iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 Issue: III Month of publication: March 2022

DOI: https://doi.org/10.22214/ijraset.2022.40580

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue III Mar 2022- Available at www.ijraset.com

Experimental Study on the Strength Characteristics of M25 & M30 Grades of Self-Compaction Concrete by Partial Replacement of Saw Dust in Fine Aggregates

Kesireddi Ashok[1], B. Sri Datta[2]
[1]M. Tech (Structural Engineering), Department of Civil Engineering, Kakinada Institute of Technology And Science. Divili
[2]Asst.Professor, Department of Civil Engineering, Kakinada Institute of Technology And Science. Divili

Abstract: Self - compacting concrete (SCC) is a high - execution concrete that can stream under its own load to totally fill the structure work and self-unites with next to no mechanical vibration. Such concretes are a speed up for the placement, to lessen the work prerequisites required for combination, getting done and wipe out ecological contamination. This will guarantee that the concrete acquired has great stream capacity, self-compacting capacity and other wanted SCC properties.Self-compacting concrete is a kind of concrete that gets under its self-weight. Self-compacting concrete is a type of concrete that gets under its self-weight. It is commonly abbreviated as the concrete. Which can placed and compacted in to every corner of a formwork; purely means of its self-weight by eliminating the need of either external energy input from vibrators or any type of compacting effort. There is a current trend in all over the world to utilize the treated and untreated industrial By-products, domestic wastes etc. as raw materials in concrete. These not only help in the reduce of the waste materials but also create a cleaner and greener environment. This report demonstrates the possibilities of using saw dust as partial replacement of fine aggregate in concrete. This experimental investigation was performed to evaluate the strength and durability properties of M25 and M30 grade of self compaction concrete, in which fine aggregate was partial, replaced with saw dust waste. Fine aggregate was replaced with four percentage (0%, 10%, 20%, 30%) of saw dust waste by weight. Fresh properties of self-compacting concrete were studied. Compression test and splitting tensile strength test were carried out to evaluate the strength properties of concrete at the age of 7, 14, and 28 days.

Keywords: Self-compacting concrete (SCC), Saw dust, strength and durability properties of concrete, Compression test and splitting tensile strength test.

I. INTRODUCTION

A. General

Concrete is a very strong and versatile mouldable construction material. It is a composite material that consists essentially of a binding medium within which are embedded particles or fragments of aggregate. In the world of construction, one material is used above all others and that is “concrete”. Concrete is absolutely indispensable in modern society’s fascination with new roads, buildings and other constructions. The three basic ingredients of concrete are aggregate, cement, water. Cement is the fixture that binds the ingredients together, water gives the concrete viscosity in order to be moulded and react with the ingredients, and the aggregates are what adds bulk to the concrete, but are not involved in the chemical processes. The soonest is the customary typical strength concrete which is made out of just four constituent materials, which are cement, water, fine and coarse aggregates. With a quick populace development and a more popularity for lodging and foundation, joined by ongoing advancements in Civil Engineering, for example, tall structures and long-range spans, higher compressive strength concrete was required.

Toward the start, decreasing the water-cement proportion was the most straightforward method for accomplishing the high compressive strength. From there on, the fifth fixing, a water decreasing specialist or super plasticizer, was essential. The synthetic admixture is supposed to be any materia3l that is included a little amount (i.e., under 5%) to the concrete mixture which improves the properties of concrete in both the new and solidified state. As of late, the utilization of self-compacting concrete in prepared mix concrete plants have massively expanded because of its benefits in solidification, consistency and unwavering quality. Self-compacting Concrete is an inventive concrete that doesn't need any vibration for putting and compaction. It can stream under its own weight, totally filling formwork and accomplishing full compaction, even within the sight of blocked reinforcement.

B. Important Features

The following are the important features of SCC over and above the usual factors, which influence the design of normal concrete.

1) Increases the powder content, ensures cohesiveness or viscosity of the mixture and reduces coarse aggregate.
2) A substitution part of fine aggregate that is saw dust is used for achieving economy. Microsilica is used for the better packing of powder particles.
3) The required flow ability is achieved with the help of super plasticizers which is able to retain its dispersing effect for at list two hours.
4) Stabilizing agent (viscosity modifying agent) is usually needed through that small changes in water concrete of mixes, which arise due to site variables, do not adversely affect the cohesiveness of SCC.

C. Mechanism For Achieving Self-Compatibility

Basically expanding the water content in a mix to accomplish a flowable concrete like SCC is clearly not a feasible choice. All things considered, the test is to build the flowability of the molecule suspension and simultaneously stay away from isolation of the stages. The principle system controlling the harmony between higher flowability and security are identified with surface science. The advancement of SCC has along these lines been emphatically reliant upon surface dynamic admixtures just as on the expanded explicit surface region acquired through the pre-owned fillers.The technique for accomplishing Self-Compatibility includes high deformability of glue or mortar, yet in addition protection from isolation between coarse total and mortar when the concrete courses through the bound zone of supporting bars . Hajime Okamura et al., [2003] and Ozawa K et al., [1989] have employed the following methods to achieve Self-Compatibility.

