Development of Fabrication Material for Low Cost Housing Using Sisal Fiber Composite: Review Paper

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Abstract – In our country demand of wood as building material is rapidly growing .Now situation has led to use environment friendly construction & structurally safe another material. It alone represent more than 25-35% of total construction cost of house .By using asbestos cement roofing sheet causes health problem.there is need to replace asbestos, wood by eco-friendly material. Sisal fiber is locally available eco-friendly material having low density high strength durability & reasonable cost. Sisal is bio-degradable organic fiber material.By using epoxy chemical in fabrication of sisal fibers composite we get hardness in particular panel.

This paper analyzes the sisal fiber is construction material which is used for low cost housing purpose also presents a summary of recent development of sisal fiber & its composite

Keywords- Sisal Fiber, Asbestos, Epoxy Chemical

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1. INTRODUCTION

Low cost housing refers to those housing units which are affordable to the people whose income is below than median household income.It depends on three parameter. First income, second size of dwelling &affordability.for low cost housing we use different material having low cost high strength easily available.

A natural fiber has special application in the field of civil engineering. The cost of natural fibers is reasonable. The advantages of natural fibers materials are strength, better durability, competitive cost, environmental compatibility and bio degradability., sisal fiber is hard and tough fibers, polygonal to round in section has the greatest tearing strength and retains this property even in wet condition. Sisal is a bio degradable organic fibers material containing 46% lignin, 54% cellulose. Due to high percentage of lignin, sisal is much more advantageous than other natural fibers.

Sisal Fiber is one of the most widely used natural fiber and is very easily cultivated. It is obtain from sisal plant. The plant, known formally as Agave sisalana. These plants produce rosettes of sword-shaped leaves which start out toothed, and gradually lose their teeth with maturity. Each leaf contains a number of long, straight fibers which can be removed in a process known as decortications. During decortications, the leaves are beaten to remove the pulp and plant material, leaving the tough fibers behind. The fibers can be spun into thread for twine and textile production, or pulped to make paper products.

Sisal having several advantages like abundant availability,less cost &does not pose health hazard,& hence can be used to develop various pozzolanas ,flyash,is abundantly available in several countries. Hence, there is scope and a necessities and products.

2. LITERATURE REVIEW

Parandaman and Jayaraman (2015) In this paper author Invested that hybridization of glass fibers with natural fibers for the applications of structural, aerospace and automobile industry. A composite made of natural fibres has low cost, light weight and user friendly but lower in strength when compared to synthetic fibers. Hence, the natural fiber and synthetic fiber composition need to be optimized for utilization as High Strength (HS) hybrid composite materials for many applications. In that work two hybrid composites have been developed using Glass, Jute, Sisal and Banana fibers in the form of

laminates, namely Jute-Sisal- Glass (JSG) and Jute-Banana-Glass (JBG) combinations. The fabricated test samples had subjected to tensile, flexural and impact tests to evaluate their mechanical properties.. The results shows that the high strength hybrid composite made of Jute-Banana-Glass (JBG) provides better mechanical properties and it could be used for a wide range of applications.

Rabi (2009) In this paper author studied that the durable fiber-cement roofing tiles (approximate dimensions: 500 mm long, 275 mm wide, 8 mm thick) by slurry dewatering technique and using sisal (*Agave*) Kraft pulp as reinforcement. Effects of accelerated carbonation on physical and mechanical performances of vegetable fiber reinforced cementations tiles were evaluated along with their consequent behaviors after ageing. Cement raw materials mixture was prepared with approximately 40% of solids (comprising 4.7% sisal pulp, 78.8% cement, and 16.5% ground carbonate material).

Ramakrishna et.al (2011) Ramakrishna studied that ,the Sisal fibers corrugated roofing sheets of (mortar / composites) couldn't match the high strength exhibited by the commercial type corrugated roofing sheet considered in this study, with respect to the flexural and splitting loads and within the range of sisal fibers contents (0 - 2%) and fly ash contents (0 - 30%) considered.

Reddy (2013) Author state that, the applicability of jute textile FRP as a strengthening material was investigated through various experimental works of mechanical characterization of the FRP, and strengthening effects provided by bonding of jute textile FRP to Zbeams over bonding of carbon textile FRP and glass textile FRP.

Vijaychandrakanth (2015)]In this paper he state that the study of this investigation was find out the behavior of sisal fiber in concrete, there by optimum amount of sisal fiber that can be used in various application such as pavements, industrial floors, etc. thus enhance the concrete quality.

Sajjanshetty et.al (2014) In this paper he concluded that, flexural behavior of RCC beams and the fibers reinforced concrete composite wrapped retrofitted RCC beams. Beams were retrofitted with 20mm and 30mm steel and coir fibers reinforced concrete composite layers using epoxy resins.

