Case Study

Long Son Project

Industry
Petrochemical

Cargo Highlight
778.1 MT and nearly 100 m C3 tower

Volume
280,000 FRT

Origins
Shipments from over 35 seaports and airports worldwide

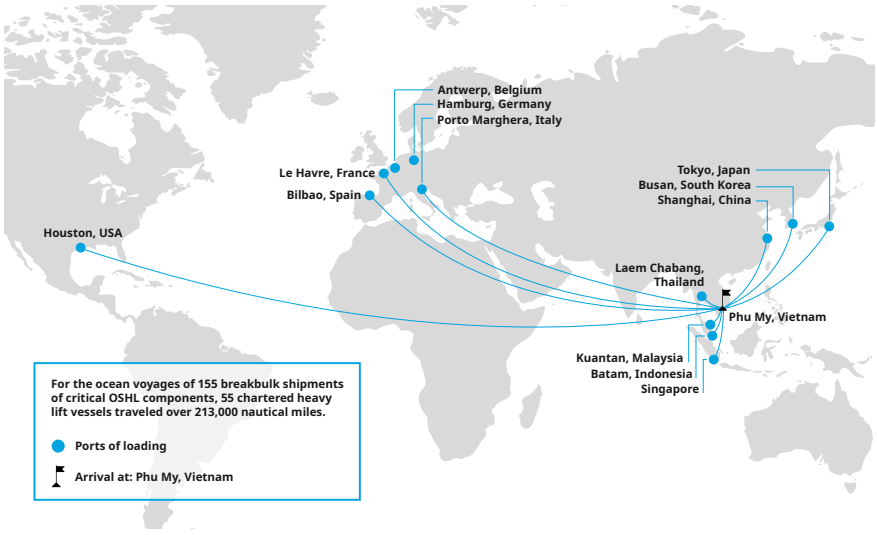
Chartering
155 breakbulk shipments on 55 chartered heavy lift vessels

deugro Team
Over 50 experts from 16 deugro country organizations worldwide

Case Study: Long Son A1 – Olefins Plant Project

For the Olefins Plant Project, deugro was awarded the contract for the transportation of more than 280,000 freight tons of petrochemical equipment from over 35 worldwide seaports and airports to the construction site on Long Son Island near Vung Tau, Vietnam. The most critical oversized and heavy lift components with a volume of nearly 178,300 freight tons were successfully delivered by 155 breakbulk shipments on 55 chartered heavy lift vessels in times of widespread and ever-changing restrictions on short notice due to the COVID-19 pandemic, and with skyrocketing freight rates and severely limited vessel and vessel space capacities.

The overall project encompassed over 1,400 breakbulk, container and air freight shipments—with nearly 37,000 packages and a total weight of almost 68,510 metric tons—from Singapore, Belgium, Canada, China, France, Germany, Indonesia, Italy, Japan, South Korea, Malaysia, the Netherlands, Thailand, the UK and the USA to Phu My, Vietnam.



To meet the extraordinary complexity of this major project, deugro Singapore, as the project control tower, worked closely with a total of 16 deugro country organizations around the globe. More than 50 deugro experts were in daily contact with the client and all subcontractors and worked together across the project supply chain to ensure safe delivery, smooth operations, and efficient responses to a variety of challenges in a timely manner.

To ensure the safe ocean transportation of the huge cargo packages across more than 213,000 nautical miles, deugro and its partners produced bespoke method statements, transport arrangement drawings, detailed motion analyses, ballasting and mooring calculations, ramp arrangements, lifting and rigging calculations, as well as stowage and seafastening designs.

Cargo units with single weights of up to 778 metric tons and lengths of nearly 100 meters

The most challenging oversized and heavy lift (OSHL) components

The 24 most challenging OSHL components—with single weights of up to 778 metric tons, lengths of nearly 100 meters, and a total volume of over 48,000 cubic meters—were delivered from Kuantan, Malaysia to Long Son, Vung Tau, Vietnam despite last-minute schedule changes during the peak of the COVID-19 pandemic and strict mandates.

With skyrocketing global freight rates and a significant shortage of suitable vessels at an early stage of the project, deugro proactively contracted six semi-submersible, heavy lift RO/RO multi-purpose dry cargo vessels, strengthened for heavy cargo, with their partner Roll Group. This enabled deugro to not only guarantee the required cargo space, but also to secure the estimated project budget for the client.

Preparations to safely move these 24 most challenging OSHL components from Malaysia to Vietnam took more than a year. Due to the constraints of the COVID-19 pandemic, traveling and personal on-site meetings were restricted to a minimum and required several weeks of quarantine as well as a considerable amount of remote planning and coordination. deugro's QHSES department supported all teams with comprehensive risk assessments, working instructions and trainings to guarantee the safety of all participants and trouble-free operations.

Drastically increasing COVID-19 cases and the associated restrictions in Malaysia and Vietnam led to repeated and last-minute changes in the schedule. Flexibility, coordination and timely communication of deugro's project team with the client, the project owner, the supplier and all partners were critical to keep the project on track and to minimize additional costs. To ensure successful project execution within this challenging scenario, deugro's project teams proactively provided daily status reports and were in permanent communication with the client, the project owner, local authorities and all partners.

Challenges at the fabrication yard, Kuantan Port and the job site in Vietnam included inadequate ground-carrying capacities, insufficient turning radiuses, and slopes that were too steep for the trailer configurations. These required extensive engineering and preparation to be completed by deugro in advance.

Therefore, deugro worked with the experienced teams from dteq, a company of deugro group, and Roll Group, whose experts conducted route surveys, identified obstacles and developed technical solutions during personal on-site visits in Malaysia and Vietnam over a period of several weeks. They prepared route surveys, designed lifting, rigging, stowage and cargo securing plans, calculated ramp arrangements and drafted loading and discharge plans. During project implementation, they personally supervised operations and the removal of obstacles.

Six km journey of the C3 tower from the production yard to Kuantan Port, Malaysia

Pre-carriage

The operations started with cargo pick-up and transportation from KNM Process Systems Sdn Bhd's production yard in the Gebeng industrial area in Kuantan, Malaysia to Kuantan Port. For the safe transportation, a journey management plan, including traffic and road diversion, was designed and approved by the port prior to the start of the operations. Safety analysis meetings were held to ensure emergency routes and access for emergency vehicles. To inform the public about waiting times and road closures, the dates for the OSHL transportations were published in local newspapers and social media.

The main challenges were obstacles at the fabrication yard, tight turning radiuses, and ground-bearing capacities on the road and especially at the port—resulting in countless axles being added to distribute the load better. Therefore, additional trailers from the USA had to be shipped in to meet these exceptional requirements.

Further preparations included the removal of lamp posts, the arrangement of permits and police escorts, leveling and compacting pinch-points, booking power and telephone cable lifting, removal of obstacles at the fabrication yard to clear the travel path, strengthening drains that had to be crossed, trailer performance checks and daily equipment maintenance. As the width of the cargo saddles for nine OSHL components were insufficient for transportation and jack-down at the job site, deugro arranged for transport beams from the UAE, Singapore and Malaysia. The transport beams were then placed under the transport saddles and used for the movements to the construction site in Vietnam.

While the smaller items were lifted onto the trailers, the majority of the OSHL components were jacked up using the trailers' hydraulic systems. Once the individual cargo units were safely lashed and secured on the trailers, the truck–trailer configurations were tested for functionality and safely moved on public roads to Kuantan Port, escorted by escort cars and the local traffic police. To double-check lashing and trailer hydraulics, stops at several checkpoints were arranged.

The 6-kilometer journey of the impressive C3 tower from the fabrication yard to Kuantan Port was the most challenging and took nearly 11 hours at a driving speed of a maximum of 3 kilometers per hour.

