BARNHART

LIFTING LETTER

www.barnhartcrane.com

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A Publication Of Barnhart

AN ENGINEERING MARVEL

Barnhart Moves The World's Largest Tunnel-Boring Machine

COVER STORY

One of Barnhart's largest lifts ever took place in Seattle and involved the world's largest tunnel-boring machine.

In early April, the $80 million machine arrived at the Port of Seattle from Osaka, Japan to help dig a tunnel beneath Seattle as part of the project to replace the Alaskan Way Viaduct. The five-story-tall machine had been taken apart into 41 pieces for transport, the largest weighing about 850 tons.

The tunnel-boring machine (TBM) was met at the port by the Barnhart team. The pieces, along with hundreds of other smaller tools and equipment, were offloaded onto Goldhofer trailers in a 24-line quad-wide configuration. From there, Barnhart transported the major components to the launch pit site over nine days with teams working round-the-clock.

At the site, each of the large TBM components had to be carefully staged in the correct sequence before being lowered into the launch pit for reassembly, 80 feet below the surface. Barnhart used a modular lift tower to lower the components.

The feat was impressive enough to earn the praise of Juan Luis Magro, lead construction manager of Seattle Tunnel Partners, who said, "Barnhart has performed an engineering marvel."

> "With a job this big, safety is always a challenge. There is zero margin for error. This job was absolutely perfect."

NUCLEAR PLANT UPRATE UPDATE

Parallel Planning and Specialized Fabrication Made The Schedule a Reality

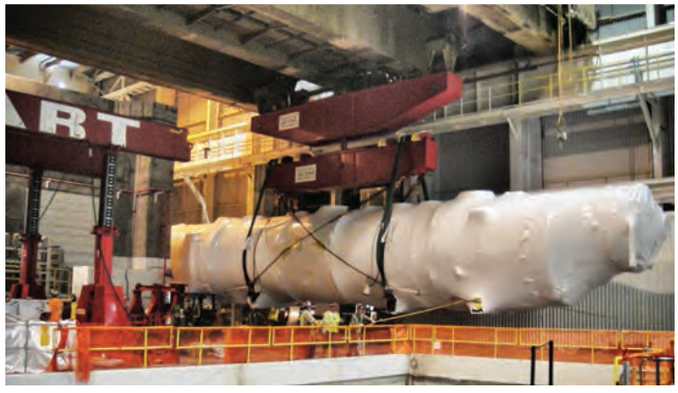
PROJECT FEATURE

Barnhart teams lifted, hauled or handled more than 19 million pounds of equipment on a major plant uprate project at a Mississippi nuclear station. Most of the major components were replaced to facilitate the power increase from 1201 MWe to 1475 MWe. The team removed and replaced four main transformers, two moisture separator reheaters (MSRs), nine feedwater heaters (FWHs), two reactor feed pump turbines, the rotor, stator and the steam dryer. When the old components were removed, the team relocated 48 contaminated components to the onsite mausoleum.

Given a project of this magnitude, many tasks were conducted in parallel to reduce overall schedule duration – i.e., the FWHs and MSRs had parallel activities. More than 150 crewmen worked on the job at any one time and more than 300 trucks were used to mobilize equipment. Mobilization required one centralized laydown yard to receive, track and redistribute the components and tooling. Barnhart established a first-rate logistics team to track and coordinate manpower and equipment. For each phase of the project, Barnhart fabricated specialized, job-specific equipment off-site and delivered it to the plant. Through their exemplary planning and execution in the field, the teams improved schedule times on every aspect of the massive project and completed the project safely.

BARNHART RECEIVED THE 2013 SCR&A RIGGING JOB OF THE YEAR AWARD FOR THE WORK ON THE NUCLEAR PLANT UPRATE.


BARNHART



GRAND GULF: Moisture Separator Reheater (MSR) Replacements

MISSISSIPPI

Barnhart replaced two MSRs in the turbine building via a passage through a bio shield wall on the turbine deck. Barnhart's standard jack and slide methods were used along with custom-fabricated saddles to remove the components. The team also used a specialized rotating lifting beam and two 250-ton overhead cranes in tandem configuration.

