



REPRINT | CONCRETE TECHNOLOGY

NPP helps meet regional demand surge with state-of-art batch plant

REPRINT
CPI 03/17



-  Abcic
Associação Brasileira de Cimento Portland
-  ABTC
-  aci
American Concrete Institute
-  American Concrete Pipe Association
-  bim
-  British Precast Member
-  ICI
-  icpi
International Concrete Pipe Institute
-  IPHA
INTERNATIONAL PRESTRESSED
HOLLOWCORE ASSOCIATION
-  PCI
-  NATIONAL PRECAST
-  NPCA
NATIONAL PRECAST CONCRETE ASSOCIATION
-  NZCS
-  PCI
-  中国混凝土与水泥制品协会
precast.com.cn

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

NPP helps meet regional demand surge with state-of-art batch plant

■ Hank Giles, Advanced Concrete Technologies (ACT), USA

Among the important investments made by Northeast Prestressed Products LLC over the past year as part of an \$8 million plant upgrade program is the addition of a new computer-controlled concrete batching system with heated aggregate storage from Advanced Concrete Technologies (ACT). The investment—in response to a surge in new business over the past few years—also includes steerable trailers for transporting large precast beams, a 70-ton mobile crane, forms for precast concrete deck panels and box beams, and battery molds for precast bridge abutments.

Northeast Prestressed Products (NPP) is dedicated to serving the transportation infrastructure needs of the Northeast and Mid-Atlantic regions of the United States from its 80,000 square foot production facility located on 28 acres in Cresona, Pennsylvania. The firm, founded in 1950 and formerly known as Schuylkill Products, was purchased in 2009 by Glenn O. Hawbaker Inc. of State College, Pennsylvania.

Since 2009, the firm has steadily increased its share of local business and expanded further into new DOT and transportation related markets in 13 surrounding states and their associated agencies. In early 2014, the firm was named as one of three primary precasters to supply critical structural components to the \$1.5 billion Goethals Bridge Replacement Project, a public-private partnership (P3) between the Port Authority of New York and New Jersey and successful bidder, NYNJ Link Developer LLC, a consortium formed by Macquarie Infrastructure and Real Assets, and Kiewit Infrastructure Company (figure 1).

The new 7,100-foot-long Goethals Bridge—scheduled for completion in 2018—is being built alongside the existing 90-year-old bridge. The new bridge will feature two three-lane cable-stayed spans across the Arthur Kill strait from Elizabeth, New Jersey, to Staten Island, New York. NPP is providing the project with nearly 400 precast, prestressed concrete bulb-T



Figure 1 : The twin spans of the new Goethals Bridge are suspended from four towers, and are under construction next to the original 90-year-old bridge (at right), which connects Elizabeth, NJ and Staten Island, NY. [photo courtesy The Port Authority of New York and New Jersey; web cam view March 2017.]



Figure 2: Workers secure one of 400 precast, prestressed bulb-T beams—supplied by Northeast Prestressed Products—to the Goethals Bridge Replacement Project. [photo courtesy The Port Authority of New York and New Jersey]



North American Supplier of Customized Concrete Plant Solutions



- Mixing & Batching Plants
- Planetary Countercurrent Mixers
- Twin Shaft Mixers
- Color Metering
- Automatic Mixer Cleaning System
- Computer Automation
- Concrete Delivery Systems
- Admixture Metering

www.concretebiz.com 603.431.5661
American Division of Wiggert & Co. GmbH and Würschum GmbH

 **ADVANCED
CONCRETE
TECHNOLOGIES®**
WE ADD PROFITABILITY TO THE MIX



Figure 3: Each 110-ton bulb-T girder is up to 178 feet long, eight feet tall, and three-and-a-half feet wide. [photo courtesy The Port Authority of New York and New Jersey]

beams (figures 2 & 3) measuring up to 178 feet long by eight feet high and weighing as much as 110 tons. The firm is also supplying the bridge project with more than 6,000 precast, prestressed partial-depth deck panels, each weighing up to two tons.

