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A Review on Utilisation of Marble and Granite Slurry to Improve Properties of Clay Bricks

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ABSTRACT: Marble and granite sawing powder slurry is one of the major worldwide environmental problems. As a consequence of environmental and financial considerations, there is a growing demand for wastes to be re-used or recycled. There is a lot of work needed to be done in this sector. India is also coming leading waste generating countries. Marble and Granite industries in India produce lots of waste powder of marble and granite. So it is very necessary to cope up with this problem. An effective studies and experiment on this problem will lead us to the effective solutions. A very effective, eco-friendly and economical method to use the slurry powder is to replace with sand in clay bricks to improve the properties of clay bricks.

In this study I found replacement of sand with Marble and Granite slurry powder in different percentages leads to change in its properties like 10% replacement of clay with granite slurry and marble slurry gives maximum compressive strength. Whereas water absorption observed for both replacement granite and marble decreases up to 10% after that increases.

So from these results we found that replacement with sand with marble and granite slurry powder increases its strengths when mixed up to 15%

I. INTRODUCTION

There is a great impetus worldwide towards recycling industrial waste by-products and their utilization as renewable construction materials. The recycling of by-products and wastes represents an increasingly urgent problem for the immediate future of human kind. Stone, one of the most common building materials of ancient times, is a ubiquitous material. A sustainable growth in the consumption of stone is observed all over the world in the recent years. During the process of cutting, in that original stone waste mass is lost by 25% in the form of dust. Accordingly, the amount of mining and processing waste has increased. Stone waste is generally a highly polluting waste due to both its highly alkaline nature, and its manufacturing and processing techniques, which impose a health threat to the surroundings. The generated sludge from stone cutting factories is prohibited from being discharged to the public sanitary system. Use of stone waste in various engineering applications can solve the problem of disposing of stone waste and other purposes. Leaving the waste material to the environment directly can cause environmental problems. Therefore, many countries have still been working on how to reuse the waste material so that they give fewer hazards to the environment. Developed countries have strict rules to protect the environment where as many developing countries have almost no rules to protect the environment against wastes. Wastes can be used to produce new products or can be used as admixtures so that natural sources are used more efficiently and the environment is protected from waste deposits. Developed countries have strict rules to protect the environment where as many developing countries have almost no rules to protect the environment against wastes. Wastes can be used to produce new products or can be used as admixtures so that natural sources are used more efficiently and the environment is protected from waste deposit materials.

During the cutting and polishing processes about 25% marble and granite is resulted in dust, mainly composed of SiO₂, Al₂O₃, Fe₂O₃ and CaO, with some minor constituents such as Mg, Ti, Mn and Pottassium(K) oxides. Which can cause serious damages in the environment, such as soil and underground water contamination, if not efficiently treated before clear the disposal materials.

India has huge reserves of marbles, granite and their processing factories, which brings massive measures of wastes as slurry waste. Marble and granite industries increases in last decades and the waste generated from these industries are

highly polluted waste due to both its highly alkaline nature, manufacturing and processing techniques. As a study of environmental and financial considerations, there is a growing demand for wastes to be re-used or recycled. The objective of this paper is to utilize these wastes to improve the quality of clay bricks. This research will reduce the cost of clay bricks from replacing clay by cheap marble and granite waste. Accordingly, the amount of mining and processing waste has increased. Marble waste is generally a highly polluting waste due to both its highly alkaline nature, and its manufacturing and processing techniques, which impose a health threat to the surroundings. The test results revealed that the recycled products have physical and mechanical properties that qualify them for use in the building sector, where all marble and granite slurry mix brick samples tested in this study comply with the Indian code requirement for structural bricks, with granite slurry having a positive effect on cement brick samples that reach its optimum at 10% slurry internalization.

II. LITERATURE REVIEW

Following are some critical literature reviews on various national and international papers on use of stone waste into the bricks production and construction. This all reviews are on Marble, Granite and Kota stone sludge utilization and replacement of fine aggregate in bricks production and in construction work.

M.K.SINGH et al. Studied that Material Marble Powder is better than the clay. Which has more strength & cheaper. Marble and granite powder is a mixture of slurry powder having a very good impact on the environment. Saved energy and money may be used anywhere else for the development of the nation.

