



Utilization of Various Properties of Marble Waste in Different Building Works

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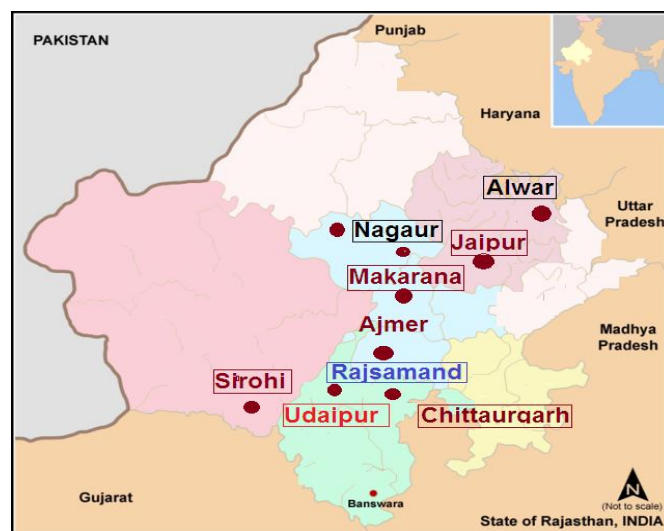
Abstract

Marble waste is obtained from mines in different sizes and marble slurry in powdered state when dry and in wet slurry form when mixed with water. The marble waste can be used in different building works big size (called Khandas) in masonry work, medium size e.g. around 60 mm size can be used in foundation concreting, under flooring, under paving and smaller size around 12mm size in reinforce cement concrete, under flooring etc. In curing the researcher has used marble slurry with overlaying gunny bags. It reduces the consumption of water but reduces the labor cost also. In Rajasthan there is scarcity of water and here with this experiment we can do the optimum use of marble slurry and as well as cut the labor cost also. In this way the marble waste and marble slurry can be used in different building works.

Key words: Marble, marble slurry, Khandas, gunny bags, marble waste, foundation concreting.

INTRODUCTION

The galaxy of the stone found in India and particularly in Rajasthan and its wide applicability has inspired at home and outside. Marble generally a white based elegant looking stone, geologically a thermally metamorphosed rocks belonging mainly to Precambrian rock formations of Rajasthan, spread over in 16 belts in 15 districts of the state is much sought after stone. The world famous Taj Mahal and Victoria Memorial are built of marble produced from the mines of Makrana (Rajasthan). The several famous temples of India have also been constructed of Makrana marble. Due to its softness it is used in sculptures and in carving also. Now a days in Makrana the mines has gone very deep and the mining is also very costly.



Ten types of Marble on the basis of color variation have identified which are plain white, panther white, white veined plain black, black zebra, brown, green, pink adanga, pink and grey (IS: 1130-1969). The ever increasing growing demand for finished and unfinished products, discovery of new marble deposits and growing

private and public demand have lead to a significant growth in marble industry of this state. As a result, number of marble quarries as well as number of processing units has significantly gone up. However, whereas there is significant growth in production of finished and unfinished marble products, there is simultaneous rise in waste generation as well, thereby causing concern towards the deteriorating environmental quality. The marble slurry goes on increasing and increasing day by day in huge stocks affecting the population, vegetation, agriculture fields and environment.

Marble waste

Types of waste generated

- Waste generated during quarrying.
- Waste generated during processing.
- Waste generated due to overburden.

Various types of waste generated during quarrying of marble are as follows:-

- Overburden
- Side burden
- Inter burden
- Undersize material
- Ungraded material

Percentage of waste generated

The marble waste generation varies widely from 30% by weight (in mechanized mines using wire saw cutting methods by extraction of marble blocks) to 65 % by weight (at mines where manual mining is resorted to and the rocks are fractured). Waste during quarrying by mechanized processes can be estimated at 30% to 40% of the production. The conventional quarrying techniques of blasting leads to a waste percentage of 60% to 70% and lead to uncontrolled stripping of vegetation cover and subsequent soil erosion. Dust generated during quarrying can also blanket surrounding areas leading to vegetation die off and adversely affecting the fertility and quality of top soil.