The bulb-T beams and deck panels for the bridge must be transported more than 120 miles from the NPP plant to the staging area in Elizabeth. The beams are so massive, they must be hauled individually on tractor trailers equipped with steerable trailers that enable the driver to steer the rear of the truck to negotiate sharp turns and other obstacles (figure 4). The firm maintains a fleet of 10 tractor-trailers and 30 steerable trailers for this purpose.

Rapid bridge replacement

In late 2014, NPP was the beneficiary of yet another major P3 transportation infrastructure project, this time for its home state. In a joint program between the Pennsylvania DOT (PennDOT) and private partner Plenary Walsh Keystone Partners, NPP was named the primary supplier of precast bridge elements for the Pennsylvania Rapid Bridge Replacement Project.

The project will replace 558 aging bridges throughout Pennsylvania that have been determined to be structurally deficient (SD). The project will use the accelerated bridge construction (ABC) approach to reduce such factors as costs, traffic impact, construction time, and the chance of weather-related delays. Bridge construction began in 2015 and will continue through 2018. NPP is supplying the bridge replacement project with a complete array of modular precast bridge com-



Figure 4: Northeast Prestressed Products is providing 400 precast, prestressed concrete bulb-T beams to the US\$1.5 billion Goethals Bridge Replacement Project. Here, a 178-foot long, 110-ton bulb-T is loaded on a truck equipped with steerable trailers that enable the rig to negotiate sharp turns.

ponents, including footers, abutments, wing walls, columns, pier caps, deck panels and parapets. In 2015, NPP was producing around the clock and hired more than 60 new employees to help meet the new demands posed by the two huge P3 contracts. Yet, the firm needed even more capacity and more capabilities. One of the key targets for improvement was to update the firm's aging concrete batching system.

Not only was every precast product the firm produced dependent on output from the relatively slow 15-year-old batching system, but the mixer and aggregate storage was occupying 3,000 square feet of valuable production space under the firm's main bridge crane. The old batching system took up to 10 minutes to produce each batch and was not able to reliably produce self-consolidating concrete—one of NPP's goals—on a consistent basis.

Each 178-foot-long bulb-T beam for the Goethals Bridge project, for instance, requires approximately 50 cubic yards of high performance concrete. It took nearly two hours just to batch and pour enough mix for one beam using the old batching system. With up to 100 pre-stressing strands and reinforcement cage, this process was labor intensive and time-critical using conventional concrete and vibration techniques. In addition to slower than desired operation, the old batching system was incapable of reliably producing self-consolidating concrete.

"We knew what we needed to do, but getting it done was a logistical challenge," notes NPP vice president Dennis Fink (figure 5). "We knew we had to find a way to locate the new batching system in its own enclosure outside the plant to free up our critical production space. We could not afford any sig-



Figure 5: From left to right above: NPP vice president Dennis Fink; NPP assistant plant manager Andrew Fink, plant superintendent Dave Guinther; NPP president Tom Koons; chief engineer Troy Jenkins; plant manager Gary Lehman; plant superintendent Mike Stancavage; batch plant operator John Shala; and QA manager Dave Bretzius.

nificant interruption in production while converting to a new batching system. And, in addition to all of that, any new batching system we installed would have to be certified by all of the different DOT agencies we work with before it could go into service."

NPP works so closely with regional DOT inspectors that the firm provides offices and housing for the inspectors and their engineering consultants. "We have nine different offices for DOT and P3 inspection teams, and they are usually filled up," Fink says. "In some cases, there will be an engineering firm representing several DOT organizations who subcontract to them."

Search for a solution

In early 2015, Fink and NPP president Thomas Koons attended trade shows and conducted other research to narrow down their search for a new concrete batching system. While

several solutions were considered, the representatives from Advanced Concrete Technologies (ACT), of Greenland, New Hampshire, USA, made the strongest impression on the NPP selection team.

"It wasn't a matter of them just selling us a mixer that would go on a platform somewhere," Fink explains. "Ours was completely a design/build challenge and what impressed us was their ability to quickly understand our situation and begin offering solutions immediately. Over the course of several months, we continued our discussions and meetings and they provided us with detailed designs and a clear proposal." NPP's wish list for its new batch plant included:

- Move the batch plant outside the main production building to free up new production space under the plant's main overhead crane;
- Protect the new batch plant from the weather, including heated aggregate storage for all-weather production;



Figure 6: New batch plant at Northeast Prestressed Products in Cressona, Pennsylvania, USA, is fully enclosed to provide all-season consistency.

