



# Study on Compressive Strength of Concrete using Quarry Dust with Partial Replacement of Fine Aggregate

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## Abstract:

The concept of replacement of river sand by quarry dust which increases the use of quarry dust generated from the quarry. By the use of quarry dust in concrete, solves the problem based on natural sand scarcity. Quarry dust satisfies as a substitute material for sand at very low cost and also reduce environmental pollutions. The specific gravity, sieve analysis and compressive strength is identified at various percentage of concrete by replacement of sand with quarry dust. The replacement of sand is done from 0% to 80% in first stage and 40% to 60% in second stage to get accuracy in maximum compressive strength without using any chemical admixture. from the result, it founds that at 45% replacement of fine aggregate by quarry dust gives maximum result in compressive strength than normal concrete.

**Keywords:** Concrete, Compressive strength, Quarry Dust, Replacement, River Sand.

## I. INTRODUCTION

Quarry dust is a by product generated from the crushing of stone. It can be use as fine aggregates in construction work and the construction material like sand would be saved and the natural resources can be used properly. Quarry dust has been used for different purposes in the construction industry, such as building materials, road construction materials and bricks. The present research work mainly focus in the different percentage of replacement of sand with quarry dust partially in the concrete. The present work is done to study the compressive strength of concrete at 28 days of curing.

## II. LITERATURE REVIEW

A Vijaykumar, K Revathi and C Bharathi conducted an experiment on concrete by using PPC of compressive, split tensile and flexural strength using M20 grade concrete by replacing sand with quarry dust from 0 to 100% at level of 25%.

It was found that at 7 days, 14 days, 28 days, at 50% replacement level maximum strength is achieved K Shyam Prakash and Ch hanumantha Rao has conducted an experiment on compressive strength of concrete using M30 grade concrete by replacing the sand with quarry dust at 0%, 20%, 25%, 30% and tested for 3 days, 7 days, 28 days and 60 days at water cement ratio of 0.45 and found that at 30% replacement of sand by quarry dust gives maximum result in strength compared to normal concrete and then decreases from 40%. Sivakumar and Prakash M. made an investigation on the mechanical properties of concrete with quarry dust is carried out.

They reported that the quarry dust may be used as an effective replacement material for natural river sand which increased the strength. Ilangovana. R carried out an investigation on strength and durability properties of concrete containing quarry rock dust as fine aggregate. It was reported that the physical and chemical properties of quarry rock dust as well as the

durability of quarry rock dust concrete under sulphate and acid action was better than that of conventional concrete.

## III. MATERIALS

### Cement:

Ordinary Portland Cement (43 Grade) with specific gravity of 3.09 is used for this experimental study.

### Fine Aggregate (River Sand):

Locally available river sand having fineness Modulus of 2.30 is used. The specific gravity was found to be 2.66. The fine aggregate was found to be confirming to Zone III as per IS 383:1970.

### Coarse Aggregate:

Natural granite aggregate having fineness modulus of 6.93 is used. The specific gravity is found to be 2.63 & water absorption having 0.80% and maximum size of aggregate is 20mm.

### Quarry Dust:

Quarry dust is fine rock particles and it is grey in colour. The quarry dust having fineness modulus of 2.22 and the specific gravity is 2.76 and water absorption of 1.01%.

### Water:

Water that used in concrete production that should be free from impurities and salt. The pH value should not be less than 6.

### Experimental Investigation:

The experimental investigation is replacing partially fine aggregate with quarry dust to improve the compressive strength of concrete. The required materials are weighed and mixing of concrete is carried out. Cube specimens of size 150 mm x 150 mm x 150 mm are casted. The specimens are demoulded after 24 hours of casting and then specimens were cured in a water tank at room temperature for 28 days.

## IV. METHODOLOGY:

Investigation is taken up with 20% interval from 0% to 80% and Reinvestigation is taken up at 5% interval from 40% to 60% to find out the accuracy in maximum compressive

strength. In this way the specimens have been casted and cured for 28days and strength testing of concrete is carried out.

**Test Procedure:**

**Workability:**

Workability is one of the physical parameters of concrete which affect the durability. Slump cone test is taken to determine the workability of concrete admixture.



Figure.1. (Slump cone)

**Casting of specimen:** The mix proportion obtained by the guidelines of IS :10262-2009 and is used for making concrete mixes in the form of cubes for study of compressive strength and cube mould of size 150\*150\*150 mm are used for casting specimen for compressive strength test .