To reduce the waiting times of the vessels during the loading operations at the jetty and to meet the ground-bearing requirements set by the loading port, deugro arranged for two temporary storage facilities inside and outside the port area for temporary storage and trailer reconfiguration. This ensured optimized operational processes and resulted in significant time and cost savings. All units were stored in the storage area outside the port except for the C3 tower, which due to its dimensions and weight, was stored within the port as close as possible to the jetty to reduce the loading time to a minimum on the day of loading. To ensure the safe maneuvering of the trailers and the cargo, the ground was reinforced with steel plates.

After arrival of the ocean vessels and after approval by the Kuantan Port Authority, the components were moved from both storage areas to the jetty by hydraulic trailers in accordance with the predefined sequences. The trailers were accompanied by a combination of the public police escort and the Kuantan Port Police.

Therefore, the concrete curb at the jetty had to be removed and rebuilt and then repaired after the operation was completed.

» With a length of 93 meters and a weight of 800 metric tons, including transport beams, the C3 tower was among the largest cargo components ever handled at Kuantan Port. «

The most challenging units were the 600-metric-ton quench water tower, which required two 36-axle lines to be driven alongside the vessel, and the C3 tower, which required two 48-axle lines and for which almost a hundred ramps and steel plates had to be placed to achieve a load spreading sufficient to meet the port's ground-bearing capacity of 3 metric tons per square meter.

Pre-carriage of the OSHL components to Kuantan Port , Malaysia

Loading operation of the C3 tower at Kuantan Port, Malaysia

Loading operations at Kuantan Port, Malaysia

The loading operations required the highest level of preparation, coordination and personal supervision. deugro's project team was in permanent communication with the client, the Roll Group team, the safety and technical teams of the Kuantan Port Authority, the stevedores and dteq's engineers. Prior to each loading, meetings and toolbox talks were held with the vessel's master, the cargo superintendent, the marine warranty surveyor and the client's representative, as well as all persons involved, to minimize any risks.

To ensure loading and stowage processes in accordance with the schedule and the highest safety requirements, a large number of analyses, studies, simulations, technical calculations and the resulting method statements were conducted under deugro's coordination by the transport engineers of dteq and Roll Group. The comprehensive method statements for the operations were based on detailed motion response analyses, ballasting and mooring calculations, ramp arrangements, lifting and rigging calculations, as well as stowage and seafastening designs. Kuantan Port had never conducted a RO/RO operation before and had no experience in handling such OSHL components. Therefore, deugro provided consultation every step of the way, considering all contingencies to meet the port's safety and technical requirements.

For the ocean voyage, deugro chartered six semi-submersible, heavy lift RO/RO multi-purpose dry cargo vessels, strengthened for heavy cargo. All units, except the

Challenges
Timely coordination of 155 breakbulk shipments on 55 chartered heavy lift vessels from over 35 seaports and airports worldwide—in times of widespread and ever-changing restrictions on short notice due to the COVID-19 pandemic, skyrocketing freight rates and severely limited vessel and vessel space capacities.

C3 tower, were loaded by vessel crane in tandem lift operations at the main berth for heavy cargo at Kuantan Port. Some units, such as the 338-metric-ton C2 tower and the 600-metric-ton quench water tower, caused additional challenges since they nearly reached the vessel crane's lifting capacity and the space was tight between the cranes to swing the cargo on board.

However, in collaboration with dteq's and Roll Group's engineers, deugro found a safe and innovative solution to successfully navigate the cargo between the vessel cranes, including the temporary removal of a crane boom support.

Initially, it was planned to utilize RO/RO operations for the C3 tower, the quench water tower and the C2 tower. However, deugro and dteq reviewed the lifting plans and designed a solution with the Roll Group team to safely lift the quench water tower and the C2 tower, which saved time and costs for the client.

The C3 tower and the quench water tower required a significant amount of load spreading and grillage, which was installed prior to loading operations. The seafastening encompassed various welding and lashing work. To safely secure the C3 tower on the turntables, additional "d" rings had to be welded to the trailer and the cargo to be able to secure it properly. All operations were closely supervised by the teams of deugro, dteq, a marine warranty surveyor, Roll Group, the client and the Kuantan Port Authority.

» The increasing COVID-19 cases and almost daily changing restrictions led to short-term changes in the schedule, so flexibility was crucial. «

Only through proactive communication, daily status reports and coordination of deugro and the Roll Group team with all parties involved was it possible to bring the vessels into Kuantan Port within only a few days. Loading, stowage and cargo securing took an average of two to four days per vessel, before they set sail for their 445-nautical-mile voyage to Phu My Port in Vietnam.

Discharge at the project construction jetty in Phu My Port, Vietnam

After safe arrival at the Phu My construction jetty, the components were discharged according to the predefined discharge plan by RO/RO and LO/LO operations and moved to the dress-up area. Due to the port's higher ground-bearing capacity of 10 metric tons per square meter, fewer steel plates for additional support and load spreading, and trailers with fewer axle lines than at the port of departure, could be used.

To safely roll off the C3 tower, several fenders had to be removed to allow the vessel to move closer to the jetty for positioning the ramp. One of the biggest challenges was the turn from the jetty to the road at the job site, which was overcome through detailed planning and the correct use of axle lines. The discharge operations of each vessel took two to four days and were personally supervised by deugro, dteq, Roll Group and the client.

Transportation from construction jetty to customs area

Timely discharge was critical to avoid detention and get the vessel back to Kuantan for the next time-critical voyage. To minimize the vessel's berthing duration, after discharge the majority of the components, apart from the C3 tower, were stored at the customs area near the construction jetty before on-carriage, which saved time and costs. Furthermore, it increased flexibility in the delivery of the individual components in accordance with the required sequences of the construction site, which was critical on acount of the rising COVID-19 cases in Malaysia and Vietnam and the associated restrictions, causing voyage detail changes (e.g. which cargo is shipped together) several times at short notice. Double-handling of the cargo at the customs area allowed for adjustment of the delivery sequence according to the client's requirements without jeopardizing the stowage plan.

deugro secured the area in cooperation with the project owner and arranged for all the preparation work such as the marking of the area, the positioning of stools and plates, or the compacting work. Hydraulic trailers were used to receive the cargo under hook, bring it to the customs area, jack it down and then go back to the vessel. The main challenges were the tight turns and the obstacles that had to be removed, such as lamp posts and fences.

Maneuvering the nearly 100 m C3 tower on the project construction jetty in Phu My Port, Vietnam with centimeter precision

On-carriage to the construction site

After timely customs clearance and in close communication with the construction site, the local authorities and the trucking company, the cargo traversed a nearly 1-kilometer heavy haul road to the site's dress-up area with a dress-up area using a total of 64 axle lines in a 4-file x 32-axle-line configuration consisting of SPMTs and conventional trailers.

Due to the size and weight of the C3 tower, and since the trailer configuration only allowed for a certain slope degree, the slopes at several areas of the job site had to be reduced. Lamp posts and fences had to be removed and several areas had to be covered with steel plates and re-enforced because various drains and underground piping had to be crossed.

Since the area in and around a pipe rack on the construction site, which had to be passed, was extremely tight, it took several meetings, site inspections and engineering to identify a safe travel path. Therefore, the road around the pipe rack had to be compacted and leveled to ensure the turning radius was fully utilized. Because it was the rain season and some areas were completely under water, sand and soil had to be piled up, and deugro's teams arranged for pumps and drainage to get the water removed and the area dried. Sophisticated engineering and in-depth preparation ensured the safe and successful delivery of all OSHL components.

Centimeter-wise navigation of the nearly 100 m C3 tower underneath an extremely tight pipe rack on the construction site

Thanks to the outstanding cooperation between deugro, dteq, Roll Group, the client, the suppliers, Kuantan Port, as well as deugro's proactive coordination, innovative solution design and detailed engineering, even the most difficult OSHL components were delivered safely and successfully without injuries or damages, while minimizing delays throughout the challenging period of widespread COVID-19 restrictions.

» In the collaboration with deugro, we experienced an overall good and fair approach throughout the project by the different involved parties, that we will also consider for future business. «

Vincenzo Lagana, Project Director, Technip Energies