USE OF WASTE-BY-PRODUCT AS A ECONOMIC REPLACEMENT FOR RIVER SAND IN CONSTRUCTION INDUSTRY WITH ADDITION OF BANANA PITH

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ABSTRACT:

In today's world, there are numerous "energy crises," which affect the globe's "limited availability of natural resources (sand) & to make good use of abundant availability of waste-by-products" from various industries to avoid landfills. Buildings were erected without the use of sand in ancient times, according to construction history. Consumption of the current significant amount of natural sand resulted in a reduction of water from the entire water table, resulting in a loss of biodiversity. As a result, finding an alternative to sand and making optimal use of waste by-products is a key discovery that will aid the building sector in developing a sustainable environment. The main goal of this research is to combine two key difficulties by determining the best percentage of waste-by-product replacement as an alternative fee.

Keywords: Natural sand, Replacement, Waste-by-product, Organic vs. Inorganic, Thermal properties, Energy & cost Analysis,

INTRODUCTION:

• In the construction business, sand is the most important raw material utilized in mix design ratios. The rapid mining of natural sand from riverbeds drives up the demand for natural raw materials in the construction industry. As a result, several different options must be investigated in order to reach a level that is comparable to the qualities of natural sand.
• The production of waste-by-products and solid trash has skyrocketed. Finally, this material is deposited in landfills, polluting the environment.
• As a solution to benefit both of the primarily concerned issues, the notion of combining both to make one helpful material that will act as the future of the construction sector as well was born.
• There are four primary environmental issues:
1. The construction industry is responsible for almost 40% of CO_2 emissions.
2. Natural River sand has become scarce due to river erosion.
3. The need for natural sand arose as a result of excessive mining along riverbeds.
4. There is an abundance of waste goods that are sent to landfills.

LITERATURE REVIEW:

Excessive Sand Mining and Its Environmental Consequences:
• The construction sector is continually evolving around the world due to the constant expansion in infrastructure development.
• The usage of synthetic materials is widespread, whereas the requirement for long-term material development is well established.
• As a result of the large amount of trash generated by many sectors, waste-by-product re-use has become a viable option.
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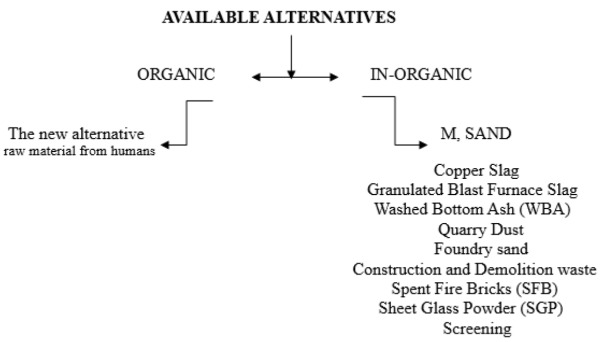
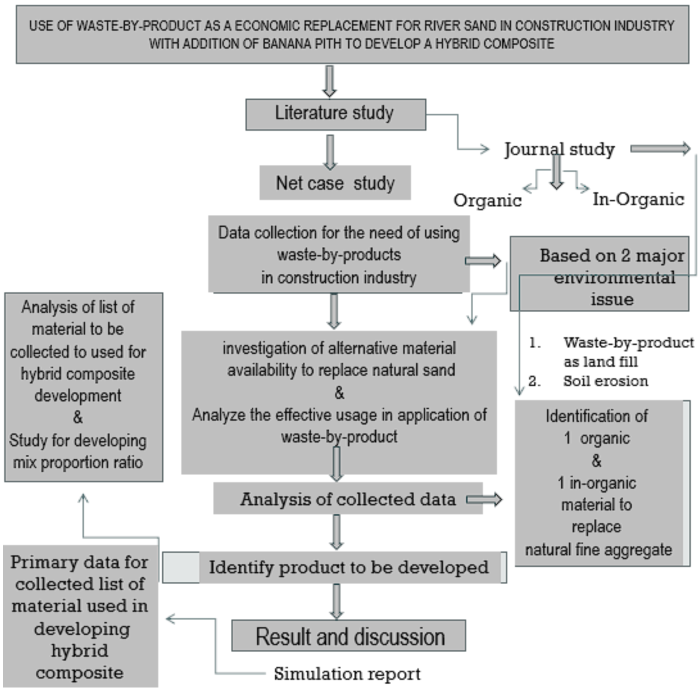
4. There is an abundance of garbage generation that is sent to landfills.

• Continual river erosion has resulted in a scarcity of river sand around the planet. Many researchers are scrambling to come up with alternate fine aggregate substitutes.

• Various possible options were investigated in order to find a solution, and some of them are given below as organic/inorganic.



METHODOLOGY:



PROJECT DISCRIPTION:

• Traditional building materials, such as brick, are not environmentally friendly and may have negative consequences on the natural environment.

• As a result, the goal of this thesis project is to evaluate several alternatives (organic vs. inorganic) as a replacement for natural sand, with the addition of banana fiber as a new emergent building material that will assist reduce the environmental effect.

• Because the findings of this study may lead to alternative recommendations, a major emphasis on energy analysis, cost analysis, and thermal analysis of developing prospective construction materials is necessary.

FOR BRICK SIMULATION, THE MATERIAL RATIO WAS USED.

