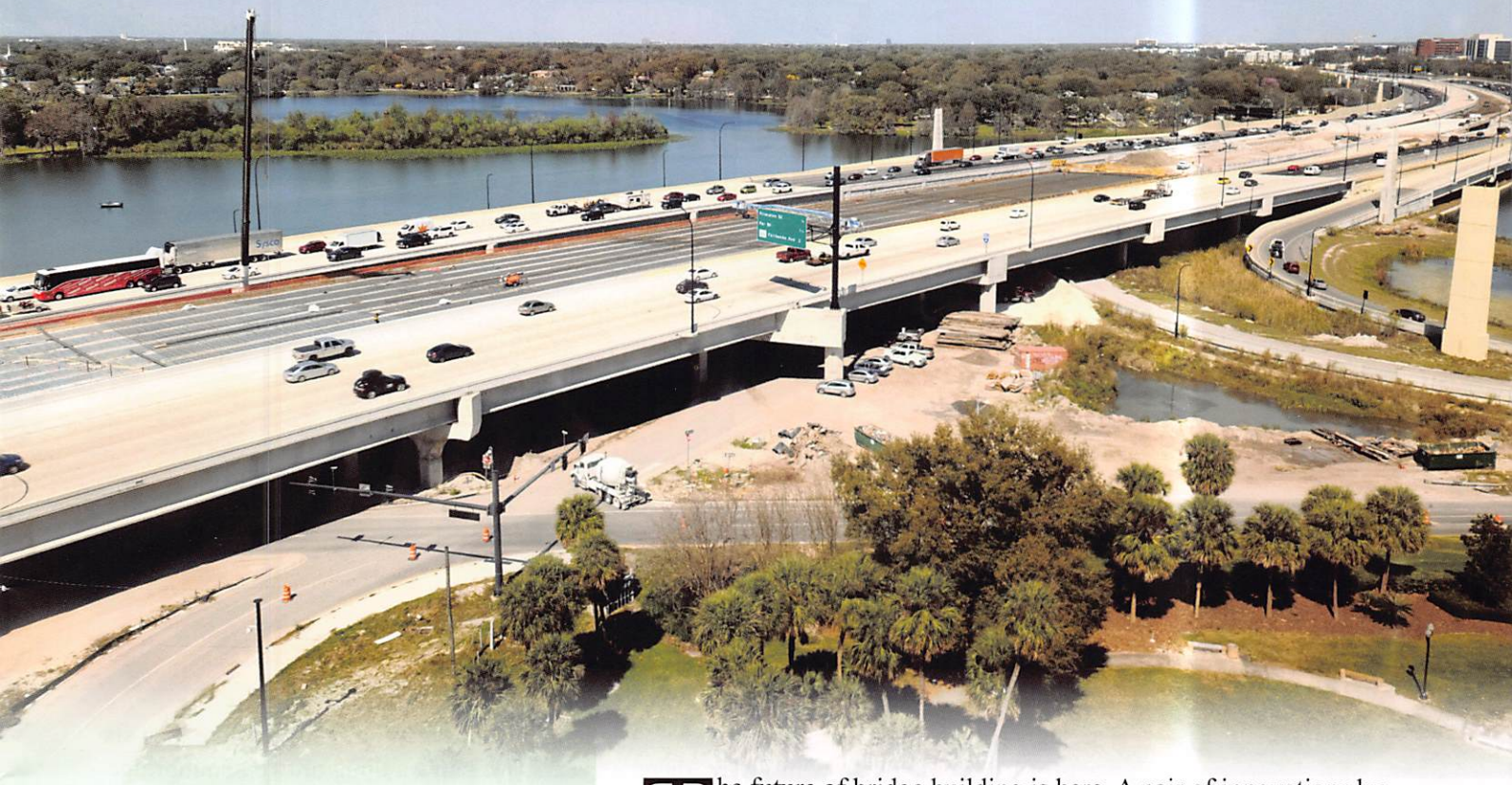
INNOVATION IN BRIDGE CONSTRUCTION

Robots are shaping the future of bridge building in Florida and beyond



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Jack Nix
Shelby Erectors Inc.

The future of bridge building is here. A pair of innovations by Advanced Construction Robotics (ACR) promise to drastically reduce the heavy labor involved in deck construction while also speeding up the time to deliver a project. As the workforce continues to age-out and as wages and the cost of materials continue to rise, bridge building, in many ways done the way it's always been done, needs a jolt of innovation.

And it's already underway. TyBot, a robotic piece of construction equipment that self-ties up to 1,000 rebar intersections per hour, has been in use since 2019. As with any piece of technology, it's been a process to fine-tune TyBot and figure out the best ways to deploy it. But with the latest generation unit expected to debut in the first quarter of 2022, and with growing interest from contractors across the country and even the globe, it's safe to say that TyBot is on its way to becoming a standard part of the bridge building process.

But TyBot's not alone. A related robot, IronBot, is set for deployment in the second quarter of 2022, and the potential is enormous. It is being designed to carry and place 5,000-pound bundles of transverse and longitudinal rebar with lengths of up to 60 feet. Considering a typical human carrying capacity is recommended to be 50 pounds, this represents an incredible reduction in the heavy lifting traditionally done by construction workers.

