

IIT-H partners with Odisha tech institute to develop bio-brick



The bio-bricks developed by researchers of IIT-Hyderabad and KIIT School of Architecture, Bhubaneswar.

Made with agri waste, it may address growing concern over CO2 emissions in construction
Researchers from Indian Institute of Technology, Hyderabad, and KIIT School of Architecture, Bhubaneswar (Odisha), have developed bio-bricks from agricultural waste that serves a dual purpose – better waste management and promoting eco-friendly and sustainable building material.

The research was undertaken by Ar. Priyabrata Rautray, a Ph.D scholar, Design Department, IIT-H, and Ar. Avik Roy, assistant professor at KIIT School of Architecture.

The results of the research work, guided by Deepak John Mathew, head of Design Department, IIT-H, and Boris Eisenbart from Swinburne University of Technology, Australia, have been presented at the International Conference on Engineering Design (ICED-2019) at TU Delft, the Netherlands.

Special recognition

The team's research also received a Special Recognition Trophy for sustainable housing at Rural Innovators' Start-Up Conclave-2019 organised recently by the National Institute of Rural Development and Panchayati Raj (NIRDPR), Hyderabad.

“About 22% of India's total annual CO2 emissions is by the construction sector. Clay bricks, for example, not only use up fertile topsoil, but their manufacturing process also emits significant

amounts of carbon dioxide into the atmosphere. Recognising this problem, the Building Materials and Technology Promotion Council (BMTPC) was set up in the 1990's by the Central government to develop eco-friendly and energy-efficient building material, providing impetus to re-purposing agricultural and industrial waste into construction material," said Ar. Priyabrata Rautray.

Re-purposing of agricultural waste is particularly important in India. More than 500 million tonnes of agricultural waste is produced in the country every year. While some of this is reused as fodder, 84 to 141 million tonnes are burnt, which results in severe air pollution.

The process of making bio-bricks starts with careful selection of the dry agro-waste like paddy straws, wheat straws, sugarcane bagasse and cotton plant.

The team decided to use dry sugarcane bagasse for the first sample. It is first chopped into a desired size. A lime-based slurry is prepared, and the chopped agro-waste is added to the slurry and mixed thoroughly by hand or mechanical mixer, to create a homogeneous mixture. This mixture is poured into moulds and rammed with a wooden block to make a compact brick. These moulds are left to dry for a day or two, after which the sides of the moulds are removed, and the brick is allowed to dry for fifteen to twenty days. It takes approximately a month's time for these bio-bricks to attain its working strength by air drying.

"Bio-bricks are not only sustainable when compared to clay bricks, but are carbon sinks as they fix more carbon dioxide than they produce during their life cycle," said Ar. Avik Roy.

Although these bio-bricks are not as strong as burnt clay bricks and cannot be used directly to build load-bearing structures, they can be used in low-cost housing with a combination of wooden or metal structural framework.

Besides, these bricks provide good insulation to heat and sound and help in maintaining humidity of the buildings, making these houses suitable for hot-humid climate like India.

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