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and output with new batching system



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Advanced Concrete Technologies, Inc., Greenland, New Hampshire, 03840, USA

Florida precaster increases efficiency and output with new batching system

■ Hank Giles, Giles Associates, USA

Forterra, Inc., with 79 manufacturing locations in the U.S., eastern Canada, and Mexico, is one of the world's largest publicly traded (Nasdaq: FRTA) producers of pipe and precast products for water-related infrastructure applications, including water transportation, distribution, and drainage. The firm was launched in 2015 via the acquisition by Irving, Texas-based Lone Star Fund of Hanson Building Products from Heidelberg Cement AG. Rebranded Forterra in October 2015, the firm has pursued a strategy of organic growth through operational efficiency, customer service and product innovation. The firm has also made several key acquisitions and divestitures designed to optimize its regional coverage, improve product offerings, and achieve economies of scale. By consistently reinvesting in its own manufacturing operations, Forterra has steadily improved capacity, product quality, and efficiency. A recent example of this success is the firm's Deland, Florida Pipe and Precast facility, located about 20 miles north of Orlando. Deland is one of five Forterra manufacturing locations in Florida. The other plants are located in Green Cove Springs, Gretna, Marianna and Winter Haven.

Formerly Hanson Pipe and Products, the 50,000 ft² (4,645 m²) Forterra Pipe and Precast plant in Deland is a major producer of precast underground utility products such as box culverts, manholes, pipe end sections, junction boxes, wet wells, lift stations, and catch basins. The plant is Forterra's largest wet cast producer of precast products in the state, exclusive of precast concrete pipe.

Change overdue

In 2017, the Deland plant began experiencing an increasing frequency of breakdowns and disruptions as a result of the 20-year-old batch plant in use there (fig 1). The old plant was based on a three cubic yard pan mixer with a split silo stacked on top of the mixer, making the mixer/silo tower almost 80 feet tall.

Frequent downtime and long morning start-up delays had begun to negatively impact production output. In addition, overtime costs were rising because longer shifts were required to compensate for batching delays.

The Deland plant manager, Tom Garred, made the case that the time was right to upgrade the batching system.

"Our old batch plant had reached the end of its useful life," Garred notes. "We were constantly making repairs and having to keep a large inventory of spare parts on hand. We were incurring overtime because of downtime and overall slow operation of the batching system. We had to control our mix moisture manually, which was a struggle. We spent a lot of time conducting 'cookouts' to determine our aggregate moisture content. **Maintaining mix consistency was challenging.**" **Another manual procedure that was time consuming, inaccurate,**



Fig 1: Original 20-year-old batch plant with high profile stacked mixer/silo.



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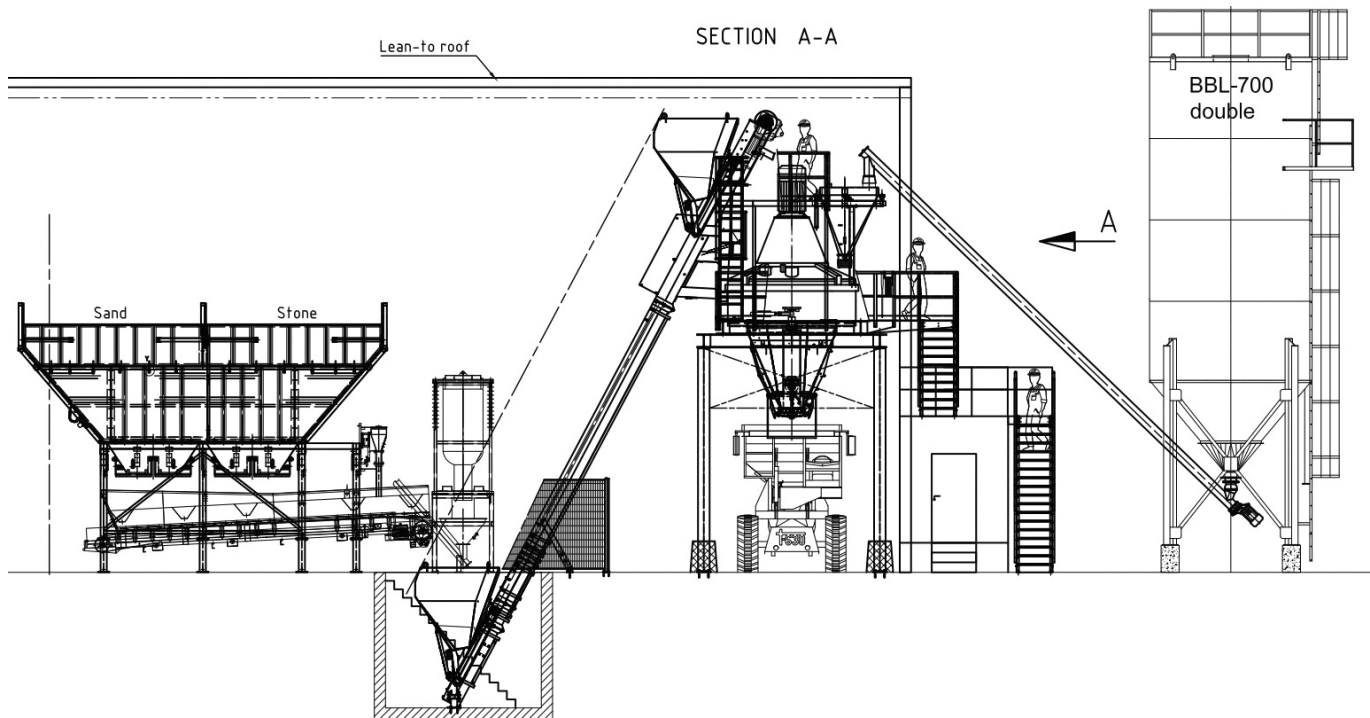


