

WOODCRETE BY SAWDUST AND WASTE PAPER

Sagar S. Sangale,¹ Junaid J. Shaikh², Taimoor Z. Shaikh³

¹ BE Scholar, Department of Civil Engineering. GCOERC, Nashik

² BE Scholar, Department of Civil Engineering. GCOERC, Nashik

³ BE Scholar, Department of Civil Engineering. GCOERC, Nashik

ssangale299@gmail.com

junaidjshaikh3@gmail.com

taimoor.shaikh100000@gmail.com

Abstract- This paper has a look at how to expand a new construction material, woodcrete, the usage of sawdust, waste paper and lime. The report gives the processing technology, factors which have an effect on the overall performance of the advanced composites, and houses of woodcrete. The results showed that light-weight sustainable blocks can be produced with exact insulating and different relevant resistances for construction with density ranging from 592 to 711.1 kg/m³ and compressive strength from 0.30 to 0.91 MPa. The resistances have been intentionally related to the composition of woodcrete with an addition of waste paper being a dominant factor. It has an effect on both power and thermal conductivity, reflecting its impact on the structure of composite and contribution of self power of paper fibres. The combined effect of sawdust and waste paper and lime had a right away impact on the electricity properties of woodcrete. Of widespread importance becomes the contribution of self energy of woodcrete due to the effect on the size of sawdust debris used. The developed woodcrete becomes in a position to face up to a giant quantity of effect load and taken into consideration, like hempcrete, most appropriate for wall panelling or other non- and semi-structural packages with desirable thermal insulating properties.

Index Term -Waste Paper, Sawdust, Lime, Woodcrete, Compressive strength

1. INTRODUCTION

Woodcrete is a new material made from sawdust or different wood wastes, waste paper and lime with attention for cheaper and locally available substances to meet favored needs, beautify self-efficiency, and lead to an usual reduction in production price for sustainable improvement. Wooden waste, a prime constituent of woodcrete, may additionally be sawdust from the sawing of timber or any other timber wastes. On the grounds that timber is utilized in big quantities in many different sectors and is a part of our normal lives, the volumes of sawdust and other recovered wood available are additionally big. Sawdust could be loose particles or wooden chippings received as by-products from sawing of timber into well-known useable sizes. Debris of wooden waste held collectively with an inorganic matrix, like lime and cement, form a composite that can be used for distinctive packages in the production industry. There

are a wide variety of merits supplied by means of wooden and inorganic binders over some traditional constructing substances presently used today.

These composites combine the properties of both the wooden fibre and matrix which makes them more precious to the building industry. A number of proposed benefits of evolved wood crete over different conventional wooden composite substances include higher insulation houses, resistance to water absorption, fireplace performance, and energy houses. Woodcrete is produced with a binder lime which is understood for its elasticity, sturdiness (lengthy lasting first-rate mortars), workability, vapour permeability, wholesome cloth (natural and solvent-loose) when compared to the use of cement. Woodcrete is made using mixed sawdust and addition of waste paper. It presents the factors which affect the overall performance of woodcrete and its properties in relation to sawdust and waste paper. Via using waste paper, woodcrete is not best decreasing the quantity of aggregate and binder however additionally making environmentally friendly constructing materials

1.2 Objective

- To make use of eco friendly materials for creation.
- To reduce the use of traditional creation substances which can be accountable for pollutants.
- To use the by-merchandise of industry in construction.
- To make use of low-budget as well as durable material

1.3 Scope of the project:

This research objectives to expand new constructing substances “woodcrete” and do not forget of a newly advanced building fabric to be used within the construction industry for housing shipping and energy development compared to different current materials like hempcrete. The scope of this observe is constrained to using waste substances handiest for improvement of woodcrete cloth for housing delivery. The primary purpose for proscribing the scope of this look at to apply of waste materials include the reality that for low priced housing to be completed, attention made to any fabric used for housing delivery desires to be cost powerful and without difficulty to be had. In addition, restricting the scope to low income earners is due to the fact that housing troubles throughout the globe is normally extra extreme and profound on low income earner than excessive profits earner. Foremost housing problem is targeted on developing international locations because of higher levels of population density, higher population growth rates, high levels of migration, higher costs and value of property and land, and higher levels of income and employment disparity which consequently leads to overcrowding, high rents, slums and squatter settlements. Also, issues of housing affordability are of great significance in developing countries than the developed countries