- Provide significantly more storage capacity for aggregates, cementitious materials, and admixtures;
- Provide a high shear mixer capable of producing high performance concrete, including SCC, as well as consistent four cubic-yard output even when faced with variability in aggregate specific gravity and angularity;
- Reduce batching cycle time and provide flexibility and increased mix distribution;
- Provide a higher level of system automation, including the microwave moisture technology, in-depth batch history reporting, automated moisture control, maintenance reminders, and automated inventory tracking and reordering; and
- Reduce or eliminate overtime required for batch system cleanup.



Figure 8: ACT engineers worked closely with NPP and mechanical contractors James Craft & Son, Inc., of Manchester, Pennsylvania, to help specify and design the new aggregate storage system. The five-compartment aggregate storage system is equipped with radiant heating capable of maintaining fine and coarse aggregates at approximately 65-75°F.

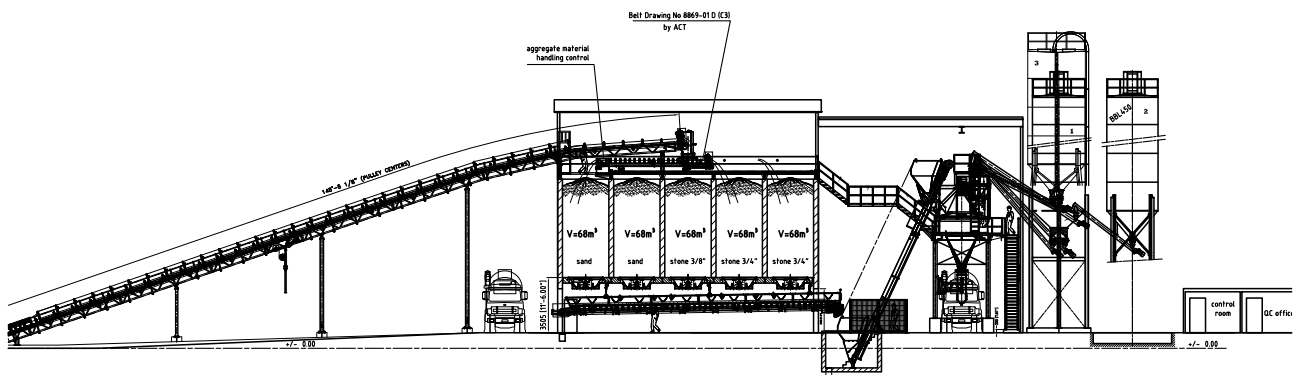


Figure 7: Elevated view showing complete batching system, including five-compartment heated aggregate storage bins, aggregate conveyor/sorting system, skip hoist, mixer platform and cement silos.

ACT worked closely with NPP's chosen local contractor, Kinsley Construction, Inc., of York, Pennsylvania, on the details of site preparation for the new batch plant. Site preparation included the construction of a large, steel-frame insulated enclosure (figure 6) to house the new batching system and aggregate storage bins.

The new aggregate storage system (figure 7) was a critical project and required that multiple contractors and subcontractors work in close cooperation. "ACT was instrumental in helping us design the aggregate bin system," Fink says. "They see many plants around the world and sell plants in cold environments, so their experience and recommendations really helped us."

ACT engineers worked closely with NPP and mechanical contractors James Craft & Son, Inc., of Manchester, Pennsylvania, to help specify and design the new aggregate storage system. The five-compartment aggregate storage system needed to be equipped with radiant heating capable of maintaining fine and coarse aggregates at approximately 65-75 degrees Fahrenheit. Craft & Son arrayed miles of radiant heat tubing over a bed of 6 inch by 6 inch reinforcement wire mesh to provide a precast heated floor for the aggregate system. Craft

also provided radiant heat controls, tubing manifolds, boilers, valves and other necessary components for the system (figure 8).

The vertical aggregate bins were precast in stackable panels and then assembled in their final position. The five compartments are capable of holding and conditioning a total of 600 tons of sand, stone and other aggregates.

