

Passive Cooling Effect of Buildings with Marble Slurry

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Abstract: -The photo energy or sunlight is main source of natural heat on earth. Sunlight is required necessarily as one element for life on earth. Nature of sunlight is to heating things and environment. In the winter season sunlight feels good because of lower temperature while in summers when the entire environment is hot then sunlight doesn't give feel well.

Winters when heating is required then sunlight or Photo energy can be utilized for heating purpose of buildings and environment surrounding. But in summers when temperature is high outside and inside the premises then it's required to keep temperature low inside the building. Marble paste can be used as a tool to Passive cooling of building.

Key words: - Environment, Photo energy, Marble paste, Solar heat, Passive cooling and Embedded.

I. INTRODUCTION

Almost all study activities are concentrated in Jaipur, where the proposed study is planned to undertake. Rajasthan is dry and arid zone. The air conditioning and air cooling needs more electricity as well as water while there's scarcity of water and at the other end in winters temperature goes down and lot of electricity is wasted for heating the buildings. This precious electricity may be saved and can be utilized in industrial production and hence development of the nation.

Summers when temperature all around is more than required and it is required to cool down the temperature then some of efforts can be made to reflect the maximum photo energy and temperature of building can be kept low. Some of steps are as follows:

(A) *Active cooling.*

- (i) *Water tubes embedded in roof with flowing water keeps cool inside.* : This is very costly method to keep building cool. But in ancient times when there was no any modern means of cooling available this method was adopted in Water Palace of Deeg in Bharatpur (Raj.). Metal tubes were embedded in roof and walls. Water was supplied in these pipes and inside temperature was lowered down.

- (ii) *Green walls:* This is modern technology adopted to cool the building under Green Building concept. Now a day's many buildings are visualized adopting this technology for cooling the buildings. Firstly direct sunlight is stopped resulting no heating of building and secondly by evaporation of water through leaves cools down the environment.
- (iii) *Roof top gardening:* Direct sunlight is stopped and no heating of roof and building takes place secondly by evaporation of water through leaves again it reduces the temperature of surrounding environment and cools the building.

(B) *Passive cooling.*

- (i) Glazing on south face.
- (ii) Marble paste finishes on south facing walls and roof top.

According to this Marble slurry can be utilized in finishing work as Marble paste. Which is 50% cheaper and also good solar heat repellent causing natural building cooling?

II. MARBLE SLURRY GENERATION

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

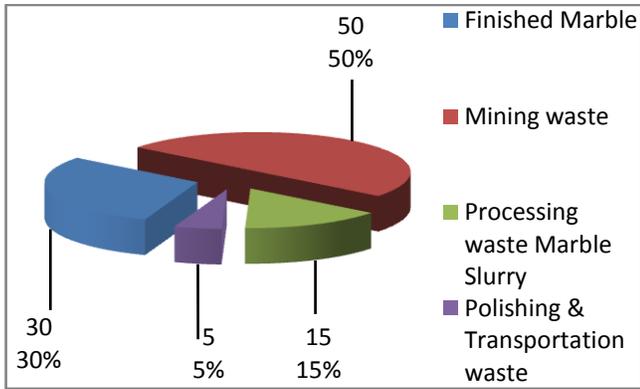
III. ENVIRONMENTAL HAZARDS DUE TO WASTE

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 nearby adversely affecting irrigation and drinking water resources.

5. Contamination of air.

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.



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

(a) Natural Resources Saved.

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) Unscientific dumping.

Due scientific dumping of mine waste and marble slurry creating waste lands. 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.

(f) Slippery roads.

In rainy season marble slurry flow on road. Due to marble slurry road becomes slippery and many accidents take place.

(g) Loss to flora & fauna

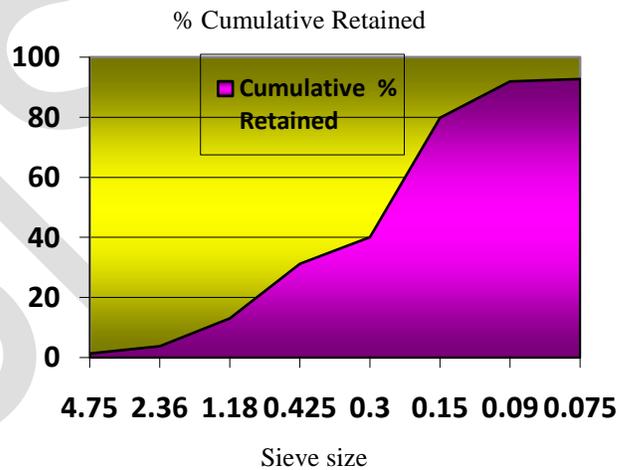
Already grown trees and bushes die out and new ones do not grow due to deposition of marble slurry. Animals also suffer for their food and shelter.

IV. AIMS AND OBJECTIVES

Cooling of buildings with utilization of marble slurry and solving the problem of environmental pollution. As a finishing material Marble slurry can be used for Marble paste and white washing with 50-50 Lime and Marble slurry.

V. EXPERIMENTS

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

It's fineness modulus allows to mix in Cement mortar and fills up voids of fine aggregate. So it can be utilized in cement mortars.

2. Marble Slurry is Cohesion less.

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 and if applied on outer surface as finishing material will definitely protect building by excessive heating.

3. Temperature control by Marble paste:

By our experiments we came to know that a minimum of 4°C temperature difference was made in white marble paste finished buildings to other color finished buildings on south west faces.

Table:-1 Marble paste

Sample / Name	1	2	3	4
Marble Paste	36 ^o C	37 ^o C	39 ^o C	35 ^o C
Other color finish	41 ^o C	41 ^o C	43.4 ^o C	39.3 ^o C
	Grey	Pink	Green	Yellow

VI. RESULT

Marble Paste finish made a difference of near about 4^oC temperature in comparison to other color washes.

Passive green cooling:

In summer the building require to be cool while temperature all-round goes high. If outer walls and roof are finished with such a material which is bright white, dense and smooth surface then it will be a good reflector and heat repellent and will keep the building cool naturally. As per a study it will create minimum of 4^oC temperature difference, which will save a lot of electricity.

Active green cooling:

1. Green south facing walls.

Green walls in south side protect walls by direct sunlight and heating. Also plants are natural coolers cools down the temperature.



2. Roof top gardening.

Roof top gardening protects direct heating of roof and cool down roof.



- Pipes embedded in roof with flow of water. Pipes are embedded in roof top which keeps temperature down because temperature is taken away by flowing water.
- Use glazing on south face of building for reflecting maximum solar heat and cooling indirectly the building.



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