iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 5 **Issue:** X **Month of publication:** October 2017

DOI: http://doi.org/10.22214/ijraset.2017.10078

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor:6.887
Volume 5 Issue X, October 2017- Available at www.ijraset.com

Experimental Study on Characteristic Strength of Concrete by Partial Replacement of Coarse Aggregate by Coconut Shell and Fine Aggregate by Stone Dust

Nikku Sharma [1], Prof. C.R. Sharma[2]
[1]*P.G. Student, Department of Civil Engineering, BIT Sindri,Dhanbad Jharkhand. India*
[2]*Associate Professor, Department of Civil Engineering, BIT Sindri,Dhanbad, Jharkhand. India*

Abstract: Today, it is becoming difficult to find the natural resources due to their high excited exploitation and the disposal of waste materials is also a great problem. By Keeping these two factors in mind, Coconut shell and stone dust used in this experiment which has many benefits like reduction in the overall cost of construction and protection of environment. The main objective of this experiment is to use the coconut shell and stone Dust in the replacement of coarse aggregate and fine aggregate in concrete to make it economical. In this project I firstly prepared concrete by the replacement of coarse aggregate by coconut shell by 7.5% ,15%, 20% and 25% and then keeping 7.5% of coconut shell constant in concrete then fine aggregate was replaced with stone dust by10%, 20%, 30% and 40%.
The proportion used in this study is 1:1.66:2.97 and water cement ratio of 0.48 for M25
Grade concrete. Cubes, cylinders and Beams were casted and their compressive, tensile and flexural strength were evaluated at 7 and 28 days and these results are compared with the conventional concrete. It is observed that as we increase the percentage of coconut shell in concrete the various above physical strength reduces and on increasing the percentage of stone dust strength increases.
Keywords: civil engineering, construction material, coconut shell, stone dust, compressive strength, tensile strength, economical, waste materials, sustainability.

I. INTRODUCTION

In present day the cost of construction is rising very rapidly and there is scarcity of raw material Which is a matter of great concern for various constructional activities across the world. So, toOvercome this problem, we should move towards some economic alternative of the construction material.As we know that concrete is the most widely used in construction material and the application of concrete is increasing at very high rate due to the development in constructional activities. But uses of concrete with such rate causes adverse impact like continuous extraction of aggregate from natural resources that causes it depletion and cause an ecological imbalance. Large scale depletion of natural sand creates so many problems like lowering of river bed, failure of river banks and so any other problem. Therefore, investigation is needed to identify the suitable substitute that make ecofriendly and inexpensive production of concrete. Researchers are in the search of replacing the aggregate i.e. Coarse aggregate and fine aggregate to make the concrete less expensive and for the sustainable development. For that reason, we need to use waste materials for construction purpose and in this project, I used some waste material to produce concrete to make the construction work cost effective. This thesis reports the basic properties of coconut shell and stone dust with their replacement in concrete and compares these properties with conventional concrete. Basic concrete properties like compressive strength, flexural strength, split tensile strength, workability, explained here and put with different combination of coconut shell and stone Dust in concrete.

II. LITERATURE REVIEW

A. J.P. RIES (2011)

In this study he mainly focused on lightweight concrete. It is because the lightweight concrete plays an important role in the sustainable development by lowering the transportation requirement and it results in the reduction in the amount of overall building materials being used that reduce the labour demand and increasing the survival life of a structural concrete.

B. Amarnathyerrmallaet al. (2012)

In his study the properties of concrete were examined with the use of coconut shell as a partial replacement of coarse aggregate. The coconut shell is used with 10 to 20% replacement of coarse aggregate. After that there were two mixes with coconut shell and fly ash was also prepared to investigate the effect of fly ash on coconut shell replaced concrete. The addition of coconut shell in the concrete decrease workability and decreases the density of concrete. The Other physical properties like compressive strength, split tensile strength are also decrease with increase in coconut shell replacement.

