CASE STUDY | FPSO LIFTING SOLUTION

Swivel Stack Maintenance on Vietnam FPSO

On an FPSO in offshore Vietnam, maintaining the upper swivel stack meant moving 13.5-tonne swivel modules between the FPSO forward deck and a supply vessel, in an area beyond the reach of the FPSO's own cranes. Thunder Cranes' TC20SL modular rental crane provided the project with the temporary lifting solution it needed to successfully complete ahead of schedule. The close-out review by the project management team stated that without the rental crane, this job scope would not have been possible to complete within the allocated shutdown window. By finishing 6 days ahead of schedule on an FPSO producing 6,000 barrels a day, the result returned 36,000 barrels to production above plan.

Application	• Lifting solution for FPSO upper swivel stack maintenance
Challenges	• Limited space on a crowded deck • 50ft boom assembled over an obstruction (cable tray) • Crane foundation • Complex lift / Heavy Lift • Handshake transfer between two cranes • Tight shutdown window
Our Service	• TC20SL modular crane with 50ft boom • Site survey, rig-up concept and engineering support • Mobilisation, installation and operation • Lift execution and rig-down
Benefits	• Shutdown completed 6 days ahead of plan • No FPSO deck strengthening and no expensive lift vessel required
Location	• Chim Sao field, offshore Vietnam



TC20SL rigged on the forward deck of FPSO, ready for lifting operations.

Background

In May and June 2026, our client's project management team carried out a major shutdown on the FPSO at the Chim Sao field, offshore Vietnam, to maintain the upper swivel stack. This turret assembly lets the vessel weathervane while process fluids, chemicals and utilities keep flowing across the rotating interface. Following the life-extension recommendations of a 2024 study by Bluewater, the swivel's OEM, the scope included renewing or replacing: the utility swivel hoses and pedestal, the M90 bolts and the driver arms, a damaged fire water swivel module.

Every critical step involved lifting. The heaviest lifts were swivel modules of around 13.5 tonnes to be removed from the stack and replaced. A turret gantry crane above the stack made the lifts directly from and into the stack. What the project lacked was a crane to move loads between the supply vessel and the FPSO deck, since the FPSO's pedestal crane could not reach the swivel area.

Our client engaged Thunder Cranes to provide lifting services using a **TC20SL crane with a 50ft boom**. Our scope covered the site survey and proposed rig-up concept; engineering support, including drawings, reaction-force calculations and lifting plans; mobilisation of the crane from Thailand; some of the preparation works for installation; installation of the TC20SL; its operation and lift execution; and rig-down.

Our scope was one part of a closely integrated team. EnQuest led the shutdown and its planning. Bluewater carried out the swivel destack and restack, and PTSC Offshore Services (POS) provided rigging, scaffolding and construction support around the clock. The gantry crane made every lift directly from and into the swivel stack, while the TC20SL moved loads between the supply vessel and the FPSO, onboard and offboard.