Fig 2: New plant solution provided by Advanced Concrete Technologies (ACT) replaced the 20-year-old batch plant at Forterra's wet cast facility in Deland, Florida, USA.

rate and not recorded on the batch report was the addition of certain admixtures. For instance, the plant was increasingly required to add Xypex crystalline waterproofing admixture to sanitary sewer products for key municipal customers. Along with waterproofing, Xypex admix also provides integrated protection against microbial induced corrosion (MIC), which is common in sewers due to the build-up of hydrogen sulfide gas.

"Xypex is an important product for some of our big municipal customers," Garred says. "It essentially takes the place of epoxy or painted coatings. We are trying to go as green as possible, and Xypex helps us do that. However, we used to have to climb the stairs to the mixer platform and dump in a bucket or water soluble bag of Xypex for every batch. It was time consuming and not as accurate as we would prefer."

Weighing choices

Garred worked alongside Forterra's Florida regional management team to evaluate replacement options for the Deland

batching system. "Maintenance had become so extreme on the Deland system. It would take two to four hours on a bad day to get the batch plant running right. We began planning to replace the Deland batch plant in 2017, and it was put in as a capital project for 2018," explains David McClintock, P.E., director of operations for Florida.

The Forterra team evaluated proposals from three batch plant suppliers, which included the manufacturer of the original Deland batching system as well as a system proposed by Advanced Concrete Technologies (ACT), a firm based in Greenland, New Hampshire, USA (fig 2).

Forterra was already using five ACT/Wiggert batch plants at three other locations in Florida, including Gretna, Marianna and Winter Haven. "We considered all our options and decided that it made the most sense to go with an ACT/Wiggert batching system (fig 3) for the Deland plant as well," McClintock continues. "We believed that we could achieve the greatest synergy within our region by extending our use of ACT/Wiggert systems."



Fig 3: A Tuckerbit concrete transport vehicle pulls out with a 6 CY load from the new ACT/Wiggert concrete batch plant.



Fig 4: Integrated automatic Xypex admixture metering system accurately dispenses correct dosage of admixture powder.

McClintock adds, "I knew the ACT/Wiggert batching system was a solid choice. My biggest concern overall was how quickly we could take the old plant down and get the new one up and running. Deland is our flagship when it comes to pre-cast drainage products. We ship a tremendous amount of product from there every day. We knew we could temporarily make up that production at other locations, but that also meant we would have to ship it further and we don't like to delay customer orders if we can help it."

Forterra's Florida region vice president and general manager Rick Rhodes was also closely involved in the selection of a new batching system for Deland. "I come from a ready-mix background and I really liked the level of automation and maintenance recordkeeping that is built into ACT/Wiggert batching systems. Maintenance reminders on a daily, weekly or monthly basis is a key way to extend the life of the mixer and the rest of the batch system."