1) Limited aggregate content
2) Low water-powder ratio
3) Use of Super Plasticizer (SP)

The recurrence of impact and contact between aggregate particles increments as the overall distance between the particles diminishes and the interior pressure increments when concrete is twisted, especially close to obstructions. It has been uncovered that the energy needed for streaming is devoured by the expanded inner burdens, bringing about blockage of total particles. Restricting the coarse total substance, whose energy utilization is especially extreme, to a level lower than typical extents is compelling in staying away from this sort of blockage. Exceptionally thick glue is likewise needed to stay away from the blockage of coarse total when concrete courses through deterrents. At the point when concrete is disfigured, the glue with high thickness likewise forestalls restricted expansion in the inner pressure, because of the methodology of coarse total particles. High deformability can be accomplished exclusively by the work of a super plasticizer, keeping the water-powder proportion at a very lower level.

II. EXPERIMENTAL WORK

Wide spread utilizations of SCC have been limited because of absence of standard mix plan technique and testing strategies. It is appropriate to make reference to those main elements of SCC have been remembered for Indian Standard Code of training for plain and supported concrete (fourth amendment), [2000]. Droop stream test, L-box test, V-pipe test, U-box test, Orimet test and GTM Screen test are suggested by EFNARC [European Federation of Producers and Applicators of Specialist Products for Structures, May 2005] for deciding the properties of SCC in new state.

The trial program comprised of projecting and testing examples for showing up the strength by incomplete replacement of saw dust instead of fine total. Distinctive grade of concrete is considered in this review. In the principal stage the Nan Su strategy for mix plan [2001] was embraced to show up at the reasonable mix extents. The mix plans were done for concrete grades 20, 25, and 30. This technique was liked as it enjoys the benefit of considering the strength of the SCC mix. The adequacy will be shown up for various grade of concrete, in view of the mechanical properties and new properties of SCC. Dissimilar to other proportioning techniques like the Okamura and EFNARC strategies, it invigorates a sign of the objective that will be gotten after 28days of curing. The water to powder proportion was differed in order to get SCC mixes of different qualities. A sum of 12 preliminary mixes were finished by shifting the extents of water and powder inside the determined reaches. The subtleties of the mixes are as in Table. Every one of the fixings were first mixed in dry condition. Then, at that point, 70% of the determined measure of water was to be added to the dry mix and mixed completely. Then, at that point, 30% of water was mixed with the super-plasticizer and remembered for the mix. Then, at that point, the mix was checked for self-similarity by stream test, V-pipe test and L-Box test.

III. MATERIALS

The materials used in the experimental investigation are locally available cement, sand, coarse aggregate, mineral and chemical admixtures. The chemicals used in the present investigation are of commercial grade. 3.1.1 Cement Ordinary Portland cement of 53 grade [IS: 12269-1987, Specifications for 53 Grade Ordinary Portland cement] has been used in the study. It was procured from a single source and stored as per IS: 4032 - 1977. Care has been taken to ensure that the cement of same company and same grade is used throughout the investigation. The cement thus obtained was tested for physical properties in accordance with the IS: 12269 - 1987.

A. Cement

Tableshows the physical characteristics of Ultra-Tech (53 Grade) cement used, tested in accordance with IS:4031-1988 [Methods of physical tests for hydraulic cement].

Table 1: Physical Properties of Ordinary Portland Cement

S. No	Property	Test Method	Test Results	IS Standard
1.	Normal Consistency	Vicat Apparatus (IS:4031 Part-4)	29.5%	
2.	Specific Gravity	Sp. Gr Bottle (IS:4031 Part-4)	3.10	
3.	Initial Setting Time	Vicat Apparatus (IS:4031 Part-4)	53 minutes	Not less than 30 minutes
	Final Setting Time		493 Minutes	Not less than 10 hours
4.	Fineness	Sieve test on sieve no.9 (IS: 4031 Part -1)	5%	10%
5.	Soundness	Le-Chatlier method (IS: 4031 Part-3)	2mm	Not more than 10mm

Physical Properties of Coarse and Fine Aggregate

S.No	Property	Method	Fine Aggregates	Coarse Aggregates
1	Specific Gravity	Pycnometer IS:2386 Part3-1986	2.65	2.85
2	Bulk Density Loose Compacted	IS:2386 Part 3-1986	1428 kg/m3 1580 kg/m3	1651 kg/m3 1896 kg/m3
3	Bulking	IS:2386 Part 3-1986	10% water	---
4	Flakiness Index	(IS:2386 Part 2-1963)	---	8.08%
5	Elongation Index	(IS:2386 Part 2-1963)	---	0%
6	Fineness Modulus	Sieve Analysis (IS:2386 Part 2-1963)	3.18	6.04

B. Water

Water used for mixing and curing was potable water, which was free from any amounts of oils, acids, alkalis, sugar, salts and organic materials or other substances that may be deleterious to concrete or steel confirming to IS : 3025 - 1964 part22, part 23 and IS : 456 - 2000 [Code of practice for plain and reinforced concrete]. The pH value should not be less than 6. The solids present were within the permissible limits as per clause 5.4 of IS: 456 - 2000.

