EFFECTIVE DESIGN AND PRODUCTION OF WOOD SAWDUST CEILING BOARD USED FOR UNDER ROOF COVERING

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ABSTRACT

The use of wood sawdust manually to replace Asbestos ceiling board which is used as an overhead interior part in a room has in no small measure contributed to the actualization of industrialization in the construction industry. Moreover, the use of locally occurring waste materials, like wood sawdust, sharp sand and water was studied in this work and also, the procedures for the production of ceiling board using wood sawdust were analyzed with the necessary laboratory procedures in accordance to Standard Organization of Nigeria (SON) and British Standard (BS). A sieve analysis was carried out to assess the particle size distribution. 500g of sample was weighed which was found to be pulverised enough to pass through a stalk of sieves. The sample was run through a stalk of sieve from the top. A stalk of sieve was then shaken by hand for 10 minutes before removing the sieves one after the other, and the weight of the material retained on each sieve obtained respectively by weighing. The weight obtained was then summed up and compared with the original weight of sample so as to detect any loss of original sample during sieving operation. The percentage error was determined using simple percentage.

Keywords: Wood, Sawdust, Production, Design, Ceiling Board.

INTRODUCTION

Recent research efforts are focused on how to use the wastes generated from paper and wood by-product for ceiling board production. These wastes have been a major source of solid waste problem in Nigerian, e.g news prints, where only a small percentage is kept in the archives as reference materials, excluding the discarded portion (from source and public) which builds up as waste paper and on the other hand, wood sawdust, a by-product from woodworking operations which is difficult to dispose.

The production of wood sawdust ceiling board from waste materials was carried out basically using waste paper and saw dust materials, which were sourced locally and found safe as every good fibre (Oladele et al., 2011).

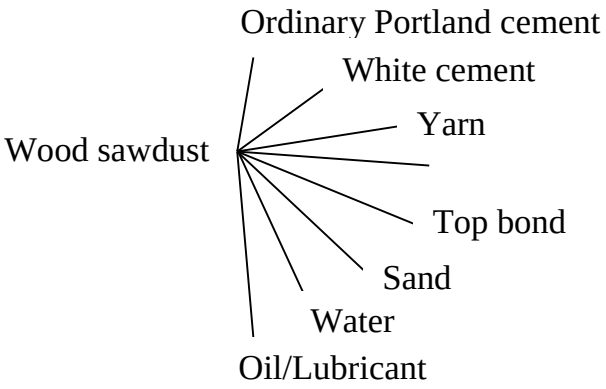
Sawdust/Wooddust: Is a by-product or waste product of wood-working operations such as sawing, sanding, milling, planning and routing. It is composed of small crushed of wood/timber (cite it from Wikipedia)

i. **Ceiling board:** This can be defined as a panel of sheets covering the upper layer of an internal section of a building which improves its aesthetics and reduces sound and heat transmission into the house.

Ceiling board also can be said to be a horizontal slab covering the upper section of a room or internal space.

Therefore, wood sawdust ceiling board is a by-product of wood/timber waste combined/together with portland cement, white cement, top bond, share sand, yarn and water for the production of an over-head interior part in a room either for aesthetic purposes or to reduce sound transmission.

ii. Component of wood sawdust ceiling board Engineering infrastructure, design, productions are sent to be a combination of materials that supports in research and fabrication work.



(a) Cement:

Ordinary Portland Cement (OPC) (15:269) NIS 4441-1:2003 CEM 11/B – L32.5R

According to Neville, (1996), cement is generally described as a material with adhesive and Cohesive properties that when mixed with water, a chemical reaction (hydration) takes place which in time produces a very hard and stirring binding medium for the aggregate particles.

(b) Sharp Sand (Fine Aggregate):

This is defined by American Association of state Highway and Transportation – officials (AA STHO M 147) as natural or crushed sand passing the No 4 sieve (4.75).

(c) **Water**:

The quality of the water used in mixing must be such that the chemical reactions which take place during the setting of the cement are not impaired. In generally, portable water is suitable for wood sawdust ceiling board.

Thus, the water should be free from impurities such as suspended solid organic matters and salt which may

affect the setting of the cement (Oyenuga, 2008).

(d) **Yarn**: Yarn is a threa d composed of fibre, filaments. Individual Fibre of extreme length), or other materials, either natural or synthetic, suitable for use in the or knitted types; (Dewit, 1989).

Use of Cement: It serves as a binder.
Use of water: It serves as a solvent.

Uses yarn
It is used from cotton
It is used as silk
It is used in wild sand dust production
It is used for Jute Flax

(e) Top Bond

Bond is an adhesive that can be used for many purposes such as wall screening, binding of books, furniture Industry etc. It is commonly referred to as top bond which is a brand name, just the way many call all detergents Omo. (Callista, 2001).

USES OF TOP BOND

1. It serves as a green printer adhesive.
2. It is used to stick the ceiling component during production.

Lubricating Oil/Lubricant

Lubricating oil is a by-product of refined crude oil after undergoing a purifying process called sedimentation. Lubricant is a substance for example, oil that you put on a surface or part of a machine to aid easy and smooth movement. (Hornby, 2006). It can also serve the purpose of preventing rust.

