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STUDY ON PERFORMANCE OF QUARRY DUST AS FINE AGGREGATE IN CONCRETE

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Abtract Concrete technology has made significant advances in recent years which results in economical improvement of the strength of concrete. This economical development depends upon the intelligent use of the locally available materials. The cheapest substitute for natural sand is quarry dust .Quarry dust, a by-product from the crushing process during quarrying activities is one of the materials being studied . The residue quarry fines less than 4.75mm obtained from the crushed quarry rock often termed Quarry dust or Quarry stone dust (QSD) and replacing the natural fine aggregate (NFA) by proportions 0 and 100%.The results indicated that the incorporation of quarry dust into the conventional Concrete mix as partial replacement material to natural sand resulted in higher compressive strength and optimization of sand replacement is 40%.

Keywords: *Concrete, sand, Quarry dust, compressive strength, Natural sand*

I INTRODUCTION

GENERAL

For the development of any structure, Concrete is the main material. The principle fixing to produce concrete is Portland cement. On the other side global warming and environmental pollution are the biggest hazard to mankind on this planet today. Concrete is the most popular building material in the world and as such by its ecstasy, there is no substitute for concrete with conventional constituents. But sustaining the building activity in the long-term to meet the future demand for buildings by using the currently available energy-intensive materials and building techniques or technologies have become seldom possible. Building industries contribute greenhouse gas (GHG) emissions (22%) to the atmosphere and as the public's concern about climate change is wisely addressed as a result of the growing impact of global warming and increasing sea level; concrete technologists face the task of leading future growth in a manner that maintains the quality of the environment. Of course, the current environmental issues are well-related to technology choices which object to the production of sustainable and environmentally friendly concrete. Primary binder to produce concrete is Ordinary Portland cement (OPC). It has major drawbacks of emission greenhouse gas which effects to global warming, environmental pollution, and depletion..

Quarry Dust In Structural Concrete

Quarry dust, a byproduct from the crushing process of stones (Blue metal) which is available abundantly from rock quarries at low cost in many areas can be an economical alternative to the river sand. Quarry dust can be defined as residue, tailing material after the extraction and processing of rocks to form fine particles less than 4.75mm . Quarry dust, which is generally considered as a waste material, causes an environmental load due to disposal problem. Quarry dust being by and large, a waste product, will also reduce environmental impact, if consumed by construction industry in large quantities .

II LITERATURE REVIEW

Literature Review

Many works have been carry out to explore the benefits of using various waste materials such as granite dust, marble dust, stone dust and glass powder in making and enhancing the properties of concrete. The work done by various authors describe below

Farooq Ahamed et al (2018) Studies on Geo Polymer Concrete with Partial Replacement of Sand by Quarry Stone Dust, In this study the solutions of sodium hydroxide (NaOH) and sodium silicate (Na2SiO3) are used as alkaline liquids for polymerization. In this work the molarity of alkaline solution is taken as 12. In India, normal stream sand (fine aggregate) is customarily utilized in cement. In any case, developing natural limitations to the abuse of sand from waterway beds is prompting research for usage of an elective material for fine aggregates in the development business. This paper explores about utilizing quarry stone dust as a fine aggregate.

Abhishek Kumar and Vikram Singh, (2019) Study the Effect of Stone Dust & Steel Fibre on Strength Properties of Concrete.he study The replacements are done at 0%, (30%, 1%), (40%, 1%), (50%, 1%) of fine aggregate with Stone dust and addition of Steel fiber 1% by the weight of cement. Design mix is prepared on M30 grade of concrete. The result showed that at fixed W/C ratio (0.40) the strength and durability increased initially at small percentages and the cost for production is also cheaper.