C. Saw Dust

Saw dust is a by-product of cutting, crushing, boring, sanding, or in any case pummeling wood with a saw or other instrument; it is made out of fine particles of wood. Water ingestion 2% and pH 8. The sawdust was obtained from Sangam saw plant &wood works in Kakinada close to petroleum bunk, jagnayakapur span. The sawdust comprised of chippings from different hardwoods. It was sun dried and kept in waterproof sacks. It was sieved through 4.75 mm sifter for the reason of concreting samples. The saw dust was tested for density, moisture content and fineness modulus in laboratory.

The percentage replacements of fine aggregates by sawdust were varied from 0%, 25%, 50%, 75% and 100% .This was done to determine the optimum percentage that would give the most favorable result. However, dry mix method was used for concrete constituent before the addition of water. The homogenized mixture was then introduced into 150 mm ×150 mm × 150 mm metal moulds; the concrete de-moulded after 24 hour and cured, while compressive strength was performed after 7 days, 14 days and 28 days.

Figure 1.1: Saw Dust Sample

Properties of saw dust

S.No	Parameters	Values
1	Fineness Modulus	1.9
2	Moisture Content	9.80%
3	Bulk Density	615Kg/m^3

D. Admixtures

The most important admixtures are the Super plasticizers (high range water reducers), used with a water reduction greater than 20%. The use of a Viscosity modifying Admixture (VMA) gives more possible of controlling segregation when the amount of powder is limited. This admixture helps to provide very good homogeneity and reduces the tendency to segregation.

E. Chemical Admixtures

Chemical admixtures are used in Self Compacting Concrete as ingredients which can be added to the concrete mixture immediately before or during mixing. The use of chemical admixtures such as water reducers, retarders, high-range water reducers or Super Plasticizers (SP), and Viscosity Modifying Admixtures (VMA) is necessary in order to improve the fundamental characteristics of fresh and hardened concrete. They help in the efficient use

of large amount of cementitious material in high strength and self-compacting concretes so as to obtain the lowest water to cementing materials ratio.

F. Super Plasticizer

Generally, in order to increase the workability, the water content is to be increased provided a corresponding quantity of cement is also added to keep the water cement ratio constant, so that the strength remains the same. Portland cement, being in fine state, has a tendency to flocculate in wet concrete. On the other hand, to avoid the use of excess quantity of water and cement, SP is used to increase the fluidity of the mix and improve the workability of concrete.. The absorption of charged polymer on cement particle creates particle to particle repulsive forces, which overcome the attractive forces. This repulsive force is called zeta potential which depends on the base, solid contents and quality of super plasticizer used. Super plasticizer is a chemical compound used to increase the workability without adding more water. It has the property of spreading the given water in the concrete throughout the concrete mix resulting in a uniform mix. Thus, super plasticizer is essential for the creation of SCC.

G. Viscosity Modifying Agent

The use of Viscosity Modifying Agent (VMA) gives higher possibilities of controlling segregation in SCC when the amount of powder is limited. This admixture helps to maintain very good homogeneity and also reduces the tendency to segregate. The VMA is incorporated to enhance the yield value and viscosity of fluid mixture.

Details of Viscosity Modifying Agent

S.No	Property	Result
1.	Aspect	Colorless free flowing liquid
2.	Relative density	1.01
3.	PH	≥6
4.	Chloride ion content	< 0.2%
5.	Compatibility	Can be used with all types of cements
6.	Incompatible	Use with naphthalene sulphonate based superplasticizer admixtures.
7.	Mechanism of action	It consists of a mixture of water soluble copolymers which is adsorbed onto the surface of the cement granules, thereby changing the viscosity of the wate and influencing the rheological properties of the mix.
8.	Dosage	50 to 500 ml/100 kg of cementitious material.

IV. MIX PROPORTIONING

In designing the SCC mix, it is most useful to consider the relative proportions of the key components by volume rather than by mass. The following key proportions for the mixes listed below:

1) Air content (by volume)
2) Coarse aggregate content (by volume)
3) Paste content (by volume)
4) Binder (cementitious) content (by weight)
5) Replacement of mineral admixture by percentage binder weight
6) Water/ binder ratio (by weight)
7) Volume of fine aggregate/ volume of mortar
8) SP dosage by percentage cementitious (binder) weight
9) VMA dosage by percentage cementitious (binder) weight

The mix proportioning was done based on the Nan Su approach [2001]. The Mix Design

V. FRESH PROPERTIES OF SCC

A. Requirements of Self –Compaction Concrete

SCC mixes must meet three key properties:

1) Ability to flow into and completely fill intricate and complex forms under its own weight.
2) Ability to pass through the congested reinforcement under its own weight.
3) High resistance to aggregate segregation.

Due to the high powder content, SCC shows more plastic shrinkage or creep than ordinary concrete mixes. These aspects should therefore be considered during designing and specifying the SCC. By definition of SCC, it is clear that the fresh concrete has to fulfill various properties. The SCC must be adequately free flowing so that the coarse aggregate particles can float in mortar but the air can still rise and escape adequately.