ACT/Wiggert MobilMat

The ACT/Wiggert MobilMat Mo4500-5-WCS batching solution was installed at the NPP plant in Cressona, PA in the summer of 2016. The solution included the following components and systems:

- Wiggert HPGM 4500 high-shear planetary counter-current pan mixer provides true 4.0 cubic yard consolidated concrete output. The mixer is factory mounted and integrated into a mixer platform. The mixer's primary discharge chute extends through an opening into the plant (see figure 9) to direct charge the crane bucket. The mixer is fitted with a second discharge gate

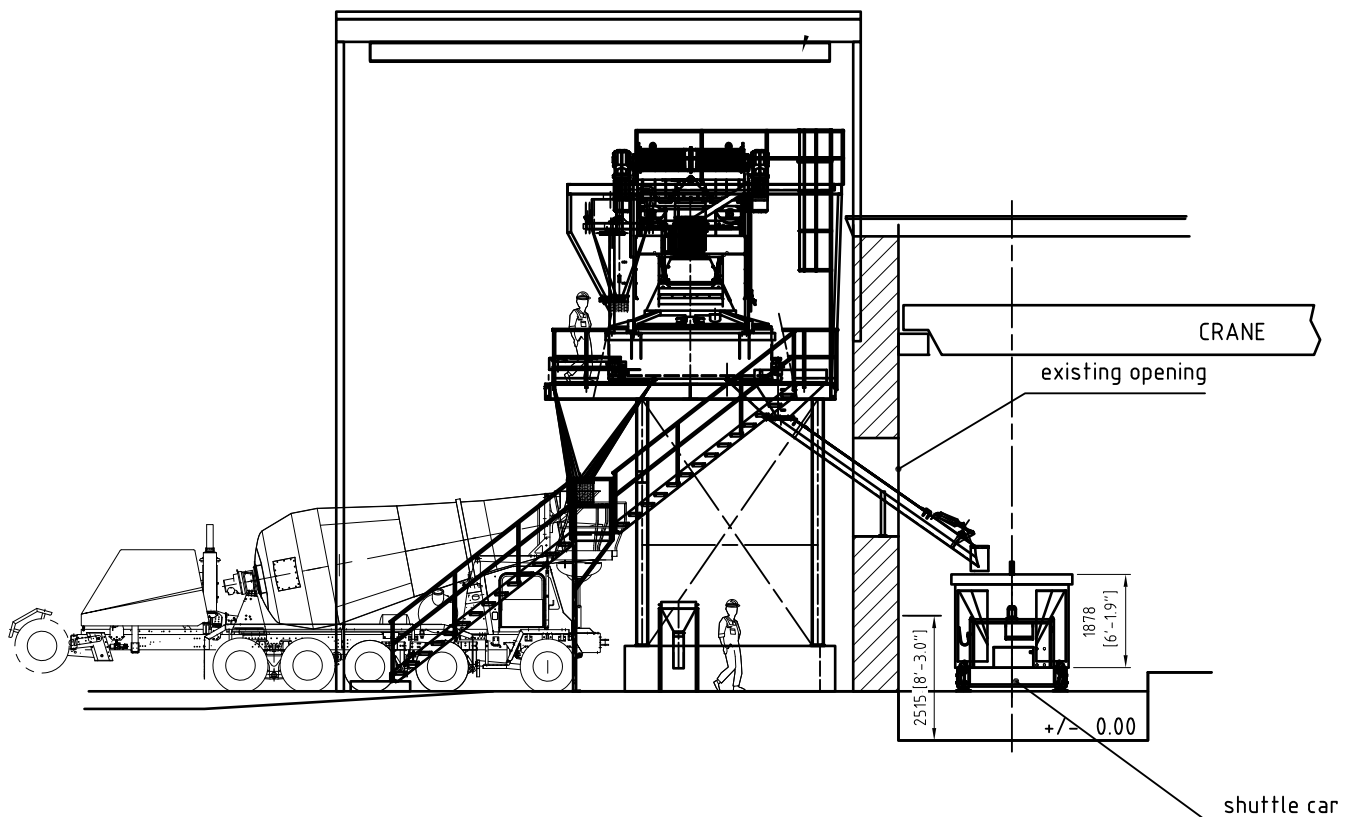


Figure 9: Elevated view from side, showing mixer platform discharging through wall to crane buckets; and optional external discharge to ready mix truck or other transport system.



