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USE OF SAWDUST IN CONCRETE

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Abstract - *The construction industry is one of the main sectors in India, and the need for building materials such as cement, sand, natural stones, bricks, steel, has increased over the last two decades. In the future years, the demand for building materials will expand as the overall value of planned projects in India rises. 16 percent of the nation's working population is supported by the construction industry. The purpose of this research is to observe and examine the compatibility of sawdust, as waste material, in concrete block using various tests, and to determine the optimal mix for concrete block based on the compressive strength of concrete cubes. We trying to find out sawdust can be used for modified concrete mix or exceeded all of the strength requirements. To identify max value of replace sand with sawdust for 30%, and any quantity in excess would damage the quality of M20 grade concrete. To find the value compressive strength to replace out and decrease the amount of sand in concrete.*

Key Words*: *Concrete blocks, sawdust, strength, construction material, light-weight, Building construction.

1.INTRODUCTION

The building industry is one of the largest industries in India and there is a growing demand for building materials in the last two decades, such as cement, sand, construction material etc. The demand for the construction material is going to increase in coming years as the total value of projects planned in India is Around 16 per cent of the nation's working population depends on construction for its employment. This expected overall growth is seen as a clear indication of a prospering market for construction materials. To meet this demand, building material suppliers have exploited natural resources. This has led government agencies to enforce stringent laws in maintaining natural resources for a livable future Further, this has motivated many researchers to adopt a concept of recycling waste materials into an inventive building material to meet the large demand of construction materials. Bricks have been a major construction and building material for a years.

Conventional bricks are produced from clay with high temperature kiln firing or from ordinary Portland cement concrete. Mining operations for obtaining the clay are energy intensive, adversely affect the landscape, and generate high level of wastes.

1.1 SAWDUST CONCRETE

The concrete is made by addition of sawdust is called as sawdust concrete. In this type of concrete, the Dry Sawdust is used to replace the fine aggregate and Sawdust Ash can be used to replace small quantity of the cement. Along with that wood chips can be used to replace coarse aggregates.

1.2 BENEFITS OF SAWDUST CONCRETE

- Sawdust concrete is made of ecologically pure stuff.
- Sawdust Concrete controls interior humidity level.
- Sawdust Concrete is frost proof.
- Sawdust Concrete is favorable thermal and soundproofing characteristics.
- Sawdust Concrete is light weight.
- It is economical alternative to conventional building concrete method and material.
- Due to material's inert nature towards cement and other aggregates, it does not react with any ingredients of concrete and steel.
- At the end of its original service life, concrete can be crushed and reused as aggregate for new concrete continuing the cycle of environmental benefits.

2. METHODOLOGY

The material identification was done for the modification of sawdust. The Sawdust was the selected material. After that the material was collected from various sawmills and furniture shops in pune. The material quality was checked with the help of sieve shaking and the material retained on 4.75 mm and passing through 425 micron was discarded. The mix design calculation for M20 grade concrete was done and the sand proportion of that was replaced 10%, 20%, 30% by weight with sawdust. The slump cone test helped in deciding the water cement ratio of the sawdust modified concrete. After that cube were casted and cured for 28 days.

One set of cubes were tested on 7th day and remaining cubes were tested on 28th day. The results were observed and recorded in results section of the paper.

2.1 MATERIAL AND MIX PROPORTIONS

Materials that were used in this study were; ordinary Portland cement, Sand, Coarse aggregate, sawdust (generated from the mechanical processing of various raw woods in the saw mill industries), It was sieved and the material passing through 4.75 mm and retaining on 425 microns used without any pre-treatment. Concrete used for this study was prepared using mix ratio of 1:1.5:3 (C:S: A) and a water to cement ratio of 0.54; while batching of the materials was done by combination of volume and weight batching due to the remarkable differences in the specific gravities of cement, sand and sawdust. The homogenized mixture was then introduced into 150 mm ×150 mm × 150 mm metal molds; the concrete de-molded after 24hour and cured, the compressive strength test was performed after 7 days and 28 days.

2.2 PROCESS

- The quantities estimation of regular mix design of M20 grade concrete was used to create Blank cubes for M20 grade concrete. Further the sand portion was weighed and percentagewise replacements were done in the respective mix designs.
- The size of Sawdust and the sand which it was replacing was in the same range.
- Throughout the experiment, same material was used for cube casting. To avoid errors occurring due to varying material property and quality.
- The quantity of sawdust used to replace the sand, was calculated based on the removal by percentage weight. The quantity of sand removed will be satisfied by the addition of same weight of sawdust. The percentage of sawdust replaced are taken as 10%, 20% and 30%.

2.3 TEST CONDUCTED FOR MIX DESIGN

Trial for mix design was done by weight using mix ratio of 1:1.5:3 and water cement ratio of 0.54% for the concrete production.