List of test methods for workability properties of SCC

S.No	Method	Property
1.	Slump flow test	Filling ability
2.	T50cm Slump flow	Filling ability
3.	V-funnel test	Filling ability
4.	V-Funnel at T5 minutes	Segregation resistance
5.	L-Box test	Passing ability
6.	U - Box test	Passing ability
7.	Fill box apparatus test	Passing ability
8.	J-Ring	Passing ability
9.	Orimet test	Filling ability
10.	GTM screen stability test	Segregation resistance

For the initial mix design of SCC all three workability parameters need to be assessed to ensure that all aspects are fulfilled. A full-scale test should be done to verify the self-compacting characteristics of the chosen design for a particular application. For site quality control, two test methods are generally sufficient to monitor production quality. Typical combinations are Slump-flow and V-funnel or Slump-flow and J-ring.

B. Workability Criteria for The Fresh SCC

Filling ability, passing ability and segregation resistance are the requirements for judging the workability criteria of fresh SCC. These requirements are to be fulfilled at the time of placing of concrete. Typical acceptance criteria for Self-Compacting Concrete with a maximum aggregate size up to 20 mm are shown in Table.

Acceptance criteria for Self-compacting Concrete.

S.No	Method	Property	Typical range of values	
			Minimum	Maximum
1.	Slump flow test	Mm	650	800
2.	T50cm Slump flow	Sec	2	5
3.	V-funnel test	Sec	6	12
4.	V-Funnel at T5 minutes	Sec	6	15
5.	L-Box test	H2/H1	0.8	1.0
6.	U - Box test	(H2-H1) mm	0	30
7.	Fill box apparatus test	%	90	100
8.	J-Ring	Mm	0	10
9.	Orimet test	Sec	0	5
10.	GTM screen stability test	%	0	15

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue III Mar 2022- Available at www.ijraset.com

C. Mix Proportions for SCC

The mix proportioning was done based on the Nan Su approach [2001]. The mix proportion is given in Table for M25, and M30 grade concrete.

Mix Proportion and Quantities of M25, and M30 grade of SCC

Grade	Mix	w/c	Water Kg/m^3	Cement Kg/m^3	FA Kg/m^3	Saw Dust Kg/m^3	Saw Dust %	CA Kg/m^3	SP %
M25	Trail-1	0.42	205.8	490	612.5	0	0%	980	0.882
	Trail-2			492	551.25	61.25	10%	980	0.882
	Trail-3			490	490	122.5	20%	980	0.882
	Trail-4			493	428.75	183.75	30%	980	0.882
M30	Trail-1	0.38	193.8	510	637.5	0	0%	795.6	0.918
	Trail-2			512	573.75	63.75	10%	795.6	0.918
	Trail-3			510	510	127.5	20%	795.6	0.918
	Trail-4			511	446.25	191.25	30%	795.6	0.918

D. Fresh Properties of SCC

The details of the fresh properties are shown in Table for M25, and M30 grade concrete.

S.NO	Grade	Mix	Slump flow value	T50	V-funnel	V-funnel at T5 minutes	L-Box H2/H1 (Blocking Ratio)
1	M25	0%	715	5sec	8.7 sec	8 sec	0.85
		10%	709	5sec	9.1sec	9 sec	0.91
		20%	697	4sec	8.4 sec	8 sec	0.97
		30%	693	5sec	8.6 sec	9 sec	0.94
2	M30	0%	710	5sec	8.8sec	8 sec	0.9
		10%	700	5sec	8.2sec	9 sec	0.93
		20%	695	4sec	8.5sec	8 sec	0.98
		30%	684	5sec	8.7 sec	9 sec	0.95

Fresh properties of for M25, and M30 grade concrete

E. Curing of Test Specimens

After 24 hours of casting, the specimens were removed from the moulds and immediately dipped in clean fresh water. The specimens were cured for 7 days, 14 days and 28 days respectively depending on the requirement of age of curing

VI. MECHANICAL PROPERTIES OF SCC WITH PARTIAL REPLACEMENT OF SAW DUST FOR DIFFERENT GRADE OF CONCRETES

A. *Compressive Strength*

The results of the mechanical properties obtained based on the specimens tested as per Indian standard test procedures (as per IS: 516) are discussed. TheM25 and M30 grades of concrete cubes are casted and the different ages of curing are the variables of investigation. The details of the compressive strengths of M25, and M30 grade of SCC are shown in Table 4.3.

MIX	SAW DUST %	COMPRESSIVE STRENGTH (Mpa)		
		7 Days	14 Days	28 Days
M25	0	22.27	26.6	32.25
	10	23.68	27.2	33.71
	20	25.04	28.46	35.68
	30	23.25	26.91	32.09
M30	0	24.86	33.66	37.05
	10	25.35	34.27	38.56
	20	27.91	35.65	39.54
	30	25.03	33.97	37.35

Compressive strength of M25, and M30 grade SCC

B. *Split Tensile Strength*

The results of the mechanical properties obtained based on the specimens tested as per Indian standard test procedures (as per IS: 516) are discussed. The M25 and M30 grades of concrete cylinders are casted and the different ages of curing are the variables of investigation. The details of the split tensile strengths of M25, and M30 grade of SCC are shown in Table.