II. LITERATURE REVIEW

Mrs Oriyomi M. Okeyinka, Dr David A. Oloke and Prof. Khatib Jamal - "Development of Environmentally Friendly Light-weight Block from Waste Paper." (May 2015) :the excessive intake of herbal resources, along with sand, gravel, clay and wood attributed to the constructing creation enterprise, coupled with the need for low-priced housing and environmentally sustainable constructing substances has caused studies on the opportunities of manufacturing alternative building substances from wastes. It changed into determined that at the proper aggregate of waste paper, sand and waste additive (binder), the trial specimen displayed an average compressive energy ranging from a highest of 2.07mpa to a lowest of 1.3mpa, this power satisfies the minimum standard energy requirement for non-load bearing masonry block

Ruhul Pervez Memon, Lemar Achekzai, Abdul Rahman Mohd. Sam, A. S. M. Abdul Awal, Uroosa Memon- "Performance Of Sawdust Concrete At Elevated Temperature" (2018)

The consequences received, and the observations made in this have a look at conclude that sawdust concrete have low workability having stooop within the range 30mm–40mm. Density of sawdust concrete is less compared to regular concrete. The various three-blend ratio, the 1:1 ratio carried out the satisfactory result in phrases of power gain. The sawdust concrete with 1:1 mix proportion exhibited nice overall performance in terms of fire resistance, the greater the sawdust content material lower turned into the fireplace resistance. So, it's far regarded as light weight concrete with a excellent electricity and extended temperature performance. Significance final results of observe is that sawdust material may be used in the creation industry material.

F.C. Jorge · C. Pereira · J. M. F. Ferreira -"Wood-cement composites: a review" (2004)

Wood-cement composites, that are of low price, have been regarded as an critical make contributions to mitigate the housing trouble in developing international locations . Making wood-cement composites can be a feasible way of recycling wooden residues, like waste from construction demolitions or preserved wood out of carrier, or nonwood residues from agriculture or food processing 375 operations. However, this form of composites also provide the opportunity of recycling fly ash, as a partial alternative for cement.

Adebayo Olatunbosun Sojobi - "Evaluation of the performance of eco-friendly lightweight interlocking concrete paving units incorporating sawdust wastes and laterite". (2016)

This research investigates the performance of sawdust wastes and laterite as an alternative lightweight fine aggregate and cementitious material respectively in eco-friendly lightweight interlocking concrete paving units (ICPU) using a mix ratio of 1:2:4. The lightweight sawdust and laterite were studied due to their abundant availability as industrial waste and cheap local construction material.

Ruhal Pervez Memon, Abdul Rahman Mohd. Sam, A. S. M. Abdul Awal, Lemar Achekzai - "Mechanical And Thermal Properties Of Sawdust Concrete " (2017)

The thermal and mechanical properties of sawdust concrete had been investigated primarily based on a hard and fast of experiments. Based on this observe the following conclusions can be drawn: 1. Sawdust concrete have low workability having hunch within the variety of 30 to forty mm 2. Density of sawdust concrete is less as compared to regular concrete hence it is able to be seemed as mild weight concrete. Three. Most of the three mix ratios, the 1:1 ratio executed the exceptional result in phrases of power gain. 4. Notwithstanding decrease energy benefit, the concrete with 1:3 blend percentage exhibited the first-rate overall performance in terms of heat transfer; the extra the sawdust content material the lower became the warmth switch. Importance final results of look at is that sawdust material may be used in the construction enterprise as ecofriendly fabric to environment.

Olugbenga Joseph Oyedepo , Seun Daniel Oluwajana , Sunmbo Peter Akande "Investigation of Properties of Concrete Using Sawdust as Partial Replacement for Sand" (2014)

Concrete produced using sawdust as partial alternative of sand has influence at the houses of the concrete. The result of the evaluation accomplished indicates that the workability of concrete with partial alternative of sand with sawdust reduces at regular water-cement ratio; even as using sawdust in concrete at high percent of sawdust alternative of sand affected the electricity of the concrete as there was a decrease within the electricity fee, and the density requirement of 1480 to 1840 kg/m³ turned into not meet.