Garred also liked the idea of stocking and sharing common parts for his new ACT/Wiggert mixer. "We chose the same mixer that we have at our Marianna and Winter Haven locations, so we can help each other if necessary. We also wanted the new plant to fit onto the same footprint and foundation as our old plant. ACT did a great job making that happen, which helped us save money and reduce downtime. We just had to build a base for the new split silo, which we moved from the previous stacked configuration to a low-profile setup beside the mixer platform. The rest of the new plant fit in the same foundation as our old one."

One option that Forterra chose for its new ACT/Wiggert batching system was an integrated Xypex powder metering system (fig 4). According to McClintock, "We do an increasing amount of Xypex treated concrete in Florida and the way we had been doing it manually was not ideal."



Fig 5: Even after 6 months of continuous use, the HPGM 3450 (3 CY) planetary mixer still looks like new thanks to good housekeeping practices and an automatic mixer cleaning system.

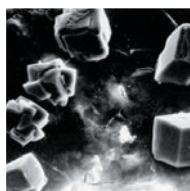
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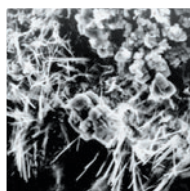
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Fig 6: The new ACT/Wiggert batching system, with integrated 3 CY concrete holding hopper, can load a 6 CY capacity Tuckerbuilt concrete transport vehicle in under a minute.



Fig 8: Plant manager Tom Garred checks on production and daily statistic using the ACT/Wiggert WCS control system while a Tucker reloads outside the control room window.



Fig 7: A video camera with light allows operator to view the concrete mix inside mixer remotely from the control room.

The new batching solution was engineered by ACT to fit on the existing foundation at Forterra's Pipe and Precast plant in Deland, Florida. The plant includes the following components:

- ACT/Wiggert WiCoMix 3450-2-WCS turnkey batch plant with a single planetary countercurrent HPGM 3450 high-shear mixer (fig 5) that produces three (3) cubic yard (2.3 m³) output every three minutes – automatically delivering about 60 CY per hour continuous production. The mixer platform is also equipped with a three cubic yard concrete holding hopper mounted below the mixer, which enables the HPGM 3450 mixer to serve the plant's two Tuckerbilt concrete distribution vehicles fast and efficiently (fig 6).
- Video camera and light built into HPGM mixer cover (fig 7) provides operator with real-time viewing of the concrete mix inside the mixer.
- ACT/Wiggert WCS PC-based computer control system (fig 8) provides a user-friendly graphical interface displaying all operations information. The system performs precise batch sequencing, records and reports on recipes, batches, inventory, maintenance, and all other production statistics critical to business operations. The WCS controls incorporate the Hydromat moisture measuring and compensation system that provides precise batch water correction. The WCS Control enables user definable pre-water to satisfy aggregate absorption. "Water/cement ratio accuracy is critical for the high



Fig 9: A front end loader refills one of two aggregate bins as the weigh belt discharges the next batch into the skip hoist bucket.



Fig 10: ACT Hydrotester moisture probe is mounted below sand bin and provides real time moisture measurement to the WCS Control system.

slump flowing mix that we use in all of our precast products,” notes Garred.

- Two-compartment aggregate bins each hold approximately 53 tons of sand and coarse aggregate and are charged by a front-end loader (fig 9). The new bins are about 25 percent larger than the previous plant, which has reduced the refill frequency from five or six times per day to about three.
- Hydrotester moisture probe in the sand bin (fig 10) auto corrects batch weight to maintain recipe-defined SSD batch weights and yield.
- 700 BBL double-wall split silo (total 2,858 ft³ or 81 m³) for the storage of Portland cement and fly ash with integrated top-mounted cartridge-style dust collectors. The silos (fig 11) are also fitted with anti-overfill protection systems and radar level sensors with 0-100% real time inventory control.
- Automatic high-pressure washout system in the mixer saves cleaning time, increases mixer life, and extends the production day. Throughout the day, the mixer continually cleans itself and final cleanout of the interior takes only about 10 minutes. Hand-operated lances allow spot cleaning and cleaning of the outside of the mixer, platform and chute. “We use a ‘pre-wet’ set up for each batch that utilizes the mixer cleaning system for 12 seconds to both clean the mixer and uses that water in the mix calculation,” notes Garred. “We used to need two 2-inch fire hoses and a lot of time to clean our old mixer.”
- Integrated Xypex metering system (fig 4) from ACT accurately delivers the precise dosage of Xypex crystalline waterproofing powder required for each batch. “We load the hopper once a week with about 1,600 lbs (726 kg) of Xypex admix. It makes things much easier and recorded on the batch ticket,” says Garred.

