

Utilization of Waste Marble Powder Dust in Manufacturing of Bricks

B. Khamkar Udaykumar^{1*}, U. Sabde Pravin², A. B. Madrewar³, S. S. Sonkamble⁴, S. G. Kulkarni⁵,
H. S. Sathe⁶

^{1,2}Lecturer, Department of Civil Engineering, Vishveshwarayya Abhyantriki Padvika Mahavidyalaya, Almala Latur, India

^{3,4,5,6}Student, Department of Civil Engineering, Vishveshwarayya Abhyantriki Padvika Mahavidyalaya, Almala Latur, India

Abstract: Marble waste, in the form of sludge obtained from the marble cutting industry, was incorporated in the mixture formulations of concrete block. The possibility of using Waste marble powders (WMP) as a substitute for limestone was investigated over a three-year period. The production of cement block from sludge was standardized in terms of process and content. Interpretation of the results have shown that appropriate incorporation of WMP can result in favorable characteristics in terms of compression strength 6-7 N/mm² at 28 days, and water absorption (7%), anticipating a complimentary usage of sludge as a by-product instead of being waste.

Keywords: eco-construction bricks, marble sludge powder, cement, environment, waste reuse.

1. Introduction

Recycling waste as useful material is a very important environmental management tool for achieving sustainable development. On the other hand, recycling waste without properly based scientific research and development can result in environmental problems greater than the waste itself. In India, about 6 million tons of wastes from marble industries are being released from marble cutting, polishing, processing and grinding. In Tamil Nadu state, Salem is an area that concentrates a large quantity of marble process industries, which are responsible by the disposing of hundreds of tons of wastes in the environment per year. This scene is even more aggravated by the increasing production in the last decade, getting attention from all society with the destination of disposal wastes.

Marble Product and Waste (% of mined out)

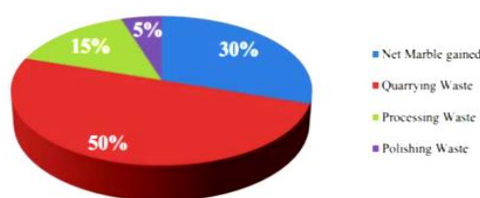


Fig. 1. Marble product and Waste (% of mined out)

2. Methodology

A. Collection of WMP

1) Origin

Marble dust comes from crushed marble, which is formed by the crystallization of limestone or dolo stone. The crystals appear as a calcite material through different atmospheric and temperature changes. The pressure present in the formation of marble destroys any other objects in the rock creating a dense, smooth rock. Colored marble is produced when different amounts of silt, clay and other objects are mixed with the limestone.

2) Identification

Marble dust is characterized by its fine powdery texture, similar to that of crushed limestone. Since marble is a harder, crystallized rock, the dust is not comprised of soft particles. The dust also has a slight shimmer to it because of the crystallized particles, and it can also be discolored with brown, grey, yellow, pink or even greenish particles due to impurities in the original marble.

B. Material Properties

Table 1
Physical properties

Colour	White
Form	Powder
Odor	Odorless
Moisture Content	1.59 %
Density	2.80

Table 2
Chemical properties

Sio2	28.35 %
Al2O3	0.42 %
Fe2O3	9.70 %
Cao	40.45 %
MgO	16.25 %

C. Use of Industrial Bricks

The usability of waste marble dust as an additive material in industrial brick was that the amount of marble dust additive had positive effect on the physical, chemical and mechanical strength of the produced industrial brick. With increasing demands of the construction industry, bricks quality and cost

Table 3
Mix proportion for 9 bricks

Trial No.	Marble Waste %	Weight	Sand %	Weight	Cement %	Weight	Total Weight
Trial 01	75 %	14 Kg	15 %	4 Kg	10 %	3 Kg	21 Kg
Trial 02	80 %	15 Kg	10 %	3 Kg	10 %	3 Kg	21 Kg
Trial 03	85 %	16 Kg	07 %	3 Kg	08 %	2 Kg	21 Kg

Table 4
Result

Trial No.	Material %	Compressive Strength (N/mm ²)	Water Absorption %
Trial 01	75%, 15 %, 10%	7.603	7.14
Trial 02	80%, 10 %, 10%	5.673	6.66
Trial 03	85%, 7%, 8%	4.570	7.33

become more important day by day. In addition, the usage of marble wastes for the production of industrial bricks has significant important role on the recycling waste marble powder in the brick production along with great contributions to economy and ecology of the country.

D. Materials Used

The varies materials used in the experimental works are

1. Cement
2. Marble Dust
3. Sand
4. Water

E. Objectives

To formulate a new process for manufacture a composite brick with the use of waste marble Powder material and compare it with the conventional bricks for compressive strength, efflorescence and water absorption which are the main properties to be checked in a brick. The main objectives for brick to be fulfilled when compared with the conventional bricks are:

- Light in weight.
- To develop an efficient way and to effectively utilize the waste marble Powder.
- To reduce the consumption of natural resources such as clay for the manufacturing.
- A brick that does not pose any threat to humans or environment health.
- Durable brick.
- Cost effective brick.

F. Procedure

1) Cube Making (brick)

1. First all the materials were taken in proportion and mixed it well in a tray.
2. Prepare the mold by properly cleaning it and applying the mixture of glycerin and dextrin evenly.
3. Then filled the material in the mold in three layers by tamping each layer 25 times.
4. Close the mold from above and kept it to set.
5. The Brick was then removed from the mold and allowed to cool at room temp.
6. Finally, after cooling the brick was tested.

Tests conducted on bricks.

1. Compressive strength of bricks

2. Water Absorption test
3. Shape and size test
4. Hardness test



Fig. 2. Mold



Fig. 2. Brick

3. Conclusion

After casting of bricks using waste marble powder several proportions it was found that the use of waste material as ingredients has made the resulting brick economical, strong and environmentally friendly. Both the methods tried have their own advantages and disadvantages. The material gets homogeneously mixed and gives higher strength (7.60MPa) in Trail 01 method. But When Weight of WMP increased strength of bricks is deceased.

References

- [1] Bahar Demirel, "The effect of the using waste marble dust as fine sand on the mechanical properties of the concrete," *International Journal of the Physical Sciences*, 5 (9), pp. 1372-1380, 2010.
- [2] Mehta, P. K. *Greening of the Concrete Industry for Sustainable Development*, *Concrete. Int.*, 24: (7): 23-27,2002.
- [3] M. S. Shetty, "Concrete Technology," S. Chand.
- [4] Anurag Mishra, Rajesh Gupta, "Utilization of Marble Slurry in Construction Materials," *Workshop on gainful utilization of Marble Slurry and other stone waste.*