III. METHODOLOGY

3.1 Procedure of casting Woodcrete cubes

- The substances which might be ecofriendly and economical had been selected
- The substances had been sorted in keeping with the amount which is going in making a unmarried batch of woodcrete. Lime > sawdust > wastepaper lime changed into termed as binder cloth
- In the course of fabrication, 3 exclusive ratios (1:1 , 1:2 , 1:3) of sawdust to binder where used to check the correlation of sawdust and binder

- Later 20% and 30% (of general weight) cement became introduced to a unique batch of 1:three (sawdust to lime) ratio making the percentage 1:3:zero. 9 and 1:three:1. Four (sawdust : lime : cement)
- Blending of numerous substances became done by way of first mixing waste paper with water earlier than the addition of all other substances to allow the paper to be nicely wetted
- After mixing of all substances, mild compaction turned into carried out within the forming mildew because of mild weight of sawdust. Samples have been left to set for twenty-four hours ,then demoulded and were allowed to dry at room temperature for 7 days
- Blocks were tested for workability ,fire resistance and compressive strength



Fig.No.1 Casting of blocks and setting



Fig.No 2 Curing in open air

3.2 Material Used In Woodcrete Cube

Materials for Ferrocent:

- Sawdust
- Lime
- Waste Paper
- Cement

3.3 Types of Testing on Woodcrete

Density, Compressive Strength, Slump flow, Fire resistance

IV. RESULTS

4.1 Compressive Strength and Density

Table no. 1: Mix Proportion, Density and Compression Test Result

Samples	Sawdust-Lime-Cement Ratio	Waste Paper (%)Of Saw Dust	Density (Kg/m ³)	Compressive Strength (N/mm ²)
1	1:1:0	50	592.6	0.33
2	1:1:0	75	622.2	0.36
3	1:2:0	50	651.8	0.45
4	1:2:0	75	666.7	0.5
5	1:3:0	50	681.5	0.57
6	1:3:0	75	711.1	0.61
7	1:3:0.9	50	595.5	0.8
8	1:3:0.9	75	648.8	0.85
9	1:3:1.4	50	634.0	0.88
10	1:3:1.4	75	651.8	0.91

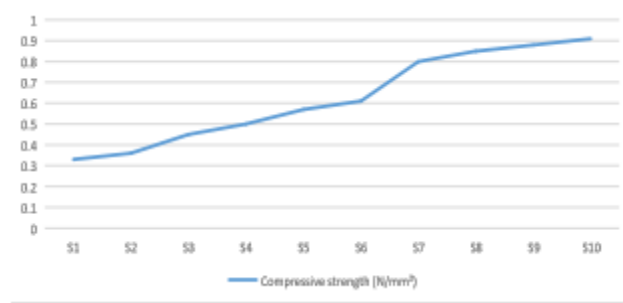


Fig.No 3 Compressive Strength of samples (N/mm²)

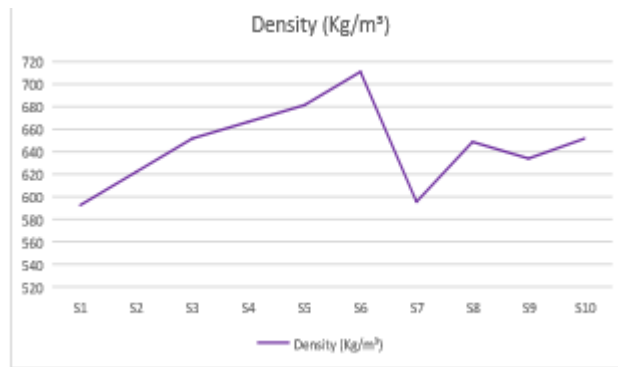


Fig.No 4 Density of samples (Kg/m³)

4.1.1 Compressive Strength

The increment electricity with age could be because of continuity of hydration procedure. This shows that compressive electricity is decreased with the addition of extra sawdust at the sooner age however it'll be multiplied on a later age of woodcrete. A 150 mm x 150mm x150 mm cubes had been organized using 1:1, 1:2 and 1:three sawdust to lime ratio with water/sawdust ratio of one. 00. The most average compressive power of 0. 91 mpa turned into recorded for 1:3:1. 4 sawdust to lime to cement ratio sample at 7 days.



Fig No 5 : Compression Testing

4.1.2 Density

It is found that the density of woodcrete blocks became closely related to the composition of sawdust, waste paper, lime and cement (table 1). Ordinary the density of woodcrete decreases with the growth of the sawdust introduced. For s-series of woodcrete, an increase in waste paper from 50 to seventy five% weight of sawdust resulted in a constant boom within the density of woodcrete. Woodcrete composites made from sawdust wastepaper lime and cement shows a reduction from 711. 1 to 595. 5 kg/m³ whilst cement changed into added as 0. 9 weight of sawdust.

4.2 Slump Cone Test

Table no. 2: Slump Cone Test Result

Sample No.	Sawdust-Lime-cement Ratio	Slump Flow Value (mm)
1	1:1:0	46
2	1:1:0	43
3	1:2:0	42
4	1:2:0	40.5
5	1:3:0	36
6	1:3:0	33
7	1:3:0.9	40.5
8	1:3:0.9	39
9	1:3:1.4	39.5
10	1:3:1.4	37

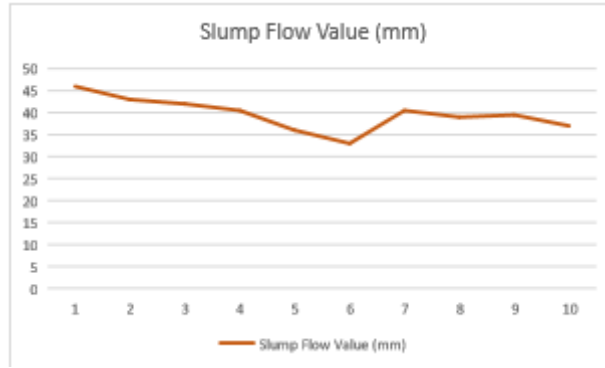


Fig No 6 Slump Flow Value of Samples (mm)

From the results, all the slumps of fresh Woodcrete were within the limit range between 30 – 50 mm. It can be seen that addition of sawdust tends to decrease the slump value. Thus, the result reveals that sawdust decreased the workability. Workability is reduced due to addition of lightweight aggregate that is sawdust.

4.3 Fires Resistance Test

The test was conducted on the Woodcrete specimen a of (150mmx150mmx150mm) cube after 7th days of curing, electric oven is used for keeping the samples, where temperature increase at the rate of 10 °c/min in order to achieve desire temperature

4.3.1 Influence of Temperature on Woodcrete Weight

It could be found that loss in weight boom because the temperature growth of check samples. In the preliminary place i. E., the loss in weight of woodcrete samples is less as much as 2 hundred°C. The loss determined in this location is due to moisture movement from woodcrete surface to the encircling environment. Change in harden houses of sawdust is due to reveal of pattern in excessive elevated temperature. Due to excessive absorption of water with the aid of sawdust particles and paper it causes more loss in weight.

V.CONCLUSION

This look at changed into broaden a new building fabric, woodcrete, the usage of sawdust, waste paper and lime. The document offers the processing technology, elements which affect the overall performance of the developed composites, and residences of woodcrete. The results confirmed that light-weight sustainable blocks may be produced with accurate insulating and other relevant properties for constructing production with density ranging from 592 to 711. 1 kg/m³ and compressive strength from zero. 30 to 0. Ninety one mpa. The residences have been carefully associated with the composition of woodcrete with an addition of waste paper being a dominant impact on each power and thermal conductivity, reflecting its impact at the shape of composite and contribution of self power of paper fibres. Thinking about the suited compressive strength displayed via the testedSpecimen, it's far a clean indication that through the use of suitable mix percentage of the constituent cloth concerned on this experimentation, an environmentally friendly, non load bearing,

lightweight block with acceptable strength homes may be produced with using much less natural assets. The behavior of sawdust concrete turned into investigated primarily based on a set of experiments with diverse lime to sawdust ratios, by volume was made. The results acquired, and the observations made in this observe finish that sawdust concrete have low workability having slump within the range 30mm–50mm. Density of woodcrete is much less as compared to ordinary concrete

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