Figure 10: The view from below the mixer platform holding the ACT/Wiggert HPGM 4500 planetary countercurrent pan mixer.



Figure 11: Here, a dry batch is transferred from the weigh belt to the skip hoist prior to loading into the mixer.

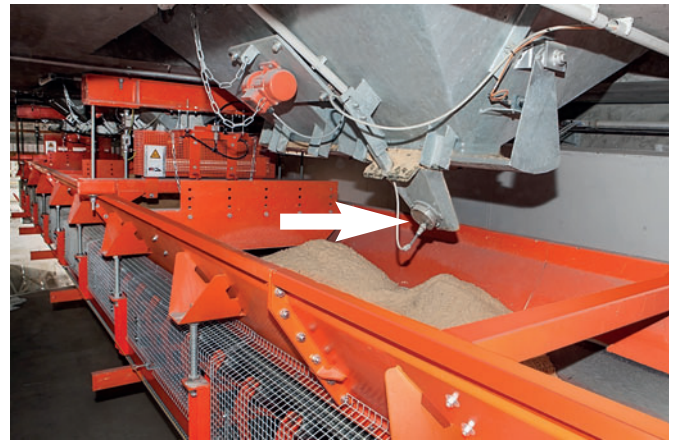


Figure 12: Close-up view of the base of aggregate storage bin. Here, sand is deposited on the weigh belt prior to loading the skip hoist for the trip up to the mixer platform. The arrow indicates the position of Hydrotester microwave moisture sensor, which provides real-time monitoring of the moisture content in the sand.

and chute (figure 10) that can be used to charging a ready mix truck or other concrete transport system for future plant opportunities and flexibility (e.g., possible outdoor production in peak summer months).

- “Sampler” door on discharge chute enables easier quality control sampling without interrupting production processes.
- Five-compartment aggregate bins provide up to 600 tons of total storage capacity. The aggregate bins were precast by NPP, providing lower initial capital cost and low operating costs. The bins are charged automatically

by an aggregate material handling conveyor system. Actual bin level is tracked in real time with laser level indicators. Each bunker bin has a galvanized cone section with dual pneumatic batching gates for fast/slow precision batching onto a high-speed weigh belt (figure 11). Fine aggregate bins are fitted with microwave ACT Hydrotester probes (figure 12) to automatically and accurately correct batch weights as aggregate moisture varies.

- WCS Control System (figure 13) is PC based and provides intuitive color-coded real-time display of critical elements of the batching process, as well as tracking of production statistics and reporting for material con-



Figure 13: NPP plant operator John Shala mans the PC-based control system for the NPP's new ACT/Wiggert MobilMat Mo4500-5-WCS batching system.

