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Use of Marble Waste as a Waste Materials in Conventional Concrete

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Abstract — *The aim of this work is to study the possible use of Marble waste in concrete production, which would reduce both the environmental impact and the production cost. The industry Marble has major environmental problems due to waste generation at different stages of mining and processing operation. Concrete is the most widely used construction materials in civil engineering because of its high structural strength and stability. Marble waste can be used to produce new products or can be use as admixtures so that resources are used more efficiently and the environment is protected from waste deposits. A comparatively good strength is expected when natural resources are replaced by Marble waste in concrete.*

Keywords- Concrete, Environmental, Strength of concrete, Marble Waste, Admixtures.

I. INTRODUCTION

Marble has been commonly used as building materials. The industrial disposal of Marble waste consists very fine powder or waste. Marble blocks are cut into smaller blocks in order to give them desired shape. During the cutting process about 25% the original marble mass is lost in the form of dust. The mixture of waste coming out during cutting is called Marble waste. Marble waste can be used in concrete to improve its strength and other durability factors. Marble waste can be used as a partial replacement of cement or replacement of fine aggregate and as a supplementary addition to achieve different properties of concrete. Concrete is a composite construction materials composed of cement, aggregate, water, admixtures. Concrete is made by mixing traditionally to make concrete that is easy to: Transport, place, compact, finish and to give a strong and durable product.

II. MARBLE WASTE GENRATION PROCESS

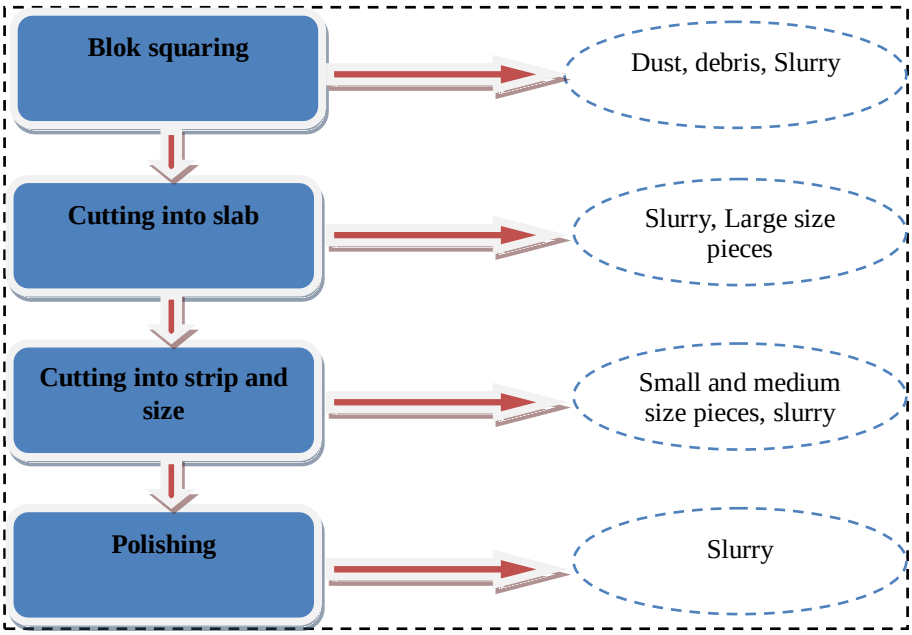

Figure: 1: Process of Marble waste generation

Marble is most used stone for commercial as well as industrial purpose. During process like cutting, policing, shaping etc produce the waste in the form of slurry or dust. The industry of dimensional marble stone has contributed to the development of major environmental problems due to waste generation at different stages of mining and processing operations. Marble waste generation continues from mining process to finished product and contributes about 60-80 % of the worked masses of the mineral mined. Depending on the type of process involved, the sludge generated is estimated over 30% of the volume of the sawn block. To solve the problem of these wastes generated by the Marble production industry, several technical solutions consider the incorporation of granite sludge in other industrial activities as a by-product.

Solid marble waste, powder and slurry are the major sources of environmental degradation in the areas where marble quarries and marble processing units are located. 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 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.

III. LITERATURE REVIEW

Several studies and reports have documented the potential use of stone slurry waste as construction materials are shown in table1.

Table: 1: Usage of Marble waste in different application

Usage of Marble Waste	Main Conclusion	Reference
Marble dust replaced as a partial replacement of OPC cement in concrete.	From the test, replacement of OPC cement with marble waste materials provides maximum compressive strength at 30% replacement	Ankit Nileshchandra Patel, Prof. Jayeshkumar Pitroda, 2013
Quarry rock dust and marble sludge powder as fine aggregate	The replacement of fine aggregate with 50% marble sludge powder and 50% Quarry rock dust (Green concrete) gives an excellent result in strength aspect and quality aspect.	M. Shahul Hameed and A. S. S. Sekar, 2009
Fine aggregates replaced by marble dust in concrete.	Compressive strength increases with increasing of marble dust.	Pooja J.Chavhan, Prof. S. D. Bhole, 2014
Fine aggregates replaced by marble dust in concrete.	The mean strength of all concrete mixes with marble powder was 5-10% higher than the references concrete	Nutan Patel, Amit Raval, Jayeshkumar Pitroda, 2013
Partial replacement of cement with marble dust in concrete.	The result obtained for 28-day compressive strength confirms that the optimal percentage for replacement of cement with marble dust powder is about 10%	Abdullah Anwar, Juned Ahmad, Meraj Ahmad Khan, Sabih Ahmad, Syed Aqeel Ahmad, 2014
Marble and Granite Waste Utilization in Concrete Bricks	Marble and granite slurry cement bricks yield similar mechanical, in terms of compressive strength, and physical, in terms of density and absorption, properties.	Rania A. Hamza, Salah El-Haggar, and Safwan Khedr, 2011
Partial replacement of cement with marble dust in concrete	The Compressive strength, Split Tensile strength and Flexural strength are increased with addition of waste marble dust up to 25% replace by weight of cement.	N. Gurumoorthy, 2014