C. Mahzuz et al. (2011)

In this study the use of stone powder in concrete as an alternative of sand using three concrete mix proportions, 1:1.5:3, 1:2:4 and 1:2.5:5. When the results of compressive strength were compared for these mixes between use of sand and stone powder, it was found that stone powder gives higher value than sand by about 14.76%, 4% and 10.44% respectively.

D. Quadri et al.(2013).

It was observed that the replacement of natural sand by crusher dust increased the compressivestrength of concrete by5-22% and it was also found that amongst all the mixes, the highest compressive strength was obtained for 40% replacement of sand by crusher dust.

III. EXPERIMENTAL INVESTIGATION

A. Materials

The constituents materials used in this project were obtained from local source and these were Portland slag cement (PSC), Coconut shell for partial replacement of coarse aggregate, stone dust for partial replacement of fine aggregate, potable water was used for mixing and curing.

B. Cement

Portland slag cement with Trade name “ACC, HPC” was used conforming to IS 455 whose Physical properties are given below

Table 3.1 Tet result of physical properties of cement

Properties	Test Results
Consistency	28%
Soundness	6 mm
Initial Setting Time	45 min
Final Setting Time	210 min
Specific Gravity	3.11
Fineness	6.5%

Table 3.2 Physical property of Fine aggregate and Coarse aggregate

Properties	Fine Aggregate	Coarse Aggregate
Specific Gravity	2.59	2.8
Bulk Density (Loose) gm/cc	1.575	1.650
Bulk Density (Compacted)gm/cc	1.630	1.909

Water Absorption (%)	0.8	0.7
Surface Moisture Content (%)	0 .6	Nil
Fineness Modulus (%)	3.02	7.38
Flakiness Index (%)	----	13.6
Elongation Index (%)	----	18.4

Table 3.3 Physical test of coconut shell

S. No,	Properties	Test Result
1	Specific Gravity	1.28
2	Moisture Content	13%
3	Water Absorption	29%
4	Impact Resistance	8.75%
5	Bulk Density	592 Kg/M3

Table 3.4 physical test of Quarry dust

S. No	Properties	Test Result
1	Specific Gravity	2.63
2	Fineness Modulus	2.31
3	Water Absorption	0.5%

C. Mix Proportion

To investigate the properties of concrete with the use of coconut shell and stone dust, firstly Conventional concrete wasprepared, and Cube, beams and cylinders were casted and tested at 7 days and 28 days of Curing. After that coconut shell was used in replacement of coarse aggregate by 7.5%, 15%, 20% and 25% and various test were done to analyse the behaviour of coconut shell concrete. Now constant percentage of coconut shell was kept (7.5%) in concrete, the fine aggregate was replaced by the stone dust with the percentage of 10%,20%, 30% & 40% and Fresh and hardened properties of concrete with coconut shell and stone Dust in concrete were analysed and it is compared with the conventional concrete at 7 days and 28 days. The constant value of water cement ratio of 0.48 is maintained throughout the experiment with the mix proportion of 1:1.66:2.97

IV.RESULTS AND DISCUSSION

In this project the replacement is done in two ways, one is the replacement of coarse aggregate by coconut shell with the percentage of 7.5% ,15%, 20% and 25% and another is the replacement of fine aggregate by the stone dust by 10% ,20%, 30% and 40% along with the 7.5% of coconut shell in the replacement of coarse aggregate. The various Parameters like compressive strength, flexural strength, split tensile strength and Workability are tested and plotted in the tabular and graphical from below.