Table -1: Trial mix design

M20 Grade Concrete Volume =0.054 Cu.m (W/C Ratio = 0.54)	**10% modification with saw dust**	**20% modification with saw dust**	**30% modification with saw dust**
Dry Ratio	1.54	1.54	1.54
Sand (Kg)	8.16	7.25	6.35
Saw Dust (Kg)	0.907	1.814	2.7216
Aggregate (Kg)	1512	1512	1512
Water (Kg)	4.35	4.35	4.35

The Volume of concrete that was created for one set of the cube mould filling was 0.0135 Cu.m.

2.4 TEST METHODS

Test that was carried out in this research and the respective standards used were:

- Particle size distribution
- Slum cone test
- Compressive Strength
- Ball Test
- Soundness Test

2.5 MATERIAL TESTING

Particle size distribution (Total sample weight = 300 grams). It was sieved and the material passing through 4.75 mm and retaining on 425 microns used without any pre-treatment.

3. RESULT AND DISCUSSION

CONCRETE TESTING

Slump cone Test
(10 % modification of sawdust with sand)

Sr. no	Water/ Cement Ratio	Slump value
1	0.2	No Slump
2	0.4	No Slump
3	0.5	True Slump
4	0.6	True Slump
5	0.7	Shear Slump

(20% modification of sawdust with sand)

Sr. no	Water/ Cement Ratio	Slump value
1	0.2	No Slump
2	0.4	No Slump
3	0.5	True Slump
4	0.6	True Slump
5	0.7	Shear Slump

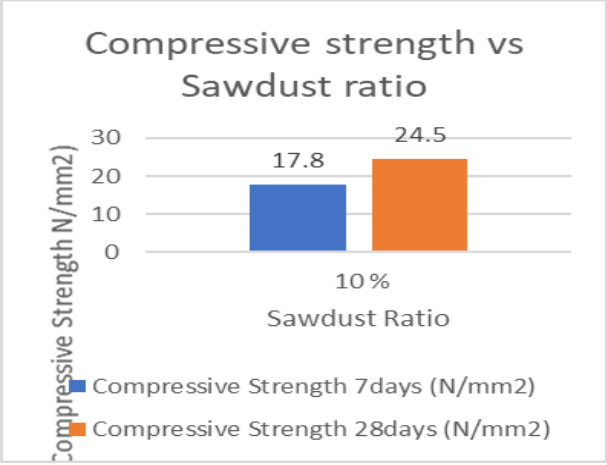
(30% modification of sawdust with sand)

Sr. no	Water/ Cement Ratio	Slump value
1	0.2	No Slump
2	0.4	No Slump
3	0.5	True Slump
4	0.6	Shear Slump
5	0.7	Collapse

COMPRESSIVE TESTING

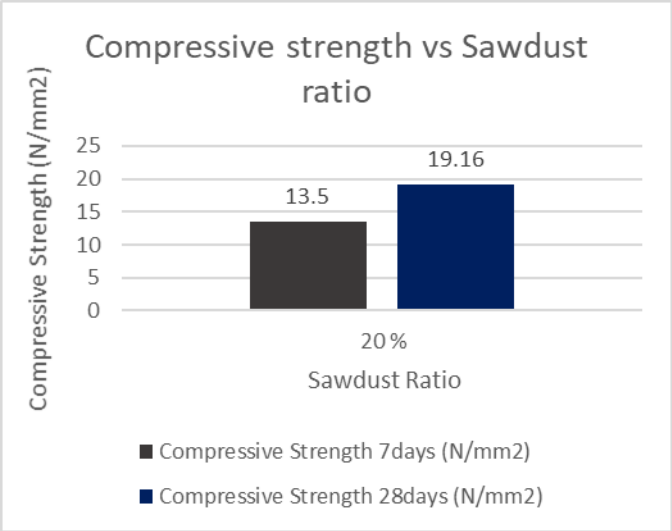
Compression testing of modification of concrete with sawdust 10% (Curing days = 07&28)

Sawdust Ratio (%)	Compressive strength 7days N/mm²	Compressive strength 28days N/mm²
10	17.8	24.5



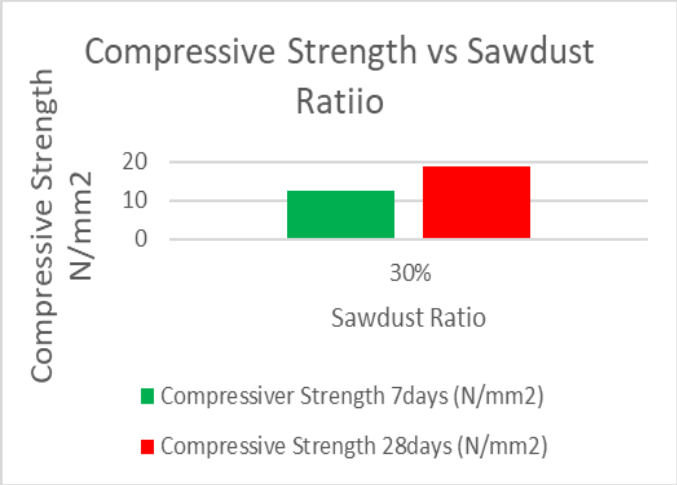
Compression testing of modification of concrete with sawdust 20% (Curing days = 07&28)

