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UTILIZATION OF AGRICULTURAL WASTE IN THE MANUFACTURING OF WOODEN PARTITION PANEL

T. RAMKUMAR[1], H. NAVIN[2], S. PARIVALLAL[3], A. KISHORE KUMAR[4], M. MURUGAN[5]

[1,2,3,4]UG Student, Department of Civil Engineering, Valliammai Engineering College, Tamil Nadu, India
[5]Assistant Professor (O.G), Department of Civil Engineering, Valliammai Engineering College, Tamil Nadu, India

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Abstract – The main objective of the project is to reduce the use of wooden material for construction with affecting the environment. Wooden panel are replaced by panel made from the agricultural materials. The materials collected from the agricultural wastes are used f+or alternative panel making. The materials are Rice husk, Corn cob, Coconut husk and Groundnut shell. The materials are dries, grinded and mixed together in certain ratio along with Urea Formaldehyde used as resin. The ammonium chloride used as hardner. The mixed materials are filled in mould for hydraulic press. After the hydraulic press the panel are dried up for 24 hours. Then various sets of tests are carried out as per Codal provision of IS-2380:1997, Methods of test for wood particle board and boards for other lignocelluosic materials. The test result made for panels are agricultural products are done. The partition panels from the agricultural materials are more effective and economic.

***Key Words*: Rice husk, Corn cob, Groundnut shell, Coconut husk, Urea formaldehyde, Ammonium Chlorine, Hydraulic press, UTM.**

1. INTRODUCTION

The increase in population, the growing desire to cutting the forest and increase the number of buildings. Nowadays the major problems faced by the world is global warming. The causes of global warming is high emission of carbon di oxide, carbon mon-oxide and hydrofluorocarbon. It is mostly controlled by afforestation but every year several square kilometers of forest are destroyed due to increase need of timber and other use in domestic. So we need alternative material for it without affecting the environment. So we recycle waste materials as alternative for wood products. Composites are an attractive materials to form panels which is effective in both cost and stability. So, we need to substitutes for Solid Wood as the factors such as Resource Quality, rising Prices in growing World. Panels made from Agricultural Materials are more economic and Long Lasting Life and also agricultural material Panels one of the suitable for replacing Wooden Panels. The materials are Eco-friendly, so it reduces the effect on Enviornment.

2. SCOPE

- To encourage the use of Agricultural materials for various purpose in Construction.
- All the materials are recyclable and finally used for Dumping in Landfill.
- To Gain the Technical Knowledge about various composition of agricultural materials.
- Panel will reduce the pollution and promotes recycle.

3. LITERATURE REVIEW

ACIU Claudiu, Nicoleta Cobirzin,"The use of Agricultural products and Wastes" from Technical University of Clauj-Napaca which was published in the year of September 2013. To study the various properties of agricultural materials are provided that makes to selection of materials for particle board panel making. The use of agricultural products and wastes in the building materials Industry is an efficient modality for implementing sustainable development in the construction industry, due to the multiple possibilities for recovering materials and at the same time for reducing energy consumption which ensures environmental protection.

Cengiz Guler "Production of particle boards from Licorice and European black pine out wood particles" is help to study about the chemical used for panel making. The use of Urea formaldehyde for making particle board panel in the right proportion makes the panel with high bonding capacity. The results indicated that it is possible to produce particle boards from licorice root alone and from the mixture of licorices root and wood chips by using Urea formaldehyde adhesives. The produced boards can be utilized for general purposes as well as furniture for interior environments and the results obtained. Show that Licorice could be an alternative raw material for particle board industry.

4. OBJECTIVES

- To utilize the agricultural materials effectively for panel making.
- To study the properties of agricultural materials for further usage of various purposes.
- To find the results of various sets of tests to be check the nature of panel.
- To compare and check the properties of wood and agricultural materials.

5. MATERIALS TO BE USED

1. Rice Husk
2. Corn cob
3. Groundnut shell
4. Coconut husk

6. CHEMICALS TO BE USED

1. Urea formaldehyde
2. Ammonium chloride

1. RICE HUSK

- Class A insulating material
- Silica in it makes less attractive to termites
- It consists of lignin and silica
- Specific weight 100Kg/m^3

2. CORN COB

- Size o.212-1.850 mm
- It is a filler
- Low density
- High toughness
- Good thermal properties

3. GROUNDNUT SHELL

- Low density
- Acts as reinforcing filers
- It consists of cellulose, hemicellulose and lignin
- High tensile
- Light weight

4. COCONUT HUSK

- It is highly porous
- Hard, very coarse and rigid
- Multicellular, Lignocellulosic
- Resistance to sunlight and saline water
- Resistant to microbes

5. UREA FORMALDEHYDE

- It acts as resin
- Thermosetting agent
- Volume resistant
- High tensile strength
- Mould shrinkage
- Bonding agent

6. AMMONIUM CHLORIDE

- It is a hardner
- It helps to attain brittle state to panel
- It is act as setting agent

7. WORKING PROCEDURE

1. SOLAR DRYING PROCESS

The materials are spread on the ground, thus exposed to sunlight and wind. Sunlight dies up moisture. Wind removes the moisture. Drying up process for all the materials on the top floor for 15 days for 4-5 hours. It is raked up daily.