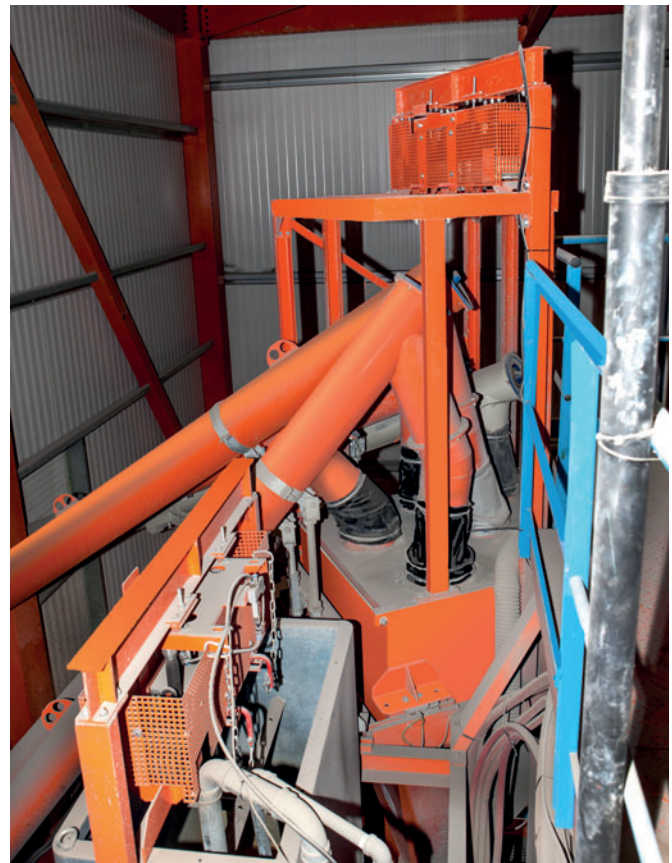


Figure 14: Screw conveyors from three cement silos feed cement, fly ash, micro silica and other cementitious components into the top of the ACT/Wiggert HPGM 4500 high-shear planetary countercurrent pan mixer.

sumption, inventory, and maintenance scheduling. The WCS includes statistic, batching history and reporting that satisfies stringent DOT requirements. A major benefit of the WCS Control System is that it allows the mixing and batching process to run automatically with an unattended control room.

- Hydrotester moisture sensors are installed in two of the aggregate compartments to monitor and auto correct for the sand moisture content.
- Hydromat microwave moisture measuring and control system provides automatic batch water correction to maintain user defined W/C ratio, which is critical for precision mix designs such as SCC. The WCS Control enables user definable pre-water to satisfy aggregate absorption (important in summer production).
- Radio remote call stations enable production managers to call for concrete, even when batch plant control room

is unattended. "One day, we anticipate, the batch plant operator could also be the crane operator because that person is the only one who sees everything on the production floor and knows when a new bucket is needed and where," notes Fink.

- Electro-mechanical cement weigh batcher provides the required precision needed by NPP's specialty high strength concrete requirements.
- Precision water weigh batching is more accurate than conventional volumetric metering methods.
- Three silos – two split silos and one full silo – provide up to 260 tons of total storage for cement, fly ash, micro silica and other cementitious components. All silos are equipped with radar level measurement 0-100 % indication, automatic silo overfill protection, and precision screw conveyors (figure 14).



Figure 15: Concrete buckets suspended from a bridge crane are in continuous motion to supply Northeast Prestressed Products production facility in Cressona, Pennsylvania, USA.

- High-pressure automatic mixer cleaning system reduces the cleaning cycle to 10 minutes at the end of shifts or during breaks. Hand-operated lances allow spot cleaning and cleaning outside of mixer, chutes and crane buckets at the end of the day. Good housekeeping equals a happier work environment and longer life for equipment.
- Two-position crane bucket shuttle cart, situated below the mixer discharge chute, enables crane operator to place empty crane bucket on the cart, and immediately pick up a full bucket without any wait time (figure 15). This feature further increases the plant productivity.
- Mixer-mounted dust collector uses cartridge style filters and features automatic air-shock cleaning to capture dust from silo charging and batching operations.

No down time allowed

Northeast Prestressed Products built its new batch plant and aggregate storage system directly outside of the production building from its old batch plant. Notes Tom Koons, "It was a logistics nightmare to ensure that we could still produce with the old batching system while we were building the new plant just outside the wall in its own enclosure. We managed to get it done within a five-day window over a long weekend when we determined we could shut down for the conversion." He continues, "Not only did we have to start up the new system while we were simultaneously removing the old batch plant, but we also had to certify the new batch plant with our DOT and P3 partners. Everything had to be verified and certified, including scales, mixer, admixtures, water metering—every single thing. Losing production for even a day would

be pretty significant for us. Luckily—actually not luck but through the hard work and collaboration of ACT and our staff—we got it right the first time."

