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RETAIL & RESTAURANT FACILITY BUSINESS®

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Walmart redefines commercial construction with 3D concrete printing.

Building in 3D

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INTERVIEW WITH DARIN ROSS

President & CEO, FMGI, Inc.

Print the WALL

Building a wall for Walmart has never been faster, cheaper or safer — thanks to 3D concrete printing.

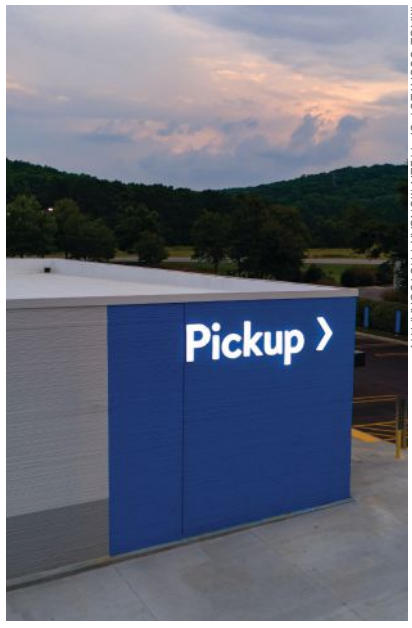


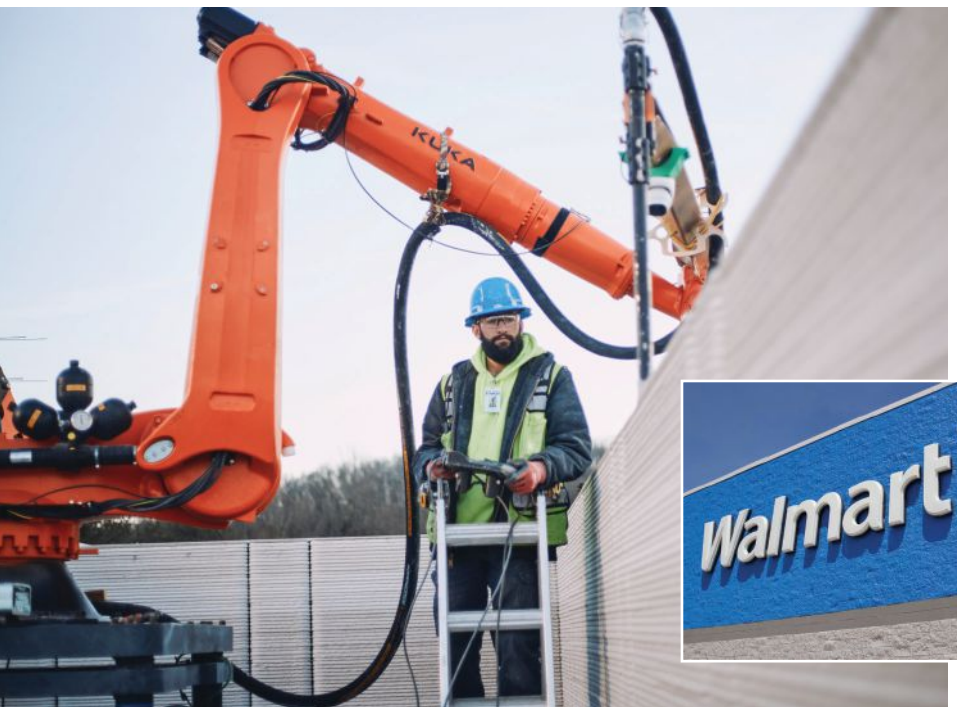
IMAGE COURTESY OF TYLER MORGAN PHOTOGRAPHY.

FMGI is working with Walmart to identify additional 3DCP projects.