A. Workability of concrete

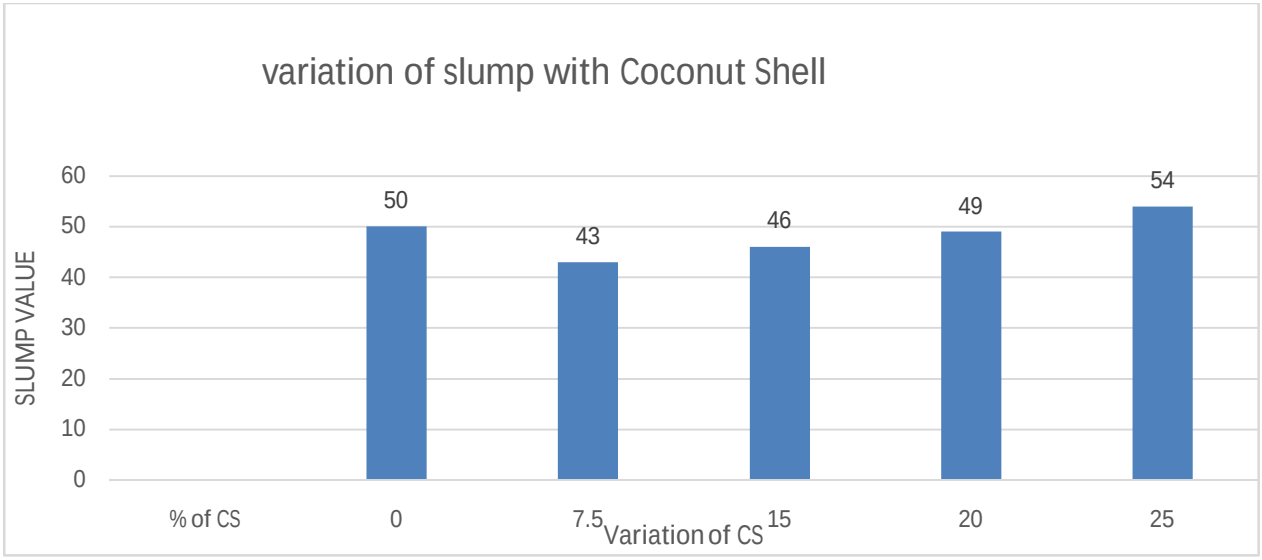
The degrees of slump value decrease initially with increase in percentage of coconut shell is due to the increase in surface area of the coconut shell. But as we increase further the percentage of coconut shell, due to increase in effect of the presence of smooth inside surface of coconut its slump value increases which is shown in graphical form. In a second phase of Replacement constant percentage of coconut shell (7.5%) was kept in concrete and the fine aggregate was replaced with stone dust with the percentage of 10%, 20% ,30% and 40%. The value of slump in the above cases decreases as we increase the percentage of stone dust.

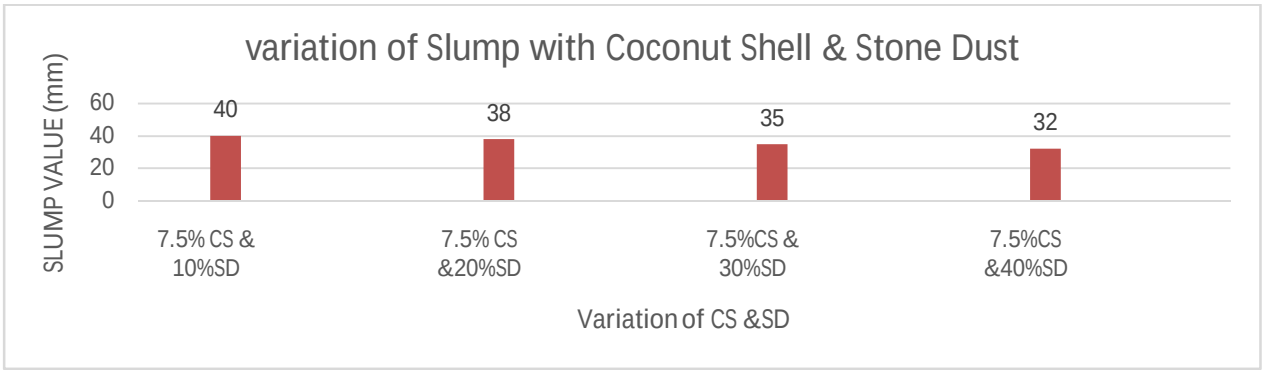
Table 4.1 variation of slump with coconut shell