III OBJECTIVE

- Main aim of this experimentation is to find the effect of replacement of Sand by Quarry Stone Dust on workability and strength characteristics of concrete
- To investigate the mechanical properties (Compressive, Split tensile, flexural strength) concrete with Quarry Stone Dust .
- The objective of this study is to search alternatives material which can fully or partially replaced naturally available material in construction

IV EXPERIMENT AND METHODOLOGY

This chapter deals with the laboratory investigation carried out during the research work. The physical properties of materials used during the experimental work have been evaluated and presented

Flow Chart of Proposed Methodology

Materials

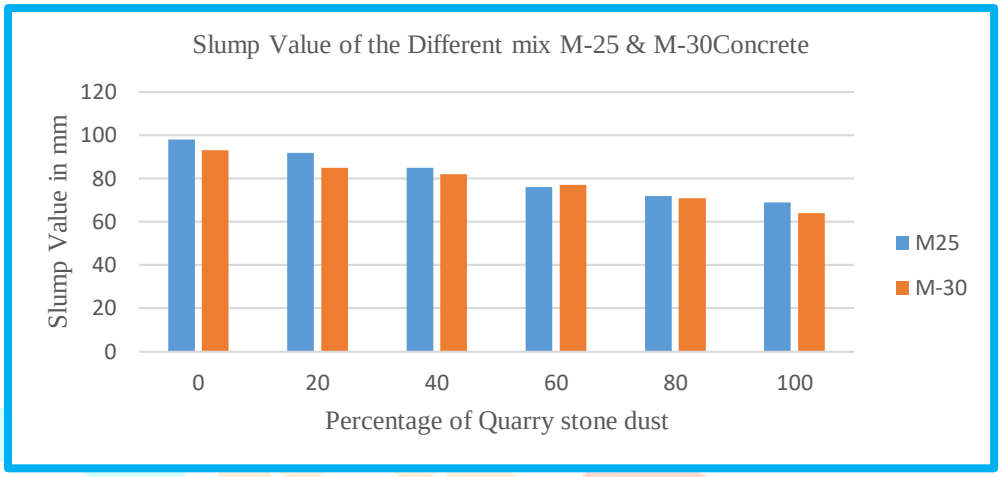
The constituent materials, additives and admixtures planned for use both in the preliminary and primary investigation for the development of quarry dust concrete are given below:

- Cement
- Sand
- Quarry dust
- Coarse aggregate
- Water
- Super plasticizer

V ANALYSIS OF EXERIENTAL RESULTS

Workability Test

In this work the workability is tested by slump test. When the concrete is freshly mix then it is tested by filling the fresh concrete in the slump cone. The workability is measured by removing the slump cone and measured the subsidence of the concrete this value is called the slump value of the concrete. The slump value for the M 25 and M 30 grade of the concrete without using Quarry Stone Dust

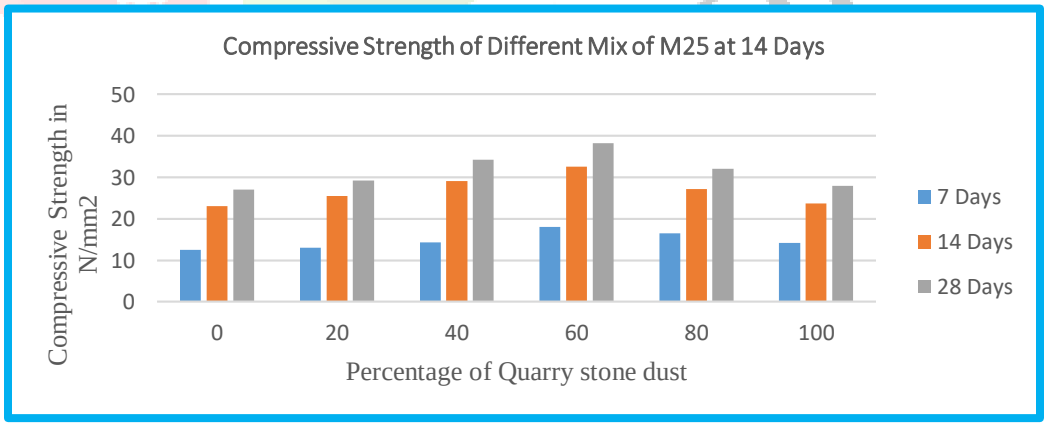


Slump Value of the Different mix M-25 &M30Concrete

DISCUSSION - From the above tables it is shown that, by increasing the percentage of the Quarry stone dust the slump value is decreases in both the grade (M25 & M30) of the concrete