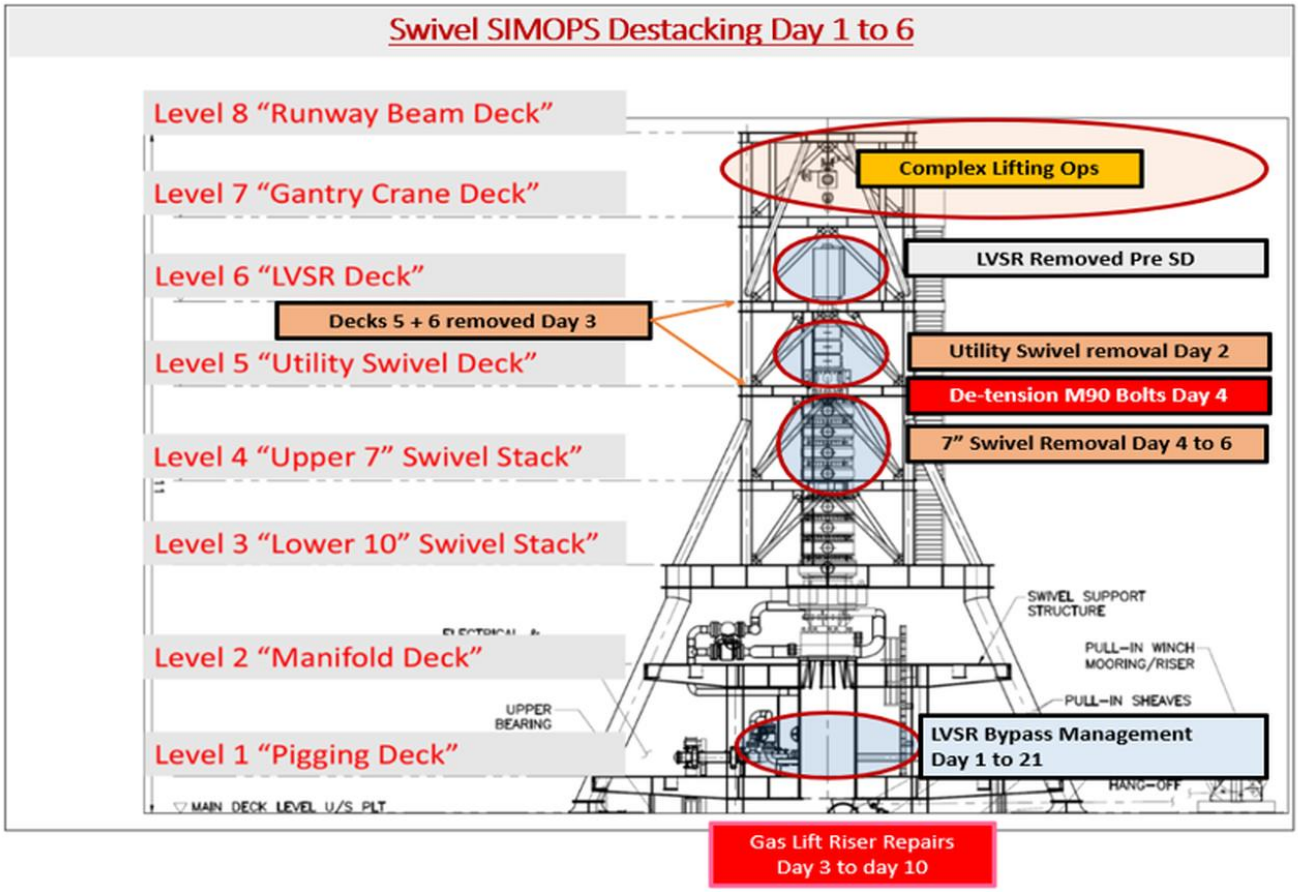


The upper swivel stack aboard FPSO Lewek Emas, before the shutdown.

Project Objectives

The shutdown combined a life-extension programme for the swivel stack with several items added to the campaign. Temporary installation of a TC20SL was part of the enabling scope, since the FPSO had no existing crane covering the forward deck area.

Core scope	• Replace the LVSR pedestal and the utility stack pedestal • Replace the utility module's flexible hoses • Replace the upper swivel stack M90 bolts and module driver arms • Replace the LVSR / utility swivel driver arm
Opportunistic scope	• Remove the damaged fire water swivel module; replace it with the used gas lift swivel module • Install a new combined gas swivel in the upper swivel stack position • Overhaul and re-certify the existing turret gantry crane (Italkrane, SWL 20 tonnes)
Enabling scope	• Install temporary TC20SL modular crane with a 50 ft boom on the forward main deck for onboard and offboard lifts between the supply vessel and the FPSO deck
In parallel	• LVEOSR bypass (MT Corp and Vector Infotech) and bundled maintenance • The swivel and crane campaign was the shutdown's critical-path driver



Swivel stack work plan for the destacking days of the shutdown, with lifting operations at the gantry crane deck.

