NUCOR® SKYLINE

CASE STUDY

Marathon Petroleum Refinery

Galveston Bay, Texas

HISTORY

The Marathon Petroleum Corp's (MPC) refinery at Galveston Bay, TX is in need of an upgrade. The Ohio-based company has been working to integrate its Texas City refinery, purchased from BP in 2013, with their facility at Galveston Bay. The refinery there is the second largest oil refinery in the country. This facility can process a wide variety of crude oils into gasoline, distillates, chemical-grade propylene, and sulfur. The proposed upgrades will also expand crude processing capacity and allow for more production of ultra-low sulfur diesel, distillates, and gas oil. By increasing its ability to produce lighter products, the Galveston Bay refinery upgrades will ready it for an increased demand in low sulfur fuels and diesel starting in 2020, when the shipping industry switches to low sulfur marine fuels to comply with new pollution rules set in place by the International Maritime Organization. Products from the refinery are distributed via pipeline, barge, transport truck, rail, and ocean tanker.

PROBLEM

Among the many upgrades at the facility will be the addition of another lift station for the wastewater treatment plant at Texas City. Lift stations, also called pump station, are used for pumping wastewater or sewage from a lower to higher elevation, particularly where the elevation of the source is not sufficient for gravity flow and/or when the use of gravity conveyance will result in excessive excavation and high construction costs.

MPC solicited a quote from Cajun Industries to install a permanent shoring system for the construction of the proposed lift station. The cofferdam design required an excavation depth of 35 feet, with dimensions of 55 by 73 feet. In addition to maintaining the open excavation,

the cofferdam was to remain in place and act as the exterior form for the lift station.

The project, inside of the refinery, posed many challenges throughout the course of planning, mobilization, and execution. The cofferdam's proposed footprint conflicted with the intersection of three plant roads, a tank dike wall, elevated pipe racks, underground storm drainage, and difficult driving conditions due to the extremely dry, dense sand with some clay. Rainfall totals in the months of April and May were measured at just over an inch, making the soils even harder and dryer than usual.

SOLUTION

The planning stages of the cofferdam were as critical as the actual construction. The proposed shoring structure had to coincide with the lift station design and construction sequence. Open lines of communication with all the parties involved were the only way to achieve a successful project conclusion. The excavation depth and large size of the cofferdam meant the shoring system was subject to larger than average loads. Traditionally, this would have been equalized by utilizing a system of multiple waler and strut tiers with cross sections, within the cofferdam design. However, the project team suggested a king pile system that utilized a heavy sheet pile profile coupled with a large beam design. This design effort would reduce labor and material costs, expedite scheduling, and eliminate the need for a multiple tier bracing system. The waler system was designed by Cajun Industries, however, Cajun reached out to Nucor Skyline for their help with the engineering phase of the king pile wall. Nucor Skyline has an in-house engineering and drafting team and is able to assist customers with design needs, taking into consideration

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cost, load, and schedule/product availability when implementing their designs.

After analyzing all constructability concerns and project risks, the team decided that Nucor Skyline's HZ 1080A beams and AZ 28-700 sheets were the right choice for this cofferdam project. The chosen material also aided in the constructability of the civil aspect of this project by eliminating concrete construction joints that require a multiple tier bracing system. Nucor Skyline has a partnership with ArcelorMittal, the only manufacturer of the HZ beam used in this configuration. Because the material originated overseas, planning and communication were the key to the success of this project. The material was shipped from Europe to the Port of Mobile, AL, where it was transported to a coating facility. The coated piles then made their way to Texas City, TX where they were delivered in a specific order to keep the project flowing smoothly, without taking up unnecessary space at the job site. This also allowed the construction crew size on site to be kept to a minimum. The single waler and strut tier was designed and fabricated offsite to allow for speedy onsite assembly.

With a six-week lead time, the schedule was dependent upon uninterrupted global shipping delivery. Nucor Skyline provided the partners with real time updates on the material location and delivery progress. Utilizing MarineTraffic.com satellite tracking, the cargo ship's actual location was shared with the project team twice per week.

Traditional vibratory installation methods were chosen to install the sheet pile and beams. Nucor Skyline worked with Cajun Industries and International Construction Equipment (ICE) to oversee proper and frequent quality control checks to prevent any tolerance issues. After one such check, Nucor Skyline suggested that with the hard, dry clay soil conditions at the site, the initial ICE 44 vibratory hammer was less successful in driving the pile to depth. Instead, an ICE 66 vibratory hammer, with added weights, was used and the sheets and beams were installed efficiently, and without issue.

This cofferdam utilized innovative design and materials, and provided the required solution while considering all cost saving measures, safety risks, schedule concerns, construction synergies, and environmental impacts. As with all successful projects, precise planning, open communication, and dedicated team collaboration and creativity were key factors in this job.

PROJECT PARTNERS

Owner
Marathon Petroleum Corporation – Findlay, OH

General Contractors
Cajun Industries – Baton Rouge, LA

PRODUCT

Steel Sheet Piles: HZ 1080 and AZ 28-700

PROJECT TIME FRAME

March 2018 through present

Skyline Steel, LLC
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For technical questions and engineering support, please contact us via our technical hotline at: **1-866-875-9546** or email us at: **engineering@nucorskyline.com**.