COMPRESSIVE STRENGTH TEST

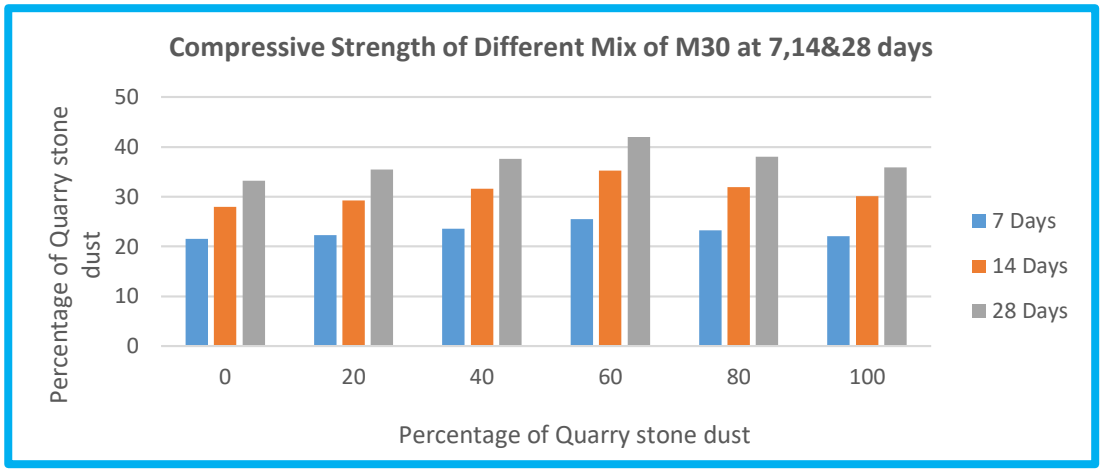
Compressive Strength of Different Mix of M20



Effect of quarry stone dust on compressive strength of concrete M25 at 7,14&28 day

From the above figure We observe that maximum value of compressive strength of concrete M25 is 38.23 N/mm2 at 60 % replacement of Quarry Stone Dust at 28 days of curing of concrete.

Compressive Strength of Different Mix of M30

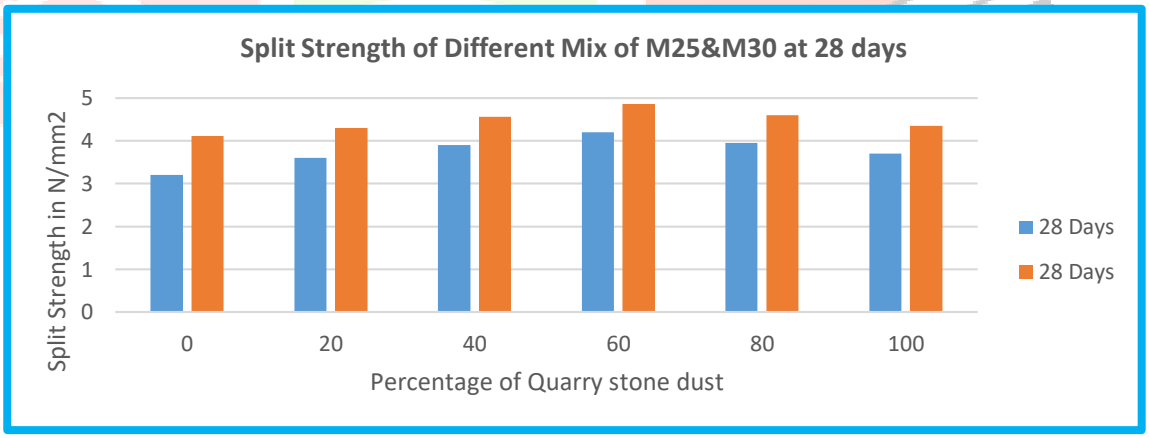


Effect of quarry stone dust on compressive strength of M30 concrete at 7,14&28 day

From the above figure We observe that maximum value of compressive strength of concrete M30is 42.01 N/mm2 at 60 % replacement of Quarry Stone Dust at 28 days of curing of concrete .