MIX	SAW DUST	SPLIT TENSILE STRENGTH MPa		
		7 Days	14 Days	28 Days
M25	0	2.25	2.84	4.25
	10	2.31	2.97	4.69
	20	2.42	3.15	4.87
	30	2.28	2.89	4.31
M30	0	2.7	2.95	4.75
	10	2.84	3.2	4.96
	20	2.91	3.48	5.34
	30	2.75	3.23	4.47

Split tensile strength of M25, and M30 grade of SCC

C. *Flexural Strength*

The results of the mechanical properties obtained based on the specimens tested as per Indian standard test procedures (as per IS: 516) are discussed. TheM25 and M30 grades of concrete cylinders are casted and the different ages of curing are the variables of investigation.

The details of the flexural strengths of M25, and M30 grade of SCC are shown in Table.

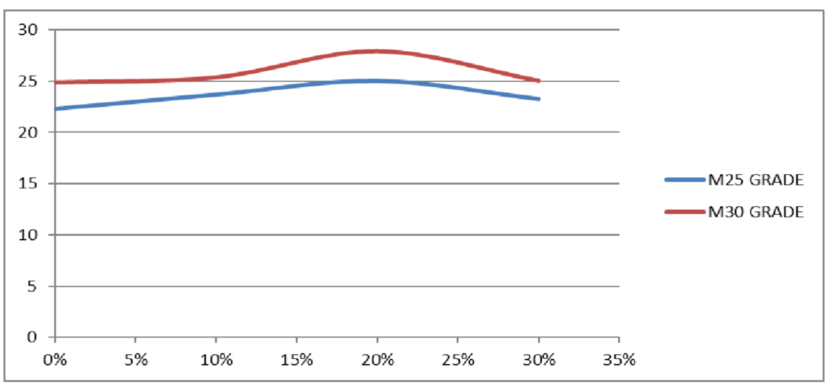
MIX	SAW DUST	FLEXURAL STRENGTH MPa		
		7 Days	14 Days	28 Days
M25	0	4.22	6.37	8.21
	10	4.35	6.48	8.5
	20	4.5	6.89	8.67
	30	4.25	6.41	8.44
M30	0	5.35	7.04	9.08
	10	5.49	7.29	9.16
	20	5.61	7.46	9.34
	30	5.43	7.11	9.13

Flexural strength of M25, and M30 grade of SCC

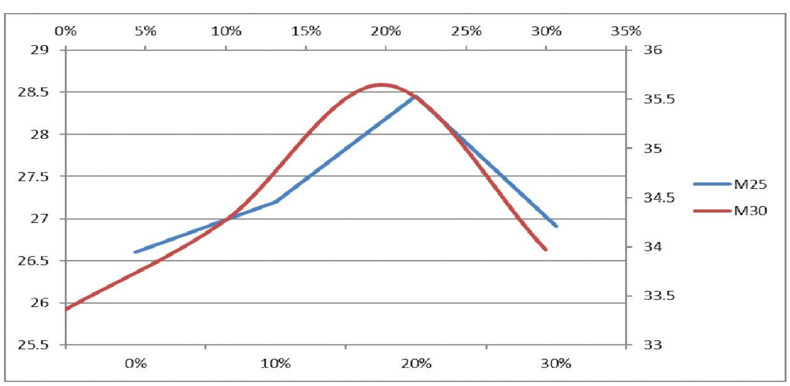
VII. MECHANICAL PROPERTIES OF SCC

A. *Compressive Strength*

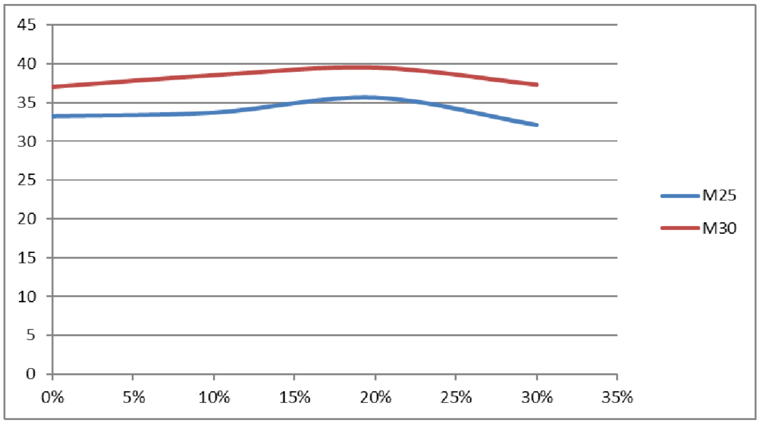
shows the details of the Compressive strength for partial replacement 10%, 20%and 30% of saw dust for M25, and M30 grades of concrete.



