iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 **Issue:** IV **Month of publication:** April 2019

DOI: https://doi.org/10.22214/ijraset.2019.4365

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International Journal For Research In Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC value: 45.98; SJ impact factor: 6.887
Volume 7 Issue IV, Apr 2019- available At www.ijraset.com

Study of Concrete by Replacement of Waste Paper Sludge Ash as a Partial Replacement in the Cement

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Abstract: ***Concrete producing trade is one in all the carbon emitting sources besides deforestation and burning of fossil fuels the world cement trade contributes regarding seven-membered green house gases emissions to earths atmosphere..so as to handle environmental effects related to cement producing and perpetually depleting natural resources,theres a necessity to develop different binders to form concrete trade property.this work examines the chance of victimization paper sludge ash was partly replaced as 5%-20% of cement in concrete for M25 and tested for its compressive strength, durability, water absorption and dry density up to twenty-eight days and compared with typical concrete.from the results obtained,its found that paper sludge ash may be used as cement replacement upto 5% by weight of cement***

Keywords: Compressive strength, Durability, Dry density, Split tensile strength, Water absorption, Waste paper sludge ash, Workability.

I. INTRODUCTION

In order to decrease the amount of cement consumption in concrete we are searching for different types of alternatives. Among that process we choose the waste paper sludge ash as a partial replacement in cement while using the concrete.

Paper mill sludge could be a major economic and environmental drawback for the paper and other business.it is producing large amount of paper sludge .In india among 0.7% of total urban waste vhas containing the paper sludge.it is disposing by land spreading or any other incineration process. waste paper sludge ash is obtained by the incineration process at 500ºC.

The resultant gas contains reactive silicon oxide and alumina oxide in addition as lime that contributes the hydraulic in gradients in cement. This project is mainly to know the importance of paper sludge ash replacement in concrete.

II. MATERIALS USED AND METHODOLOGY

A. Cement and Aggregates

Ordinary Portland cement of 53 grade is used, sieved under 90µ sieve. fine aggregate which is sieved under 4.75mm IS sieve and conformed as zone II as per specifications is used ,coarse aggregates which is passed under the sieve 25mm IS sieve is used through out the work which are having the specific gravity6 2.65,2.67.

B. Waste Paper Sludge Ash

Waste paper sludge ash was obtained from cube india papermill pvt ltd .The ash was also sieved under 90µ IS sieve.The specific gravity was 2.91.the chemical composition and properties of waste paper sludge ash was as follows

Table 1: Chemical Compostion Of Wpsa:

O	15.82
Ca	14.95
Si	61.52
Al	2.05
Mg	4.00
S	1.15
K	0.18
Fe	0.95
Na	0.24

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Fig 1 : Waste Paper Sludge Ash



Fig 2: Conducting workability tests



Fig 3: Conducting workability tests

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Fig 4: slump cone test

III. EXPERIMENTAL INVESTIGATION

Table 2 : Tests results of cement

SL.NO	TESTS ON CEMENT	RESULT	REQUIREMENT AS PER IS 4031
1.	Normal consistency	32%	Not to exceed 35%
2.	Initial setting time	35min	>30 min's
3.	Final setting time	500min	<600min's
4.	Soundness test	1mm	Not exceed 10
5.	Specific gravity	3.14	
6.	Fineness modulus	2%	

Table 3 : Tests results of fine aggregates

SL.NO	TESTS ON FINE AGGREGATES	RESULT	REQUIREMENT AS PER IS 2386
1.	Fineness Modulus	2.30	2.3-2.7
2.	Specific gravity	2.62	2.2-2.6
3.	Water absorption	1%	< 3%

Table 4 : Tests results of Coarse aggregates

SL.NO	TESTS ON COARSE AGGREGATES	RESULT	REQUIREMENT AS PER IS 2386
1.	Fineness Modulus	4.32	3.4-6.0
2.	Specific gravity	2.57	2.4-2.9
3.	Water absorption	0.3	< 0.6

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IV. MIX PROPORTIONS

The concrete mix design of M30 grade concrete by using IS 10262-2009 with water cement ratio of 0.45.