Sardar et.al (2014) According to sardar HFRPC material was less cost, low density and high strength biocompatible material and may be suggested for implant, especially for cortical bone. From the Experimental results the strengths of HFRPC materials may be suitable the cortical Strength. Finally 30% and 40% HFRPC material can be suggested for cortical. Further it can be tested for remaining mechanical cortical properties.

Sanjay et.al (2016) In the present scenario, there has been a rapid attention in research and development in the natural fiber composite field due to its better formability, abundant, renewable, cost-effective and eco-friendly features. This paper exhibits an outline on natural fibers and its composites utilized as a part of different commercial and engineering applications. In this review, many articles were related to applications of natural fiber reinforced polymer composites. It helps to provide details about the potential use of natural fibers and its composite materials, mechanical and physical properties and some of their applications in engineering sectors.

Arpitha et.al (2016) Arpita state that, Development of the Polymer Composites with natural fibers and fillers as a sustainable alternative material for some engineering applications, particularly in aerospace applications and automobile applications are being investigated. Natural fiber composites such as sisal, jute, hemp and coir polymer composites appear more attractive due to their higher specific strength, lightweight and biodegradability and low cost. In this study, sisal/glass/Sic fiber reinforced epoxy composites were prepared and their mechanical properties such as tensile strength, flexural strength and impact strength are evaluated. Composites of silicon carbide filler (without filler, 3, 6 & 9Wt %) sisal fiber and glass fiber are investigated and results show that the composites without filler better results compared to the composites with silicon carbide filler.

Rawi (2009) He invented the study of sisal fibers as concrete reinforcement material in cement based composites. A brief description on the use of the cement based composite materials as building products has been included. The influence of sisal fibers on tensile, compressive and bending strength in the hardened state of mortar mixes was discussed. The durability of natural fibers in cement based matrices was of particular interest and was also highlighted. From the hysteresis stress-strain curves it was noticed no signs of degradation for maximum stress level .For maximum stress levels; there was an increase in the hysteresis area and decrease in the Young´s modulus.

Based on the comprehensive experimental investigations carried out and on the range of various parameters considered in the this study, are summarized below: Sisal fibers corrugated roofing sheets of (mortar / composites) couldn't match the high strength exhibited by the commercial type corrugated roofing sheet considered in this study, with respect to the flexural and splitting loads and within the range of sisal fibers contents (0 - 2%) and fly ash contents (0 - 30%) considered.

3. SUMMARY

Sisal fiber is easily available material having low cost, high strength &. It will used for low cost housing.It is economical material as compare to plywood.

4. METHODOLOGY

The material Sisal fiber is collected from nearby farms of Solapur. Collected material is in dry form. This material is stored in the gunny bags along with proper ventilation as shown in fig.3.1. The material is used from the stored place as required.

Fig 3.1 Sisal fiber

As the basic Moto is to generate low cost Constructional materials, so the need is to use materials which are readily available in market with cheaper rates. So for the fabrication of the Sisal fiber Composite panels the basic material to be used is sisal.

Firstly we take the required materials those are, epoxy chemical in which tw chemicals were there Part A epoxy resin and Part B hardener, which are taken in the proportion of 100:30. Now the core material i.e.Bunch of sisal fiber is taken. After that the fiber is extracted and removes the weak fiber material. The extracted fiber are taken out and used for fabrication purpose.We want the fiber sheet of size about 40cm X40 cm, so we take the extracted fiber about 42cm. so that the remaining extra 2 cm part can be cut out at the time of finishing purpose Extraction of sisal fiber ace of table we kept one polythene paper because it cannot stick with epoxy chemical, and then we spread the fibers over this paper of required width. Now make the solution of epoxy resin and hardener as per the requirement in the proportion of 100:30 on weighing machine

After taking the solution in on pot, the mixture of both epoxy resin and hardener should be mixed homogenously, for that purpose stare that solution with stick up to they make homogeneous

Now pour that homogeneous solution of epoxy resin and hardener on layered fiber uniformly by hand. After that spread another layer of fiber on the above layer and did same procedure once again, now did above things so that we get the required thickness of composite .After that spread polythene paper on prepared sheet. Now place the plane layer of glass or plywood on the composited sheet, and on that layer place some amount of weight so that due to the weight the load is applied on the sheet and compaction of sheet take place uniformly.After 24 hrs remove that load which applied on the sheet for compaction purpose. Remove the polythene paper, now we get the composite sheet. Here after cut that sheet in required size that you want with cutter the 40 cm X40 cm size sheet.

5. CONCLUSION

As observed from the study of sisal fiber it is clearly conclude, that the sisal fiber is easily available material having low cost, high strength &. It will used for low cost housing.It is economical material as compare to plywood

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