**Development and Evaluation of Mechanical and Thermal Properties of Sawdust Reinforced with Epoxy Resin Composite and Glass Fibre Sandwich Sheet for Insulating Applications.**

1. **Introduction:**

Over the past few decades, research and engineering have advanced from using a uniform material to developing hybrid composite materials. A hybrid composite material combines two or more types of fibres within a single composite sheet. This sheet is known as matrix, which holds the entire reinforcement material together. The second layer is the reinforcement materials, which serves as the load bearing element.

The materials which are used for construction and insulating purposes are mostly non-biodegradables. These materials cannot be broken down by natural processes or organisms. Wood sawdust is the by-product produced in saw mill or timber industries. This sawdust pollutes the air and water, which cause eye irritation and skin infections.

To overcome this issue, a composite material can be developed by replacing with existing waste materials such as sawdust and glass fibre. These composites are developed by a single hand layup technique that combines wood sawdust and glass fibre as reinforcement with epoxy. These hybrid composites are amorphous, highly cross-linked polymers and this structure results in these materials possessing various desirable properties such as greater tensile strength and modulus, uncomplicated processing, fine thermal and chemical resistance, and dimensional stability. These sandwich sheets have excellent insulation properties due to their low thermal conductivity making them ideal for use in walls, floors and roofs.

1. **Objectives:**

Sawdust-reinforced composites are an innovative and sustainable material that combines sawdust, a by-product of the timber industry, with various polymers or other binding agents to create strong, durable, and eco-friendly composites.

The following objectives for developing saw dust reinforced epoxy composite with glass fibre sandwich insulation sheet are:

* To reduce the thermal conductivity and used as an insulating material in buildings, components and automobile applications etc.…
* To provides a sustainable alternative to traditional materials like concrete and steel. It also promotes the use of biodegradable and eco-friendly materials.
* To improve the durability and resistant to decay, It also offers a long-lasting alternative to traditional materials.
* To reduce the weight of conventional material, which is beneficial for construction projects where weight is a concern.

**3. Methodology:**

* 1. **Preparation of Composite**

Mahogany and teak wood sawdust are collected from the saw mill for making the composites. A die is fabricated to prepare the composite sheets. Four distinct composites sheets are produced, each with five varying weight ratios of saw dust to resin.

After creating the sawdust-reinforced epoxy composite sheet, the sandwich sheet with glass fibre is prepared.

Glass Fibre

Sawdust+ Epoxy Composite

|  |  |
| --- | --- |
| **Sandwich sheet 1** | 20% weight ratio of 3 layer composite sheet + 2 layer of glass fibre. |
| **Sandwich sheet 2** | 30% weight ratio of 3 layer composite sheet + 2 layer of glass fibre. |
| **Sandwich sheet 3** | 40% weight ratio of 3 layer composite sheet + 2 layer of glass fibre. |

* 1. **Testing**

All specimens are undergoing the following tests to evaluate the properties of the sandwich sheets. The samples are prepared according to ASTM standards.

1. Tensile test
2. Compression test
3. Flexural test
4. Impact test
5. Thermal conductivity calculation
6. Thermal resistance calculation
7. Thermal transmittance calculation
8. **Work Plan**

The work plan for the preparation of sandwich sheet involves, selecting the appropriate materials, preparing them, fabricating the composite sandwich sheets, and conducting tests and evaluations to optimize their properties.

**Literature Survey**

**Material Requirements**

* **(Epoxy Resin, Mahogany and teak saw Dust, Glass Fibre)**

**Preparation of Composites and Fabrication of Sandwich sheet**

**Tests and Evaluation of results**

**(Thermal, Tensile, Flexural, Compression and Impact**

**Preparation of final report**

**Project Submission**

**5. BUDGET:**

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| --- | --- | --- | --- |
| **Sl.**  **No** | **Description** | **Amount requested (Rs.)** | **Justification for each head** |
| 1. | Procurement of Sawdust, Chemicals and Consumables | 4500 | Saw dust, Epoxy resin, Glass fibre, Catalyst, Accelerator, Wax etc. |
| 2. | Procurement of hand tools and accessories, etc. | 1300 | Molding die for composites, Hand gloves, Scissors, Brushes, Rollers and other accessories. |
| 3. | Testing charges and contingencies | 4200 | Charges for mechanical and thermal testing, along with report preparation. |
| **Total** | | **Rs.10000/- (Rupees Ten Thousand Only)** | |