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Review Paper on Potential Use of Waste Marble Fine Inconstruction Industries

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ABTRACT

About 4,000 marble mines and 1,100 marble processing facilities are dispersed across 16 districts in the state of Rajasthan. During the processing of marble stones, these facilities produce five to six million tons of marble dust, also known as marble slurry. Massive amounts of marble slurry are released throughout the mining and polishing process. The mounds of this waste material are not only dangerous for your health, but they also take up a lot of land and stay dispersed, ruining the area's natural beauty and hurting Rajasthan's potential for tourism and industry

Key Word- *concrete, cost analysis, life cycle assessment, marble dust, mechanical and durability properties*

I. INTRODUCTION

Cement India's concrete industry is logically estimated to be the third largest globally. The building sector in the nation is expanding quickly, mostly in the domain of infrastructure development, which includes building ports, airports, power plants, highways, bridges, and other structures. Concrete is an excellent building material because it can be used in a variety of ways and can take on various shapes to meet architectural specifications. Large amounts of concrete will be needed for the majority of new building. From a sustainability standpoint, it would be imperative to guarantee the durability of newly constructed concrete structures, as they would be utilising the nation's precious non-renewable resources. The building sector understands how important it is to achieve notable gains in product quality, energy efficiency, and environmental performance. Costs associated with environmental compliance are high in the industrial sector overall, including the concrete industry

1.1 Origin of Marble Dust (md)

Pure limestone undergoes a metamorphic rock transition to become marble. The appearance of limestone that contains just calcite (100% $CaCO_3$) is pure white [Kirana et al. (2018)]. Marbles are, chemically speaking, crystalline rocks composed of minerals including serpentine, dolomite, and calcite. MD is derived from crushed marble. A massive increase in MD output in the form of mine waste, waste cutting, and waste polishing is the result of indiscriminate marble quarrying and the development of numerous processing facilities. Stone cutting is producing a significant amount of MD. Numerous uses for marble production result in massive waste output from quarries and processing facilities.

2. LITERATURE REVIEW

According to Rai et al. (2011), slump values for the same water cement ratio did not significantly change when marble dust was used in place of cement.

Research by Rania A. Hamza et al. (2011) was published in November 2011. Over the past ten years, the marble and granite sector has grown to be a significant industry. The 1990s saw a significant increase in this sector in the private sector, and Egypt's building industry had great success. As a result, there was a large quantity of garbage from cutting and quarrying. Because of its high Ph Value and the methods used for processing, cutting, and polishing it, stone debris typically pollutes large areas of the environment and poses health risks to everyone. The largest marble and granite production cluster in Egypt, the Shaq Al-Thu`ban factory zone, poses a threat to the surrounding populations, the residential neighbourhood of Zahraa El-Maadi, and the ecosystem of the neighbouring Wadi Degla land.

Prof. Naresh Chandra Saxena (2012), according to Sharma Ishwar Chand [30] Published from January through June of 2012. There are substantial quantities of marble in India especially the Indian state of Rajasthan. The business produces a staggering amount of waste, from mine wastes in mining sites to wastes from processing and polishing at gang saw locations. For every gang-saw used in the production of marble slurry, around 43,000 litres of water are needed due to the waste dust and electricity. The rapidly expanding marble business produces massive amounts of unmanaged trash, which are accumulating in the lack of appropriate disposal mechanisms. The ecosystem and human health may be irreversibly damaged before it's too late.

P.A. Shirulea (2012) clarified and published in April–June of that year. Severe environmental issues may arise if waste products are left to be handled by the environment. Thus, there has been a focus on recycling waste material. trash materials can be recycled into new goods or mixed with other materials to make better use of natural resources while preventing trash deposits in the environment. The marble stone industry produces stone slurry in addition to solid waste. Stone slurry is a semi-liquid mixture of particles from the sawing and polishing processes as well as water used to cool and lubricate the sawing and polishing machinery. Solid waste, on the other hand, comes from the rejections at the mine sites or at the processing facilities. About 40% of the finished product from the stone business is made up of the stone slurry that is produced during processing.

