IJETST- Vol.||04||Issue||06||Pages 5301-5304||June||ISSN 2348-9480 2017

Open access Journal International Journal of Emerging Trends in Science and Technology
IC Value: 76.89 (Index Copernicus) Impact Factor: 4.219 **DOI:** https://dx.doi.org/10.18535/ijetst/v4i6.13

Research Paper

Feasibility of Marble Waste Utilization in Buildings to Save Environment

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ABSTRACT
There are different types of marble wastes produced at quarrying sites such as wastes generated during quarrying, wastes generated during processing, organic solid waste and inorganic solid wastes. Different types of wastes can be used in different types of works such as in building works, road works, in different ceramic works, Ready mix concrete, and cement industries. The wastes are dumped on land and the dust is airborne by the wind and makes air pollution in environment. Marble slurry affects the soil fertility and reduces them. Here in this paper author has suggested to use in concrete works. It will solve double purpose; it will reduce the cost of construction and will save the environment. Addition of marble wastes does not affect the strengths of structures also.
Keywords: *Marble waste, marble slurry, Ready mix concrete, environment, Quarrying, structures.*

INTRODUCTION

The marble waste generation varies widely from 30% by weight (in mechanized mines using Wire saw cutting methods for extraction of marble blocks) to 65% by weight (at mines where 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. However, since most of the quarries in India are ill equipped as far as mechanization is concerned, the percentage of marble waste, as generated during quarrying of marble blocks can be estimated at 60%. This waste includes odd blocks of various sizes and shapes, unwanted blocks and rock fragments produced during trimming.

Traditionally materials like clay, sand, stone, gravels, cement, brick, block, tiles, distemper, paint, timber and raw material is of great practical significance for developing building material components as substitutes for the traditional materials and providing an alternative or supplementary materials to the housing industry in a cost effective manner. In order to effectively utilize all these solid wastes, shaping of mined out blocks before dispatch to processing units. Effort have been made and mathematical models were also established universally and as a consequence considerable quantity of wastes is now being recycled and used to achieve environmentally sound management.

Inorganic solid wastes generation, recycling and utilization Inorganic solid wastes are of both non-hazardous and hazardous in nature. Inorganic non-hazardous solid wastes are primarily from mining sector and these wastes are the primary process rejects which constitute overburden wastes. However, the inorganic hazardous waste is mainly from the secondary process of non-ferrous metal extraction like lead, zinc, and copper. The details of both non-hazardous and hazardous inorganic wastes generation, recycling potentials and their environmental concerns are reported.

Solid waste generation from mining operations and their utilization In India, more than 200 MT of non-hazardous inorganic solid wastes are being generated every year, out of which 80 MT are mine tailings/ores of iron, copper and zinc mines etc. India has considerable economically useful minerals and they constitute one-quarter of the world's known mineral resources. In India Rajasthan, Chhattisgarh, Bihar, Madhya Pradesh, Orissa, Andhra Pradesh are rich in minerals, especially non-ferrous and wastes, horticulture wastes, domestic refuses and other agro to availability of agricultural resources, manpower and technological innovations. The main objective of waste management system is to maximize economic benefits and at the same time protection of the environment and the rest is moisture industrial wastes. A number of wide ranging agro industries have come up in India due animal wastes is primarily composed. The urban waste mainly consists of organic matter (46%), paper (6%), glass 0.7%), rags (3.2%), plastic (1%) of organics and moisture. Decomposition of both the animal and urban organic wastes can be done in an aerobic or anaerobic digestion. Since, huge quantity of both these organic wastes are produced annually in India,

In the absence of research, dumping of marble slurry is unscientific and continues environmental hazards in land, water and air. Lack of utilization in the industry and construction activities further multiplies the complexity. Water logging and loss of water table compound the complex situation. Due to alacrity of the marble slurry, fertility of the soil is reduced, Dumped wastes dry fast and dust suspends in air. These fine particles are dangerous to human health; particularly respiratory dieses are rampant in the affected areas. Settling of fine particles on crops and negation threaten the production