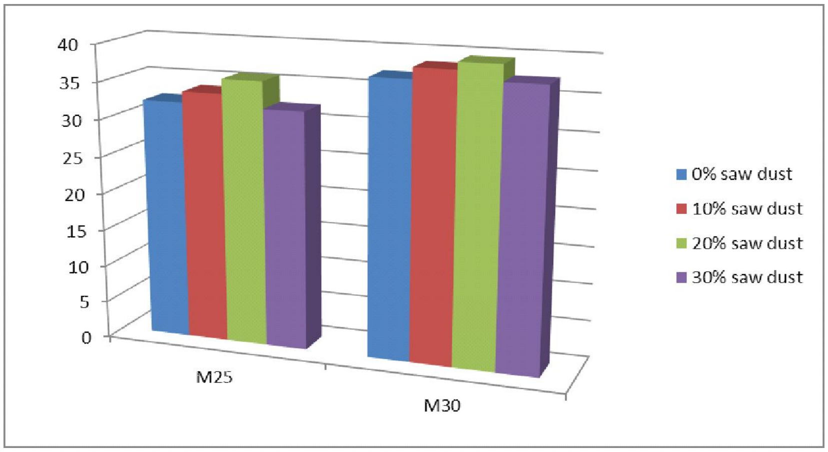
Graph : 7 Days of Compressive strength for different Grades of Concrete



Graph : 14 Days of Compressive strength for different Grades of Concrete



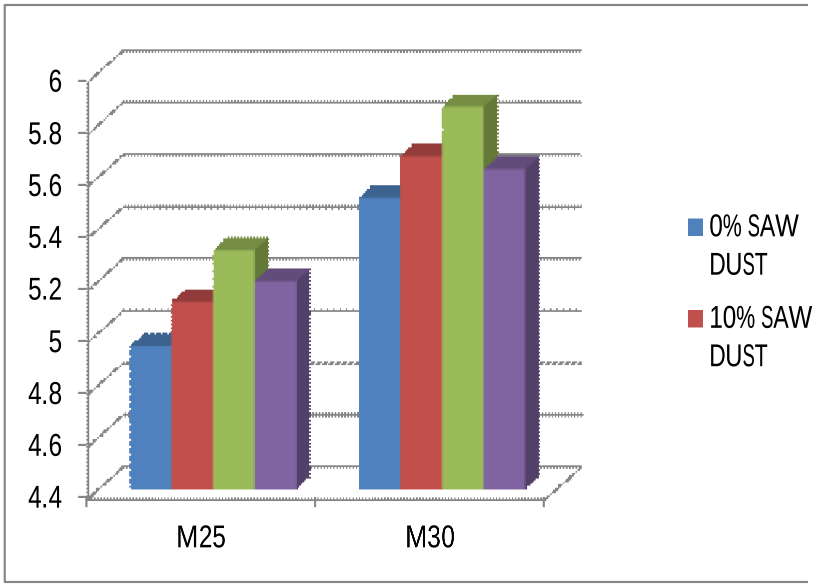
Graph : 28 Days of Compressive strength for different Grades of Concrete



Graph : Bar Diagram for 28 Days Compressive strength for partial replacement of Saw Dust for different Grades of Concrete.

B. *Split Tensile Strength*

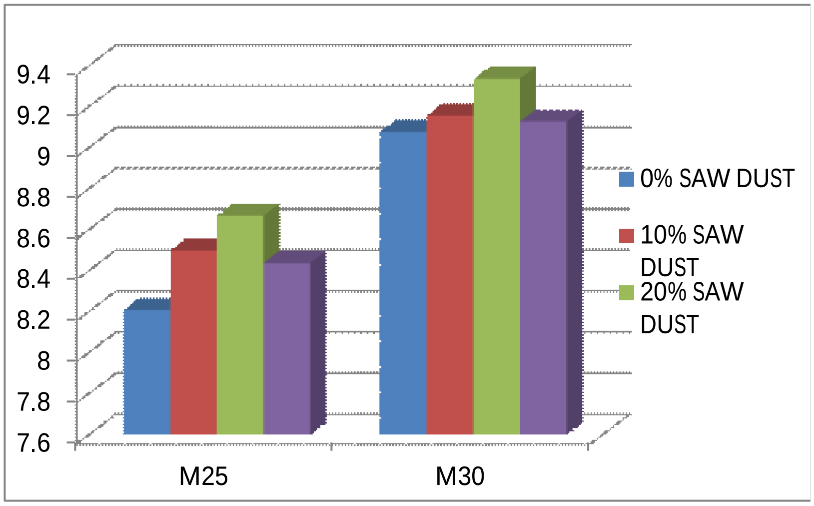
Graph shows the details of the split tensile strength of different grade of concrete. A similar trend as that of compressive strength was noted with regard to the strength criteria.



Graph : Bar Diagram for 28 Days Split Tensile strength for partial replacement of Saw Dust for different Grades of Concrete

C. Flexural Strength

Graph: shows the details of the flexural strength for partial replacement 0%, 10%, 20% and 30% of saw dust for M25, and M30 grades of concrete.



Graph : Bar Diagram for 28 Days flexural strength for partial replacement of Saw Dust for different Grades of Concrete.

