

Effect of Dust Contain In Artificial Sand on Compressive Strength and Workability of Concrete

Rajawardan N. Sarnobbat^a, Dr.Sushma S. Kulkarni^b

^a Research Student, RIT College, Islampur

^bDirector, RIT College, Islampur

Abstract: *India is a developing country and construction industry is one of the main industry in India as it creates investment opportunities across various sectors. Concrete is the main ingredient of this industry and volume of concrete used is very high also sand used in this process is of enormous amount hence depletion of natural sand and river banks have become an issue. hence the alternative artificial sand is the remedy for the problem.*

This article presents a research work on effect of dust contain in artificial sand on compressive strength and workability of concrete A brief summary of the most significant investigations on the behavior of concrete after alteration of dust percentage in artificial sand.

Result shows that dust contain is inversely proportional to strength when dust increases strength decreases. The workability in artificial sand is considerable low and increase in dust contain increases workability but not on a larger extent.

Keywords: Artificial sand, Concrete, Compressive strength, Workability.

1. Introduction

As sand is one of the main constituent of concrete making and the river sand has been banned by the Indian government as river sand is becoming a scarce material. Sand mining from rivers has become very excessive. It has reached a stage where it is killing all our rivers day by day, so mining has been stopped to save rivers we need an alternative which has been found which is artificial crush sand.

Artificial sand is a substitute of river sand for concrete construction. Artificial sand is produced from hard granite stone by crushing, The crushed sand is of cubical shape with grounded edges, washed and graded to as a construction material. The size of manufactured sand is less than 4.75mm. Due to the depletion of good quality river sand for the use of construction, the use of Artificial sand has been increased. Another reason for use of Artificial Sand is its availability and transportation cost. Since Artificial sand can be crushed

from hard granite rocks, it can be readily available at the nearby place, reducing the cost of transportation from far-off river sand bed.

1.1 Advantages of Artificial sand

- It is well graded in the required proportion.
- It does not contain organic and soluble compound that affects the setting time and properties of cement, thus the required strength of concrete can be maintained.
- It does not have the presence of impurities such as clay, silt coatings, increase water requirement as in the case of river sand which impair bond between cement paste and aggregate. Thus, increased quality and durability of concrete.

2. Literature Review

Nimitha Vijayaraghavan and A S Wayal (2013) concluded from experimental research that the river sand can be fully replaced by manufactured sand. Harshlata R. Raut, Ashish B. Ugale (2016) concluded that that the compressive strength increases with increase in the percentage of artificial sand but workability reduces at a higher rate. Dr. S. Ravindran Dr. N. K. Udhaya Prakash 2012 concludes from their paper that Crushing of boulders lead to production of large quantity of dust, which tends to float in air and spread in the vicinity of the stone crusher. Inhalation of the fine dust is dangerous to health. Amit Kumar Singh, Vikas Srivastava, V.C. Agarwal 2015 states that Use of stone dust in concrete not only improve the quality of concrete but also conserve the natural river sand for future generations. Also Results showed that by replacing 60% of fine aggregate with stone dust concrete of maximum compressive strength can be made as compared to all other replacement levels.

3. Experimental Investigation

3.1 Materials:

To check the impact of dust contain we have tested m20 grade concrete with different samples of sand available in market.

In today's market we get two types of artificial sand which is 1. high dust contain 2. low dust contain. The

first sample contains about 22-23% of dust in it and the second contains about 12-13% dust.

3.2 Mix proportion details

In this investigation concrete mix design m20 is used. The mix proportions is 1:1.5:3 where one part of cement 1.5 parts of artificial sand and three parts of aggregates. Also as per IS consideration 0.5 water cement ratio is used.

Here we have 3 types of sand to be tested which is of 23% , 13% and 0% dust sand.

For the above mix proportion we require 37.26kgs of cement 81kg of sand 130kg of aggregate.

4. Experimental Procedure

4.1 Compressive Strength

The specimen of standard cube of (150 mm x 150 mm x 150mm) was used to determine the compressive strength of concrete. Three specimens were tested for 7, 14 and 28 days with varying proportion of artificial sand .i.e. (23%,13%,0%) The constituents were weighed and the materials were hand mixed. The mixes were compacted with the help of taping rod.