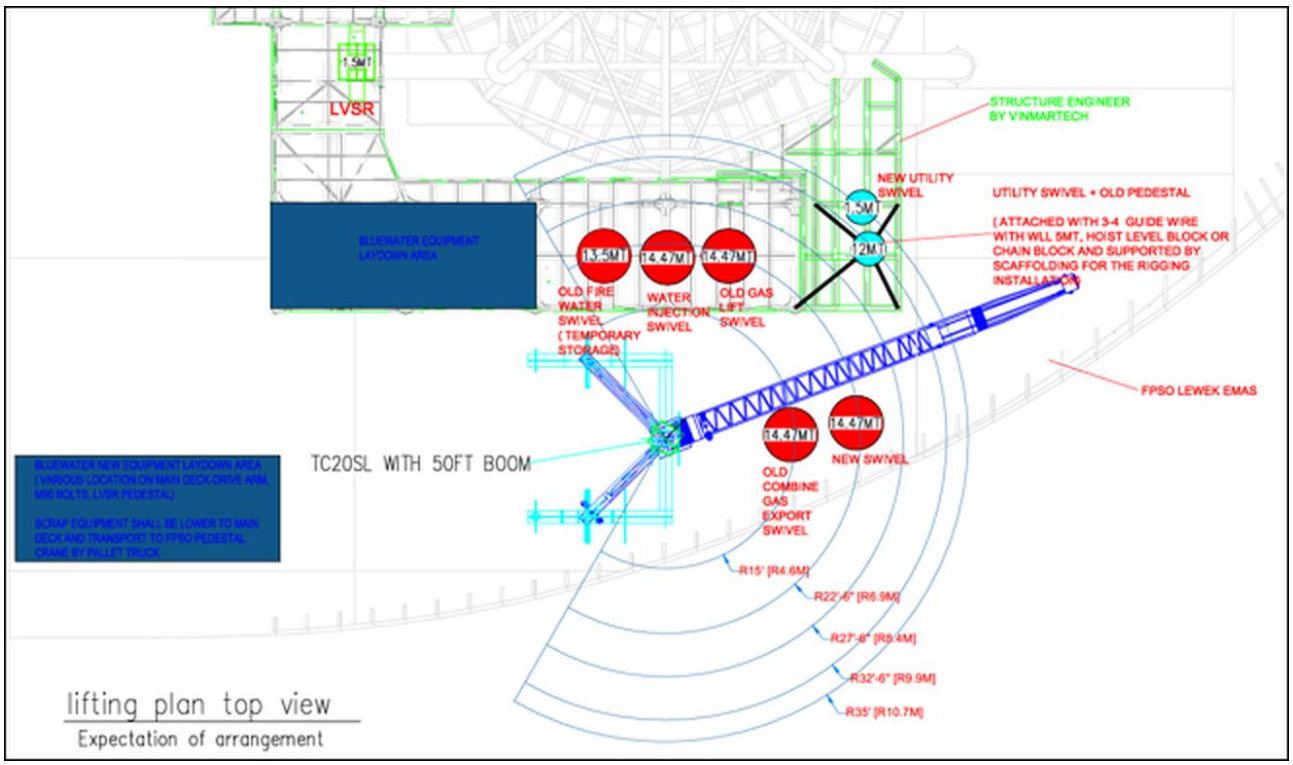
Project Team

EnQuest	Operator. Led the shutdown, overall planning and marine coordination, and commissioned the structural assessment of the deck and crane position.
Bluewater	Swivel OEM. Carried out the swivel destack and restack, and engineered the temporary support posts used during the handshake transfer.
PTSC Offshore Services (POS)	Rigging, scaffolding, mechanical and construction support around the clock, including obstruction clearance, crane-foundation installation and the boom-assembly scaffold.
MT Corp and Vector Infotech	LVEOSR bypass scope, run in parallel with the swivel work.
Thunder Cranes	Modular crane services: site survey and rig-up concept; engineering support (drawings, reaction-force calculations, lifting plans); mobilisation from Thailand; preparation works for installation; installation, operation and lift execution of the TC20SL; rig-down.

Comparison of Mechanical Handling Options

Our client evaluated four mechanical-handling options for the swivel modules: a forklift, railway lines with a deck extension, and two rental cranes. The table compares the cranes available to the project on the points that decided the outcome.

