

Energy-smart bricks keep waste out of landfill

April 23 2024, by Will Wright



The team can make energy-smart bricks in a range of colours. Credit: Seamus Daniel, RMIT University

Engineers have invented energy-efficient bricks with scrap materials, including glass, that are normally destined for landfill.

RMIT University engineers collaborated with Visy—Australia's largest

recycling company—to make bricks with a minimum of 15% waste glass and 20% combusted solid waste (ash), as substitutes for clay.

Test results indicate that using these bricks in the construction of a single-story building could reduce household energy bills by up to 5% compared to regular bricks, due to improved insulation.

Replacing clay with waste materials in the brick production helped reduce the firing temperature by up to 20% compared with standard brick mixtures, offering potential cost savings to manufacturers.

Team leader Associate Professor Dilan Robert said about 1.4 trillion bricks were used in [construction projects](#) globally every year.

"Business-as-usual brick production produces harmful emissions—including [carbon dioxide](#), sulfur dioxide and chlorine—and puts a serious strain on our natural resources, particularly clay," said Dilan, from RMIT's School of Engineering.

The team's latest research is [published](#) in the journal *Construction and Building Materials*.

Potential to make our homes and workplaces more energy efficient

The team's research showed the new bricks have enhanced [energy efficiency](#) through improved thermal performance, and met stringent structural, durability and environmental sustainability standards. The technology has met the key compliance requirement of fired clay bricks set by Standards Australia (AS 3700).

"Bricks play a key role in preventing energy loss from buildings," Robert

said.

"We can also produce light-weight bricks in a range of colors from white to dark red by changing our formulations."

Dr. Biplob Pramanik, the RMIT team's environmental engineer, said the new bricks were safe to use in construction projects.

"Our bricks, manufactured from industry waste, meet state environmental regulations," he said.

A 'circular-economy solution' to a big waste challenge

In Victoria, Visy recycles glass packaging back into new bottles and jars. However, glass pieces smaller than 3mm—referred to as fines—cannot be recycled into bottles.

"We are focusing on scaling up the production process to facilitate the commercialization of our innovative bricks in collaboration with brick manufacturers in Melbourne," Robert said.

Paul Andrich, Innovation Project Manager at Visy, said the company was thrilled to find a solution for material that cannot be recycled into food and beverage packaging.

"Diverting this waste into [bricks](#) with added insulation, rather than landfill, is another way we are powering the circular economy," he said.

The research team wants to collaborate with industries to explore applications of waste material in other construction products.

More information: Yuecheng Xin et al, Utilizing rejected contaminants from the paper recycling process in fired clay brick production, *Construction and Building Materials* (2023). [DOI: 10.1016/j.conbuildmat.2023.134031](https://doi.org/10.1016/j.conbuildmat.2023.134031)

The RMIT team has published peer-reviewed research on the brick innovation in several journals:

Yuecheng Xin et al, Energy efficiency of waste reformed fired clay bricks-from manufacturing to post application, *Energy* (2023). [DOI: 10.1016/j.energy.2023.128755](https://doi.org/10.1016/j.energy.2023.128755)

Yuecheng Xin et al, A Viable Solution for Industrial Waste Ash: Recycling in Fired Clay Bricks, *Journal of Materials in Civil Engineering* (2023). [DOI: 10.1061/JMCEE7.MTENG-15165](https://doi.org/10.1061/JMCEE7.MTENG-15165)

Yuecheng Xin et al, Transformation of waste-contaminated glass dust in sustainable fired clay bricks, *Case Studies in Construction Materials* (2022). [DOI: 10.1016/j.cscm.2022.e01717](https://doi.org/10.1016/j.cscm.2022.e01717)

Provided by RMIT University

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