Smooth transition

Preparations for the arrival and setup of the new ACT/Wiggert batch plant were started in late 2018 with an on-site technical clarification meeting with the Forterra team to ensure a smooth installation process. Forterra constructed a foundation for the new low-profile split silo and added a height increase to the loading ramp to enable the front-end loader to reach the new, larger aggregate bins.

Installation of the new ACT/Wiggert batching system was carried out in January 2019, beginning with disassembly of the old batch plant over a weekend by Tom Garred and his DeLand team members. “We rented a 100-ton and a 75-ton crane



Fig 11: 700 BBL split silo contains Portland cement and fly ash. The Tucker operators are responsible for running the concrete batch plant in addition to refilling the aggregate bins as needed. Tucker drivers are trained in the use of the WCS control system and can order their own batches whenever needed.

and were able to remove the old plant in one day," Garred notes. "With ACT service tech supervision, it only took about eight days to install the new plant."

During the first week after installation of the new batch plant, the Deland plant maintenance supervisor was trained by ACT service engineer in the operation of the system, and about 60 tons of concrete were produced. This increased to nearly 400 tons the second week and 1,500 tons during the third week post installation. Garred says, "We had some specialized staff here from our Texas headquarters to help with the plant installation of the new system and they said this was one of the smoothest installs they'd ever worked on."

Payback begins early

Once the new batch plant was up and running, the improvements over the old plant were immediately evident. The Deland plant uses a flowing mix that is approved by Florida DOT and does not require vibration to settle. Continuous and fully automated monitoring and control of mix moisture means that mix consistency and accuracy are always spot on.



Fig 12: Superior high early strength, verified through cylinder tests, provides greater confidence when stripping forms and moving products.

The ACT/Wiggert HPGM countercurrent mixer provides high shear mixing action that is fast and thorough.

"The quality of our concrete is just better now, in so many ways," notes Garred. "For instance, we immediately noticed an increase in early strength—24 hours—of about 600 PSI (fig 12). That's a huge increase with no change in our mix whatsoever. Higher early strength gives us great confidence when stripping forms and moving product out to the yard. We're also seeing about a 500 PSI increase in 28-day strength."

The Deland plant is also producing products that look better (fig 13). "We've virtually eliminated bug holes and other defects, which our regular customers have noticed. Because we started production with the new batch plant during the winter, we discovered that we no longer need to use a non-chloride accelerator during cold weather. The high shear of the new mixer, we believe is more thoroughly hydrating the cement. So, we're saving money on admixtures."



Fig 13: Finished product is prepared for delivery.

Faster fill-ups

The three cubic yard mixer in combination with the three cubic yard holding hopper means that the system can fill a six-yard capacity Tuckerbilt concrete transport vehicle in under a minute (fig 14). The previous batching system in use at the Deland plant required the Tucker to wait more than six minutes for a full load.

"That's a major time savings when we're hauling 50 loads per day in our two Tuckers," Garred observes. "We used to be able to pour only about 60 yards before lunch with our old batching system. Now, we can pour 90 every morning and twice that in the afternoons. Our overall output in tons per man-hour has increased by about 30 percent since we commissioned the new system (fig 15)."



Fig 14: A 6-CY capacity Tuckerbilt concrete transport vehicle fills forms on the production floor at Forterra's Deland, Florida wet cast plant.



Fig 15: A form is filled on the production floor by a Tuckerbilt concrete transport vehicle.



Fig 16: Quality, safety and productivity requires teamwork at Forterra.

According to McClintock, "When we proposed this capital expenditure, we calculated our payback based on greatly reduced maintenance costs and efficiency improvements. If the market stays strong and we continue high volume output and sales, we estimate our return on investment to be in the three to five year range."

He continues, "Of course, there's also the whole stay in business part of the equation. We were struggling with an old batching system and that wasn't going to get any better. The new batching system solves all those problems and sets us up for whatever the future holds. In my 23 years of experience in this industry, there's no doubt that this was one of the best projects I've worked on. There were no surprises, no budget changes required, and we got it installed and running with minimal downtime."

Forterra regional VP Rick Rhodes admires the dedication of the Deland plant manager and his staff. "I have no idea how Tom (Garred) kept that last batching system running as long as he did. He took incredible care of it. The new ACT system is like a sports car compared to that old plant. He keeps it looking great all the time. I would not be surprised to learn that he actually waxes it. That kind of pride of ownership in management is something that trickles down to everyone who works there (fig 16). It's contagious."



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