Option	What it offered	Limitation on this FPSO	Outcome
FPSO pedestal crane (25 t SWL)	Handles cargo from the supply vessel to the main-deck laydown	Cannot reach the swivel deck	Used to land TC20SL components
Turret gantry crane	Lifts directly from and into the swivel stack, and to its laydown	Serves the stack and its laydown area only	Made every lift directly from and into the stack
Larger modular crane	More lifting capacity	A naval architect's assessment found that the deck structure in the tank below would need strengthening	Ruled out
Competing modular crane	A comparable rental crane	Heavier, with a two-piece boom that could not be installed over the cable tray, and needing re-activation in the UAE before mobilising	Ruled out
Thunder Cranes TC20SL, 50 ft boom	14.5 t rated capacity; heaviest component 3.3 t; shipped by standard freight	Needed a purpose-built foundation and a boom-assembly scaffold, both engineered for this deck	**Selected**



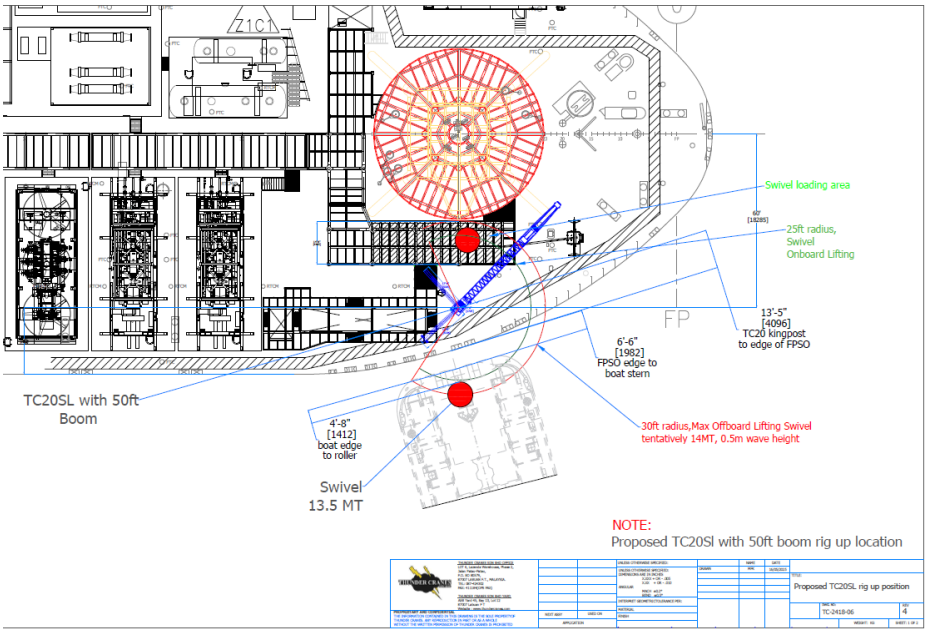
Lifting plan, plan view: swivel module positions at the turret and the TC20SL's working arc.