% of CS	0%	7.5%	15%	20%	25%
slump value(mm)	50	43	46	49	54

Table 4.2 variation of slump with coconut shell and Stone Dust

% of CS & SD	7.5% CS &10%SD	7.5% CS &20%SD	7.5% CS &30%SD	7.5% CS &40%SD
slump value(mm)	40	38	35	32





B. Compressive strength test

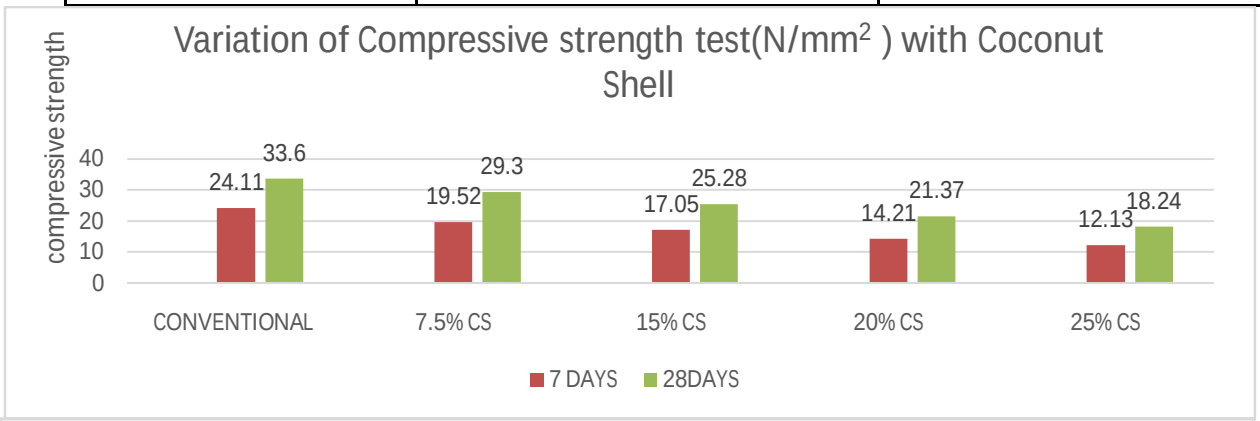
From this test result as we increase the percentage of coconuts shell in concrete, the compressive strength value decreases. This decrease of strength on increasing the percentage of coconut shell is due to increases the surface area, so more amount of cement paste is required for proper bonding, but the cement quantity remains constant therefore no extra bonding occurs, and strength reduces. Now a constant percentage of coconut shell (7.5%) kept in Concrete and fine aggregate was replaced with the stone dust in the percentage of 10%, 20%, 30% and 40%. Experimenting with these samples I found that the compressive strength increases as percentage of stone dust replacement from 0% to 40%.

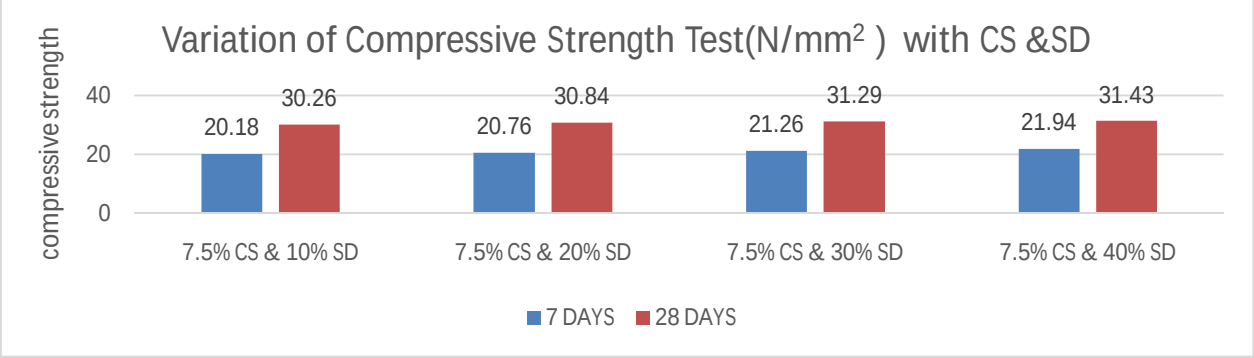
Table 4.3compressive strength test of concrete by replacing CA by CS