Figure.2. (Cube Mould)

**Compressive strength test:**

After 28 days of curing, the cubes were taken out of the tank, dried and tested in compressive strength machine.



Figure.3. (Casted cubes)

**V. TEST RESULTS:**

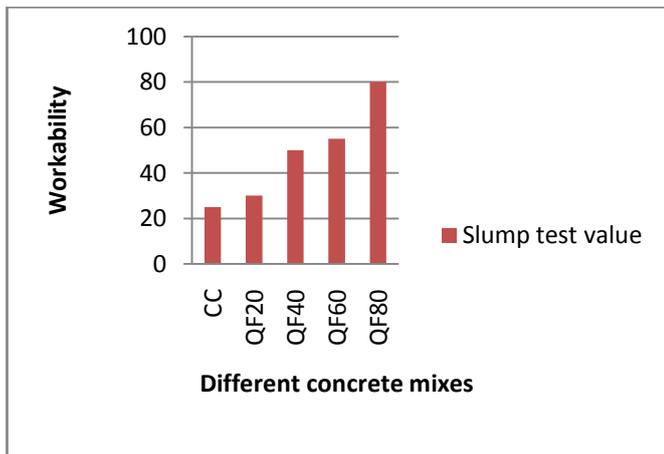


Figure.4. (Workability)

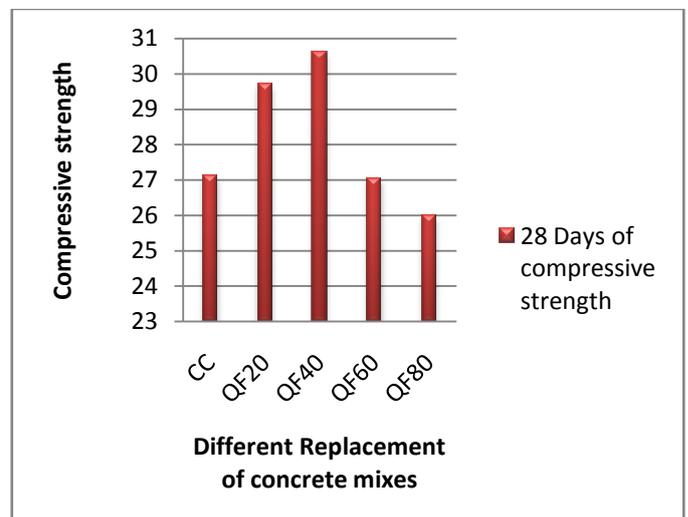
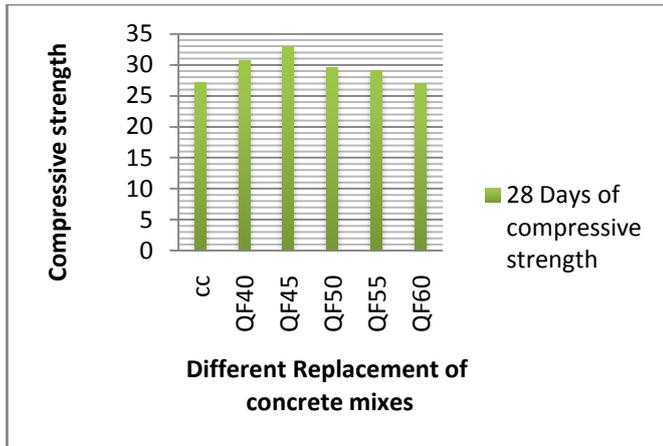


Figure.5. (Compressive strength)

### Reinvestigation:

Reinvestigation is done by taking the replacement of quarry dust from 40% to 60% with an interval at 5% to get accuracy in replacement level where we can get maximum compressive strength.



### VI. CONCLUSION:

Based on this experimental investigation, it is found that quarry dust can be used as an alternative material for the river sand. The properties of quarry dust satisfy the requirements of fine aggregate. It is found that there is an increase in the compressive strength of around 21% more than control concrete i.e. 33N/ mm<sup>2</sup>. The workability increases with increases in replacement level. Strength of the concrete is mainly depend upon bonding of fine aggregates which fills the voids between the aggregate. Quarry waste aggregate decreases resistance to water penetration. Because of the surface texture of quarry dust, the bonding between sand, quarry dust and coarse aggregate gives denser and compact than normal concrete. Due to addition of quarry dust the slump value increases due to deviation in gradation of quarry fine aggregate.

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