SPLIT TENSILE STRENGTH TEST

Split Strength of Different Mix of M25 and M30

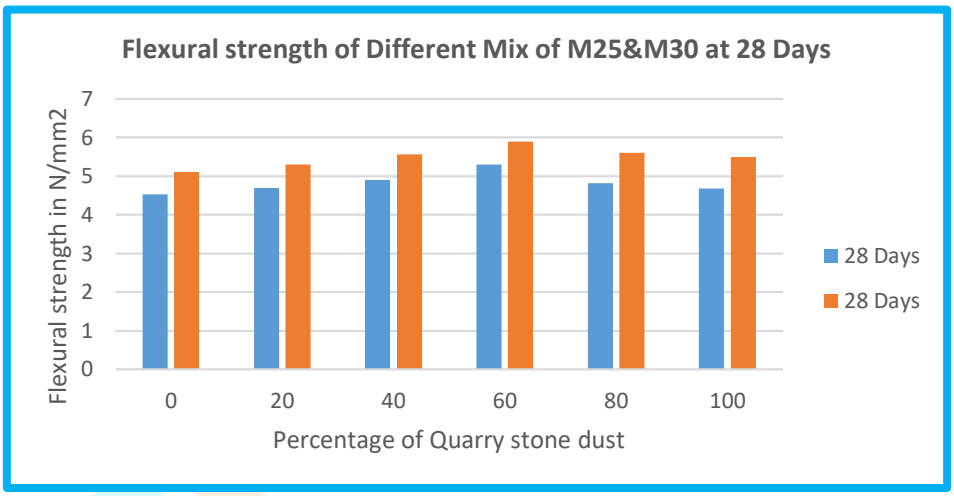


Effect of quarry stone dust on Split Tensile strength of M25and M30 concrete at 28 day

Discussion: Quarry Stone dust is mixed in 0%, 20%, 40%, 60%, 80% and 100% amount. It is found that the Split Tensile strength increased significantly initially but as the amount of Quarry Stone dust is increased beyond 60%, the strength starts decreasing. The effect of Quarry Stone dust on Split Tensile strength of concrete is shown in figure 5.12.From experiment maximum Split Tensile strength of M25 and M30 concrete achieve at 60% of replacement of quarry stone dust is 4.2 and 4.81 N/mm2, at 28 days.

FLEXURE STRENGH TEST

Flexural strength of Different Mix of M25 and M30



Effect of quarry stone dust on Flexural Strength of M25and M30 concrete at 28 days

Discussion**:** Quarry Stone dust is mixed in 0%, 20%, 40%, 60%, 80% and 100% amount. It is found that the Flexural Strength increased significantly initially but as the amount of Quarry Stone dust is increased beyond 60%, the strength starts decreasing. The effect of Quarry Stone dust on Flexural Strength of concrete is shown in figure 5.12.From experiment maximum Flexural Strength of M25and M30 achieve at 60% of replacement of quarry stone dust is5.3 and 5.9 N/mm2, at 28 days.

IV CONCLUSION

- From the experimental investigation carried out for present dissertation work, following salient conclusion can be drawn.
- The workability of concrete decreases, as the percentage of quarry stone dust increases in the concrete mix.
- Fine aggregate can be replaced up to 60% by Quarry Stone Dust .in concrete mix, beyond 60% the strength of concrete starts decreasing compared with control mix. It is observed that maximum compressive strength of M25 and M30 concrete achieve at 60% of replacement of quarry stone dust is 32.25 and 42.01 N/mm2

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