Challenges & Solutions for Thunder Cranes

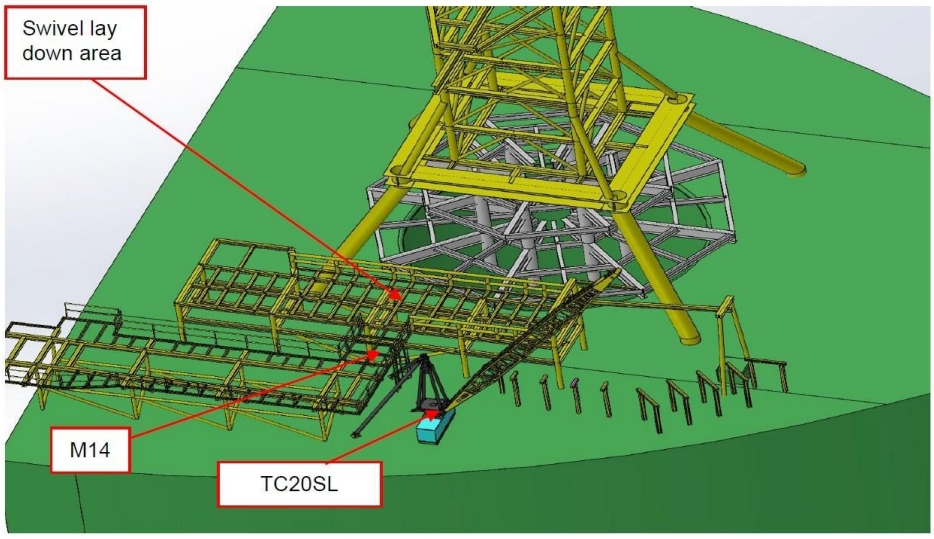
Challenge 1 Limited space

The requirement was to install a temporary crane close to module M14, in a position allowing the crane to cover both the swivel laydown area and the supply vessel. However, this was also a crowded corner of the forward deck with a railway beam, monkey ladder, firefighting equipment cabinet, mooring bollard, and a large cable tray structure causing significant space limitation.

The solution was to install a TC20SL by Thunder Cranes. The TC20SL is built from modules, and its heaviest component, the lower king post, weighs only 3.3 tonnes. That is light enough for the FPSO's own 25-tonne pedestal crane to land each component from the supply vessel, and small enough for our crew to skid it across the deck and assemble the crane in the right location.



Plan view: TC20SL on the forward deck with its 25 ft onboard and 30 ft offboard working radii.

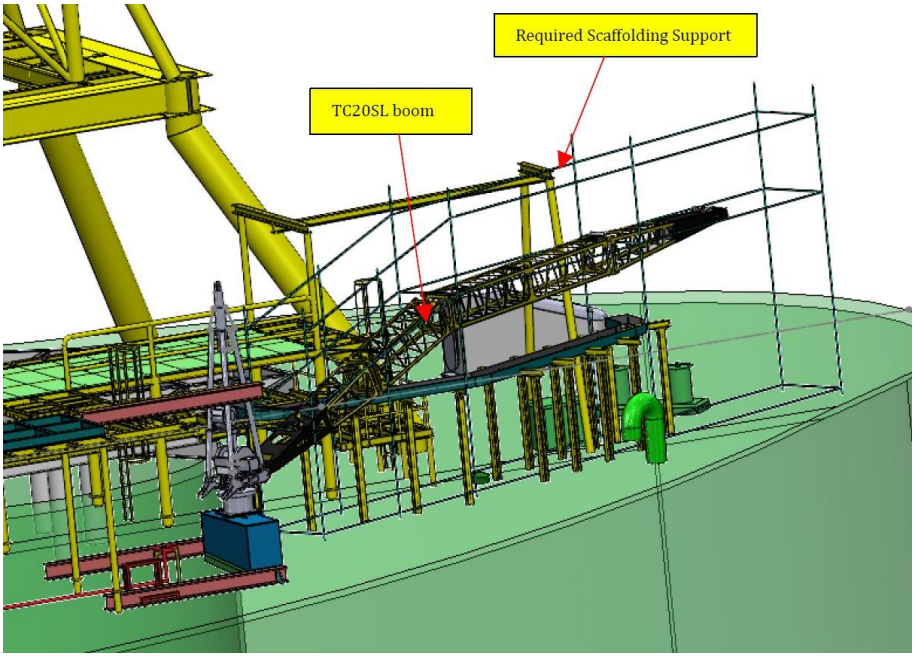


Engineering concept: proposed TC20SL rig-up location at module M14, next to the swivel laydown area.