When Walmart makes waves, it can create a tsunami. The mega-retailer, which has more than 10,000 stores around the globe, continues to be a leader in sustainability, productivity and innovation. Recently, Walmart teamed up with Alquist 3D, in partnership with Atlanta-based FMGI as general contractor, to complete their second 3DCP (3D Concrete Printing) build. The new 5,000-square-foot expansion at Walmart Supercenter #5197 outside Huntsville, Alabama, set a new industry record for speed of commercial construction — the walls of the structure were "printed" in just 75 hours. A five-person Alquist 3D and FMGI team used two 3DCP systems to construct the 16-foot walls in just 7 operational days. Traditional concrete masonry building methods would have taken a larger crew more than 3 weeks to complete. The Huntsville structure opened in May and serves as Walmart's online grocery pickup and delivery (OPD) location as part of the store's overall

R&R: According to Patrick Callahan, CEO of Alquist 3D, this Walmart project demonstrates how retail expansions can be faster, more cost-effective and less wasteful. How did the partnership originally come about?

Darin Ross, President & CEO, FMGI, Inc.: Walmart connected with Alquist 3D to 3DCP the 8,000-square-foot Athens, Tennessee, project and realized that we, as general contractor, needed to be involved in the planning and construction process. Combining 3DCP technology with the expertise of traditional construction was a winning solution. We quickly recognized this technology would change the retail construction industry and partnered with Alquist 3D to lead the change.



R&R: Is this the main type of construction FMGI does, or does it mainly handle traditional construction while exploring new building innovation as well?

Ross: FMGI manages traditional construction and is leading the industry with incorporating 3DCP into the retail construction process. The firm is currently working with architectural firm GreenbergFarrow on creating specifications for 3DCP so it can be adopted effectively and efficiently into a traditional construction program where appropriate.

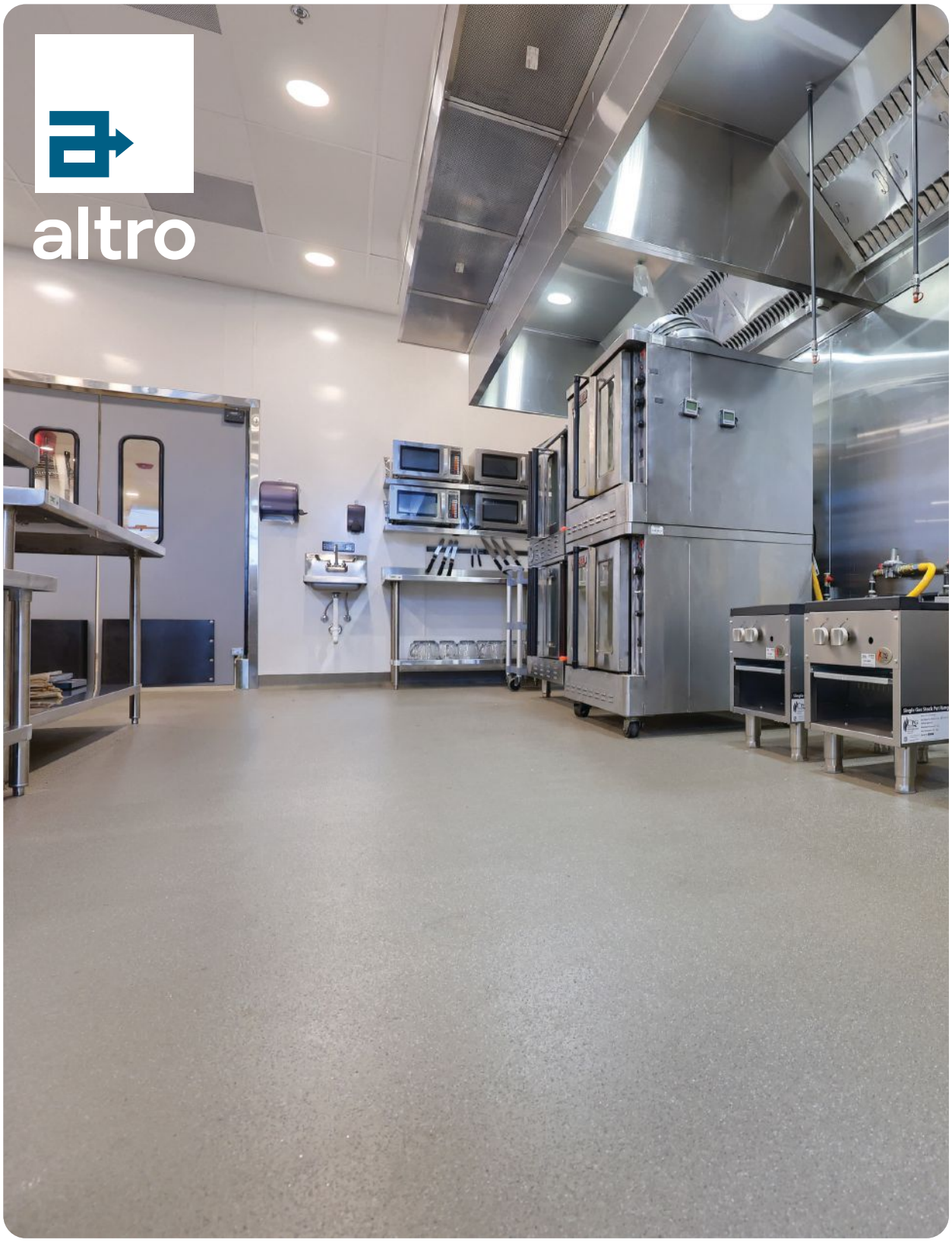
R&R: Tell me about the new 5,000-square-foot expansion near Huntsville, Alabama.