2. GRINDING PROCESS

The size of the materials is main factor influencing the bonding of the materials. The materials are grinded by using a wood powder grinding machine.

Fine grinded – Coconut husk, Rice husk

Coarse grinded – Corn cob, Groundnut shell

Again all the materials are dried up to remove the moisture content in the materials by solar drying process. It takes up to 5 days. It is raked up daily about 4-5 times. It takes 8-9 hours of drying.

3. DESIGN MIX

Mixing the materials in the right proportion makes the materials to bond together. The main ratio mix are one part of rice husk, one part of coconut husk, half part of groundnut shell and half part of corn cob. The materials and urea formaldehyde is mix in the ratio of 1:1.5. The ammonium chloride mixed with urea formaldehyde about 2% of its quantity.

Fig.1 MIXED MATERIALS

4. UTM HYDRAULIC PRESS

The materials filled in the mould about 8cm of height are well compacted in the compaction rod. Then bottom and top is closed with Aluminum sheet. It prevent materials are not make bond on iron mould. Finally top of mould is closed with a plate thickness about 0.8 cm. Then Mould is placed in the UTM. Then it is operated gradually load is applied then the maximum load applied is 120 KN. The height of the materials in the mould is reduced from 10 cm to 2.5 mm. Then the mould is removed from the UTM. Finally the plate is formed.

Fig.2 MOULD PLACED IN UTM

Fig.3 HYRAULIC PRESS IN UTM

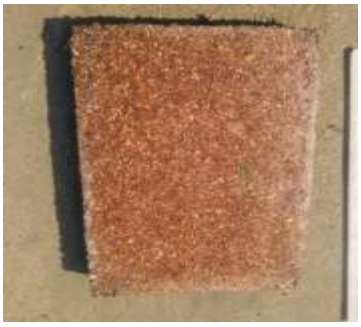

Fig.4 PLATE FORMED

8. VARIOUS SETS OF TESTS

1. DETERMINATION OF COMPRESSIVE STRENGTH PARALLEL TO SURFACE

The main purpose of the test is check the strength of the specimen. The test is carried out in UTM. Based upon the load withstanding capacity the usage of the panel is desired. The specimen shall be compressed vertically in the direction of length by means of a spherical and a self-aligning type loading block in a Universal testing machine at uniform rate of strain of 0.6mm/min till a failure in the specimen is indicated. Due to compression the thickness of the specimen is reduced.

2. DETERMINATION OF COMPRESSIVE STRENGTH PERPENDICULAR TO SURFACE

The test is carried to check the change in thickness due to load applied perpendicularly to surface. The load shall be applied vertically on the specimen through the bearing plate placed on the specimen and covering the whole surface, at a constant rate of loading of 0.6mm/min. Initially a load of 10 Kg will be given on span and this shall be taken as zero position. The deformation shall taken at a regular load interval of 50 Kg and the test is continued till a load of 500 Kg is reached. The difference between the original thickness and the thickness of the compressed specimen shall be recorded as the value of retention of compression.

3. DETERMINATION OF MISTURE CONTENT

The specimen shall be at the full thickness of the material and shall be 7.5 cm wide and 15 cm long. Each specimen shall be weighed to an accurately. The specimen shall then be dried in a ventilated furnace at a temperature of 103^{0} c. Then the specimen is taken out. Then the specimen kept in room temperature for 2 hours. Then the dried specimen weighed accurately. Finally difference in weight is measured. So the percentage of weight change is determined.

4. DETERMINATION OF WATER ABSORPTION

The specimen shall be sized about 30 x 30 cm. The weight is measured accurately. The specimen shall be submerged horizontally under 25 mm fresh clean water maintained at a temperature of 27^{0} c. After 2 hours submersion the specimen shall be suspended to drain for 10 minutes, at the end of which time the excess surface water shall be removed and the specimen immediately weighed. The specimen shall then be submerged for an additional period of 22 hours and above weighing procedure repeated. Finally the average value of percentage change in weight is determined.

5. DETERMINATION OF SWELLING IN WATER

The test is performed to determine the change in thickness throughout the specimen. The test specimen shall be immersed in fresh clean water having a temperature of 27 ^{0} c. The specimen shall be covered by approximately 25 mm in water. At the end of 2 hours then the specimen shall be withdrawn from water, wiped with a damp cloth and allowed to stand under normal room condition for 1 hour with its bottom edge on non-absorbent surface such as glass sheet. The result is expressed in the test the average value of values which is changed in thickness.

CONCLUSION

In our project the main purpose is to replace the wooden partition panel is replace by panel is made from agricultural materials finally the result made from several test are prove that the panel made from agricultural materials are also having high compressive strength, less water absorbing capacity, high strength, high load bearing capacity, less swelling in nature. So that our panel are good enough to replace the wooden partition panel. It is attain a compressive strength of 51 N/mm^2. The percentage moisture content is about 22 %. The water absorption capacity in the percentage about 5.74 %. The swelling of specimen by increasing its thickness in percentage about 2.21 %. Final consideration of the project is Partition panel is eco-friendly and reduce the effect on Environment.

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