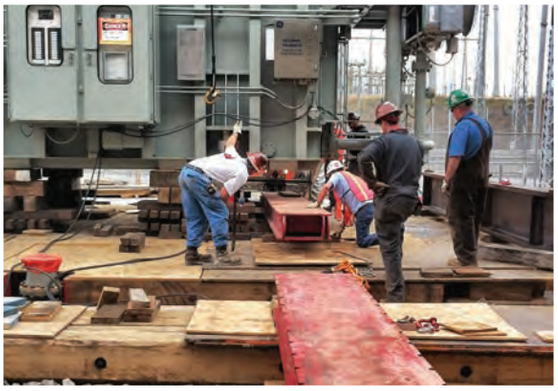
The 92-foot long, 603,000-pound MSRs were in confined positions in the bio shield wall bay and were suspended slightly off the floor, so it was difficult to support the load for the slide removal system. Barnhart created supports to span existing structural beams and positioned the supports manually using skates and come-alongs.

The MSRs were shrink-wrapped to protect against loose contamination. When the team removed the MSRs from the bay, they used a rotating lifting beam to lift and move the components to the train bay. Using the job-specific equipment, the vessel could be rotated 360 degrees and navigate the tight confines. Two 18-line PSTe Goldhofer trailers transported the MSRs to the mausoleum. B

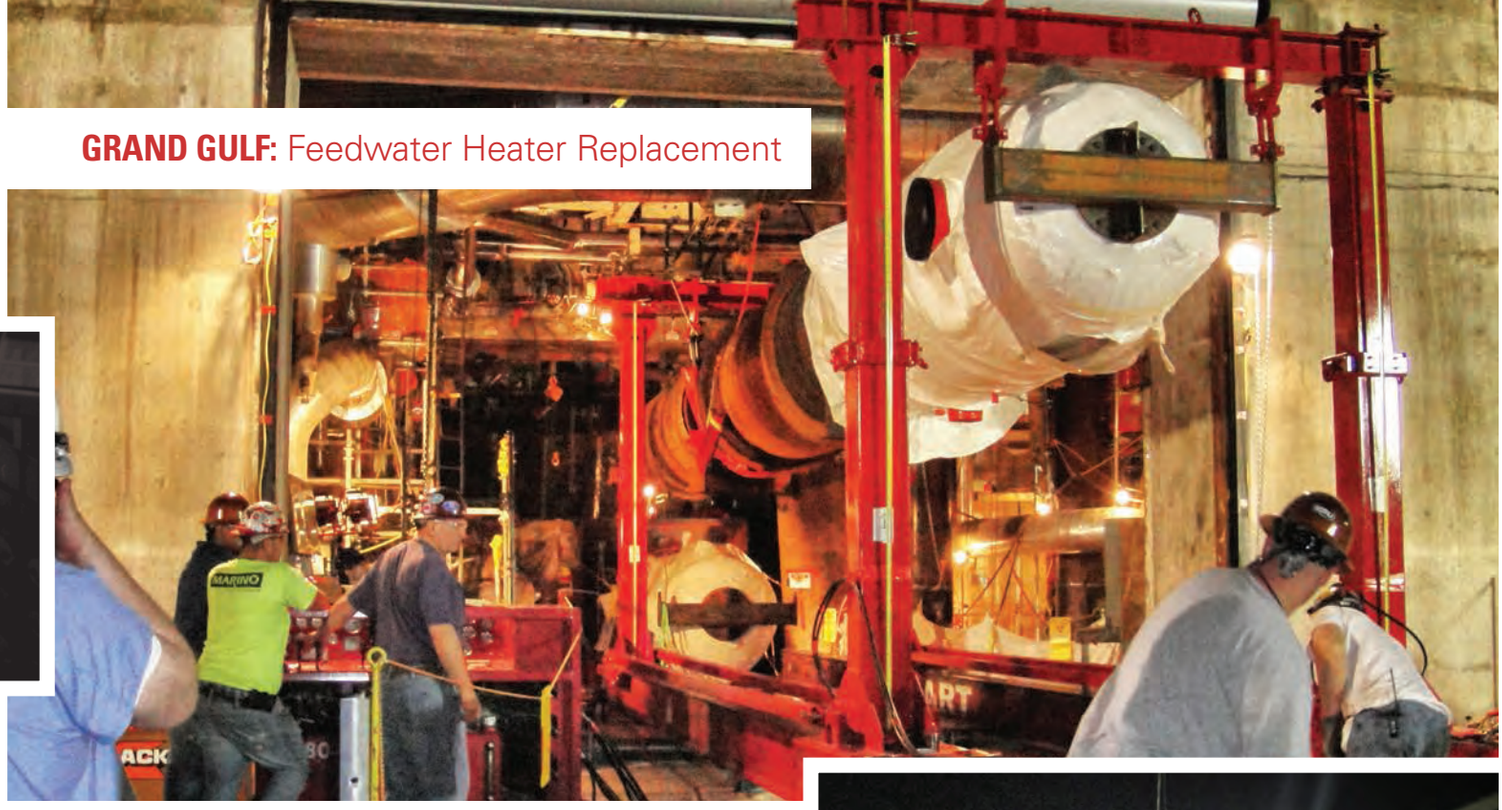
GRAND GULF: Transformer Replacement

MISSISSIPPI

Barnhart removed and replaced four main transformers with four new 720,000-pound transformers that were 18' wide, 22' long and 40' high with the bushing on top. The team transported the components with two 15-line one-and-a-half-wide Goldhofer trailers from the laydown area to the transformer yard via a haul path with tight turns, several grades, and cross falls. The transformer swap was difficult because there was a single haul path to the turbine building's only entrance. The crew had to move the old transformers at the same time they moved the new transformers. Since the yard "fill rock" was not compact and would not support the jack and slide process to remove the old transformers, the team removed the rock below the jacking haunch. Temporary Barnhart pipe stands received the jacking loads for the four transformers. B

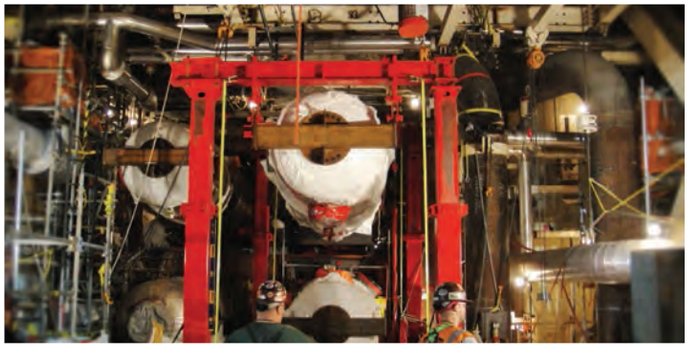


GRAND GULF: Feedwater Heater Replacement



MISSISSIPPI

Barnhart removed and replaced nine FWHs in three of the nuclear station's condenser bays. The Barnhart custom-fabricated sliding gantry system removed the 63,000-pound, 40-foot-long FWHs. The entire vessel was removed, not simply the bundle. The FWHs' access location was in an elevated position, on grating, with the slide termination point located over a 90-foot vault. A tight hole was adjacent to the vault that was required to support the Manitowoc M-888 crane operation. The team strategically placed support dunnage close to the plant's supports to share the loads. A cable tray in the removal path of two heaters could not be moved, so the gantry system worked around the tray and lowered the front and rear of the vessels, removing the components by sending them under the tray. The team installed the new FWHs by reversing the "limbo" process. To contain possible loose contamination, the vessels were bagged using a shrink-wrapping process in conjunction with the gantry system. B



GRAND GULF: Steam Dryer Replacement

MISSISSIPPI

Barnhart removed three containment boxes with the sections of the old steam dryer using a multi-air skate system, specialized rigging and a 6-line Goldhofer trailer to haul the boxes to the plant's mausoleum. Each of the 125,000-pound boxes was crescent-shaped, 21' long, 10' wide and 10' high. The work was conducted under stringent regulations because of radiological dose concerns. Barnhart established processes and strategic manpower rotation to limit radiation exposure when work was performed on the re-fuel floor next to the fuel pool. To lower the container from its 208-foot elevation to a 166-foot elevation, the container passed down through a narrow column designed for light loads. Barnhart used a steel dance floor at the landing zone inside the hatch to support the container because a new design increased its weight and size. Remote grip hoses and cables secured to the container limited the crew's exposure and enabled translation across the fuel handling building. The container was placed in a lead-encased steel frame for additional protection when it reached the Goldhofer on the 133-foot elevation and was hauled to the mausoleum. B

CHEMICAL AND REFINING: Transport

MISSISSIPPI & TENNESSEE

Barnhart was contracted to transport eight tanks from the manufacturer to a port on the Mississippi River for transloading to deck barges. Once the barges reached Tennessee, the team used a 300-ton CC1800 crane to off-load the tanks. They transported the tanks on a 12-line PST Goldhofer to the construction site, where they staged the tanks on beams and pipe stands in the laydown yard. Since the customer's schedule changed several times over a six-month period, logistics were a challenge. Barnhart mobilized the 12-line PST to Mississippi, loaded the tanks and hauled them in a one-week window once the mobilization date was confirmed. The team transported the same hydraulic trailer back and forth to the job site to optimize equipment use and to minimize the customer's costs. Barnhart coordinated with local authorities to raise power and communication lines along the route because the transport height was approximately 25' tall and required very high clearances. B

CHEMICAL PROCESS: Columns Roll-Off

TENNESSEE

Engineering challenges are nothing new to Barnhart. A recent job involving the transport of five massive process columns was no exception. Each column weighed roughly the equivalent of 90 mid-size sedans and was the approximate length of a football field. After the columns were rolled off a barge, they were transported by Goldhofer trailer more than 32 miles to the job site, where the team staged the components on beams and pipe stands.

Barnhart's initial challenge was to locate a roll-off site and haul route suitable for the oversize columns. The site and route were chosen following extensive haul route surveys to ensure safe transport. The team worked closely with TDOT to acquire permits and transported the equipment on two-lane country roads, four-lane state roads and interstate highways that required execution at night. Barnhart encountered overhead obstructions, bridge loading restraints and sloped road conditions. Three different trailer configurations were used to accomplish the haul. B

FOSSIL POWER: Component Off-Load and Set

CALIFORNIA

Barnhart was contracted to off-load and rough set eight 352,000-pound, 30' long, 13' wide and 10' tall steam generators; eight 369,000-pound, 60' long, 17' wide and 15' tall steam turbines; and eight 195,000-pound, 42' long, 12' 5" wide and 12' 8" tall intercoolers on a congested construction site with a high level of traffic and little space to maneuver. Limited site access forced the team to deliver two of the generators perpendicular to their final orientation alongside the foundation. The generators were transported on a 500-ton slide system supported atop a 750-ton turntable on top of the Goldhofer to achieve the delivery. The team then rotated the generators 90 degrees using the turntable, slid them off the Goldhofer 30 feet with the slide system and lifted them with the 400-ton gantry for final placement. The remaining six generators were picked directly from the Goldhofer using the gantry since they were on the trailer and parallel to the foundation. There were 24 lifts in all for the eight units on the job site. B

FOSSIL POWER: Concentrator Haul

MISSISSIPPI & ALABAMA

Barnhart was contracted by a power company to transport two 400,000-pound regenerators and two 350,000-pound concentrators to a Mississippi job site. The crew received the 212' long, 17'6" wide, and 18' high regenerator towers and the 155' long, 13'6" wide, and 14' high concentrator towers from ships gear to barge at the Port of Mobile, AL. They transported the towers by barge 160 miles on the Tombigbee River to the discharge site where they used an 18-line Goldhofer PST and a Titan Bolster for the roll-off. Then they staged the equipment for the 80-mile haul to the job site. A 500-ton lift system gantry was used to transload the towers onto two 24-line Goldhofer THP doublewide trailers with self-tracking bolsters and two prime movers. Throughout the project, Barnhart coordinated with other heavy haul contractors, the DOT, and utility companies. The team delivered the four towers safely and without complications. B

FOSSIL POWER: Feedwater Heater Replacement

MICHIGAN

Barnhart was contracted to remove and replace two 145,000-pound Feedwater Heaters (FWHs) from a Michigan power plant. The new 45-foot-long long units with 6-foot diameters were transported to the plant using 6-line and 10-line Goldhofer PSTe trailers. Powered and idle rollers were used to move the FWHs to an opening in the building's side. A 500-ton crane and Barnhart's Tri-Block System removed the existing units. The existing FWHs were on the fifth floor of the plant and floor beams were in different locations throughout the travel path. As a result, there were floor-loading concerns with the power rollers and roller track system. The team moved the FWHs laterally to line up with the opening and then had to jack and slide the units. The rigging team created a safe rigging method using multiple sling configurations since the old units did not have adequate lift points. Following removal, the units were transported to the Barnhart Monroe (MI) Branch's yard and trans-loaded to a third party truck for disposal. B

FOSSIL POWER: Generator Upend

MINNESOTA

Barnhart engineered, planned, and executed two lifts upending and down-ending a 430-ton generator that was 34′ 6 ½″ long, 13′ wide and 13′ 6 ½″ high. Barnhart's engineered solution saved costs and allowed re-stacking the generator core onsite over the foundation pad. The alternative required shipping the generator to an out-of-state maintenance facility. First the team installed a tailing beam to the backside of the generator, lifted it and staged it at a 42-inch elevation to remove the lower bushing box. Then the team upended the generator with two telescoping hydraulic gantry systems – a 48A 800-ton set and a 44A 400-ton set. Barnhart down-ended and staged the generator using the same gantries to re-install the bushing box and lower the generator to the foundation. The plant had low headroom and the foundation floor had a narrow opening, making it difficult to sink the generator down to the floor for staging, thus keeping the 44A backside gantries out during the generator down-ending. B

FOSSIL POWER: Heavy Haul

TEXAS

Barnhart performed heavy haul and lifting services for a Texas company that is building a combined cycle power facility to replace an existing plant. The team received 31 pieces of equipment from a rail off-loading site and hauled the equipment to the job site, then lifted and installed the equipment: 20 heat-recycling steam generators (HRSGs), two HP steam drums, three transformers, three generators, two gas turbines, and one steam turbine. Barnhart worked with Texas DOT to secure transport permits and performed civil improvements at the rail spur. The EasTrac trailer hauled 31 loads 90 miles from the rail site to the construction site. The team used a 600-ton gantry to install the gas turbines and generators. They installed 20 HRSGs with a 600-ton CC2600 Crane and used the CC2600 to install the steam drums. Barnhart's team and the customer's team worked together and set 20 modules in seven days. On the final day, six HRSGs were installed – setting a new company record for the customer! B

MINING: Screener Remove and Replace

CALIFORNIA

Barnhart completed an industrial mining project to remove an existing screener from the operation's structure, place it on supports on the ground, place a new screener into the structure, and rough set the screener on the foundation. The team used 44A 400-ton gantries to remove the screener from its foundation supports and then moved it onto the gantry track that was supported by the 600-ton gantry. A 265-ton hydraulic crane was used to lift the screener from the track and lower it onto supports on the ground. Then the team reversed the procedure to place the new screener in the structure. The crew encountered limited space in which to erect the gantry system and limited space for the crane's "hook" to be inserted into the structure, and the project had to be executed during an outage. B

NUCLEAR POWER: Vessel Roll-Off

GEORGIA & SOUTH CAROLINA

Barnhart conducted a feasibility study to determine if four 30-ton Deaerator (DEAR) vessels could be delivered safely by road to Georgia and South Carolina nuclear plants. Originally the oversize and overweight vessels were to be delivered by rail, but there were clearance restrictions. Barnhart worked with Georgia Department of Transportation and South Carolina Department of Transportation to study transporting the vessels from the states' ports by road to the plants, but both ports' infrastructures posed obstacles. Barnhart provided the solution: receive the vessels to waiting barges at each port, travel as far inland as possible, then transport the vessels over the road to the plants. At the Georgia port, Barnhart received one vessel directly to a Goldhofer trailer on the barge deck for the 30-mile river transport. A 144-foot, 16-line Goldhofer EasTrac trailer and two four-axle prime movers performed the 70-mile road haul. One vessel was received at the South Carolina port in the same way - transported by barge inland and hauled 150 miles over the road. Barnhart will receive the remaining vessels at each port and repeat the transport procedure. B

PETROCHEMICAL: Lift and Rough Set

TEXAS

Barnhart completed a project to lift and rough set four vessels of varying weights and sizes at a Texas petrochemical complex. The smallest vessel weighed 150,000 pounds and the largest was 1.7 million pounds; vessel heights ranged from 92 feet up to 219 feet. The team assembled the LR-11350 Crawler Crane in 400 man-hours in one week – record time since assembly normally requires three weeks. They then used the 1500-ton capacity crane to make all the picks. Barnhart's Modular Tailing Tower was used to tail the largest vessel and move it from a horizontal position to a vertical position; the LR-11350 then moved the vessel 82 feet. The crew tailed the other three vessels with the 400-ton Sany CC4000 Crawler Crane. In addition, Barnhart fabricated special rigging for the project in 30 days from idea to design, fabrication to assembly, and from testing to shipping the rigging to the job site where the new rigging was used for all the lifts. B

POWER DISTRIBUTION: Power Cable Move

LOUISIANA & ALABAMA

Barnhart provided inland transportation for four 140-ton power cable reels from the Port of Chalmette, LA by barge to an intermediate storage facility in Orange Beach, AL. The barge was placed alongside a vessel at the port where the team received the 30' long, 15' high, and 14'9" wide reels under the vessel's hook. They discharged the reels directly from the vessel to the barge and transported them to Orange Beach by way of the Port of Mobile, AL. The job, proposed initially as a roll-off operation, became a lift-off job at a secondary location because the roll-off site was unavailable. The team used a 550-ton hydraulic truck crane to unload the reels at the final destination where they placed them on stands and beams. They transported the reels to the storage facility via 10-line Goldhofer PSTe and self-unloaded them to stands and beams. Inland transport was completed under budget and ahead of schedule. B

PROJECT CARGO LOGISTICS: Bullet Tanks

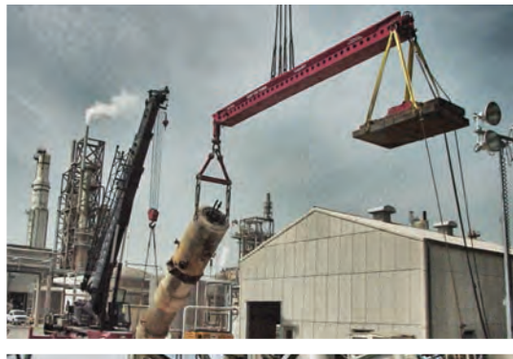
OKLAHOMA & TENNESSEE

Barnhart was contracted by a tank fabricator in Tulsa, OK to transport four 364,000-pound, 118-foot-long bullet tanks, each with a 17'5" diameter, from the fabrication facility to the Port of Catoosa. The team used a 12-line dolly rig in a bolster-to-bolster configuration on the 11-mile haul. Since the overall height of the dolly rig with each vessel was 22 feet, there were transport challenges – wire lifts and crossing high voltage overhead transmission lines. Barnhart delivered the tanks one at a time to a staging area and transferred the tanks to stands and beams using pull-up gantries. They loaded the tanks to barge at the port using the Goldhofer and transported the tanks along with the 12-line Goldhofer PSTe on the barge to New Johnsonville, TN to save time and mobilization costs. The four tanks were rolled off at the final destination and staged on stands. Using the Goldhofer, the crew transported the tanks onto the job site and set the tanks directly to the pedestal foundations. B

NEW TOOLS: The Tip Stick

TIP STICK

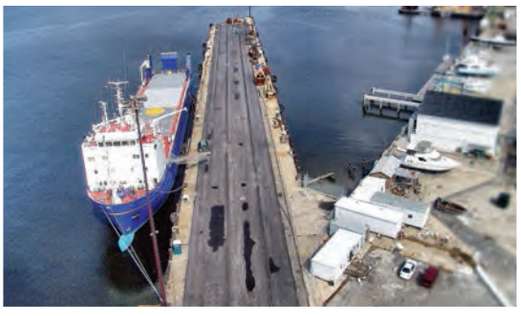
Barnhart's innovative Tip Stick provides custom solutions to overcome challenges in the rigging industry. Barnhart engineers developed the original equipment as a solution to lower major components. The Tip Stick is able to upend or down-end heavy over-dimensional equipment and offers a cantilever system to down-end and navigate under overhead obstacles. In one challenging project, an overhead crane at a steel plant could not position itself over the center of gravity to install a base plate and coil positioner. The Tip Stick provided a lifting point over center of gravity for both pieces. The Tip Stick also allows components to be assembled off-site and set as one complete piece during critical stage outage. See Barnhart's Tip Stick Animation on YouTube. B



BARNHART: Charleston

Located at Charleston's multimodal Marine Terminals, Barnhart's Charleston Branch is strategically located and offers port facilities with barge access and rail services. The branch is equipped to handle unloading from ship's gear and provide anchor-to-anchor bolt services. Jeff Bailey, Charleston Branch Manager, said, "Our location at Marine Terminals in North Charleston gives Barnhart a great opportunity competitively to bring our value proposition to market in heavy industries located in Georgia, South Carolina and North Carolina."

The branch handles transportation and heavy haul logistics for oversize and overweight transport. In fact, the team recently transported 300-ton Deaerator (DEAR) vessels to nuclear power plants in Georgia and South Carolina. At each of the states' ports, the team unloaded one vessel from ship's gear onto Barnhart's EasTrac Goldhofer trailer on a barge deck and transported the vessels inland to the Georgia and South Carolina discharge sites. Then they hauled the vessels over the road to the respective plants using the Goldhofer and two four-axle prime movers. Later this year, Barnhart will receive the remaining two vessels at each port and repeat the transport process. "Over the past decade, Barnhart has developed a strong project presence in the region. A permanent branch location in Charleston will serve to establish us as a market leader and enable us to better serve our customers," Bailey concluded. B



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