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Let this sink in: When combining the impacts of IronBot together with TyBot, there is an opportunity to automate up to 80% of the manhours associated with the typical horizontal rebar installation on bridge decks. This is nothing short of a watershed for the industry, as these robots remove the toughest part of deck building—the backbreaking part that workers increasingly don't want to do—while also streamlining the workflow. And, looking further down the road, there are plans to introduce the technology to ground slabs and Continuous Reinforced Concrete Paving projects like roadways.

In Florida, robots have proven themselves

But let's take a few steps back. Shelby Erectors Inc. has been in business since April 1, 1997, and became a Florida Department of Transportation (FDOT) certified Disadvantaged Business Entity (DBE) on August 6, 2010. The company employs over 200 people and has contracts that range in length from several months to more than six years. We know a thing or two about bridge building.

Shelby Erectors has used TyBot for nearly two years, and we've put the technology to the test. We've deployed the robot on the I-4 Ultimate and Wekiva Parkway-Section 6 in Orlando, and the Gateway Express in Pinellas County, where TyBot completed over 275,000 total ties, the most yet on a single project. These were big jobs in big markets, so the stakes were high and plenty of people were interested in the process and the outcome. But if you're not part of the future, you're going to be left behind. So, we embraced the future. It paid off and will continue to do so.

R&D and a specification change

Before we could use TyBot, we had to acquire a specification change from FDOT. Regulations require a double-strand single tie at every third intersection within the interior. To accommodate TyBot, the state of Florida

approved a change allowing for a single-strand single tie at every other intersection within the interior. It took time to obtain the blanket specification change, but that's what it took to bring new technology to a place like Florida, which has a healthy outlook for bridge construction.

As with any new technology, ACR continues to improve and upgrade TyBot as more field experience is achieved. Robots aren't perfect, especially when they first come to market, so there was some R&D and tweaking involved as we learned more about what the robot could and couldn't do. What we found is that longer multi-span bridges —when there is a continuous workflow and not a lot of phasing—are ideal for TyBot. When you have this type of setup, TyBot is an amazing tool.

And when it comes to setup and operation, TyBot is simple. It can be assembled in one to four hours with only two laborers, and once it's up and running, all TyBot needs is a Robot Supervisor to monitor its performance, and in some cases, to manually override the autonomous operation. But the unit needs no pre-mapping, programming, or calibration. TyBot self-locates and self-positions and is not remotely operated.

TyBot represents a big change in the way bridges are built. With change comes hesitancy and even resistance. It's understandable. But the reality is that there's already more work than the construction industry can handle. It's time to step past the hesitancy and accept the fact that robots can do certain grueling jobs—like carrying tons of rebar and then tying thousands of intersections—better, faster, and longer than construction workers. Robots like TyBot and IronBot are a supplement for ironworkers, not a replacement, and together the new technology only increases productivity for everyone on the jobsite.

Shelby Erectors had the pleasure of working with national design and professional services firm WGI on the Wekiva Parkway-Section 6, where TyBot completed over 112,000 total ties. Henri Belrose, PE, is WGI's design project manager for Wekiva 6. He saw firsthand the value in TyBot's ability to address the workforce shortage across the industry. Its engineers like Belrose and firms like WGI that will help bring innovation to the building of bridge decks.

Schedule improvement along with productivity

Thus far, TyBot has been deployed in the Midwest and the Eastern Seaboard, from New Hampshire down to Florida. But that's going to change soon. Contractors across the country have expressed interest in TyBot. Domestically, the company can deploy units from its office in Pittsburgh to anywhere within the U.S. As business grows and resources are added, TyBot plans to create regional dispatch centers to optimize deployment.

While the impact on productivity is extremely compelling, the potential for schedule improvements is just as impressive. This technology is going to force the industry to rethink how they plan and execute their projects as TyBot—and eventually IronBot —is putting pressure on the workflow. As the rebar placing and tying becomes faster, contractors will have to be ready to support the process with their deck soffit formwork, overhang jacks and screed rail.

ACR is focused on bringing technology like TyBot and IronBot to the jobsite, where they will prove themselves indispensable. Having been associated with TyBot for nearly two years, and as we plan on being early adopters of IronBot, Shelby Erectors knows that the future of building bridges is here. And if you're not preparing for the future, then you're already behind.

Author

***Jack Nix** has been in the steel industry since 1985, where he started as a rodbuster out in the field—working his way up to Foreman, Superintendent, and eventual COO of his father's company, V&M Erectors Inc. He currently holds the title of VP of Operations for Shelby Erectors Inc., which specializes in bridge rebar and metal decking. He is a lifelong Floridian currently residing in Key Largo, FL with his wife of 30 years, Jennifer. They have 2 adult children, Shelby & Jackson and 2 grandchildren, Wyatt and Levi. He enjoys fishing and boating in the beautiful waters of the Florida Keys in his spare time.*