The specimens were de molded after 24 h, cured in water for 7, 14 and 28 days, and then tested for its compressive strength as per Indian Standards. For this experiment we have casted cubes with alteration of sand with dust contains and compressive test. 27 cubes are casted in total and tested after 7, 14 and 28 days. Table 1 & Figure 1 gives the details of results of compression test.

Table No. 1. Results of Compression Strength

Percentage Dust	Strength in N/mm2		
	7 days	14 days	28 days
23	9.6	14.9	18.1
13	11.4	17.34	19.58
0	14.75	19.9	22.86

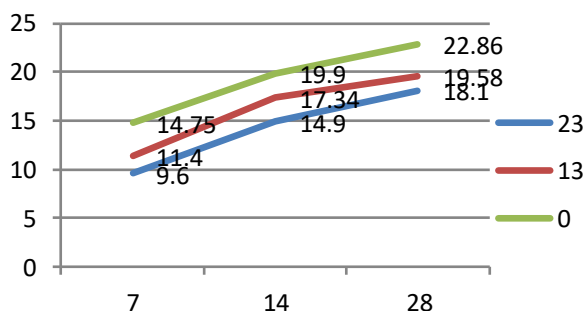


Fig. No. 1 Graph showing Results of Compressive Strength

For 23% dust percentage we get 9.6N/mm2 on 7 days and on 14th day we get 14.9N/mm2 and on 28th days we got 18.1N/mm2.

Then we tested sand of 13% dust contain we get 11.4N/mm,17.34N/mm2,19.58N/mm2 on 7 ,14 ,28 days.

Then for 0% dust contain we get 14.75N/mm2,19.9N/mm2,22.86N/mm2 for 7 ,14 ,28 days.

Hence dust contain is inversely proportional to strength when dust increases strength decreases. in fig no 1 X axis represents days and Y axis represents strength achieved.

4.2 Workability by Slump Cone Test

As working with artificial sand the workability has always been a issue, Each mortar was tested for workability it was shown that the workability of all the mix was low as all the slump obtain were true slump, however as the dust contain increases the workability also gets increases but not on a larger extent.

For measure of workability we have conducted slump cone test of each mix i.e. for each dust percentage 23%,13%,0%.



Fig no 2 Slumps of various concrete mixes

4.3 Slump cone Test Results

- Specimen first of 23% dust contain, slump for the given sample= 45mm
- Specimen second of 13% dust contain, slump for the given sample= 36mm
- Specimen third of 0% dust contain , slump for the given sample= 27mm.

From the above results we get to know that for all specimens the workability was considerable low and also dust contain increases workability but not on a larger extent

5. Conclusion

1. Result shows that dust contain is inversely proportional to strength when dust increases strength decreases.
2. Concrete mix becomes harsh with decrease in proportion of dust in manufactured sand.
3. The workability in artificial sand is considerable low and also increase in dust contain increases workability but not on a larger extent.

References

- Harshlata R. Raut, Ashish B. Ugale 2016 "Effect of Artificial Sand on Compressive Strength and Workability of Concrete" *International Journal of Engineering Research* ISSN:2319-6890(online),2347-5013(print) Volume No.5 Issue: Special 3, pp: 673-674 27-28
- Nimitha Vijayaraghavan and A S Wayal, 2013, *Effects of Manufactured Sand on Compressive Strength and Workability of Concrete*, *international journal of Structural & Civil Engineering Research*, Vol. 2, No. 4, pp 228-232, November 2013.
- Dr. S. Ravindran Dr. N. K. Udhaya Prakash 2012 "stone crushers and dust problem" *International Journal for Applied Biology*, Vol 3, No. 1,
- Amit Kumar Singh, Vikas Srivastava, V.C. Agarwal 2015 "Stone Dust in Concrete: Effect on Compressive Strength" *International Journal of Engineering and Technical Research (IJETR)* ISSN: 2321-0869 (O) 2454-4698 (P), Volume-3, Issue-8, August.