All natural stones including marble, granite and slate, which can be cut to sizes, polished and used for construction purposes, are referred to as dimensional. Dimensional stones are characterized by aesthetics/acoustics and practicality in use. Marble is a crystalline, compact variety of metamorphosed limestone, consisting primarily of calcite ($CaCO_3$), dolomite (CaMg $(CO_3)^2$) or a combination of both minerals. Pure calcite is white, but mineral impurities add color in variegated patterns. Marble is a durable stone in dry atmosphere only when protected from rain. The surface of marble crumbles readily when exposed to moist or Acidic environment. There are two types of by-products of marble processing. During marble processing, 30% of the stone (in case of unprocessed stone) goes to scrap because of being in

Smaller size and/or irregular shape. This is then sold to chip manufacturers. In case of semi-processed slab, the scrap level reduces to 2-5%. The other waste material is slurry. It is basically the water containing marble powder. The water is reused till it gets thick enough (70% water containing marble powder. The water is reused till it gets thick enough (70% water, 30% marble powder) to be insoluble for marble powder. It can be safely estimated that 1 ton of marble stone processed in Gang-Saw or a vertical/horizontal cutter produces almost 1 ton of slurry (70% water). As an industrial concept and for natural resources sustainable development, waste might be used as by- product in some other industry, and the byproduct of one industry may be used as raw material for other industry. The use of industrial waste materials as alternatives, and sometimes as additives, in the construction and manufacture of ceramic industry.

EFFECT ON ENVIRONMENT

Quarrying is by conventional rope and bucket method and the quarries run along the strike and dip of marble bands. Large scale land transformations, unscientific mining, unsegregated waste land degradation, ponding and flooding of water, visual impact, loss of aesthetics, pollution, health and safety hazards, damps, incompatible land uses and improper waste disposal have caused long term deposition on land the finer particles block flow regime of aquifers thus seriously affecting underground water availability. Due to long term deposition on land the finer particles block flow regime of aquifers thus seriously affecting underground water availability. When dumped on land, it adversely affects the productivity of land due to decreased porosity, water absorption, water percolation etc. When dried, the fine particles become air borne and cause severe air pollution. Apart from occupational health problems, it also affects machinery and instruments installed in industrial areas. Slurry dumped areas can not support any vegetation and remain degraded.

The conservational waste is valuable national wealth is getting wasted mainly due to lack of management and lack of technology. This waste, if recovered as useful, can change perhaps the entire scenario of the industry. Since it is not impacting directly on the environment the non-conversion of useful mining product is a graver problem in longer term than other direct problems. The air pollution is most direct and hazardous impact of the industry. As it is clear that slurry is produced at almost every operation and its dumping is a great problem. When it gets dried and airborne, it causes air pollution and related problems.

The marble industry needs water in its different operations for cooling and flushing different discharge. In these operations water gets contaminated. This contamination is considerable and it can be said that water pollution of the region is caused by discharging slurry.

The production of a large huge amount of waste needs additional land for its dumping and handling. There are a number of accidents due to unscientific dumping of mine waste on road and quarrying sites creating lot of environmental pollution.

METHODOLOGY

The test conducted is based on Indian standards (IS-10262-1982) design mix for M20 grade of concrete was prepared by partial replacement of fine aggregate with five different percentages by weight of marble powder (0%, 5%, 10%, 15%,and 20%)

COMPRESSIVESTRENGTH

However by increasing the waste marble powder the compressive strength of concrete tends to increase after each curing days. This shows that marble powder possesses cementing properties. It also indicates that it is much effective in enhancing cohesiveness due to lower fineness modulus of the marble powder. Further the mean strength of concrete mixes with marble powder was 5% to10% higher than the reference concretes. However, there is a slight decrease in compressive strength value concrete mix when 20% marble powder is used as compared to that of 15% marble powder mix.

TABLE: Compressive Strength of Concrete with Varying Percentage of Marble Waste

% Marble	Compressive strength		
	7 Day	14 Day	28 Day
0	31	33	38
5	31.5	34	39
10	33	34.5	40
15	33	35	40.5
20	33.5	35.5	39

CONCLUSION

The compressive strength of concrete confirming to IS: 456-2000 has increased 38 N/mm^2 by adding marble dust in 28 days and has further also increased 40.5% by adding marble dust as shown in table. The highest compressive strength has been achieved by adding 15% marble dust. By adding marble waste and dust, we have protected the environment also. In this way we have reduced the cost of concrete by adding marble dust waste material.

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