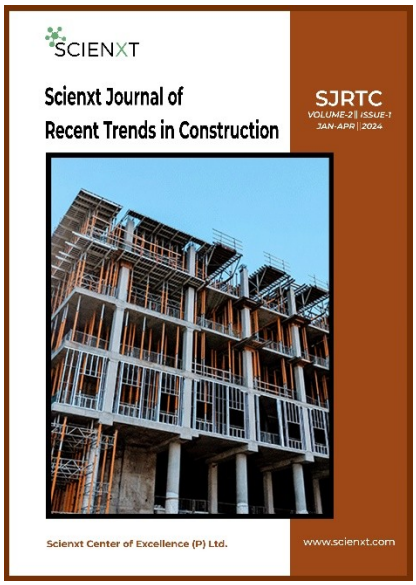

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Review paper on partial replacement of cement by marble dust and rural waste fiber in concrete

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Abstract:

This research paper explores the feasibility and benefits of partially replacing cement with marble dust and rural waste fiber in concrete production, aiming to enhance sustainability in construction practices. Marble dust, a byproduct of the marble industry, and rural waste fibers, such as rice husk ash and coconut fiber, are investigated for their potential as supplementary cementitious materials. The paper reviews existing literature, methodologies, and findings related to the incorporation of these materials in concrete mixtures, focusing on their effects on mechanical properties, durability, and environmental impact. The research contributes to advancing sustainable construction practices by promoting the utilization of waste materials in concrete production.

Keywords:

Cement, Marble Dust, Rural Waste Fiber

1. Introduction:

The depletion of natural resources and the environmental impact associated with cement production have led to a growing interest in sustainable alternatives for concrete. This paper investigates the utilization of marble dust and rural waste fibers as partial replacements for cement in concrete mixtures. Marble dust, generated as a byproduct of marble processing, exhibits pozzolanic properties, while rural waste fibers offer opportunities for waste valorization and improved concrete performance. The introduction provides an overview of the research objectives, significance, and structure of the paper. High Strength concrete (HSC) because as per requirement high cementations materials content and low W/(C+P) ratio (W = water content, C = cement content, P = pozzolans cement).

2. Literature review:

Manpreet Singh et. al., (2019) were concluded that "Cement is one of the main emitters of CO2 globally. Therefore, reduction in cement content in concrete would result in reduction of CO2 emission. Cement reductions show a decrease in CO2 emissions by 5.2% from 510.92 to 475.92 kg=m3 on replacing 10% cement by marble powder, thus having a significant effect on the global construction industry. Improved hydration, better particle packing, and higher strength are additional advantages that would help in promoting use of marble powder as a partial replacement of cement in concrete. A substantial amount of experiments were conducted to study the effect of marble powder on compressive strength of concrete for varying w/b ratios from 0.35 to 0.5 and different replacement percentages. With the use of regression analysis, a model was developed for prediction of compressive strength of marble powder incorporated in concrete, which would be independent of the shape or type of specimens, i.e., based on the strength ratios. The model has been duly verified by applying the results of other researchers as available in the literature. The values fit within the error bars of the model. The maximum variation was found to be 7.15%, which was for 20% or 25% replacement. Others fit approximately 4%-5% of the data well."

Naresh Kumar et. al., (2018), were concluded that without super plasticizer, as the replacement % increases the workability reduces. Super plasticizer at different dosage for all replacement increased workability. Compressive strength and split tensile strength for 5% marble dust and 10% IOT was more than normal concrete. Flexural strength for normal concrete was more than all the replacement percentages. The optimum mix should be limited

to 5% marble dust and 10% IOT in the concrete mix. Water absorption increases as the % of replacement increases in a durability test."

Suraj Singh Shekhawat and Siddharth Sharma (2018) were concluded that the " Five different replacement levels namely 4%, 8%, 12%, 16% & 20% of WMP and 20% of Fly ash are chosen for the study concern to replacement method. Large range of curing periods starting from 7 days, 14 days & 28 days are considered in the present study. From the study it was observed that compressive strength gets increased as we increase the percentage of WMP after 7, 14 & 28 days. It was also observed that optimum percentage increment in compressive strength of concrete was 53.87% for 7 to 28 days of curing. Further it was observed that split tensile strength also increases when percentage of WMP in concrete was increased after 7, 14 & 28 days curing. The optimum percentage increment in split tensile strength was 40.43% for 7 to 28 days curing. It was also noted that flexural strength of concrete increases gradually with addition of WMP and minimum flexural strength was obtained at 0% (3.85 N/mm2). 4.18 N/mm2 optimum flexural strength was obtained with addition of 12% WMP after 28 days of curing."

Nadhir toubal seghir et. al., (2018) were concluded that "It can be stated that the C-S-H content is not significantly affected by the use of WMD in an amount of up to 10% when the composites are cured in water. In turn, for the air cured composites, the C-S-H content was affected by the use of WMD in an amount up to 15%. The decrease of compressive strength is due to the water-evaporation rate, the presence of low humidity in air, the C-S-H content and also the decrease of apparent density. The parameters, such as compressive strength, apparent density and porosity, proved that there is dependence between them."

Anwar (2015) study includes the behaviour of concrete durability in comparison by partial replacement of cement with both ceramic waste powder (CWP) and marble dust powder (MDP).