Increased production and efficiency

The list of benefits derived from the capital investments made by NPP over the past 18 months is long. When it comes to its new batch plant, the key highlights include:

- **Reclaimed approximately 3,000 square feet of valuable production space** by placing its new batch plant in a weather-proof housing outside the building. This "new" production space directly enabled the firm to produce the 6,000 precast prestressed deck panels for the Goethals Bridge replacement project.
- **Achieving high early strength** sooner thanks to the increased energy and accuracy of the new batching system. "Usually two to four hours sooner, despite the fact that our clients require up to 10,000 psi at 28 days," Dennis Fink observes. "We achieve from 9,500 to 13,000 psi within 24 hours in most cases. That level of early strength gives us the extra time we need for the complex set-up requirements and reinforcing details and still allows us to maintain our 24-hour production cycle. It has also given us greater flexibility to meet demanding delivery schedules when necessary."
- **Greater production output.** The ACT MobilMat Mo4500 batching system has cut NPP's batch cycle time in half, from ten minutes to about five minutes per batch. "What used to take us 10-12 hours, we can now do in a standard 8-hour shift," explains Tom Koons. "That's had a critical impact on our production capacity. We can produce more product every day and it has enabled us to expand, which is good for everyone." Overall, NPP output has increased by 10,000 additional cubic yards of concrete per year over the past five years—enough additional concrete to fill three Olympic swimming pools, every year.
- **Increased production flexibility.** Given the 50 percent faster cycle time of NPP's new batching system and the faster exchange of crane buckets made possible by the ACT two-position crane bucket shuttle cart, the firm is able to not only pour individual beds faster, but pour multiple beds simultaneously if need be. "We are able to pour different mixes one after the other," Fink explains. "That's one of the things the ACT computer system allows us to do. We can have two different mixes and one batch can go one direction and another batch can go to another project without skipping a beat. One after another after another. That wasn't possible with our old batching system."

- **Reduced overtime.** NPP's new batch plant features an automated cleanout system that reduces mixer cleanup and maintenance demands. "With our old batch system, we would only washout the mixer at the end of the day or end of a shift," says Koons. "Concrete would continually build up inside the mixer so by the time you did cleanup you would need people to actually get in the mixer with jackhammers to get it out. We are running six days a week, which meant we'd have to bring in two guys on a Sunday at double time to do maintenance." NPP is saving approximately \$24,000 per year in overtime it no longer has to pay just to keep its batch plant clean.
- **Improved accuracy and consistency.** The WCS Control System in the ACT MobilMat batch plant provides NPP with greater batching accuracy, automated moisture measurement and compensation, detailed records of every batch produced, automated maintenance reminders, and automatic inventory tracking and reorder. NPP is now able to reliably and consistently produce any high performance mix required by its demanding DOT and P3 clients, and producing SCC, which is saving on labor and providing consistent quality.
- **Improved safety.** Strict lockout systems and safety interlocks on the ACT MobilMat batch plant greatly reduce the chance of accidents. In addition, the automated scale calibration check system has eliminated the need for workers to place certified weights on a scale, which was required with the old batching system.

DOT milestone achieved

Another key milestone that NPP attributes to its new ACT batching system is the recent acceptance by one of the firm's key customers of the new batch system's automated moisture measurement and compensation using microwave probes in the aggregate bins and mixer. In the past, and continuing today for most DOT and P3 inspectors, a single moisture test is conducted at the start of a shift and entered into the batching system for use throughout the day.

"We're offering our DOT and P3 partners a new, higher level of batching consistency and accuracy with continuous moisture monitoring and correction," notes Dennis Fink. "With our new batching technology, you are placing your faith in science and technology rather than from a single moisture reading taken by a person from the bottom of a 120-ton aggregate bin. That single reading does not represent the entire bin. We can provide an accurate reading in real time to ensure that 100 percent of our batches meet the specified mix design."

Tom Koons concludes: "Our firm is in great shape for the next 10-20 years. We are state-of-art across the board at this point and capable of delivering whatever high quality products that our demanding DOT and P3 customers demand. Our recent investments are already paying off in every way imaginable."

FURTHER INFORMATION



Advanced Concrete Technologies, Inc.
300 Portsmouth Avenue
Greenland, New Hampshire, 03840, USA
T +1 603 4315661
F +1 603 4315547
info@concretebiz.com
www.concretebiz.com



Wiggert & Co. GmbH
Wachhausstr. 3b
76227 Karlsruhe, Germany
T +49 721 943460
F +49 721 402208
info@wiggert.com
www.wiggert.com



Northeast Prestressed Products, LLC
121 River St. Cressona, PA 17929, USA
T +1 570 3852352
info@npp-llc.com
www.npp-llc.com