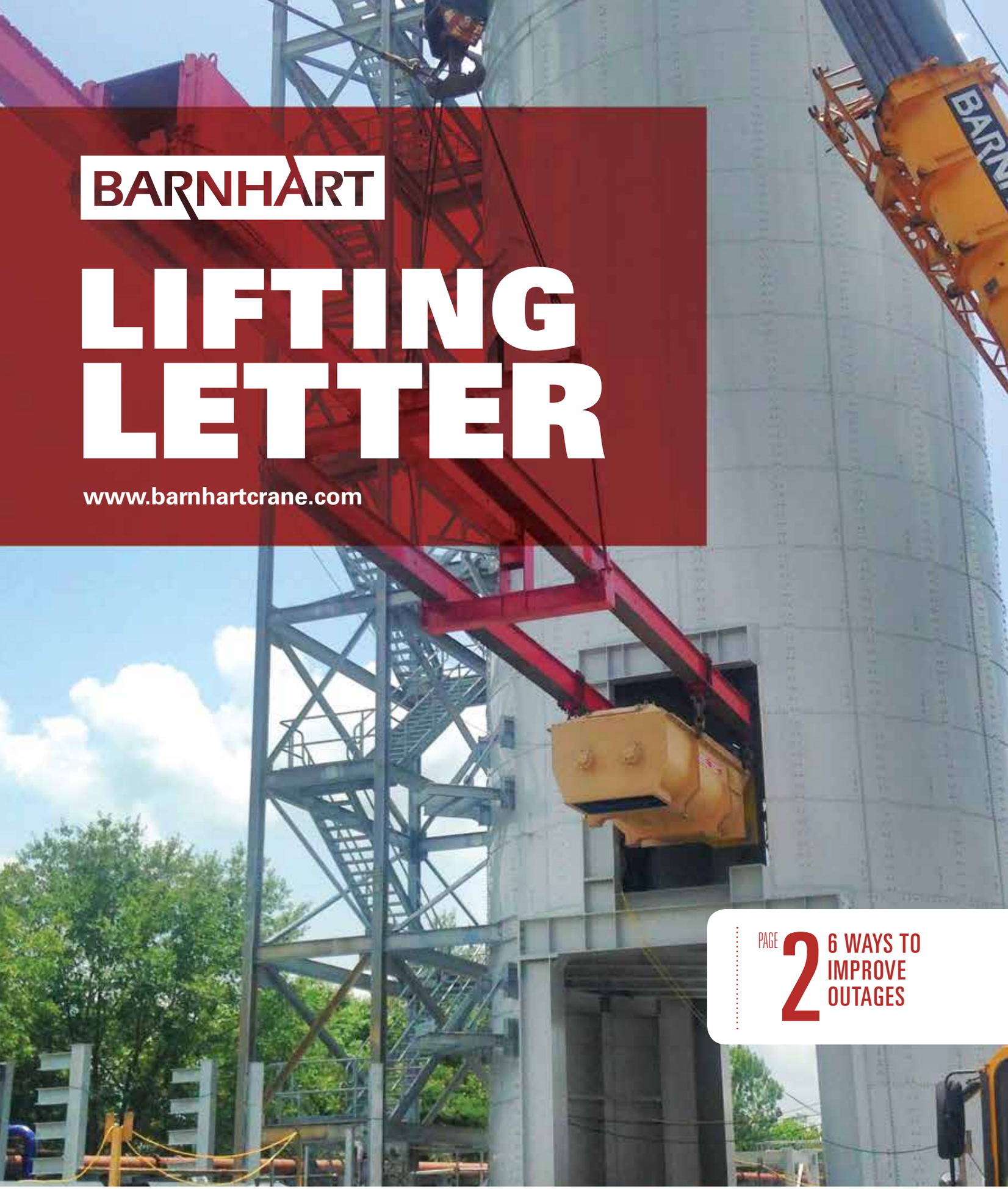


BARNHART

LIFTING LETTER

www.barnhartcrane.com

VOL. 55

A Publication of Barnhart

6 WAYS TO IMPROVE OUTAGE PERFORMANCE

COVER STORY

The old saying, "time is money," is never more true than with turnarounds, shutdowns, and outages requiring cranes and other specialized equipment. The need to reduce cost through better planning is where Barnhart's national network of people, branches, and deep inventory of cranes and other rigging and transportation equipment really make a difference.

1. MAKE UP YOUR MIND

Much of outage rigging is on the critical path. The earlier the rigging contractor is chosen, the more consistent and efficient the delivery can be. In the case of specialized rigging and transport services, more preparation and planning time usually means safer, faster, and more elegant solutions.

2. VET THE VENDOR

Take the time to learn as much as you can about a vendor - well in advance of any outage. Choose vendors that have a proven resume and a deep inventory of resources and equipment. Learn more about their protocols and procedures, particularly in the area of safety. Take time to audit your contractor's home office to learn how they think. Be sure your contractors have a deep pool of qualified personnel who are familiar with working within complex facilities. Anyone can promise to provide the personnel and equipment, but many can be tapped out when things get busy.

TABLE OF CONTENTS

3. THE RIGHT TOOLS MATTER

Knowing you have the right tools and equipment in the hands of the right rigging contractor can reduce hours and mitigate risk. The best contractors may have innovative tools and techniques that could be unknown to plant personnel. Failure to learn about alternatives may cost the plant time, money and safety.