DAYS	CONVENTIONAL CONCRETE(N/mm^2)	7.5% CS	15% CS	20% CS	25% CS
7 DAYS	24.11	19.52	17.05	14.21	12.13
28DAYS	33.6	29.30	25.28	21.37	18.24

Table 4.4compressive strength test of concrete by replacing CA by CS and FA by SD

VARIATION OF CS AND SD	COMPRESSIVE STRENGTH(N/mm^2) 7 DAYS	COMPRESSIVE STRENGTH(N/mm^2) 28DAYS
7.5% CS & 10% SD	20.18	30.26
7.5% CS & 20% SD	20.76	30.84
7.5% CS & 30% SD	21.26	31.29
7.5% CS & 40% SD	21.94	31.43





C. Flexural strength test

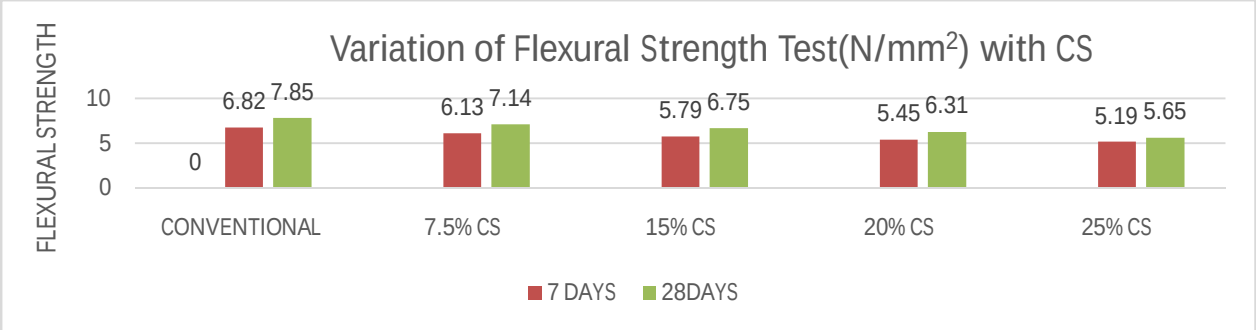
The test results so that as we increase the percentage of coconut shell, the flexural strength decreases. The reason of this decrease of strength is due to the weaker bonding between different ingredients of concrete in the presence of coconut shell. In the second phase of replacement, constant percentage of coconut shell was kept that is 7.5% and the fine aggregate was replaced by Stone Dust in the percentage of 10%, 20% ,30% and 40%.

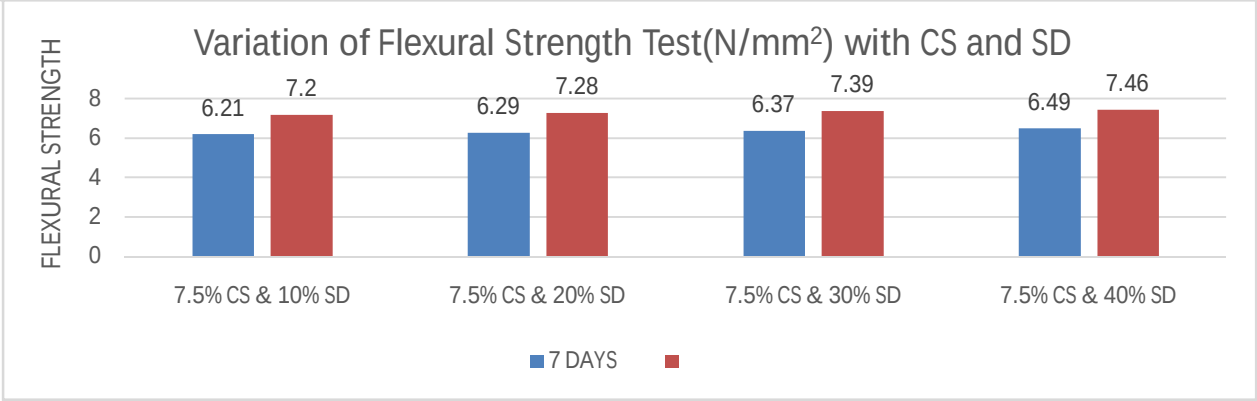
Table 4.5 Variation of Flexural Strength Test with CS at 7 & 28 days

