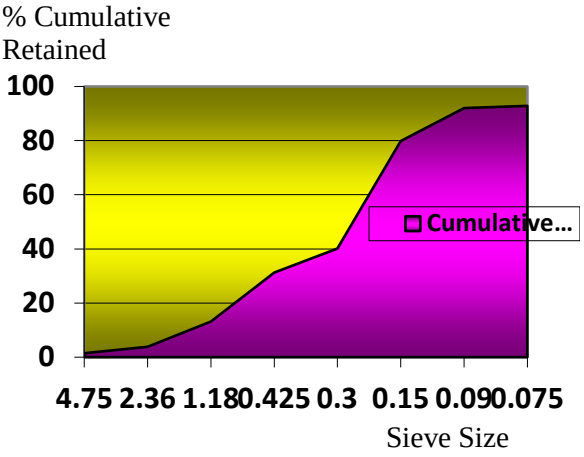
e. Spray of Marble slurry fine particles.

1.Fineness Modulus of Marble Slurry:-

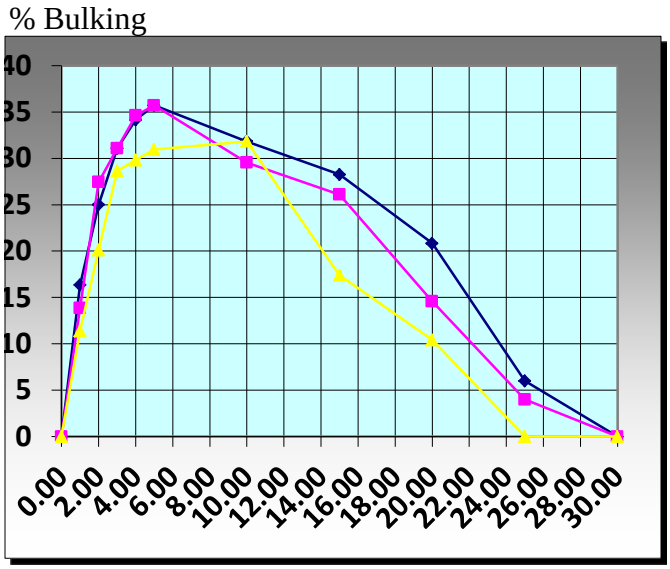


Fineness Modulus = (1.41+2.42+9.27+18.15+8.87+39.72+12.10) /100
= 0.9194
Fineness Modulus = 0.91

2.Bulking of Marble Slurry:-

% of Maximum bulking occurred = 36% in marble slurry. Pink & Blue line for Marble slurry. % of water content for maximum bulking of Marble Slurry = 5%

% of water content when bulking is zero= 0% and 30% for Marble slurry.



Conclusion:-

1. Due to white colour of marble slurry most of heat is reflected and minimum heat is absorbed so maximum curing may achieved in minimum of water.
2. Due to fine particles and bulking the voids of concrete are filled up and the water trapped inside the concrete is available for curing for long time.

So Marble Slurry may be used as Curing aid in construction.

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