VIII. CONCLUSIONS

The most recent investigates are focusing on ways of making new concrete by utilizing different industrial wastes. The expansion of saw dust into concrete was a stage that was taken to use saw dust got from the saw plants in a compelling way. Different properties of the saw dust incorporated SCC mixes like self-similarity, compressive strength, and flexural strength were assessed and contrasted and those of traditional SCC.

In view of the deliberate and point by point trial examinations directed on SCC mixes with a mean to foster execution mixes, the accompanying ends were shown up at:

1) There is reduction in density of sawdust concrete with increase in percentage of sawdust in concrete.
2) Use of sawdust as a waste in concrete decrease the pollution which is caused after burning of sawdust.
3) The addition of saw dust in SCC mixes increases the self-compatibility characteristics like filling ability, passing ability and segregation resistance.
4) The flow value increase by an average of 1.30%, 2.5% and 5.36% for saw dust replacements of 10%, 20% and 30% respectively.
5) The V-funnel time was observed to increase by an average of 6.21%, 15% and 22.54% for saw dust contents of 10%, 20%and 30% respectively. This increase in the V-funnel time indicates increase values of relative flow time and thereby the higher viscosity (resistance to flow) for the mixes
6) The L-box value was also observed to follow an increasing trend with an average variation of 1.5%, 3.2% and 5% for saw dust contents of 10%,20%and 30% respectively.
7) The compressive strength of the mixes was observed that gradual increase with level of increase in saw dust contents. The average growth in compressive strength for all grades was around 6%, 15% and 20% for saw dust contents of 10%, 20%and 30% respectively.
8) The flexural strengths of the mixes were observed that gradual increase with level of increment in saw dust contents. The average growth in flexural strengths for all grades was around 2%, 3.7% and 6.75% for of 1.30%, 2.5% and 5.36% for saw dust replacements of 10%, 20% and 30% respectively.

From the above experimental results on mechanical properties for M25 and M30 grade of SCC mix, it is clear that the percentage of replacement of saw dust is increases the strength is also increases gradually. From the above mentioned work of various researchers and our present experimental work, it is clear that saw dust can be used as a replacement of fine aggregate in concrete because of its increased workability, strength parameters.

REFERENCES

[1] Daniel Yaw Osei, Emmanuel Nana Jackson, "Compressive strength of concrete using sawdust's aggregate", International Journal of scientific & engineering Research, vol.7, (2016).

[2] EFNARC. "Specification and guidelines for self-compacting concrete", European Federation of Producers and Applicators of Specialist Products for Structures."

[3] EFNARC. "Specification and guidelines for self-compacting concrete", European Federation of Producers and Applicators of Specialist Products for Structures, May 2005.

[4] Jaya Shankar R, Hemalatha T, Palanichamy. K and Santhakumar. S, "Influence of saw dust and VMA on properties of self-compacting concrete", National Conference on Advances in materials and mechanics of concrete structures Department of Civil Engineering, IIT Madras, Chennai 12-13 August 2005, pp 25 - 32.

[5] Nan Su, Kung-Chung Hsub and His-Wan Chai. "A simple mix design method for self-compacting concrete". Cement and Concrete Research, 2001, Vol. 31, pp1799 - 1807.

[6] Okamura H, Ozawa K. "Mix design for self-compacting concrete". Concrete Library of Japanese Society of Civil Engineers, 1995, Vol. 25, No. 6, pp107-120.

[7] Yong Cheng ,Wen you, Chaoyong Zhang, Huanhuan Li,Jian Hu/, "The Implementation Of Waste Sawdust In Concrete", Sichuan Agriculture University, Ya'an, china (2013).

[8] A. A. Raheem, B. S. Olasunkanmi, C. S. Folorunso, "Sawdust ash as partial replacement for cement in concrete", An International Journal of organization, technology and management in construction (2012).

[9] Okamura Hajime and Ouchi Masahiro. "Self - Compacting Concrete". Journal of advanced concrete technology, 2003, Vol.1, No.1, pp 5 - 15.

[10] Subramanian, S. and Chattopadhyay D. "Experiments for mix proportioning of self-compacting concrete", The Indian Concrete Journal, 2002, pp.13-20.

[11] Olugbenga Joseph Oyedpo, Seun Daniel Oluwajana Sunmbo, Peter Akande, "Investigation of properties of concrete using sawdust as partial replacement for sand", civil and environmental research, vol.6, no.2, (2014)

[12] P.K.Roy, Devanshjain, Vijay Meshram,(2015) "Use Of Electronic Waste As A Partial Replacement of coarse aggregate in Concrete" International Journal of Engineering Research, Vol.3., Issue.4., JulyAug, ISSN: 2321-7758

[13] P.Krishna prasanna, M.Kanto Rao (2014) "Strength Variations in concrete by using E-waste as Coarse Aggregate" IJEAR Vol. 4, Issue Spl-2, Jan - June 2014, ISSN: 2348-0033 (Online) ISSN : 2249-4944 (Print)

[14] Suchithra S, Manoj Kumar, Indu V.S, `"Study on replacement of coarse aggregate by E-wate in concrete" International Journal of Technical Research and applications e-ISSN:2320-8163, vol 3, Issue 4 (July – August 2015), pp 266-270.