DAYS	CONVENTIONAL CONCRETE(N/mm^2)	7.5% CS	15% CS	20% CS	25% CS
7 DAYS	6.82	6.13	5.79	5.45	5.19
28DAYS	7.85	7.14	6.75	6.31	5.65

Table 4.6 Variation of Flexural Strength Test with CS and SD at 7 & 28 days

VARIATION OF CS AND SD	FLXURAL STRENGTH (N/mm^2) 7 DAYS	FLEXURAL STRENGTH (N/mm^2) 28DAYS
7.5% CS & 10% SD	6.21	7.20
7.5% CS & 20% SD	6.29	7.28
7.5% CS & 30% SD	6.37	7.39
7.5% CS & 40% SD	6.49	7.46





D. Split Tensile Strength

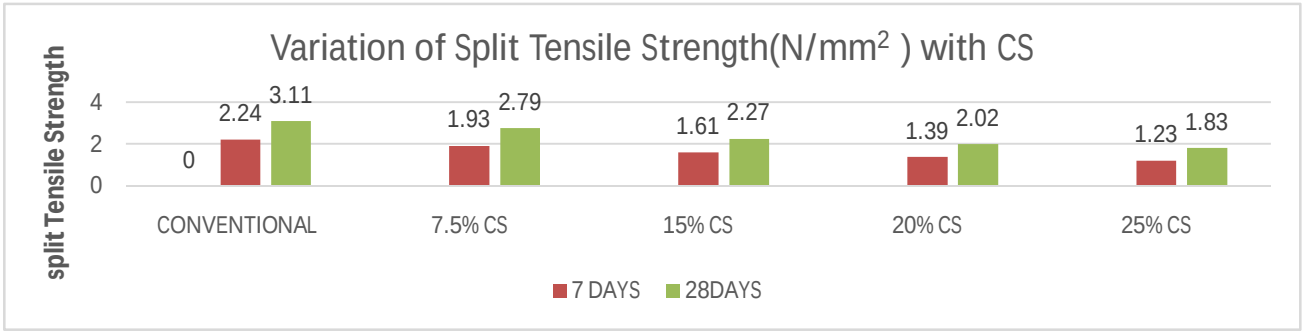
In this test cylinder of dimension 300 mm X 150 mm is prepared and after curing in water tested in compressive testing machine at 7 days and 28 days respectively.The test results showed that as we increase the percentage of coconut shell the Split Tensile strength decreases. The reason of this decrease of strength is due to the weaker bonding between different ingredients of concrete in the presence of coconut shell. In the second phase of Replacement constant percentage of coconut shell was kept that is 7.5% and fine aggregate was replaced by Stone Dust in the percentage of 10%, 20%, 30% and 40%.