Table 5 : Mix Proportions

PAPER SLUDGE ASH %	W/C RATIO	CEMENT kg/m3	WSPA kg/m3	FINE AGGRGATE kg/m3	CORSE AGGREGATE kg/m3	WATER kg/m3
0%	0.45	3.28	0	3.1.1	3.1.2	3.1.3
5%	0.45	3.16	0.164	3.1.4	3.1.5	3.1.6
10%	0.45	2.95	0.328	3.1.7	3.1.8	3.1.9
15%	0.45	2.78	0.492	3.1.10	3.1.11	3.1.12
20%	0.45	1.96	0.656	3.1.13	3.1.14	3.1.15

Table 6: Tests Results Of Workability Tests

PAPER SLUDGE ASH %	SLUMP VALUE (MM)	COMPACTION VALUE (MM)
0%	25	0.95
5%	24	0.82
10%	22	0.85
15%	16	0.92
20%	14	0.80

Table 7: Compressive test results(N/mm²):

MIX DESIGNATION	**PERCENTAGE OF WASTE PAPER SLUDGE ASH**	**7 DAYS**	**14 DAYS**	**28 DAYS**
M0	0	16.17	21.77	27.55
M1	5	21.25	28.02	32.66
M2	10	19.68	25.82	28.53
M3	15	15.20	20.24	22.37
M4	20	13.77	17.64	18.73

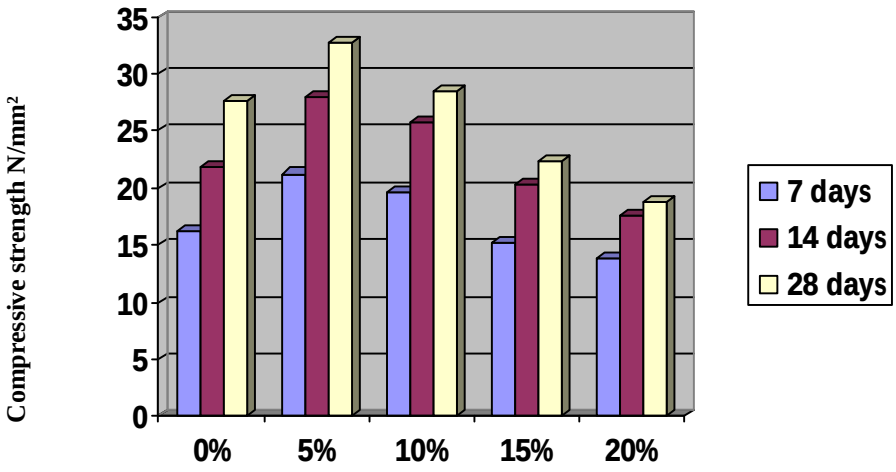
M1,M2.., M4 = Mix trail 0,Mix1,Mix2..,

Table 8 : Split tensile test results(N/mm²):

MIX DESIGNATION	PERCENTAGE OF WASTE PAPER SLUDGE ASH	7 DAYS	14 DAYS	28 DAYS
M0	0	1.980	2.152	2.252
M1	5	2.205	2.436	2.796
M2	10	1.872	2.312	2.510
M3	15	1.716	2.102	2.224
M4	20	1.695	1.987	2.125

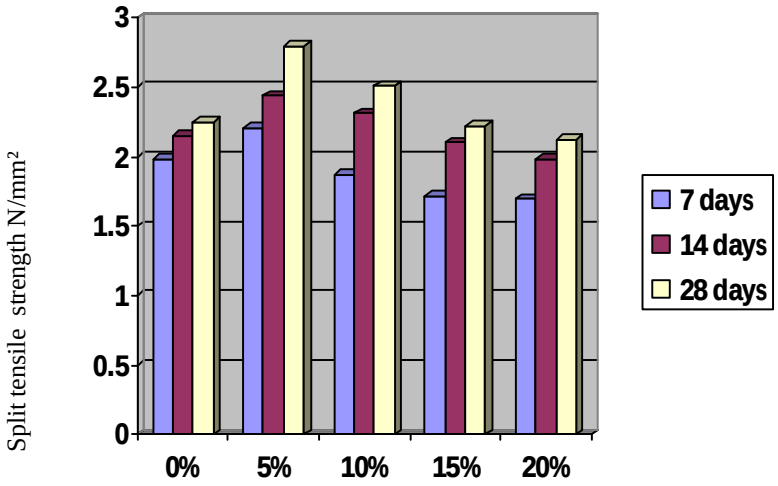
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V. RESULTS AND DISCUSSIONS



Waste paper sludge ash (%)

Fig 5: Graphical representation of compressive strength test results



Waste paper sludge ash (%)

Fig 6: Graphical representation of split tensile strength test results

Mechanical behaviour of concrete cubes prepared without chemical admixtures was studied by compressive tests (Grade M30 and curing time of 7,14 and 28 days. It can be noticed that 5% replacement of cement with waste paper sludge ash in mild condition, are showing increase in compressive strength.

Mechanical behaviour of cylindrical specimens prepared without chemical admixtures was studied by tensile strength test. (Grade M30),curing times of 7,14 and 28 days and the results obtained are reported. It is noticed that 5% replacement of cement with WPSA are showing increase in tensile strength

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VI. CONCLUSION

From the results obtained , the following conclusions are taken as:

A. The increase in the compressive strength of the concrete with 5% replacement of cement with waste paper sludge ash than 10% replacement with waste paper sludge ash was found to be given a better strength.