Partial replacement of cement with Waste marble powder with m25 grade	With the inclusion of Marble powder the strength of concrete gradually increases up to a certain limit but the gradually decreases.	Jashandeep singh, Er. R S Bansal, 2015

IV. OBJECTIVE OF STUDY

- The main objectives of the present work are to study the effect of partial replacement of cement by Marble slurry as Industrial Waste.
- The development of alternate low-cost and ecologically suitable building materials from industrial wastes is an economic necessity.
- Check & utilize the suitable waste products to replace some of the conventional materials. The use of such materials would minimize the use of scarce materials and also generate appreciable economy.
- The use of industrial wastes in place of conventional raw materials will help to decrease the environmental pollution and also conserve our natural resources.

V. SCOPE OF STUDY

- Identifying and collecting the samples of Marble slurry material that are suitable for the concrete mix
- Detailed laboratory investigations for determination of mechanical properties of Concrete like compressive strength, flexural strength performed with different proportions and combinations of marble slurry.
- To asses and analyze the laboratory results of mechanical properties obtained at 7 & 28 days.
- Performing the statistical analysis of results obtained from experimental investigation.
- To make cost comparison of conventional concrete and Renewal concrete.

VI. RESEARCH METHODOLOGY

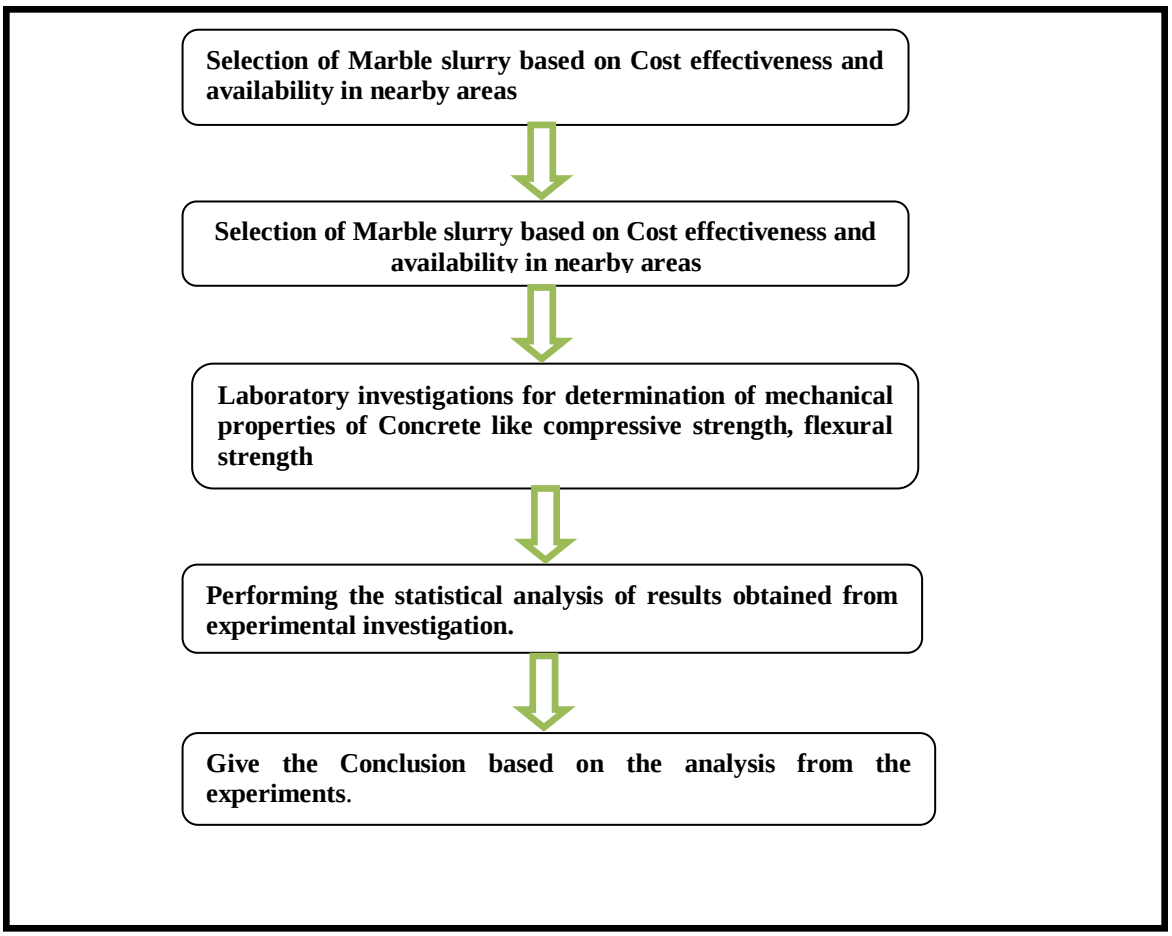

Figure: 2 : Research methodology

VII. CONCLUSION

Based on the above literature review the following observations are made regarding the resistance of partially replaced stone waste:

- We can produce the durable concrete with the use of Marble waste like dust or slurry with the replace of conventional materials like sand or cement.
- We can produce the low cost concrete and reduce the environmental effect by using the marble waste in the concrete.

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