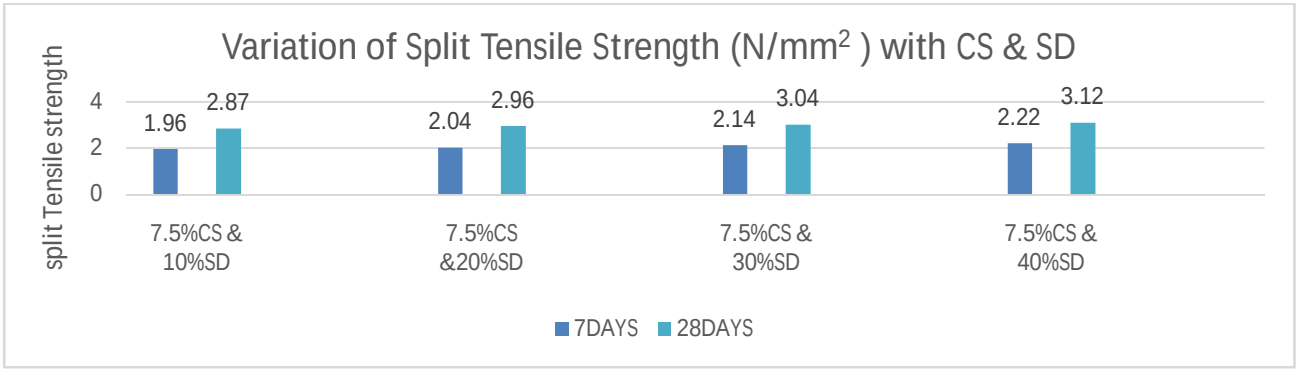
Table 4.7Variation of Split Tensile Strength with CS

DAYS	CONVENTIONAL CONCRETE(N/mm^2)	7.5% CS	15% CS	20% CS	25% CS
7 DAYS	2.24	1.93	1.61	1.39	1.23
28DAYS	3.11	2.79	2.27	2.02	1.83

Table 4.8 Variation of Split Tensile Strength with CS & SD

VARIATION OF CS AND SD	SPLIT TENSILE STRENGTH(N/mm^2) 7 DAYS	SPLIT TENSILE RENGTH(N/mm^2) 28DAYS
7.5% CS & 10% SD	1.96	2.87
7.5% CS & 20% SD	2.04	2.96
7.5% CS & 30% SD	2.14	3.04
7.5% CS & 40% SD	2.22	3.12





