Case Study

EGAT Project

Industry
Petrochemical

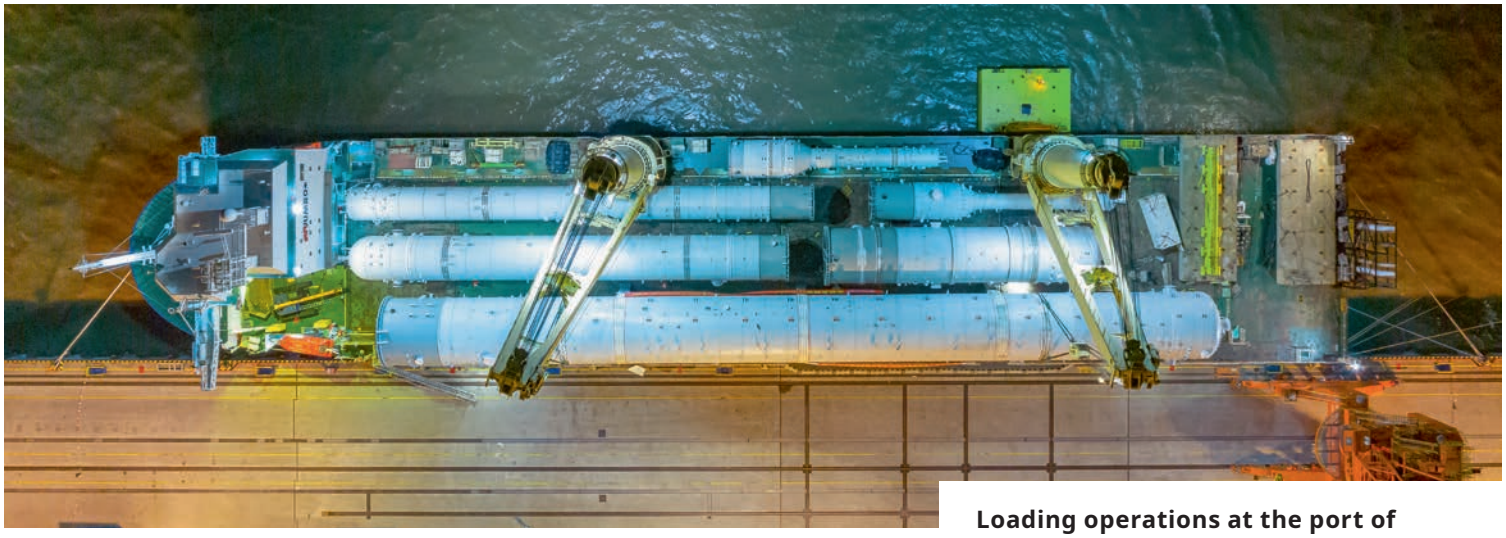
On-carriage
Comprehensive transport engineering and civil works

Volume
120,000 FRT

Weather Challenges
–17°C, heavy snowfall, ice and strong winds

Cargo Highlight
889 MT and 96 m propylene-propane splitter

Performance
On time, within budget, without QHSES incidents



Loading operations at the port of Zhangjiagang, China

Case Study: EGAT Project

For the EGAT Project, deugro Korea was contracted by its client Hyundai Engineering to move 120,000 freight tons (14,000 metric tons) of petrochemical cargo to a project site in Police, Poland. The project encompassed a considerable amount of oversized and heavy lift (OSHL) units, including an 889-metric-ton propylene-propane splitter, with impressive dimensions of 96 x 9.35 x 8.90 meters; five 613.98-metric-ton and over 72-meter-long propylene storage bullets; and a 44-meter-long, 596-metric-ton reactor.

A tight time frame, temperatures down to –17°C, heavy snowfall, ice and strong winds called for sophisticated planning, specialized transport engineering and strict QHSES measures to face the project challenges and meet the client's demands. With the highest quality standards, deugro successfully delivered the sensitive cargo and critical components under extreme conditions to the job site.

The most critical OSHL units of 67,800 freight tons (7,156 metric tons) overall were loaded in South Korea and China.

Preparation

Prior to the operational execution, deugro and dteq Transport Engineering Solutions, both companies of the deugro group,

conducted personal site visits to identify potential obstacles and challenges and to develop appropriate transport and engineering solutions. dteq performed the route survey and provided detailed third-party method statement reviews.