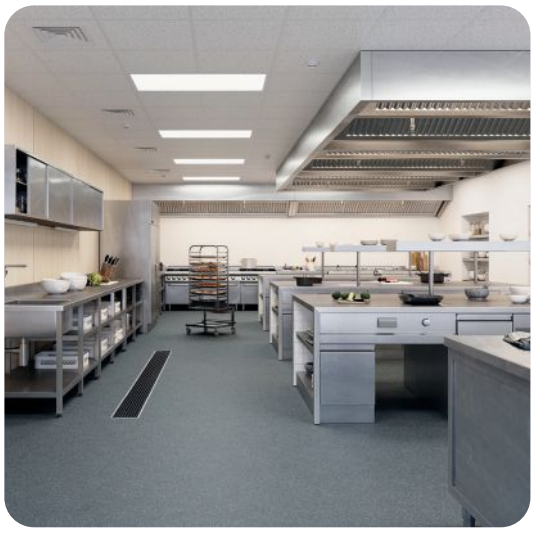
Ross: We applied lessons learned from Athens, Tennessee, to our Huntsville, Alabama, project. We deployed two robots onsite, which expedited the printing process and also reduced the number of times the robots had to be repositioned. The FMGI and Alquist 3D teams worked really well together on both sites, and the efficiency of our collaboration was clearly demonstrated in Huntsville.

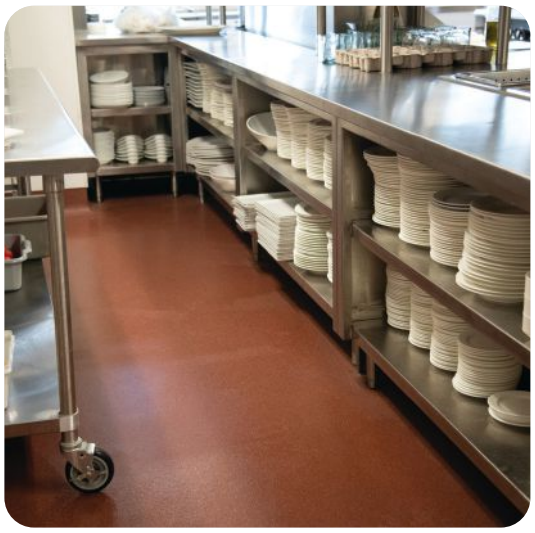
R&R: Please explain how the printing process can be completed so much faster than traditional CMU (concrete masonry unit) building methods.