Quarrying waste disposal practice

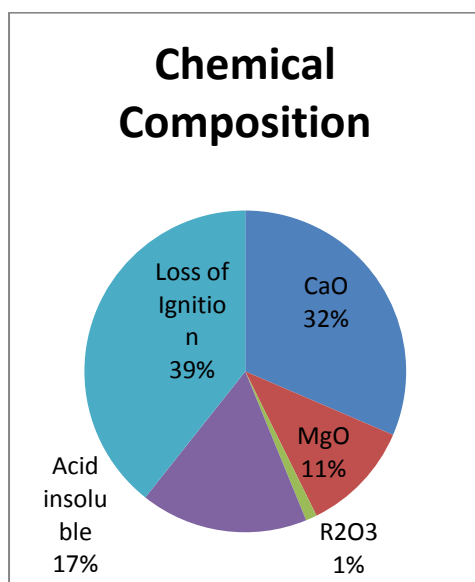
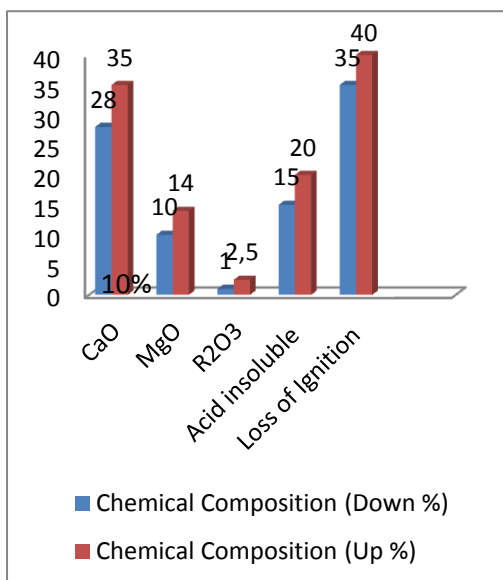
- The waste generated during the quarrying operations is mainly in the form of rock fragments (called Khandas) are dumped in empty pits creating huge amount of waste.
- The overburden is dumped on roads, river beds, pasture land and agriculture land leading to widespread environmental degradation.
- No segregation of the overburden from Khandas, thereby causing a loss of fertile top soil.
- There is a severe health hazard to workers on account of dust and water pollution.
- No proper disposal as the quarries is in very small size areas.

Quality of Waste Generated

- Marble slurry is a suspension of marble fines in water, generated during processing, polishing etc.
- The chemically composition is 28-35% CaO,10-14% MgO, 1-2.5% R_2O_3 %, 15-20 % Acid insoluble and 35 -40% Loss on ignition with traces of titanium Oxide and lead.

Table 1 Marble waste utilization

S no	Utilization area	Utilization %
1	Highway embankment fill, stabilization	10-14%
2	Bricks, Tiles.	10-12%
3	Concrete roofing sheets	5-10%
4	Aggregates	2-6%
5	Cement	9-11%
6	Particle board , panel	10-12%
7	Ceramic product	10-12%
8	Plaster and pointing	2-5%



Marble slurry used in curing

Here we have selected a different method of curing. we have done an experiment on a stretch of cement concreting newly laid of size 3mt x 6mt was divided into three parts of size 1mt x 2mt. Over this platform the boundary was made of lean cement sand mortar .It was divided into three chambers of depth 10cms.In its chamber curing was done with simple water. In Kind and Bird chamber marble slurry was to be used. For this we have taken of 0.40m³ of marble slurry was to be mixed with 1.80 m³ of water. This slurry was laid in both the chambers. In last chamber we have taken gunny begs. Or jute begs laid over marble slurry paste .This experiment was done at

temperature of 32⁰ c to 43⁰ c in open, day time. It was noticed that in the it's chamber water evaporated in 2 days. In Kind chamber water evaporated in 4 days and in Bird chamber evaporated in 5days.It satisfies the requirement of curing, promotion of hydration and absorption of heat.

In rajasthan state of India where there is scarcity of water this method will be very good for saving of water and labor.

AIMS AND OBJECTIVES

- The salient points under the research work for utilization with marble waste.
- The density of waste marble is better than the soil.
- The use of marble waste also effect and protect environment (Air & water), human health and agricultural land.
- The strength of mix of soil with marble dust is much higher than the ordinary soil.
- The different types of materials obtained from marble waste can be utilized in different engineering works.

RESULTS AND DISCUSSION

The different type of waste material is used in different engineering works. According to their use and according to their size waste material is used by different govt. departments and different agencies such as:-

COMMON USE IN BUILDING WORKS

1. In the quarrying waste material we have discussed big size rock fragments named Khandas are used in building works in foundations, columns and under flooring as a hard sub base.
2. The medium size stone is used in sub base of footing, foundation concreting and under pathways as hard base.
3. The smaller size i.e. up to 25mm size the material can be utilized in different concreting works.

4. , cement and sand bricks were molded in different proportions molded by fibro – compaction technique .It attained a compressive strength of 80-120 kg/cm².
5. In the manufacture of The marble slurry can be utilized in multifarious works as under:-
 - a) In silty soil there is a 12 % increase in unconfined compressive strength (UCS) with 10% marble dust.
 - b) There is 20% increase in UCS with 30% marble dust.
- C) There is no improvement in clayey soil.
 6. In concrete mixes there is a 15% increase in compressive strength when sand is mixed with 35% marble dust.
 7. For manufacture of bricks-
 - a) The marble slurry, hydrated lime and sand mix bricks were cured in a steam at normal pressure. It attains 50-60 % strength.
 - b) Marble slurry cement and ceramic tiles.
 8. In the curing of different types of concreting work.
3. MNIT (Jaipur) research communication on” Use of marble slurry for soil stabilization”.
4. IS: 2720-1985 (PART 4) “Method of test of soils: grain size analysis”, (BIS, New Delhi) 1985.
5. Personnel discussion with authorities concerned with marble slurry.
6. Consulted with marble gang saw units in Rajasthan.

CONCLUSION

In this way, we concluded that marble waste of different sizes can be utilized in different building works and around 15% marble slurry can be utilized in other types such as stabilization of soil etc. Here it is also mentioned that in curing total marble slurry with jute gunny bags with water can be utilized effectively .It not only saves water in Rajasthan where there is scarcity of water but saves labor also.

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