Dharma et al. Studied that the marble waste and Granite waste can be used as filling material as 15% replacement with natural soil in the clay bricks. Improve water conductivity, increases in the percentage of water absorption. It reduces the liquid limit, raises the shrinkage limit and decrease in the plasticity index of the soil in.

Iqbal Malik et al. Studied the replacement of natural soil by waste marble powder. 20% of replacement of Granite slurry and 20% increase in strength at clay bricks. Water absorption can be reduced compared with conventional clay bricks.

Vijay Sekhar Reddy et al. Studied experimentally and concluded that 20% of replacements gave maximum percentage of increase in strength. With increase of replacement clay bricks weight can be reduced up to 5%.

Tiwari Darshita et al. Studied the replacement of natural soil with Marble and Granite powder slurry observed that 15% replacement of fine powder slurry increases the compressive strength and beyond this % addition reduces the strength. Even with 20% of replacement a marginal strength decrease was found.

Nabil et al. - Investigated that the potential utilization of Marble slurry powder in clay bricks production. The test results indicated that the compressive strength increased by slurry powder, the compressive strength of the marble and granite stones is largely affected by the powder percent.

Viswakarma et al. - Studied that Marble slurry utilization in the soil is one of the best ways to improve soil properties and to protect the environment up to some extent from the harmful effects of disposing of marble slurry in land and water.

Ankit et al. - Carried out an investigation by Compressive strength increase when replacement with stone waste percentage increases when compare to natural soil clay bricks. Replacement of clay with this stone waste material provides maximum compressive strength at 20% replacement.

S. Dhanapandian et al. - Investigated that the Marble and granite waste content up to 50 wt. % can be incorporated into clay mixture, without degrading their mechanical properties. The presence of marble and granite wastes allow one to obtain a clay brick with better properties as the conventional clay brick at low temperatures as the normally used for brick products in the brick industry

Swaminathan et al. - Studied that from the results of technological tests, it is suggested that granite and marble wastes can be incorporated up to 50 wt. % in clay materials for the production of bricks. The incorporation of granite and marble wastes has negligible effect on the mechanical properties during the entire process of brick

M. SHANTHIB et al. The presence of marble and granite wastes allow one to obtain a clay brick with better properties as the conventional clay brick at low temperatures as the normally used for brick products in the brick industry, resulting in energy saving and waste reduction.

Dr. R.J. Choudhary et al. The incorporation of marble and granite wastes in brick production anticipates safe for the health an environmentally friendly recycling products, resulting in energy saving and waste reduction.

Rajni et al. - Studied that the utilization of stone waste, in the form of a mineral admixture as a clay material for natural clay bricks. The stone waste can be utilized for developing low cost building materials such as block, brick, tiles etc.

Mamta et al. - Conclude that if the percentage of stone waste increases, compressive strength increases up to a certain point and then after the decreases. The optimum point at which we get maximum strength is replaced 20% clay by marble and granite powder slurry.



W. Rehman et al.- Found that the marble waste bricks are lower in strength than conventional fired bricks, yet their low cost, ease and speed of fabrication recommend them to be used in area where higher strength is not concern. They can be utilized in shelter for people in earthquake and flood affected areas

Kushwah et al.- Studied that the utilization of marble slurry and granite slurry in manufacturing of clay bricks. Properties of marble slurry are Bulking is 42%, which is maximum at 5% moisture. Fineness modulus was found to be 0.93. According to these parameters Marble slurry can be utilized in as partial replacement in clay bricks.

III. CONCLUSION

(i) After collecting and analysing all the results, we can conclude that, at 10 % replacement of clay with granite slurry and marble slurry gives maximum compressive strength. After 15%, the compressive strength starts decreasing in both granite and sand replacement.

(ii) Water absorption observed for both replacement granite and marble decreases up to 10 % after that increases.

(iii) Density of brick after replacement of granite continuously decreases and after replacement marble continuously increases.

(vi).So we can analyze that 10 % replacement of marble and granite slurry is optimum.

(v)The presence of marble and granite wastes allow one to obtain a clay brick with better properties as the conventional clay brick at low temperatures as the normally used for brick products in the brick industry, resulting in energy saving and waste reduction.

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