Sawdust Ratio (%)	Compressive strength 7days N/mm²	Compressive strength 28days N/mm²
20	13.5	19.16



Compression testing of modification of concrete with sawdust 30% (Curing days = 07&28)

Sawdust Ratio (%)	Compressive strength 7days N/mm²	Compressive strength 28days N/mm²
30	12.6	18.7

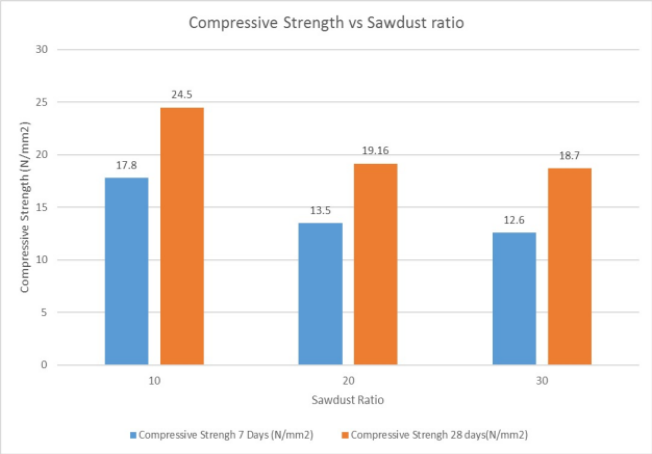


Compression testing of modification of concrete with sawdust 10%, 20% & 30% (Curing days = 07)

Sr. no	Sawdust Ratio	Compressive strength N/mm^2
1.	10	17.8
2.	20	13.5
3.	30	12.6

Compression testing of modification of concrete with sawdust 10%, 20% & 30% (Curing days = 28)

Sr. no	Sawdust Ratio	Compressive Strength (N/mm2)
1.	10	24.5
2.	20	19.16
3.	30	18.7



4. APPLICATION OF SAWDUST

1. Sawdust was used partially replacement for sand in concrete production.
2. Sawdust concrete mix for residential building structural member such as column, beam, slab and foundation and plastering are also elicited.
3. A major use of sawdust is for particleboard.
4. Sawdust is used in the manufacture of charcoal briquettes. (Henry ford)
5. Sawdust has been used for cultivation of greenhouse vegetables and strawberries in bag.
6. Spreading sawdust around the base of your garden plants can prevent weeds, help retain moisture and keep roots cooler.

5. CONCLUSION

The sawdust modified concrete was observed to be performing excellent in terms of the strength criteria. The observed maximum value to replace sand by sawdust was observed to be 30% any excess amount will degrade the quality of M20 grade concrete. The sawdust a waste material was observed to be a suitable material to replace and reduce the usage of sand in the concrete.

6. REFERENCE

- K. Ambiga and P. Meenakshi (2015), "Studies on Strength of concrete by Partial Replacement of sand with Sawdust", International Journal of Advanced Engineering Research and Studies.
- Sourabh G. Sable and S.B. Walke (2015), "Experimental Investigation on Properties of Concrete for Partial replacement of Brick Ballast Aggregate", International Journal of Emerging Technology and advanced Engineering.
- P. Sri Chandana and Shaik Ahamad Myauddin (2015), "Experimental study on strength of concrete by partial replacement of Fine aggregate with Sawdust and Robosand", International Journal and Magazine of Engineering, Technology, Management and Research.
- K. Gopinath, K. Anuradha, R. Harisundar and M. Saravanan (2015), "Utilization of Sawdust in Cement Mortar and Cement Concrete", International Journal of Scientific Research, Volume 6, Issue 8, August 2015.

- Mahmud Abubakar and Abayomi Afolayan (2013), "Partial replacement of Sand with Sawdust in Concrete Production", Conference Paper, May 2013.
- Prof. R. Sathish Kumar (2012), "Experimental study on the properties of concrete made with alternate construction materials", International Journal of Modern Engineering Research, Vol. 2, Issue 5, Sept-Oct. 2012.
- M. Mageswari and B. Vidivelli (2009), "The use of sawdust ash as fine aggregate replacement in Concrete", Journal of Environmental Research and Development, Vol.3, No. 3, January-March 2009.
- S. Acharya, U. Neupane, and S. Adhikari, "Strength Optimization of Sawdust Concrete through Cement Variation Strength Optimization of Sawdust Concrete through Cement Variation," Proceedings Of 8th Graduate Conference, vol. 8, pp. 730–736, 2021.