4. GET IN SYNC

It is critical that the plant's and contractors' schedules align ***perfectly***. For operations involving crane and rigging contractors, it is important to hire a team that has a ***successful record*** of mobilizing teams and equipment within the schedule's tight tolerances and performing the work, all within the critical path.

5. CHECK AND DOUBLE CHECK

Simply said – have someone check your work. A thorough review of your plan from a trusted partner will help ensure success and help you sleep better at night!

6. ASK FOR PROOF

Ask your crane and rigging contractor to show you their track record of adding value through innovative tools, methods, and key personnel. Talk is cheap, but proof is in performance.

HEAVY INDUSTRIAL: Caster Bow Transport

MARYLAND

Sometimes limited options produce unusual solutions. This was the case when Barnhart was hired to perform the turnkey transport of a caster bow from a fabricating shop in Sparrows Point, MD to the customer's steel facility in Burns Harbor, IN.

The massive cargo included the bow, measuring 30' x 17' x 21', weighing 520,000 lbs., and ladle test weight at 20' x 11' x 13', 570,000 lbs. The cargo was too tall to transport over road or rail leaving barge transport as the only option. While the St. Lawrence Seaway was an option, the most efficient and cost effective path was actually a longer route.

Barnhart's solution was to use an oceangoing deck barge from Sparrow's Point all the way around Florida to the Port of Mobile. There, the caster bow was loaded onto a hopper barge by Barnhart's 400 ton barge crane known as "Big Al." Since port cranes at Burns Harbor could not handle the weight, another transload was made by the Barnhart TC3000 at the Port of Chicago returning the cargo to a deck barge for roll-off.

This solution required extensive coordination between the Mobile and Chicago branches as well as the management of multiple subcontractors. Barnhart's positioning on the Gulf Coast and Great Lakes allowed the necessary cargo transfers to barge south around Florida and up through the river system, which ultimately saved the customer money..

REFINING: Reactor Haul And Set

WASHINGTON

Barnhart was contracted to receive a 340 Ton Reactor from India at the Port of Everett in Washington and barge it to a refinery site. The reactor was discharged directly to a waiting Barnhart barge via two large on board ship cranes. The barge was outfitted with 12 lines 1.5 wide of self-propelled hydraulic platform trailer, which assisted in reducing discharge time for the over the road transport to the plant.

At the discharge location near the plant, crews safely installed the ramps and unloaded the vessel. The self-propelled trailer continued the journey to the plant. The vessel was then staged inside the plant near the foundation, so the installation and final touches could be installed prior to erection.

One month later, Barnhart mobilized to the site again to start the construction of the Modular Lift Tower (MLT) which was used to rough set the reactor. The MLT was configured to allow sliding of the vessel in multiple directions. A new swivel system was also utilized to allow 360 degree rotation. Despite the wind and rainy condition the MLT was erected in record time without any safety incidents. On lift day, everything went as planned and the vessel was over the anchor bolts before lunch.

The location of this project required very close coordination with several government agencies including the wildlife department, and state and local officials to obtain the necessary permits. In addition, the team had to overcome weather conditions and tidal issues, requiring careful timing. B

POWER: Generator Cage Removal and Replacement

NORTH CAROLINA

Barnhart was hired to remove a generator cage for repair work and then replace it during an outage at a power plant. The project was broken down into three phases with Barnhart providing engineering design and plans for each critical lift. First, the 520,000 lb. frame was lifted and staged on Barnhart designed and fabricated stands. The 150,000 lb. cage was then pulled from the frame and moved outside the turbine building and staged in a horizontal position for initial repairs. In the meantime Barnhart mobilized, assembled and load tested their 500 ton lift system. Once the initial cage repairs were complete, Barnhart utilized the lift system to upend and stage the cage vertically. This procedure met the customer's requirements to complete the remaining restoration work.

The final phase consisted of down-ending the repaired cage with the lift system, sliding it back into the generator frame on the frame rails, and rough setting the 1,043,000 lb. assembled unit back onto the anchor bolts.

Since the procedures took place in an operating facility, the coordination and scheduling was very challenging but successful in the end. B

WIND MAINTENANCE: Blade Removal And Replacement

NEW YORK

Wind tower erection and maintenance are costly because they generally require the work of a large, expensive crawler crane. Using a craneless single blade solution, which provided a less expensive alternative, Barnhart removed and replaced a damaged 153-foot-long blade on a 2.5 megawatt C-96 Liberty wind turbine generator. This innovative approach was recognized with the 2015 **SC&RA Rigging Job of the Year** under $150,000.

The system conceptualized, engineered and designed by Barnhart was built to be used multiple times for this turbine platform. It included a blade lifting beam based on a spreader bar concept with a pioneering fully articulating dual sheave lifting point. The load line was routed from a winch truck (an over-the-road tractor modified to accept a winch commonly found on a 100-ton RT) through the nacelle, around the gearbox, into the hub and connected to the blade lifting beam. The winch was mounted to a rotex bearing, giving the operator the ability to line up the cable.

Barnhart utilized their Multi-Tagline Device to safely perform the lift of the blade. It consisted of three winches which operated independently to control eight taglines, and collectively to achieve the control needed.

Additional weight created by ice buildup on the blade posed a challenge that Barnhart met by employing a "steam genie" to melt the ice and perform the exchange. B

CHEMICAL: Demethanizer Tower Transport

TEXAS

Barnhart was hired to transport several components from a steel fabricator in Houston to a chemical plant in Port Arthur, TX. The haul included two 283,000 lb. dryers and a 700,000 lb. demethanizer tower.

The dryers were transported over the road on a 10 line TEX Trac trailer. The demethanizer tower was rolled onto the barge in Houston and rolled off at Port Arthur and transported to the site on 20-Line PSTe trailer w/ bolsters.

At the site, the tower was transported through a live operating unit and staged at the foundation while it waited to be lifted in place using Barnhart's Modular Lift Tower (MLT) and 500T hoist. Barnhart assembled the 4.5 bent MLT with a 300T crane in a confined 125' x 175' area. The tower was then lifted into place and the MLT was disassembled. Barnhart was able to perform all the steps of the process while the plant continued production.

When unanticipated situations arose, Barnhart's project manager and engineer were able to quickly respond with safe, cost effective solutions and verifications. This resulted in a satisfied customer and no safety incidents. B

HEAVY HAUL: Reformer Vessel

OKLAHOMA

Barnhart won the **2015 SC&RA Job of the Year Award** after transporting a reformer vessel more than 1,600 miles from Tulsa, OK, to Lima, OH by means of barge and over-the-road trucking. The vessel was 73 feet long and weighed 425,000 pounds.

The vessel's size necessitated the creation of the longest and widest dolly transporter that Barnhart ever assembled. The result was a 300-foot-long, 24-foot wide, 18-foot, 9-inch high permitted load with a gross weight of 885,000 pounds.

The vessel was transported 13 miles from Tulsa to the Port of Catoosa, where the cargo—including the transporter—was loaded onto a barge for the 1,357-mile transport to Burns Harbor, IN, followed by another 235-mile haul to the final destination in Lima.

Before the vessel could begin the final leg of its journey, the team at Barnhart had to overcome one last hurdle: getting past the Lemont Bridge which spans the canal connecting Lake Michigan to the Illinois River. The bridge has a clearance of 19 feet between the water's surface and the bottom of the bridge; the top of the transport measured more than 22 feet from the surface. The Barnhart team ballasted the barge to within two inches of the bottom of the bridge, transiting the canal without incident. B

MEDICAL: Cyclotron Assembly, Transport & Set

TENNESSEE

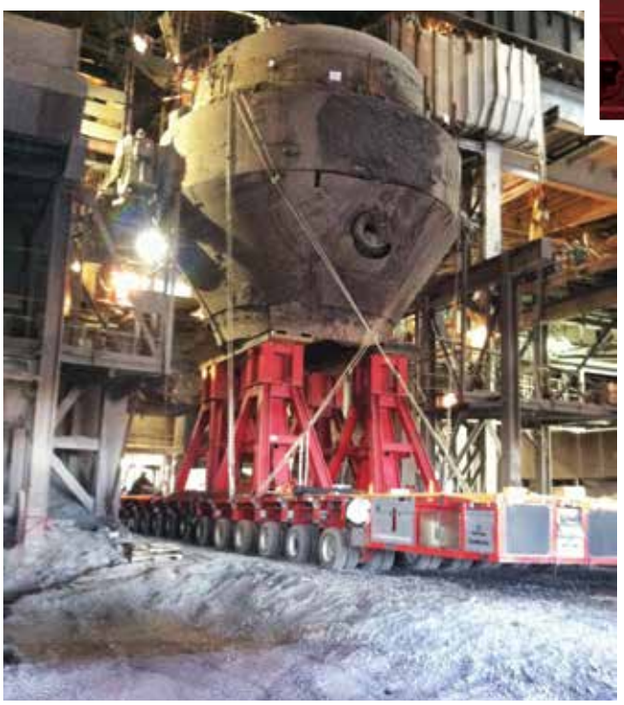
Barnhart was called upon to provide logistical and heavy rigging expertise to receive and assemble an $8 million piece of medical equipment, known as a cyclotron, in Knoxville, TN.

Given the logistical complexity and space limitations on site, the cyclotron pieces were received at one of Barnhart's local facilities. There, Barnhart assembled the cyclotron into two large sections - 110 metric tons each – which made for faster final assembly at the site.

Barnhart offloaded, staged, and then preassembled the sections using its 44a gantry with 200T swivel and a 500T slide system. The two halves were then transported on a 12 line 1-1/2 wide SPMT Goldholfer to their destination.

There were more challenges at the medical facility. The center of the hatch opening where the equipment was to be lowered was offset approximately 7' to where the center of the cyclotron was to be placed in its final position. A modified Barnhart Stator Frame was able to lift and move horizontally over the opening, lower and then side shift to required location. Both halves had to be set within +/- 1 millimeter. Equipment included were Barnhart's 200T hoist and an elevated 600T gantry system. B

STEEL FOUNDRIES: BOP Vessel Haul & Set



MICHIGAN

Barnhart was faced with an engineering challenge during a project that involved removing and replacing an 850,000 lb. basic oxygen process (BOP) vessel at a steel plant in Michigan.

The onsite transport of the BOP components took place inside a very congested and busy worksite. Working with the plant while they maintained operation on remaining units while adhering to a tight schedule posed a significant obstacle.

Midway through the project, a major change in scope required Barnhart's engineers to develop a new lifting operation for raising the BOP components from the on-site transporter to the final set. A gantry lifting arrangement was quickly engineered that accommodated the limited space, headroom demands and necessary capacity needed to complete the complex lift.

Barnhart's specialty equipment, innovative approach, experience and engineering horsepower provided this project with the necessary tools and capabilities to safely and successfully complete this very complex lifting and transport operation while maintaining the schedule. B

CHEMICAL: Gas Cooler Replacement

ILLINOIS

During a turnaround Barnhart was contracted to remove and replace a vertical gas cooler at a chemical facility in Illinois.

The old cooler was located deep within the production facility and surrounded by numerous obstructions. It was determined that Barnhart's Tip Stick would be required to make the initial lift after a prefabricated stand was installed onto the bottom of the cooler.

The cooler was then pulled out of the surrounding structure and set in a staging location while the crane and the tip tick were changed out. Very tight clearances meant one crane had to be set up to make the tip stick pick and another smaller crane would be utilized for the swing.

A larger crane was then used with the quad block to remove the cooler from the unit and down end onto a trailer. Due to limited set up and staging areas, all equipment not being used had to be removed from the area.

An excellent engineering plan provided an alternate solution for dismantling the surrounding structure and removing an additional heat exchanger located on top of the gas cooler. This would have caused the shutdown of a second production line. B

NUCLEAR: Vault And Reactor Transport And Set

SC&RA

WASHINGTON

In a project that won the **2015 SC&RA Rigging Job of the Year Award** for projects over $2 million, Barnhart was contracted to provide engineering, craft, material and equipment to lift, transport and set a waste vault and test reactor from a nuclear site in Hanford, Washington. The destination for the components was the Environmental Restoration Disposal Facility (ERDF) approximately 50 miles away.

Besides the obvious challenge of dealing with nuclear waste, the location of the pieces called for extensive engineering and planning. The vault was originally a basement for a larger building. The building had to be removed from above the vault and extensive excavation was required to allow access to lift the vault and transport it to the ERDF.

The test reactor was also located below grade in the bottom of a containment structure. Being highly radioactive, it had to be removed concurrently with its shielding structure as one large monolith. Special lifting and transportation securement devices had to be designed, fabricated and tested for both the waste vault and test reactor. The 1000-ton loads were then transported to the ERDF.

Engineering for the project began in January of 2012 and the final piece was set at the ERDF in February of 2014.

NUCLEAR: Feedwater Heater Removal And Replacement

MICHIGAN

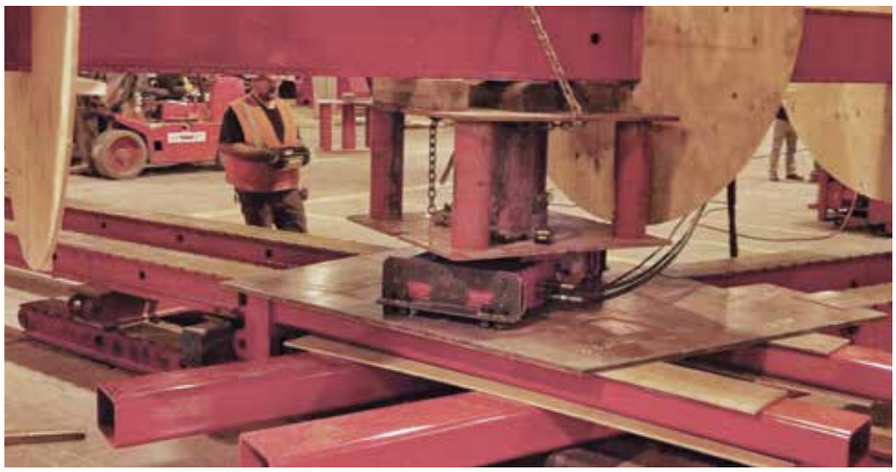
Advance work on a project that involved removing and replacing 5AB feedwater heaters (FWH) helped Barnhart navigate obstructions at a nuclear plant in Michigan. Barnhart was able to anticipate issues which may have delayed the project. They did this by mocking up the path and movement of the FWH in their Channahon, IL office.

At the facility, Barnhart weighed, jacked and drained the existing 2B FWH and old 5AB FWH. The 2B FWH had to be moved back 30 feet to clear an opening for the 5AB replacement.

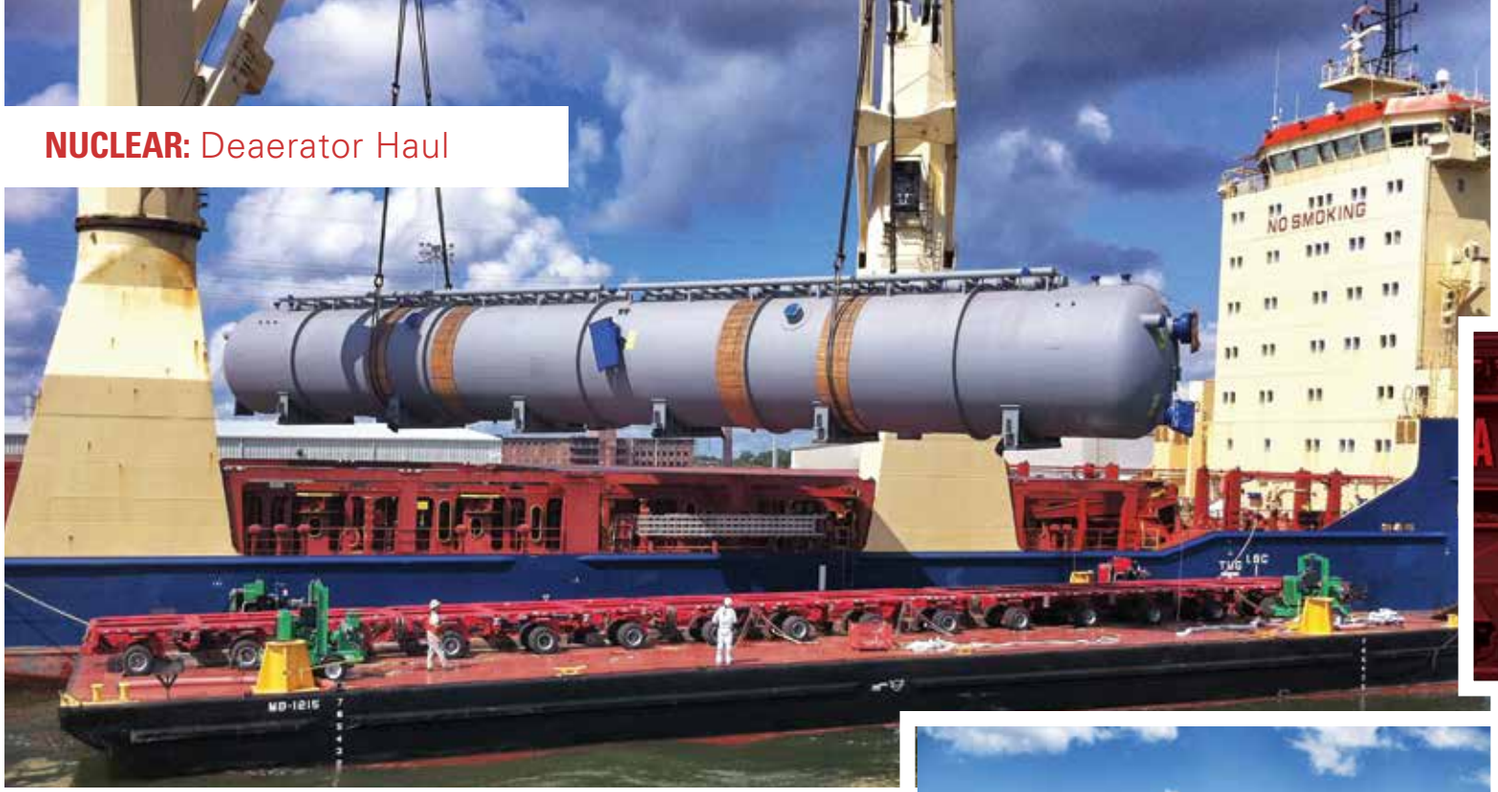
The new feedwater heaters had to be offloaded and staged from an over-the-road trailer at the staging area using Barnhart's pull up gantry system. The old 5AB FWH's were then loaded out on this trailer.

Floor loading issues necessitated the creation of an alternate slide method utilizing 16' deep slide beams and fabricated end connections to allow for multiple turns over slide beams on powered saddled rollers. An accelerated manpower schedule added late in the project required double crews and double shifts.

The client was impressed with Barnhart's engineering, fabrication, and execution of this project which was performed safely and smoothly. B



NUCLEAR: Deaerator Haul



GEORGIA AND SOUTH CAROLINA

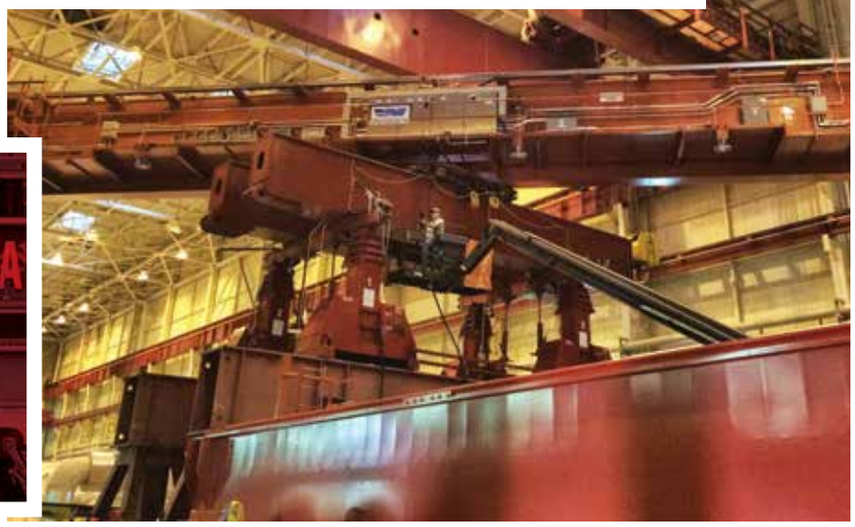
Barnhart was hired to move four 300-ton deaerators to two separate nuclear plants. They were fabricated in South Korea, so Barnhart had to receive all four from ship's gear and then transfer them to a barge, roll off and haul them to their destination.

The first two arrived at the port of Savannah were transferred to a deck barge and then hauled 70 miles using 16 lines of EasTrac to a plant in Georgia. Months later, the second two deaerators arrived at the Port of Charleston. This time Barnhart had to use a smaller deck barge due to the size restriction on the Pinopolis Lock on Lake Moultrie. Once the cargo was rolled off, it was hauled 170 miles to a plant in South Carolina.

The deaerators had to be transported over the road because they were too large to receive rail clearance. This necessitated extensive planning on Barnhart's part, including meeting two different states DOT requirements. Extensive bridge analysis was required on 50 plus bridges, plus shoring of a number of bridges. The move required the overhead relocation of hundreds of electrical and communication wires. Finally, to accommodate the turning radius of the 150' long EasTrac, major haul route improvements had to be made.

The project took place over an 18-month period. B

NUCLEAR: Turbine Crane Installation



MICHIGAN

Barnhart's engineering team was put to the test on a project that involved installing a new 250-ton capacity turbine crane at a nuclear plant in Michigan.

Before the project began, the project team completed a variety of tests at their Channahon yard. Two of these tests included a design and load test of the main and auxiliary trolley rigging arrangement, along with a full mock up test lift of the lifting, rotating, and rough setting of the new crane's 120,000 lbs, 90 ft. long girder. The mockup was based off the actual setting height of the girders 40 ft. in the air.

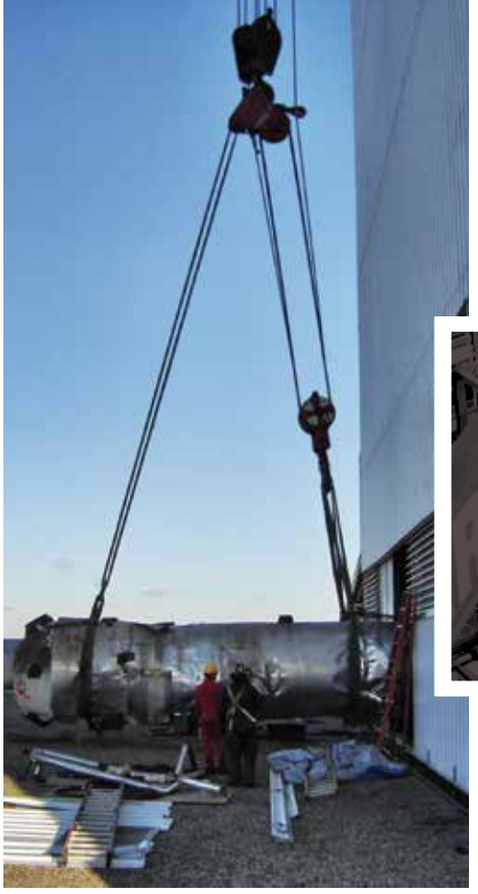
At the manufacturer, Barnhart performed a load weighing / CG identification of major components (girders and trolleys) using Barnhart load cells.

The crane components were then transported by Barnhart trailers from Illinois to the plant in Michigan and offloaded onto the turbine deck staging arrangement using the existing overhead turbine crane. The team faced tight clearance in the delivery haul path up through the turbine truck bay.

Barnhart then installed and rough set the crane's major components using their gantry tower swivel arrangement. A load test of the main and auxiliary hoists was performed after installation of the new crane was completed.

Thorough pre-project planning & testing resulted in the smooth and safe execution of all elements of the project. B

COOL TOOLS: Tri-Block

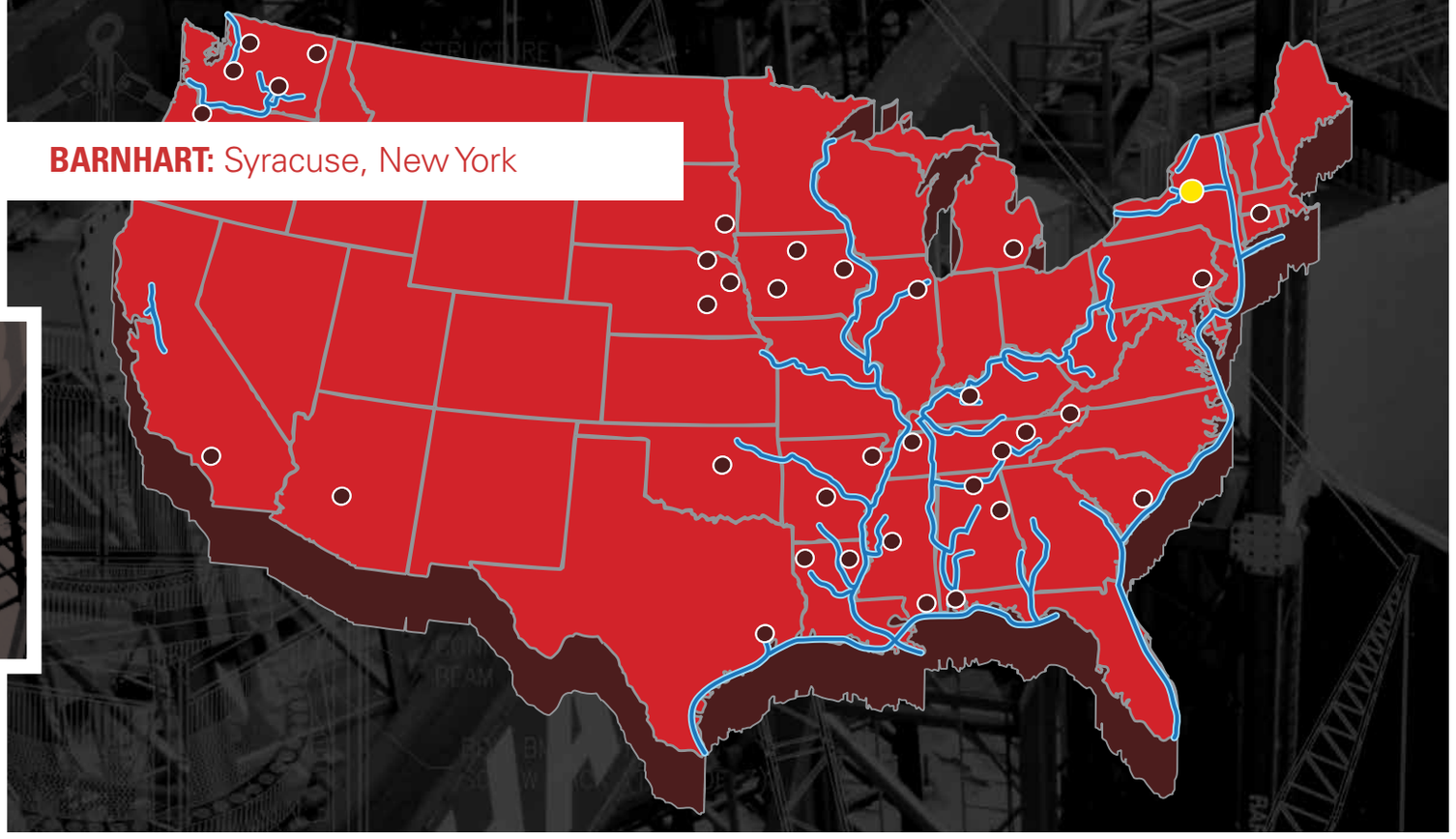


TRI-BLOCK

Sometimes in order to provide a solution to an engineering challenge, you have to improve on an existing piece of equipment. Barnhart's Tri-Block is a custom piece of lifting gear based on a bear paw but with significant upgrades that give it a higher capacity and make it easier for field use.

The Tri-Block utilizes an internal assembly of three sheaves along with a fixed rigging connection point and an external rigging block. This innovative tool is often used to upend and downend vessels, eliminating the need for a second crane. It is also used for passing loads from one lifting device (typically a crane) to another lifting device located inside a building or plant area. With these capabilities, it's no surprise this tool is used extensively to support outage work.

Most often used to self-tail a vessel or other equipment in tight work areas, the tool is frequently used in conjunction with cantilever beams. This was the case in a project that was recognized with an SC&RA job of the year award, where the tri-block and cantilever beam system were utilized to replace two massive vessels in an operating refinery. There was very limited access to the worksite, and work had to be done over and around active process piping and equipment. The Tri-Block was the ideal rigging selection for this congested and challenging environment.
For more information on this innovative tool, contact your local Barnhart sales representative. B



BARNHART: Syracuse, New York

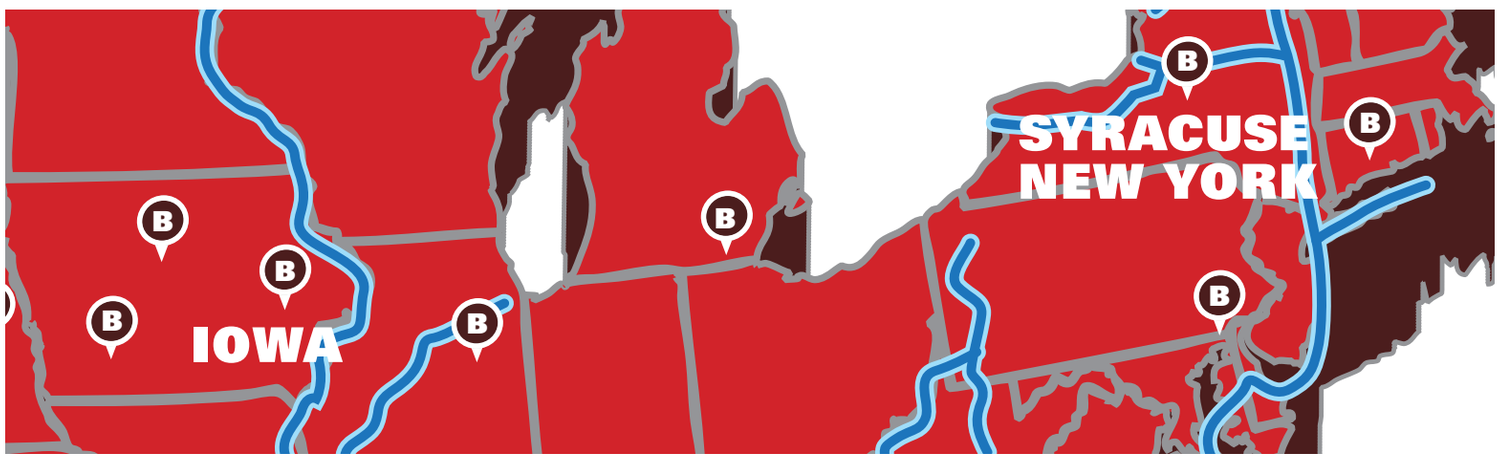
Barnhart's Syracuse branch is a part of Barnhart's growing network across the United States. The branch offers project management, wind maintenance, machinery moving, nuclear services and a wide variety of heavy rigging and transportation services, plus full engineering support from FEED (Front End Engineering Design) to field support for critical lifts.

Serving clients primarily in the upstate New York region, including the Albany-Buffalo corridor, and cities including Rochester, Syracuse, Albany, Utica, Binghamton and Watertown, plus Northern Pennsylvania. Barnhart is familiar with the unique demands of this region. As a union contractor, they are ready to assist.

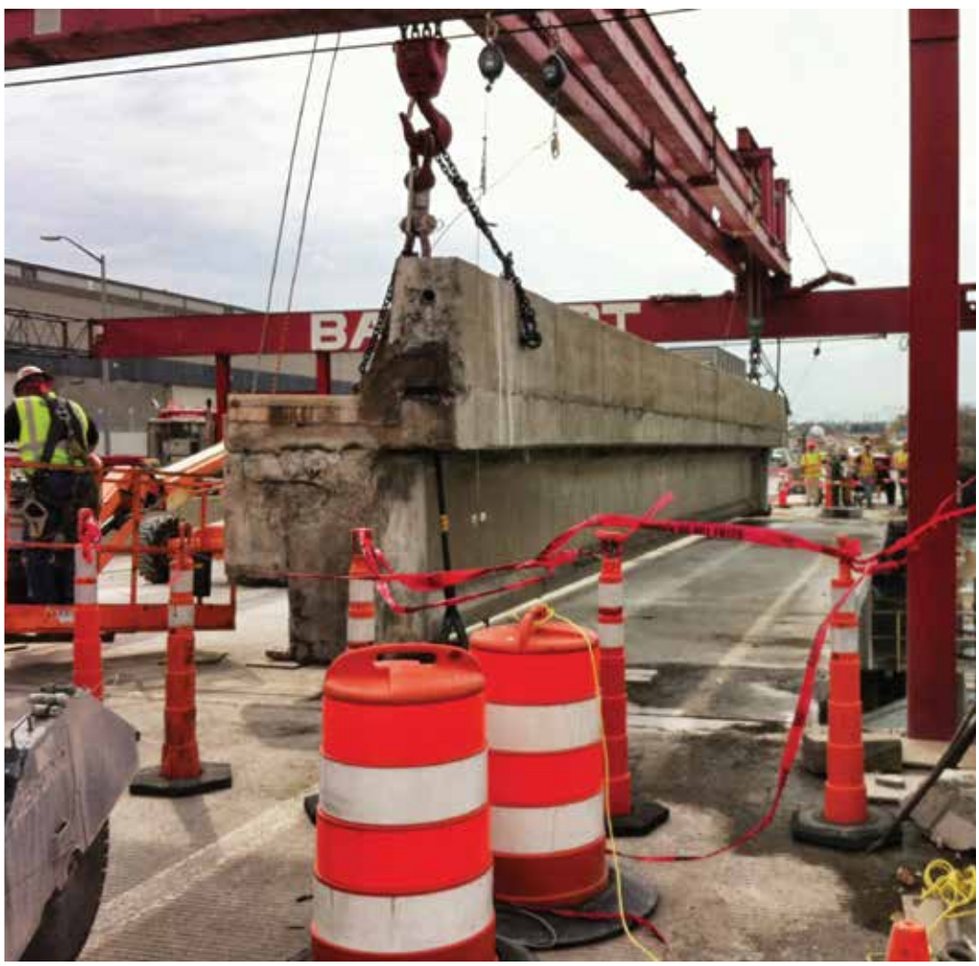
The 12-acre branch contains six bays of storage and nine docks. Along with local branch equipment, Barnhart Syracuse has access to a nationwide inventory of equipment including lattice and hydraulic cranes, hydraulic gantries, slide systems, Goldhofer heavy haul platform trailers, Modular Lift Tower, forklifts and other unique rigging tools.

"We can handle the bigger jobs others can't handle, because of the experience of our field crew and our tools," said Branch Manager Scott Murray.

The crew's experience was recently at work in a project that required the removal of a bridge over a waterway leading to a hydropower plant. The bridge could not be jackhammered because its pieces would fall in the water and potentially damage the plant's turbine generators. Barnhart had to carefully remove the bridge in sections. B



LEFT PHOTO: Finished hoisting the bridge, 3rd Phase of project. Pictured in photo, from left to right: Steve Hill, *Ironworker*; Ryan Frigon, *Operator*; Tim Frigon, *Ironworker*; Sterling Zacek, *Ironworker*; Kevin Goforlk, *Ironworker*; Bryan Mueller, *Operator* and Ryan Walker, *Ironworker*.



THIS Syracuse project involved the superstructure replacement for three adjacent 813 ft. long bridges. Barnhart was asked to remove 68 ft. long, 138,000 lb. pre-cast bridge sections. The team lifted and slide the sections to the transfer area where they would then be loaded on Barnhart's 5-axle dolly and moved to the laydown area. B

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- Modular Lifting Tower
- Pull-Up Gantry
- Hydraulic Slide System
- Jacks & Rams
- 4-pont Gantry System
- Strand Jacks
- Modular Hoists

TRANSPORTATION SYSTEMS
- Dual Lane Transporters
- Goldhofer PSTe
- Hydraulic Dolly Systems
- Barging
- Ramps and Temporary Bridges

MARINE HEAVY LIFT
- Derrick Crane – Mississippi River
- Barge Crane – Gulf Coast
- Barge Crane – Great Lakes
- Heavy Lift Terminal – Great Lakes
- Heavy Lift Crane – Houston

TELESCOPIC BOOM CRANES
- 110 cranes from 17.5 to 80 tons
- 25 cranes from 100 to 180 tons
- 15 cranes from 210 to 500 tons

LATTICE BOOM CRANES
- Crawlers from 250 to 700 tons
- Truck cranes from 125 to 800 tons
- Ringer cranes from 360 to 1,760 tons