» The scope of the project required intensive technical analyses and preparations. «

The project preparation spanned a period of approximately one year, because deugro Korea and its subcontractors had to carry out extensive civil works to enable the project delivery. These included the construction of new roads and a temporary 650-metric-ton bridge, several road widenings, the installation of foldable streetlamps, the movement of steam pipes and medium-voltage wires underground, and the construction of a site entrance, to name just a few.

Technical engineering was required to create complex traffic management plans, and the subsequent approval processes to obtain all transportation permits took nearly six months alone. Due to environmental impact and QHSES considerations, only nighttime travel was allowed for the OSHL units. This meant that focused attention and care was required for the escorted on-carriage of the special oversized components. Because the operational project duration ran over several months, with significant temperature fluctuations, the weight loading limits of frozen, thawing and thawed ground had to be included in the safe project planning considerations from the start.

Vessel arrival at the Port of Morski, Poland

Due to the limited river draft, the winter navigation time, and the narrow channel from the western Oder River leading to the unloading site at the Barkowy jetty in Police, Poland, the number of ocean-going vessels and barges suitable for the barge operations was limited and a tailor-made solution had to be designed, developed and delivered.

Loading operations in South Korea and China

The most critical cargo units were loaded at the Ports of Gunsan and Masan in South Korea, and Zhangjiagang, China. To reduce unloading times from the vessels to the barges and to optimize the discharge processes at the Port of Morski, Poland, the stowage on the ocean-going vessels was planned well in advance. The stowage plans considered the unloading sequences, the respective barge types, and the final discharge method (RO/RO or LO/LO) at the Barkowy jetty in Police.

The loading operations of the most critical OSHL units began in Gunsan and Masan, South Korea—taking almost four days to safely complete. Since many of the cargo units were not stackable, a customized stowage concept was required to match the vessel's stowage capacity. Under the supervision of the local deugro teams, 249 cargo units, weighing a total of over 16,000 freight tons and including a 44-meter-long, 596-metric-ton reactor, were successfully loaded on board the multi-purpose heavy lift vessel MV *Pietersgracht* (Ice Class E3). The loading was performed using the on-board cranes with a combined lifting capacity of up to 800 metric tons. All cargo was safely shipped from Asia to the Port of Morski, Poland.

deugro Korea's team then shifted their attention quickly to the next loading operation in the Port of Zhangjiagang, China. This included the loading of 40 cargo units, totaling 15,962 freight tons and 2,000 metric tons.

The challenges

- OSHL cargo units with weights of up to 889 MT and up to 96 m in length
- Challenging weather conditions with temperatures down to −17°C, heavy snowfall, ice and strong winds
- Comprehensive transport engineering and civil works

Loading of the 96-meter-long propylene-propane splitter at the Port of Zhangjiagang, China

Cargo arriving at the Port of Morski, Poland

The biggest challenge was the loading of the 889-metric-ton propylene-propane splitter, with impressive dimensions of 96 x 9.35 x 8.90 meters, and the five 72.13-meter-long, 613.98-metric-ton propylene storage bullets, as well as further OSHL cargo units. Again, the stowage capacity and the space for the lifting and securing operations on the weather deck were limited. Due to the overhang of the propylene-propane splitter, conventional stoppers in the transversal direction could not be used, and a bespoke stopper design had to be developed. This detailed engineering planning was required to ensure safe lifting and stowage.

» Well-prepared stowage plans ensured an optimum utilization of the vessel's loading capacities. «

All cargo was loaded onto the heavy lift vessel MV *Jumbo Jubilee* using the vessel's on-board cranes with a combined lifting capacity of up to 1,800 metric tons. After three loading days, the cargo was safely secured and the vessel ready for its 10,500-nautical-mile voyage to the Port of Morski, Poland.

Discharge operations at the Port of Morski, Poland

Because seasonal temperatures at the Port of Morski dropped to –17°C, ice breakers and special tugs had to be arranged to break the ice prior to berthing and to ensure smooth unloading operations. Due to local restrictions from the port authorities, the discharging operations from the vessel to the barge, the barge trips and the roll-off operations from the barge to the jetty could only take place during daylight. In addition to the discharge restrictions, the inland transport to the construction site was only allowed starting at 11 o'clock at night.

Therefore, the OSHL cargo had to wait on the trailers until it could be directly transported by road to the site.

Upon arrival of the heavy lift vessels and under supervision of deugro Korea and dteq, the main equipment was discharged directly from the vessels onto barges and safely secured according to the loading and stowage plans. For this purpose, method statements, motion analysis, load distribution plans and lashing arrangements, among others, were prepared beforehand and reviewed by dteq.

» deugro Korea's personal supervision and coordination ensured smooth operations at all times. «

The load-spreading was placed in accordance with the strong point of the vessel and saddle distances of the cargo, in combination with an additional 400-millimeter timber load-spreading layout on the deck. During the double-banking operations, special attention was given to the vessel's mooring orientation and the wave height to ensure cargo positioning according to the discharge plans. deugro and dteq took care that the simultaneous ballasting operations were safely executed in close cooperation and with communication between both vessel crews during the lifting operations.

The consecutive barge trips were executed by three main barges so that these could be reused; therefore, it was not required to reposition the wooden mats and stools on the barges. This led to time, risk and cost savings while also minimizing waiting times.

Within six weeks and after over 30 barge trips, the discharge operations from all incoming vessels were completed according to schedule and the cargo was delivered to the Barkowy jetty six kilometers away. The discharge operations of the MV *Jumbo Jubilee* took five days and of the MS *Pietersgracht* almost 10 days.

Roll-off operation at the Barkowy jetty

One of five storage bullets arriving at the Barkowy jetty

Barge unloading at the Barkowy jetty

During the barge unloading operations at the Barkowy jetty, the mooring arrangement was crucial. The barges had to always be in the correct position. To ensure adequate mooring was implemented, four winches were placed on the deck of the barge and an additional temporary bollard was placed on the pier.

A new ramp had to be built at the port. Since the weight of the adjacent railroad tracks could not be touched or loaded, a flyover bridge was designed. To meet the height of the ramp of about 700 millimeters, wooden mats covering the path of the trailers were built on the deck of the barges. Due to the overhang of the 96-meter-long propylene-propane splitter, the RO/RO ramp had to be placed on temporary stools. After the vessel was in its Mediterranean mooring position, the stools were removed and the ramp sat on the vessel's deck.

The roll-off was executed according to a detailed ballast calculation that was prepared and approved well in advance of the operation. Close communication between the ballast engineer and trailer operational crew throughout the roll-off discharge activities was critical to the success of the operation.

Following the precise schedule and individual barge arrivals, the cargo units were picked up by self-propelled modular transporters (SPMTs) for their on-carriage to the construction site. The 889-metric-ton propylene-propane splitter was moved on a KAMAG K25 modular platform trailer using two 16-axle lines (double file) with turntable to meet the requirements of the narrow turns.

Because it was not possible to place a crane on the barge, the seafastening of the five 72.13-meter-long and 613.98-metric-ton propylene storage bullets had to be removed after roll-off on the shore side. Therefore, all wires had to be fixed safely under the cargo units and above the trailers to keep

the wires from touching the trailer during the roll-off operation. Due to temperatures of around –10˚C to –17˚C, considerable amounts of ice and snow had to be removed on each day prior to each operation to ensure a safe working environment for all teams involved.

On-carriage to the construction site

Once safely secured on the trailers, the sensitive cargo units started their six-kilometer overland trip through the City of Police to the construction site. Due to local regulations, the transportation could only be carried out at night, and to ensure a safe movement, extensive traffic management measures were prepared in advance over a period of one year.

To accommodate the extraordinary dimensions and loads of the OSHL cargo units, new roads were constructed and existing roads widened. A building along the transport route had to be modified to meet the width of the oversized load and allow for safe transit. Steam pipes and medium-voltage wires were moved underground, streetlamps were replaced by foldable types, electric railway wires were disassembled, local 110-kilovolt power lines had to be shut down and a new site entrance constructed. Furthermore, considering the heavy weight of the cargo, a temporary 650-metric-ton bridge needed to be built, and ground-bearing capacities along the route were increased.

The most impressive cargo units to be moved were the 596-metric-ton reactor, the five 72.13-meter-long and 613.98-metric-ton propylene storage bullets, and the 889-metric-ton propylene-propane splitter with an impressive length of 96 meters. The propylene-propane splitter was moved to the construction site on a 64-axle-line hydraulic trailer, escorted by the traffic police.

Thanks to deugro's excellent cooperation and coordination with dteq, the client and all partners, this complex project was successfully and safely delivered despite challenging weather conditions with temperatures down to –17°C, heavy snowfall, ice and strong winds, as well as extensive transportation engineering and construction work.