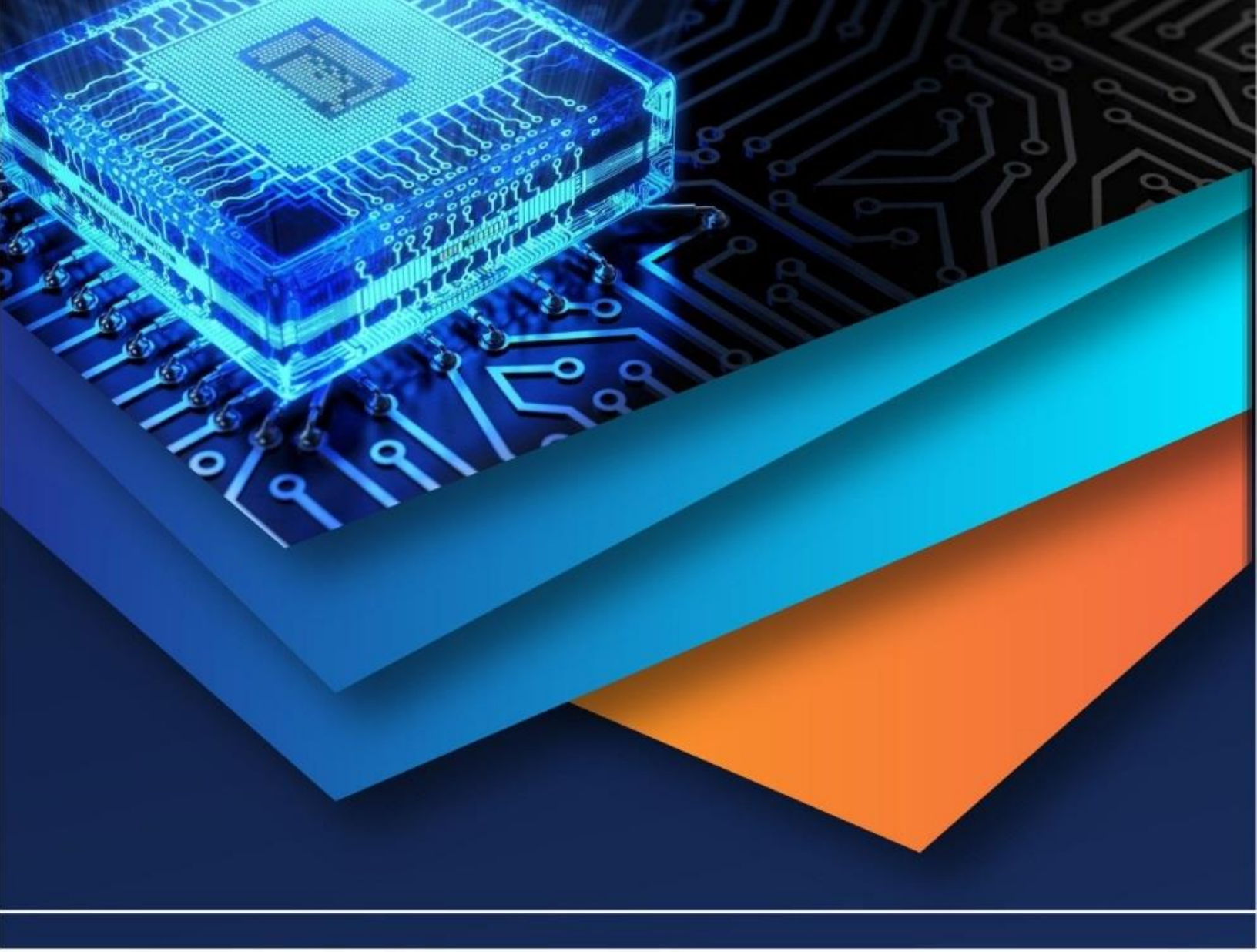
V. CONCLUSION

It was concluded that

A. Specific gravity and bulk density of coconut shell is less as compared to the natural coarse aggregate.
B. Specific gravity and bulk density of stone dust is more than the fine aggregate.
C. The percentage absorption of water in coconut shell is more as compared to the natural and fine aggregate.
D. The slump value of concrete as we increase the percentage of coconut shell firstly decreases up to 15% and then increases up to 25% replacement.
E. Slump value decreases as we increase the percentage of stone dust from 10% to 40%
F. The various properties of hardened concrete that is compressive strength test, flexural strength test and split tensile strength test decreases as we increase the percentage of coconut shell.
G. Keeping a constant percentage of coconut shell as we increased the percentage of stone Dust in the concrete then strength properties increases and reaches approximately to value of conventional concrete.

REFERENCES

[1] DewanshuAhlawat, L.G. Kalurkar (2013), “Strength Properties of Coconut Shell Concrete”, International Journal of Civil Engineering and Technology, vol 4, issue 6 Dec 2013
[2] Kulkarni V.P, Kumar. S, (2013), “Comparative study on coconut shell aggregate with conventional concrete”, Vol.2, Issue 12, pp 67-7
[3] Daniel Y.O, (2013), “Experimental Assessment on Coconut Shell as aggregate in concrete”, International Journal of Engineering Science Invention, Vol.2, Issue 5, pp 07-11
[4] Gunasekaran, K., Annadurai, R. & Kumar, P. S., “Long term study on compressive and bond strength of coconut shell aggregate concrete” Construction and Building Materials 28 (1) 208-215, 2012
[5] J. P. Ries, J. Speck, (2010), “Lightweight Aggregate Optimizes the Sustainability of Concrete”, Concrete Sustainability Conference, National Ready Mixed Concrete Association
[6] G. Balamurugan, P. Perumal (2013) “Use of quarry dust to replace sand in concrete –An experimental study”, IJSRP, volume 3, issue 12, pp 1-4.
[7] M.S. Shetty (2013) “Concrete Technology Theory and Practice”, S. Chand & company Pvt.Ltd, New Delhi.
[8] H.M.A. Mahzuz, A.A.M. Ahmed, M.A. Yusuf (2011) "Use of stone powder in concrete and mortar as an alternative of sand", AJEST, Vol. 5(5), pp. 381-388.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY