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Tower power!

New feats in specialized lifting

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Tower power

Burkhalter's self erecting tower system handles the erection of a hydrocracker reactor with ease. **D.Ann Shiffler** reports

In early 2009 Burkhalter introduced a lifting innovation to its clients in North America. Known as the Burkhalter Self Erecting Tower, (BSET), the system is a self-erecting, hybrid tower gantry system that has the capacity to lift up to 2,240 tons (2,000 metric tons). The modular and portable system uses hydraulic strand jacks mounted atop a set of girders spanning two pairs of hydraulically self-erecting lattice towers.

The BSET is a single source, rapid deploy and highly configurable lifting solution, says Delynn Burkhalter, president of the Columbus, Mississippi-based company. "It offers computer synchronized lifting and precise all-axis movements in confined spaces," says Burkhalter. "It also erects or jacks up from the bottom up so you don't have to have a big crane to set the girders and practically all work is completed at a low elevation."

The BSET has given Burkhalter a new dimension in its lifting services. The company successfully used the BSET for the installation of a hydrocracker reactor at an operating refinery near Tulsa, Oklahoma. The job presented a variety of challenges, the most difficult aspect being the extremely tight and crowded conditions.

"The erection site was located at the back of the refinery between two operating units," says Burkhalter. "There were myriad obstacles including fire hydrants, electrical transformers, heat exchangers and active railroad tracks.

The reactor measured 130 feet long and almost 14 feet in diameter. The total lift weight was 1,051,000 pounds

'They want what where?'

The reactor measured 130 feet long and almost 14 feet in diameter. The total lift weight was 1,051,000 pounds. Prior to receiving the package for the erection of the reactor vessel, Burkhalter had secured the work for the complete transportation of the reactor from Moji, Japan to the refinery in Tulsa, OK. Once it arrived at the Port of Houston, Burkhalter arranged for a direct discharge to previously prepared rail cars.

Once the reactor arrived at the rail yard in Tulsa, Burkhalter off-loaded it using one of its gantry systems, and then transported it underneath a multi-lane freeway, over railroad tracks and on city streets to the refinery where it was unloaded using the same gantry in the lay-down area so it could be insulated and dressed out. At that point Burkhalter started the bid process for the erection of the reactor.

Burkhalter says when they took the bid to Senior Rigging Engineer Jay Solomon, his first words were: "They want what where?"

The obstacles and obstructions within the refinery were like a maze. There was a lot of underground piping and existing operating facilities.

"Essentially, we were to install the reactor in the middle of an active

operating refinery," says Burkhalter.

Several companies bid on the project and some probably did so using a crane. "I'm sure there's a crane that could have done the work," says Burkhalter. "There was not a lot of room for that type of crane and we did not have such crane available to us here at Burkhalter."

In June 2010, after several Q&A sessions, Burkhalter was issued a contract for the erection of the reactor using its BSET system.

"Up until that time, the only project that we had used our BSET on was to erect two 1,000 metric ton hydrocracker reactors at a refinery in Alabama," says Burkhalter. "While weighing two times

The tailing crane was a Liebherr LR1400/2. The crane started out at just under 90 percent of its load chart and then diminished to 69 percent at the last critical point while booming down over the corner of the track

more than the weight of the reactor in Tulsa, our first lifts with the BSET were much more straight forward, with a narrower gage lift girder arrangement and not inside an operating unit."

Besides the incredibly tight working conditions, another complication for Burkhalter's engineering crews was that the customer kept changing its location for the reactor foundations – three times, in fact.

Change-ups

"We'd get just about arranged for a particular location and then there would be a change," he says. "Even if they moved it two or three feet it would impact our set up. But we were able to accommodate them."

The Burkhalter team held several Q&A meetings with the client, and many times these sessions would last several hours. In one of the meetings, the client asked about the feasibility of a test lift in the area prior to moving the reactor into position.

"Once we pointed out that we would have to make 120 roundtrip truckloads of counterweights and 240 some odd lifts all in the active unit they nixed the idea before we even priced it," says Burkhalter. "During these discussions I had mentioned we could do the test lifting at our location in Mississippi."

One of the primary concerns for the lift was the potential for high wind conditions. Burkhalter's engineering team worked with Hydrospex to develop ways to increase the allowable wind speeds for the un-guyed BSET. The BSET was actually the most vulnerable to wind when erected but with no load on the hook, Burkhalter explains. "Our engineers came up with the concept of using two HSL 2000 strand jacks pulling straight down between the towers," he says.

Rigging innovation

By adding the compression to the towers, they were able to increase the allowable sustained wind speed by greater than 50 percent. The allowable wind speed was increased from roughly 48 mph to almost 75 mph – all without increasing the footprint or impacting the refinery

EQUIPMENT USED

- BSET – Burkhalter Self Erecting Tower System
- HSL 6000 Strand Jack System (used as a part of the BSET system)
- HSL 2000 Strand Jack System (used as a wind guy)
- Liebherr R 1400/2 (used as the tailing crane)
- 20-line, 4-file Goldhofer SPMT trailers
- 80-ton Tadano hydraulic crane

operations. Back-up plans were in place to lower the towers in the event of severe weather. Once the BSET was erected, the overall height at the top of the strand jack palm tree was 193 feet. As an added layer of oversight and safety, Burkhalter had a third party PE stamp the drawings and procedures.

The BSET was rigged to safely lift roughly 1,609,000 pounds (65 percent of capacity for the number of strands) using 68 strands of 15.7 mm wires in the 600

>30

metric ton strand jacks (34 per strand jack). The tailing crane was Burkhalter's Liebherr LR1400/2. The crane started out at just under 90 percent of its load chart and then diminished to 69 percent at the last critical point while booming down over the corner of the track. The BSET and tail crane had to maintain less than 2,000 PSF. The BSET saw 1,977 PSF on the side closest to the vessel and 1,320 PSF on the opposite.

Slow and steady

Doug Miller and Brooke Burkhalter developed an innovative plan to move the BSET lift girders preassembled into the operating unit at the refinery. They did this by removing the decks and goosenecks from a 19-axle Trail King trailer and fitting the girders with a transition to the hat boxes on the 19-axle. The girders weighed nearly 200,000 pounds, and this idea enhanced safety by avoiding work in the operating unit of the refinery and improved the assembly and disassembly schedule, saving time and money.

The morning of the lift, Burkhalter's supervision staff and crew assembled to go over every detail of the plan which included plant safety, refinery operations, and fire brigade. Then the reactor was moved into the refinery on a Goldhofer SPMT, carefully skirting around operating vessels and other obstructions.

In the BSET Control Conex, operator David James monitored the strokes on the strand jacks and controlled all operations. He was in radio contact with Lift Director John White, who was outside supervising the lift and communicating with two transit technicians monitoring the plumb of the towers. James could view 16 different camera locations, monitor actual wind speed and weather radar, and also monitor strand jack stroke and load data.

The LR1400 was maneuvered to accommodate the PSF loadings. At one point a client representative expressed concern about head room. He said, "There's no way we are going to make it without two-blocking." Burkhalter says, "I told him I was prepared to make a large wager. They had no idea how many times we had analyzed this lift."

As planned there was ample head room, in fact, they could have actually gone up another 12 feet. "We slid the complete system a short distance north and side shifted west before rotating the vessel to achieve alignment over the anchor bolts," says Burkhalter.

The pre-lift safety meeting was completed at 8:12 a.m. and the lift was started right after that. "We were sitting on the shims at 2:27 p.m., just a little over 6 hours," he says.

Safety was the number one priority. "One thing the refinery safety managers did there more often than any place I've seen before was the random inspection of employees on the jobsite, asking to see their documentation and certifications," he says. For the project Burkhalter developed a site-specific safety program and presented a site-specific safety orientation of all jobsite personnel. A 110 percent load test was performed, and all operators were certified. Burkhalter performed 6,723 man-hours on the job with no incidents, accidents or property damage.

What was the hardest part of the job? "The hardest part was the site being so cramped and working in hot units," says Burkhalter. "The crane didn't have much room to spare, sometimes inches. We had just inches to spare in several directions with the BSET and the reactor itself. It really went seamless. The client was thorough and asked more questions than any client we've worked with. In the end they were very happy with our performance." ■

The BSET was rigged to lift roughly 1,051,000 pounds using 68 strands of 15.7 mm wires in the 600 metric ton strand jacks (34 per strand jack)