Consequently, ceramic waste proves more economical as compare to marble dust powder without rationing concrete strength than the standard concrete. Hence justifying the replacement both technically and economically. Rajan Shikha, et. al., (2015), were concluded that"this investigation states the behavioural search of coconut fiber in the concrete structure. Totalling of coconut fiber in concrete it develops several engineering properties of concrete. Since it possesses good to tie up properties in concrete. Coir fiber is treated as organic latex when previously using in concrete. So that it not affected by wetness in concrete Addition of coconut fiber increases compressive strength flexure strength and tensile intensity of concrete.

The research establishes the optimum fiber content to be 1% 2% 3% (by weight of cement). 27 cube ware cast of Trial Mix 25 and Trial Mix 30 Grade concrete the comp. trength of cured concrete estimated of 7, 14, 28 days. This outcomes show coconut coir concert can be used in construction and coconut fiber is enhanced controlling of west fiber and it is also eco fondly.

Bhupendra Kumar (2015) was discusses the comparative study between Fly ash based coconut fiber concrete with simple cement concrete of M40 grade. This research paper offers use of the agricultural and commercial waste material into concrete, which more advantageous the homes of concrete and makes environment eco-friendly. The fly ash is changed with the cement as 10, 20, and 30% and coconut fibers are delivered moreover by weight of cement inside the proportions of 0, 1, 1.5, 2 2.5, 3%. The diameter of coconut fiber is varies among 0.25 to 1.0 cm and period is taken 4 cm. The results shows increment in compressive power of concrete by adding fly ash and coconut fiber collectively into concrete. Separately adding of coconut fiber and fly ash does now not show great outcomes.

N. Gurumoorthy (2014) studied influence of partial replacement of marble dust at different percentages i.e. at 10%, 15%, 20%, 25%, & 30% in concrete with materials- OPC cement of 43 grade, fine aggregate of 4.75 mm nominal size, coarse aggregate of 20mm nominal size& marble dust. Tests performed were; Compressive strength test by casting of 150mm size cubes for 7, 28 &90 days, Flexural strength test by cast in 500mm X 100mmX 100mm beams for 7 and 28 days & Split tensile strength test by casting 150mm dia. X 300mm high cylindersfor7 & 28 days.It was concluded that the compressive strength, flexural strength & split tensile strength were increased up to 25% replacement of cement by marble dust in concrete. Further any substitution leads to decrease in strength. Hence it was found that 25% is the optimum percentage for replacement of cement with marble dust.

Saravana Raja Mohanet. al., (2012) were concluded that "the experimental probe to study the effects of replacement of cement (by weight) with severas percent's of fly ash and the effects of addition of processed organic coconut fiber on comp. Strength, split tensile force, flexure intensity, and modulus of elasticity was taken up. A regulate blend of ratios (1:1.49:2.79) with w/c of 0.45 was created for the normally popular M20 concrete. Cement was changed with five parts (10 to 30%) of fine fly ash. Four parts of coconut fibers (0.15% to 0.60%) consuming and 40 mm distance were used. Test outcomes show that the renewal of 43 grades ordinary Portland cement with fly powder showed a rise in compressive strength split tensile intensity, flexure intensity and modulus of elasticity for the preferred blend ratio. Totalling of coconut fibers resultant in fly residue blended concrete composite -FMCC did improve the

mechanical properties of FMCC and at the same time increased the strength levels reflected by enlarged collapse strain, production the matter fit for seismic provisions." A comprehensive review of existing literature is conducted to examine previous research on the partial replacement of cement by marble dust and rural waste fiber in concrete. The review covers studies investigating the properties of marble dust and various rural waste fibers, their effects on concrete properties, and optimization techniques for concrete mixtures. Additionally, the review discusses the environmental benefits and challenges associated with the utilization of these materials in concrete production.

Properties and Effects of Marble Dust and Rural Waste Fiber in Concrete: This section analyzes the properties of marble dust and rural waste fibers and their impact on the mechanical and durability properties of concrete. It explores the effects of varying replacement levels, particle sizes, and processing methods on concrete performance, including compressive strength, flexural strength, permeability, and shrinkage. The section also examines the synergistic effects of combining marble dust and rural waste fibers in concrete mixtures and discusses optimization strategies for achieving desired properties.l

3. Outcome from the literature review:

By the review of above literatures, it was observed that both marble dust & super plasticizers can be used to enhance the physical properties of concrete. Replacement of cement can bring a remarkable reduction in emission of greenhouse gases emitted during production of cement, hence producing agreen concrete i.e. environment friendly & economical concrete. Addition of super plasticizers reduces the water requirement concrete by producing highly workable concrete with less amount of water, thus reducing the w/c ratio and hence enhancing compressive strength of concrete. Thus both materials were found suitable for concrete production; hence investigation of properties of concrete produced by conjunction of waste marble dust and super plasticizer is carried out.In view of past audits on the solid material. The present examination empowers the usage of mechanical waste artistic tile in concrete and concentrated its impact on the properties of cement for acquiring a supplementary of bond substitute material. Also, discover the physical qualities of marble clean as a correlation with ordinary bond utilized as a part of solid generation. Assessed the compressive quality improvement of marble tidy as halfway substitution of concrete utilizing amid techniques.

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