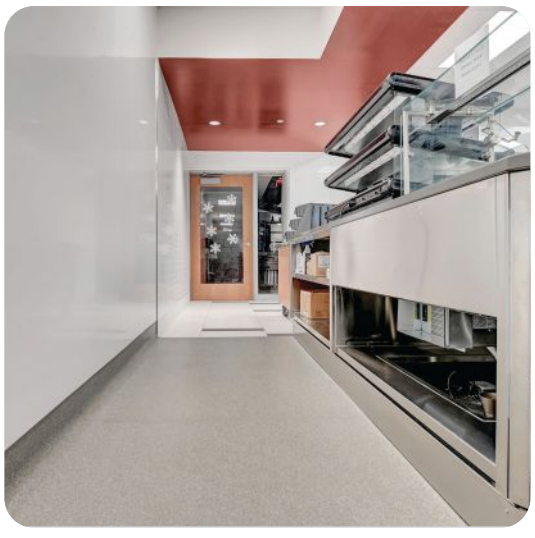
Ross: The elimination of scaffolding is a huge time saver and risk mitigator. Also, we can build higher, faster — cure times are faster for 3DCP and we can print in any weather condition once we identify the ideal water temperature to optimize the mix. Third, we can operate a robot for 18 hours in 1 day with just a 6-person crew (2 shifts of 3 people).

R&R: The Huntsville 3DCP project comes soon after the team's first 3DCP Walmart build that constructed walls for an 8,000-square-









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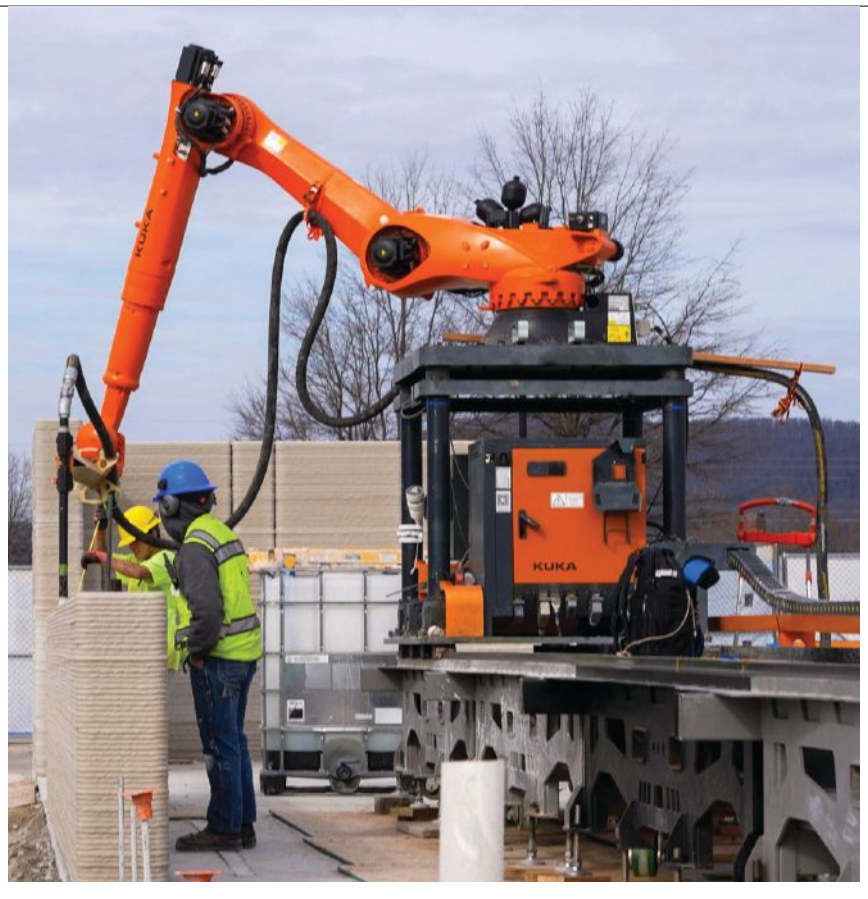
foot addition in Tennessee late last year. What was learned from the first project to prove the technology can thrive in real-world, high-demand commercial environments?