B. The compressive strength and split tensile strength of concrete for M30 grade concrete was found to be useful and given better strength .

C. The increase of cement usage increases pollution ,to reduce it & also to reduce cost like for various reasons,searched for alternative material as waste paper sludge ash qualifies itself as a suitable substitute for cement at very low cost.

D. Waste paper sludge ash is a free chemical impurities such as chlorides and sulphates which improves the property of concrete like strength anddurability.

E. Effective utilization of waste paper sludge ash in concrete can save the waste of paper mills and also produces a ‘’greener’’ concrete.

F. In the study compressive strength of specimens is increased with replacement of waste paper sludge ash with cement and compared to conventional concrete and up to 5% replacement it gives better stregth , and there is a sudden decrease in strength for 10% replacement of waste paper sludge ash.

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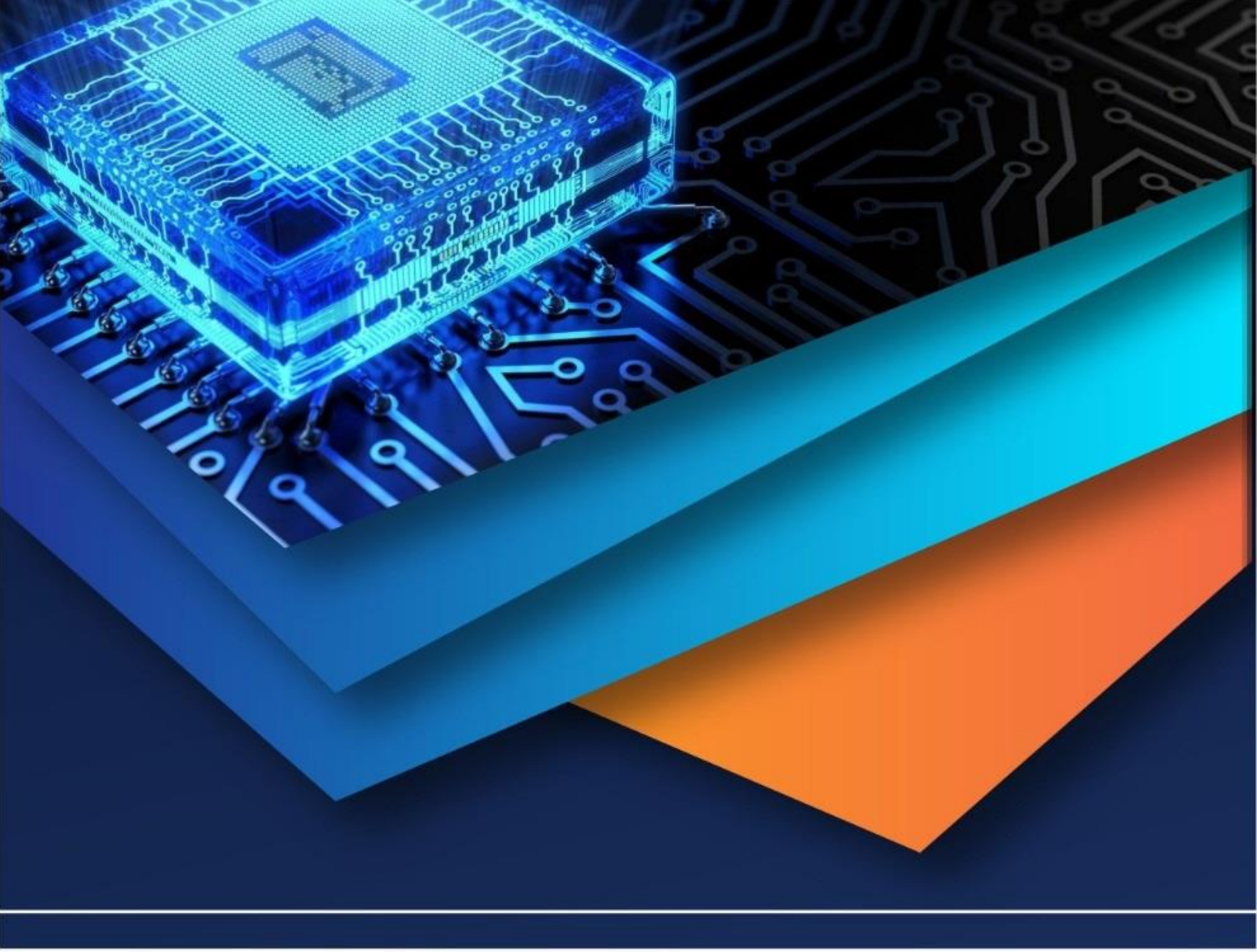
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