[15] P.Gomathi Nagajothi, Dr. T. Felixkala, "Compressive strength of concrete Incorporated with E Fibre waste", International Journal of Emerging Technology and Advanced Engineering, Volume 4, Special Issue 4, June 2014.

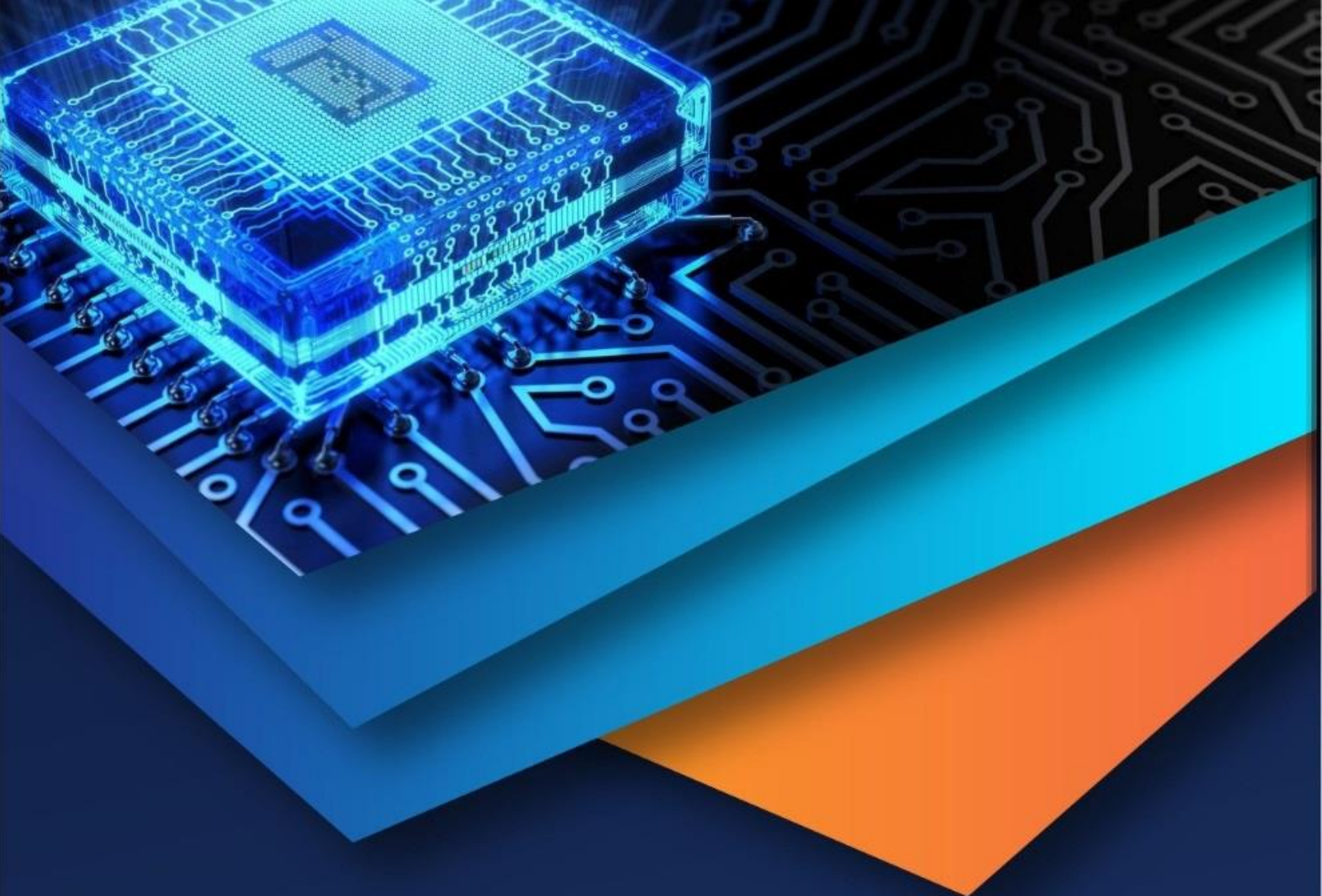
[16] IS 8112 Specification for 43 Grade Ordinary Portland Cement, Bureau of Indian Standards, New Delhi, India, 1987.

[17] IS 383-1970, Specification for coarse and fine aggregate for natural sources for concrete, second revision, 9th reprint, 1993.

[18] IS 456-2000, Indian standard plain and reinforced concrete-code of practice, 4th revision, 1st reprint Sep- 2000.

[19] "Indian standard code of practice—methods of test for strength of concrete," Tech. Rep. IS 516-1959, Bureau of Indian Standards, New Delhi, India, 2013.

[20] IS 2386 (Part I-IV), "Methods of test for aggregates for concrete, "Indian Standard, Bureau of Indian Standards", New Delhi, India, 1963.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY