Research team publishes benefit breakdown of 3D-printed vs. wood molds for precast concrete

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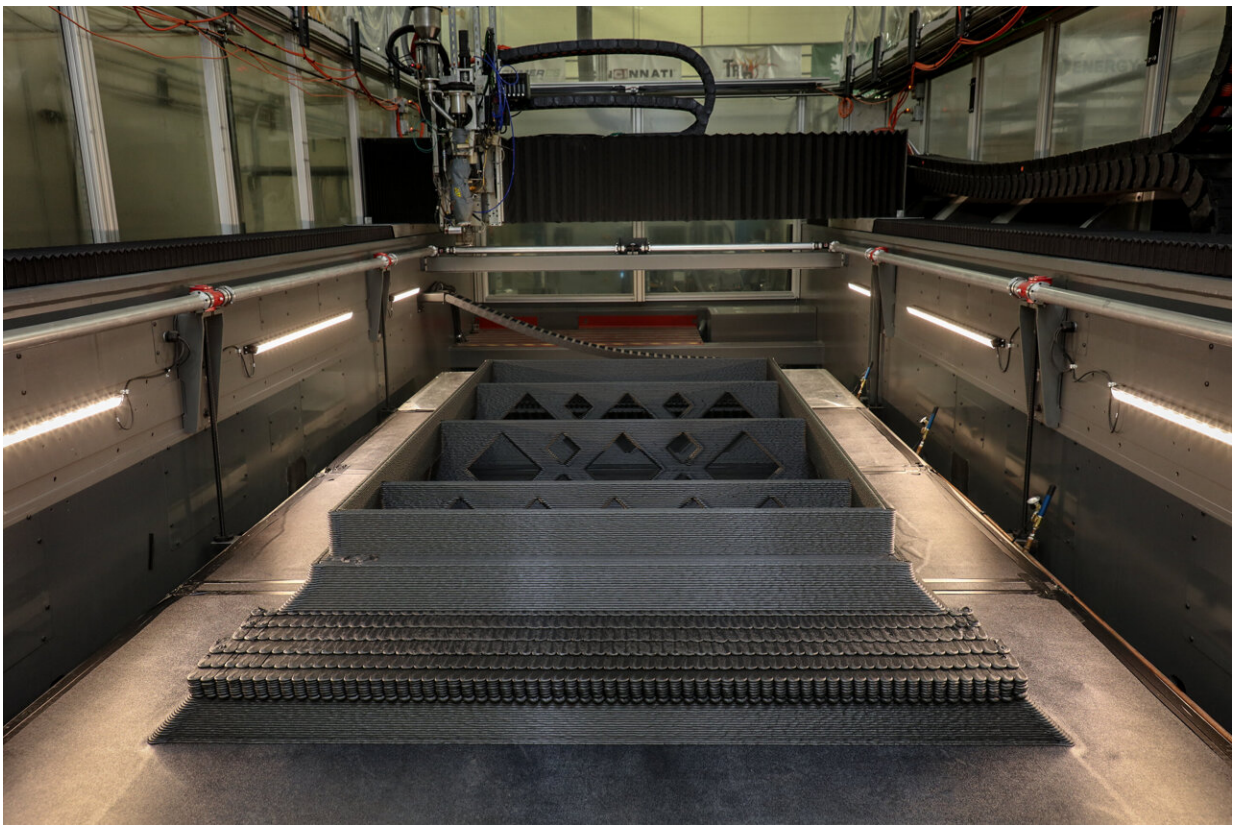

ORNL's 3D-printed polymer composite mold was used to produce precast concrete parts for a New York City building. Researchers conducted a techno-economic analysis that highlights the benefits over wood molds. Credit: ORNL, U.S. Dept. of Energy and Gate Precast

Oak Ridge National Laboratory researchers have conducted a comprehensive life cycle, cost and carbon emissions analysis on 3D-printed molds for precast concrete and have determined that the method is economically beneficial compared to conventional wood molds.

The work is published in the journal *Resources, Conservation and Recycling*.

Precast concrete is used in building construction and produced by pouring the material into a reusable mold. For decades, these molds have been made from wood—a technique that requires a highly specialized skillset. As an alternative, molds made from fiber-reinforced polymer composites can be 3D printed.

"We developed a techno-economic model that compared costs associated with each method, evaluating materials, equipment, energy and labor," ORNL's Kristina Armstrong said. "3D printing can make complex molds faster, and the composites can be recycled, leading to more economical molds when used many times for precast concrete parts."

Optimizing mold designs also reduces energy demand and carbon emissions. Future studies will further evaluate the recycling impact.

More information: Kristina O. Armstrong et al, Life cycle cost, energy, and carbon emissions of molds for precast concrete: Exploring the impacts of material choices and additive manufacturing, *Resources, Conservation and Recycling* (2023). DOI: 10.1016/j.resconrec.2023.107117

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