• 1:6 masonry brick mixing ratio

• Brick volume

• wall to be imitated – 3mx3m

• Brick quality – class A

• Size – 288x107x69mm

• Mortar thickness – 10mm

In order to build a 3m x 3m cube box, we will require approximately 1.500 bricks.

2. 50 kg of cement

3. 10 cubic feet of sand

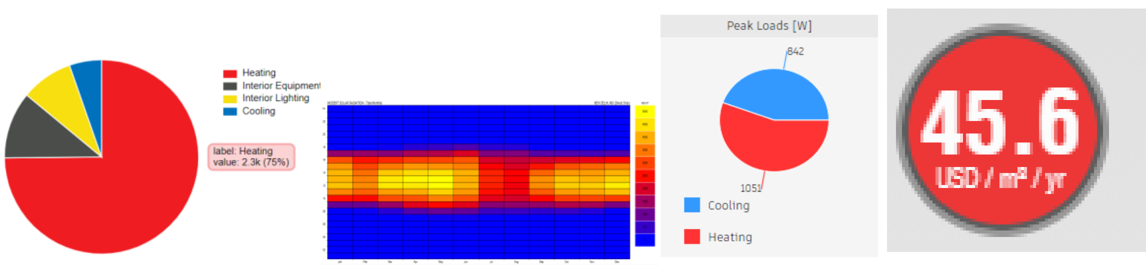
RESULTS & DISCUSSION

SAMPLE – 1 – CONVENTIONAL BRICK

Location -Chennai, Tamil Nādu

Temperature difference ranged from: 30 – 37-degree c

- AVERAGE ANNUAL OF HEAT GENERATOR, AVERAGE ANNUAL OVERVIEW OF TEMPERATURE DISTRIBUTION, AVERAGE COOLING LOAD OBTAIN THERMAL CHARACTERISTIC VALUE

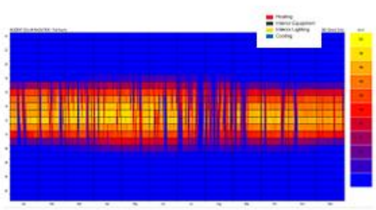
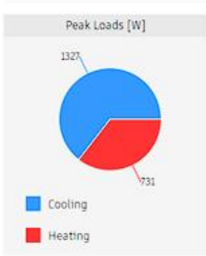


SAMPLE – 2 – GRANUILATED BLAST FURNACE SLAG BRICK

Location -Chennai, Tamil Nādu

Temperature difference ranged from: 30 – 37-degree c

- AVERAGE ANNUAL OF HEAT GENERATOR, AVERAGE ANNUAL OVERVIEW OF TEMPERATURE DISTRIBUTION, AVERAGE COOLING LOAD OBTAIN THERMAL CHARACTERISTIC VALUE

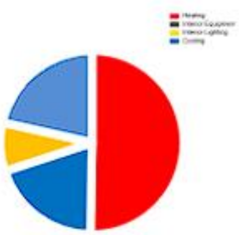
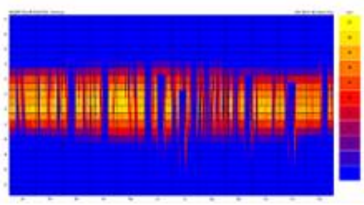
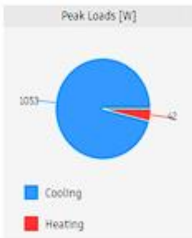




SAMPLE – 3 – SOLID WASTE ASH BRICK

Location -Chennai, Tamil Nādu

Temperature difference ranged from: 30 – 37-degree c

- AVERAGE ANNUAL OF HEAT GENERATOR, AVERAGE ANNUAL OVERVIEW OF TEMPERATURE DISTRIBUTION, AVERAGE COOLING LOAD OBTAIN THERMAL CHARACTERISTIC VALUE

CONCLUSION:

• The analysis was carried out to determine the major heat transmission / heat distribution throughout the 10x10x10 foot cube box (which was deemed a room).

• The inquiry analysis was carried out in brick form.

• During the research, three distinct combinations were used.

• The bricks' dimensions were given as 288x107x69mm.

• These brick modules keep the same external dimensions and were designed to keep the same external temperature in the same spot in Oder.

samples	Cconventional brick • 100%SAND+cement+water+red soil	Simulated brick sample 1 • 75%GBFS+25%sd+lime+water+5%bf	Simulated brick sample 2 • 75%SWA+25%sd+lime+water+5%bf

• Increasing the percentage of each material combination inside the simulated room samples improved thermal comfort and energy performance.

• Based on the findings and analysis, we discovered that the simulated GBFS and SOLID WASTE ASH with the inclusion of BANANA FIBER can assist reduce heat transfer/heat dispersion inside the room more effectively than regular bricks.

• The use of sand as a sand replacement material in brick walls resulted in a reduction in the amount of thermal energy entering a space.

INFERENCE:

• As a result, applications such as Ecotec, Energy Plus, and Revit were used to reproduce the observed temperature distribution / thermal comfort of the room.

• The heat penetration within the simulated room with fresh emerging bricks was smaller than the heat penetration inside the simulated room with conventionally utilized bricks, according to the findings.

• When compared to conventional bricks, the simulated software findings of both new developing bricks revealed positive thermal qualities.

• When these combinations undergo primary testing for all mechanical and physical aspects, their results may gain more positive value.

• Depending on the test primary findings values, the combinations may change (e.g., each material % may be added or subtracted).

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