Ross: We learned several lessons from the Athens, Tennessee, project. Our biggest takeaways revolved around refining our processes:

- Collaborating with Walmart and Alquist 3D from project inception streamlined the process.
- Understanding the 3D concrete printing process thoroughly so we could then apply our traditional construction knowledge to the 3DCP process.
- Limiting the number of robot moves allowed us to print the walls in 7 days as opposed to 3 weeks for CMU masonry.
- Experimenting to find the ideal water temperature for the mix in order to print continuously in all weather conditions.



R&R: Tell me about the benefits of using 3DCP (because building delays and cost overruns plague almost all new commercial construction). It's safer, faster, cheaper?

Ross: Yes, yes and yes.

- Zero scaffolding was required, which mitigates risk and improves worksite safety.
- Time is saved by not having to install/dismantle/move the scaffolding and then repeat again and again.
- Robots can work 24-7 with minimal human crews and can be moved/repositioned with no down time.
- Financial savings are realized through faster build times, reduction of delays due to weather, crew or human errors, reduced crew and less material waste.

R&R: And you can build in all kinds of weather?

Ross: Yes. The robot can perform in adverse weather conditions. Mixing equipment is covered with a portable tent. The mixture is regulated as needed per weather conditions (heat, cold, humidity, etc.).

R&R: Is 3DCP a more sustainable way to build, too?

Ross: Yes, less waste, less trucks with emissions, less materials. And it's stronger.

R&R: Rounding out the team are Sika USA, which supplied custom-

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3DCP is safer, faster and cheaper than traditional concrete masonry construction.

ized concrete mixes, and robotics provider, RIC Technology, which furnished the robotic systems designed to achieve high-precision printing with reduced labor requirements. Is this the wave of the future, with robotics soon to be commonplace in construction projects?

Ross: Yes, 3DCP is now a component of construction and will be incorporated for a variety of — but not all — projects. Building codes and regulations need to be adapted to accommodate this new construction method. It's important to note that construction workers and expert contractors will always be needed. Robots will not replace all humans; rather, workforce development will look a little different. The younger generation wants to operate a robot versus learning the trades, so we'll see a new and different method of training for the construction industry.

R&R: Starbucks, the U.S. Air Force and others are adopting 3D Concrete Printing too. Any others? Is Walmart leading the way when it comes to retailers?

Ross: Yes, Walmart is on the cutting edge of this technology. They solidify for other retailers that 3DCP is a viable component of construction — the robot is just another tool in our toolbox.

R&R: Is this technology ready to scale? What feedback has the team gotten from Walmart? Are other commercial clients taking notice?

Ross: Yes, this technology is ready to scale. American-built robots are in production. 3DCP design + engineering specifications are in the works. Workforces are being trained. A proprietary concrete mix is being finalized. The world's largest retailer now considers 3DCP a component of construction, not just a concept. We are seeing interest from home improvement retailers, quick-serve restaurants, fuel stations as well as single-tenant and small multi-tenant builders.

R&R: What are the biggest challenges to completing a 3DCP project?

Ross: The biggest challenge with completing a 3DCP project is scheduling, which will be streamlined as more projects are completed and timelines become consistent. Predicting how many linear feet can be printed within 24 hours is crucial to effectively scheduling labor, subcontractors, material deliveries, etc., to ensure the next stage of construction begins in a timely manner.

R&R: How long do you think it will take to become truly "mainstream?"

Ross: I am not a fortune teller, but I believe we are on the cusp of a major shift in retail construction. With some of the nation's top retailers utilizing 3DCP, we'll see more innovative brands embrace the technology — especially those with a focus on sustainability. I think we'll see a surge within the next 12 to 18 months and major adoption within the next 2 to 5 years — and we're happy to lead the way. Retailers want to deliver to market faster and cheaper — 3DCP is a tool to help achieve that goal. ■