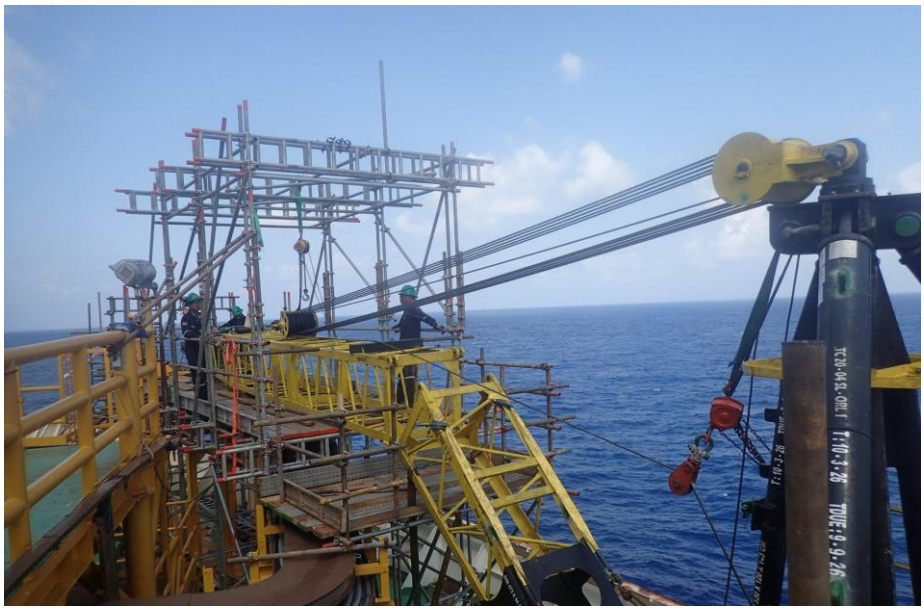
Challenge 2 Scaffolding to support the boom

The TC20SL's 50 ft boom is assembled from 5 sections, and each section must be pinned together. Usually this will be done at the level of the floor/deck. However, at this position an existing cable tray and its structures, ran through the boom's installation path, so the crane could only be completed if the boom could be installed above it.

We designed a load-bearing scaffold platform and gantry structure, 12 m high, on which the boom could be laid out and assembled section by section. The sections were then lifted into position with chain blocks from rigging points on the gantry structure above, and the boom was pinned together. The TC20 rig up was therefore completed without removing the cable tray.



Engineering concept: scaffold platform supporting the TC20SL boom during assembly.



The rig-up area at the FPSO's bow, with boom-assembly scaffolding built around the existing cable tray.

Challenge 3 Foundations for the TC20SL

A crane of this size loads its supports heavily: our reaction-force calculations put the peak uplift at a support point at about 65 tonnes (144 kips). The TC20SL's lower king post and outriggers therefore had to be tied into the FPSO's deck beam structure, which called for purpose-built mounting stools. The answer was a customized foundation designed by our client specifically for this project. The stool structure, designed by EnQuest's structural engineers to those loads, was fabricated and welded to the deck during the pre-shutdown construction phase.

Welding the base into the deck structure gave the TC20SL a rigid foundation that passes its loads into the FPSO's own beams, with no strengthening needed below deck. We supplied the reaction forces and verified the bolted connections and the outrigger mounting by finite-element analysis to API Spec 2C and AISC allowable-stress limits.

65 t	API 2C / AISC	None
peak uplift at a support point (144 kips)	mounting verified by finite-element analysis	deck strengthening needed below the foundation



Foundation stool in place on the forward deck.



TC20SL king post assembled on its purpose-built foundation on the forward deck.

Challenge 4 Complex lifts

The fire water swivel module (and its replacement) weighed 13.5 tonnes and had to be lifted from the FPSO deck to a supply vessel (and vice versa). The TC20SL's 14.5-tonne rating covered the load, however these were classified as complex lifts as the vessel moves (dynamic loading), the operator cannot see the vessel's deck (blind lift), and the load was 93% of the TC20SL's rated capacity (heavy lift). The lift was run under our Engineering Manager as Lifting Technical Authority, with a HIRA and a signed Go/No-Go before the lifting.

Lifting Technical Authority. On a complex lift, the Lifting Technical Authority is the engineer who reviews the lifting plan and its calculations and confirms that the lift stays within the crane's operating limits before work can start. Our Engineering Manager held this role for every complex TC20SL lift, supported by independent crane certification and structural verification.

Go/No-Go. A signed readiness review held before a high-risk lift. For the dynamic lift it scored People, Plant, and Process and Procedures, from crew plans to crane certification, weather forecasting and permit-to-work status. