

CATEGORY
BUILDING PRODUCTS FROM RECYCLING OF WASTES



PRODUCT / TECHNOLOGY



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Technology Detail

BIO-BRICKS FROM AGRICULTURAL WASTE

Alternate to burnt clay bricks/blocks.



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CONTACT DETAILS

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BRIEF

Researchers from IIT, Hyderabad and KIIT, Bhubaneshwar in collaboration with Swinburne University of Technology, Australia, have developed bio-bricks - a sustainable building material from agricultural waste as an alternate to burnt clay bricks. The product serves the dual purpose of waste management and development of eco-friendly, sustainable buildings. The process of making bio-bricks starts with careful selection of dry agro-waste such as paddy straw, wheat straw, sugarcane bagasse and cotton plant. The agro waste is first chopped to desired size and mixed with lime based slurry and water with the help of hand or mixer. The mixture is poured into moulds and thoroughly compacted with a wooden dowel to make compact bricks. The moulds are then left for 24 hours before the sides of the moulds were opened and left to dry for 15 to 20 days.

The chopped husk and lime slurry are mixed in 1:3 ratio by weight. To improve the strength and binding of the bio-brick traditional additives are added such as pulp of "Bel fruit", river clay slurry, and liquid molasses.



Bio-brick is prepared by mixing chopped husk, lime slurry in 1:3 ratio by weight.



SALIENT FEATURES

- More sustainable than clay bricks
- Suited for non-load bearing walls
- Density of Bio-Brick is 455.5 kg/m^3 as against density of fired clay brick: $2000 \sim 2400 \text{ kg/m}^3$ and concrete block: $1800 \sim 2100 \text{ kg/m}^3$
- Being lighter in weight, the overall weight of structure is reduced giving economical design
- Better seismic resistance being lighter in weight.
- Fire retardant.
- Serves as carbon sinks as they fix more CO_2 than they produce during their lifecycle.
- Good insulation to heat and sound and helps in maintaining humidity in a building.
- Recycling agro waste in this way reduces air pollution, which might have been caused if this waste was burnt instead.
- Eco friendly sustainable Building Materials.

ECONOMIC ASPECTS

- Owing to its low density, bio-bricks can effectively reduce the load on the column and beams structure, thereby reducing the amount of steel and concrete thereby reducing the overall cost of the building.
- Thin sections of bio-bricks can be used as insulation boards in existing buildings to reduce the heat gain from the surrounding, these can help in reducing the air conditioning load and can save lot of energy, making our building more greener and sustainable.
- The researchers have shown that cost reduction in walls for a typical EWS house of 25 sqm. will be around Rs. 70,950 per DU. The cost of bio-brick as claimed by IIT Hyderabad is Rs.3 as against Rs.8.50 for burnt clay bricks.



SUSTAINABILITY ASPECTS

- Most of the manufacturing process in India moves in a linear path of “resource-product-waste” leading to unsustainable development.
- The development of Bio-Bricks was based on the three fundamentals of Circular Economy, i.e., “reduce, reuse and recycle”.
- Bio-Bricks recycle and reduce the agro-wastes to create new building materials and at the End Of Life (EOL) it can be crushed and reused as raw materials for creating new bio-bricks thereby confirming to the three paradigms of Circular Economy.
- Bio-bricks can give additional income to farmers from the agro-wastes there by making the whole process economically viable. This will lead to reduction of stubble burning and air pollution.
- These bricks can substitute a part of burnt clay bricks there by reducing loss of topsoil.
- The demand for such bio-bricks will lead to development of new green and sustainable industries and create new jobs at grassroot levels.

SUITABILITY AND AVAILABILITY

- Suitable in all climate conditions.
- Use of local available agricultural waste material
- Can be used in low cost Housing with combination of wooden or metal structural framework.



LIMITATIONS, IF ANY

- At a research and development level.
- Not as strong as burnt clay bricks and cannot be used directly to build load bearing structures.

MARKET LINKAGES

- The technology is at a proof of concept stage and need to be upscaled and accelerated.

MAJOR PROJECTS

- In collaboration with IIT Hyderabad and funded by BUILD project IITH, a first of its kind prototype building i.e. a guard cabin based on Bio-bricks is constructed in IIT Hyderabad.

CERTIFICATION/INDIAN STANDARD/ ENDORSEMENT

- Indian Patent
- Special recognition at Rural Innovators Start-Up Conclave 2019 by National Institute of Rural Development and Panchayati Raj (NIRDPR)
- Research Papers at International Conference - ICED19 and ICoRD21.