According to Animesh Mishra (2013), he clarified and published in April–June 2013 the use of industrial sludge and marble debris as a raw material to lessen negative environmental consequences and make it eco-friendly. Powdered marble sludge can be used as a filler and lowers the overall amount of voids in concrete. The viability of using marble sludge dust as a 100% replacement for natural sand in concrete is discussed in this research. This study looked into the microstructure and compressive strength of mixed cement. Scanning electron microscopy was used to identify the cement hydration products. Compressive strength is examined in relation to a number of variables, including the binder/aggregate ratio, composition, and curing duration. It was noted that after 28 days as opposed to 7 days, the blended cements showed greater strength development. The higher the concentration of marble dust, the greater the strength increase. Therefore, concrete made with marble dust helps to lower energy and natural resource use as well as environmental pollution. Slurry of marble was used

In 2013, Soliman conducted research on concrete mixtures that substituted different amounts of MD for cement, ranging from 0 to 20 percent. A slump test was used to determine how partially substituting MD for cement would affect the strength of the concrete mixtures. When 10% of MD was used in place of cement, workability increased.

Pitroda Jayeshkumar and Rajgor Mamta (2013) clarified and released in April of that year.By eating Class F fly ash, a new method of making bricks was eliminated. Since the early 1990s, the production of marble and granite has increased dramatically, driven by both governmental and private sector trends.resulting in an abundance of waste from mine, quarrying, and processing. Because of its alkaline composition and the methods used in its manufacture and processing, stone waste is extremely polluting and poses a health risk to the surrounding community.

In 2013, Rajput Rakesh Singh and Amit Viswakarma published their conclusion. April–June in 2013 India has abundant marble resources, with the most valuable deposits concentrated in the states of Rajasthan, Gujarat, Madhya Pradesh, Haryana, and Andhra Pradesh. Marble slurry is a significant environmental danger and takes up a lot of area, making its proper disposal a major challenge, particularly as it dries up. 15-20 million tonnes of waste marble slurry are produced by thousands of cutters and nearly a thousand Gang saws, which is an indestructible waste that causes losses to the general public. Utilising marble slurry to improve soil qualities through experimentation and partially protecting the environment from the negative impacts of disposing of waste marble slurry in the open are the primary goals of this study.

Aliabdo et al. (2014) report that when the amount of marble dust increases, the slump value drops. The large proportion of particles in marble dust is cited as the cause, which raises the need for water in concrete. However, Gupta et al. (2008) found that when the percentage of cement replaced with marble dust increased, the values of slump increased as well.

According to Gameiro et al. (2014), waste marble dust from quarries was used to replace0%,20%,50%, and 100% of the fine aggregates. A small adjustment to the w/c ratio was found to be an efficient means of reaching the desired workability.

In 2007 as well as Hebhoub et al. It was also noted that using marble dust in place of some of the sand reduced its workability.

Marble powder was used in place of sand by Silva et al. (2014), and as it absorbs water less than basalt and silica sand, the workability should have increased.

On the other hand, workability decreased, which was consistent with Hebhoub et al. (2011) findings. They came to the conclusion that the grading and form of fine aggregates, the ratio of fine to coarse aggregates, and the properties of the materials are some of the variables that may have an impact on the workability of concrete.

According to Rodrigues et al. (2015), adding marble dust to concrete did not significantly alter the bulk density. The maximum density increase of 2.3% was attained. However, using super plasticizers increased bulk density, which became more apparent as the superplasticizer's reductive power increased. This reductive power increases the compactness of concrete.

Silva et al. (2014) found that adding waste fine aggregate from marble quarries to concrete had a negligible impact on the bulk density when it was first mixed. The comparable values of the fine, primary, and secondary aggregate bulk densities were the cause of this.

According to Ali and Hashmi (2014), marble dust substitution up to 10% by weight of cement increased split tensile strength; however, additional marble dust addition resulted in a drop in strength. The initial split tensile strength increases by 19.61% at 10% replacement during a 28-day period.

Arshad et al. (2014) reported that adding 20% more marble dust resulted in a 6% increase in split tensile strength when 10% of the original marble dust was replaced with cement.

Concrete's split tensile strength was evaluated by Kaur and Singh (2015) at various MK and MP percentages, ranging from 0% to 13% MK and 0% to 10% MP (constant). It was discovered that the ideal dosage was 10% MD and 9% MK. The pozzolanic reaction of metakaolin may be the cause of this.

In a study by Aliabdo et al. (2014), split tensile strength tests were performed on concrete at varying curing ages using marble dust substitution percentages of 0%, 5%, 7.5%, 10%, and 15% by weight. When marble dust was used in place of cement for w/b ratio 0.50, there was a reported 10% increase in tensile strength when compared to the control mix. The greatest tensile strength was attained at 7.5% and the minimum at 15% replacement level for all curing ages. All curing ages exhibit an improvement in tensile strength when marble dust is substituted for cement at a weight-to-cement ratio of 0.40, up to a maximum of 15%.

Ramesh Babu et al. (2014) As stated in ACME - February 9, 2014, environmental issues are brought on by the waste that businesses produce. Therefore, it is important to recycle this waste material in order to reduce disposal and environmental issues caused by the usage of stone waste, as well as to make low-cost concrete by substituting Bethamcherla marble stone waste. The creation of inexpensive building materials from stone debris is crucial. The alternative to conventional concrete was the creative use of stone waste in concrete by substituting this material for the Bethamcherla marble stone aggregate.

In the International Journal of Emerging Technology and Advanced Engineering (IJETAE), ISSN 2250-2459, 4(2014)772-74, Saxena H. et al. (2014) provided an explanation of ACME. Buildings can be passively cooled by using landscaping. In order to prepare the landscape on the side opposite the sun, researchers employed landscaping. The dug soil or earth was then placed on the sunny side, shielding the building from the light and, eventually, heat. He proposed that cold air be evacuated from the sunny side and allowed to enter the building from the opposite side.

Zumrawi and Mohammed (2016) investigated how FA affected Sudan's PBCS [63]. Three soil specimens were gathered by the authors from various sites throughout the state of Khartoum, and they were stabilised using FA. A mixture of 10%, 20%, 25%, and 30% FA was used. The UCS value of the untreated soil can be enhanced twice by adding 10% fly ash, according to the results of swelling potential and UCS. Additionally, it was found that adding 10% fly ash reduced the soil's free swell, swell pressure, and swell potential by 50% to 70%. With 25% FA, the swell characteristics were reduced by 90%. Ultimately, the authors came to the conclusion that 10% fly ash is adequate to improve the qualities of PBCS.

Using granite dust and lime, Vali Baba et al. (2017) examined the problematic black cotton soil's performance evaluation [60]. To improve the performance of problematic black cotton soil, the authors applied granite dust at rates of 0%, 10%, 20%, and 30% and 3%, 4%, 5%, and 6%. The performance evaluation of problematic black cotton soil was analysed by the authors using experimental findings for CBR, swell index, compaction, and plasticity index. The authors came to the conclusion that granite dust and lime enhanced the plastic limit, PI, and MDD of soil. Additionally, it was determined that there was a decrease in the OMC, liquid limit, and degree of free swell. The scientists also came to the conclusion that adding lime and granite dust to problematic black cotton soil raised its CBR from 0.84% to 8.51%.

Fly ash was used by Mohanty et al. (2018) to stabilise the expansive soils in the high (soil 1) and low (soil 2) [38]. The fly ash was combined by the authors at a variance of 5% between 5% and 30%. The highest drop in LL and PI of soil was found for the specimen with a 30% fly ash mix, according to the scientists' observations. Additionally, a maximum decline in the free swell index was found with a 30% soil addition of fly ash. The fly ash content led to an increase in the OMC and a decrease in the MDD. It was discovered that adding 30% fly ash raised the CBR of soils 1 and 2 by 126% and 117%, respectively. To ascertain the CBR of treated soil, the soaked CBR test was carried out.

The strength and resilience behaviour of lime-modified pond ash as pavement layers were investigated by Mogili et al. (2020) [37]. Lime enhanced the engineering qualities of the pond ash in the reported research paper. The unconfined compressive strength, California bearing ratio (CBR), and resilience modulus (Mg) were examined and evaluated. According to the authors, pond ash's engineering qualities are enhanced by lime. The robustness modulus values were confirmed by previously published studies.

Waste glass powder was utilised by Blayi et al. (2020) to improve the soil's strength characteristics [7]. In the soil, the leftover glass powder was distributed at 2.5%, 5%, 10%, 15%, and 25%. To ascertain the strength parameters, compaction parameters, and Atterberg's limitations, the authors conducted an experimental investigation.

3. CONCLUSION

A review of the most recent research on the application of leftover marble dust in the building sector is included in this chapter. First, research on concrete life cycle assessment has been discussed. A thorough analysis of the research on the impact of partially substituting marble dust for cement and sand on the characteristics of mortar and regular concrete follows

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