Uses of Lubricant

Lubricant serves as a membrane/separator between the moulded wood sawdust ceiling board and the formwork or mould used during production.

MATERIALS AND METHOD OF PRODUCTION

A 10 litre of portable water was poured into a head pan and about 676g of white cement, 406g of Portland cement and 693g of wood sawdust was mixed thoroughly with 200g of top bond was also added to the mixture to strengthen the mix.

Lubricant (oil) was robbed on the surface of glass or a base thickness of 6mm before pouring the mixture to enable easy removal of the sample/wood sawdust ceiling board after setting.

A little quantity was the mixture was poured to cover the surface of the entire Mould the yarns was immediately spread on top of the mixture. After spreading the yarn, another quantity of the mixture was poured on top of the yarn and levelled to get a smooth surface of the board and after about 10 minutes the samples was removed from the mold glass with the help of knife which served as the Extruder.

Test Result

TABLE 1.0 Sieve Analysis of Fine Aggregate (River Sand) in Accordance with BS 812: Part 103: 1985.

Sieve Number	Sieve Size	WTRTD	%WTRTD	%WT Passing
4	4.750	0	-	100
10	2.00	0	-	100
20	0.850	18.6	16.32	25.36
40	0.425	291.6	58.32	2.88
60	0.212	112.4	22.48	0.54
100	0.150	11.7	2.34	0.42
200	0.075	0.7	0.14	0.30
Ram	-	0.5	0.10	
Total		**498.5**		

Error = 500 – 498.5 = 1.5g

$$\text{Error \%} = \frac{1.5}{500} \times \frac{100}{1} = 0.3\ \%$$

… (Nkama, 2015)

TABLE 1.1: Determination of particle density and water absorption of River Sand (AASHTO T84 & T85)

Mass	Condition of Aggregate	Test No 1	Test No 2	Average
A	Mass of saturated surface dry sample in air (g)	500.0	500.0	500.0
B	Vessel containing sample and filled with water (g)	134.3.4	1343.7	1343.6
C	Mass of vessel filled with water only (g)	1033.7	1033.7	1033.7
D	Mass of the oven dry sample in air (g) Particle, density oven-dry basis: D/(A-(B-C)) mg/m3	2.627	2.632	2.630
	Particle density apparent: D/(D-/B-C) mg/m3	2.643	2.644	2.644
	Water absorption 100 × (A-D)/D%	0.361	0.280	0.321

(Nkama, 2017).

Table 1.2: Determination of Clay, Silt and Fine Content of Sharp and

Determination of Clay, Silt and Fines	
Weight of materials	320
Vol. of fines after 1 hour	1.5
Content of Fines	
1.5 $\frac{0.6 \times 100}{320}$	0.28%
N/B 0.6 is a constant	Light yellow

N/B 0.6 is a constant.

Determination of Clay, Silt and Fines	
Weight of Materials	89
Vol. of fines after 1 hour	2.5
Content of fines 2.5 $\frac{0.6 \times 100}{89}$	1.68%
Colour enhance after 24 hours	Dark brown

Labourer test

Mix Proportion of Wood Sawdust Ceiling Board Constituents
Table 1.4

Material	Volume	Setting Time
White Cement	676g	
Portland cement	406g	10 minutes
Saw dust	693g	
Top Bond sand	200g	
Water	1 Litre	

Table 1.5

Material	**Volume**	**Setting Time**
White cement	676g	
Portland Cement	106g	
Saw dust	1386g	20 minutes
Top Bond sand	200g	
Water	$1^1/_2$ Litres	

Table 1.6

Materials	**Volume**	**Setting Time**
White cement	1352g	
Portland cement	406	
Saw dust	347	5 minutes
Top Bond	200g	
Water	1 Litre	

Table 1.7

Materials	**Volume**	**Setting Time**
White cement	676	
Portland Cement	812	
Sharp sand	820	15 minutes
Top bond	200g	
Water	1 Litre	

Table 1.8

Materials	Volume	Setting Time
White cement	1352g	
Portland cement	406g	
Saw dust	104g	
Sand	1g	20 minutes
Top bond	200	
Water	2 litres	

Conclusion

From the Research Table (Table 1.6) which has the minimal setting time, less Portland cement, highest white cement and the highest comprehensive strength during caring, therefore it is concluded that the best alternative in producing ceiling board is by using wood sawdust in order to reduce the weight of the imposed load in a building and durability because of its high rate of setting time and tensile strength based on the findings that it is more economical, aesthetic in nature and a research work for a new invention.

Recommendations

Since most Research work is based on the use of local contents as different production, the production of ceiling board from waste materials which was sourced locally and found safe as a very good fibre. It is therefore recommended that waste wood sawdust can be reversed into a more permanent usage in the production of the ceiling board for under roof covering in a building and in turn, solve the disposal problem of waste generated from wood.

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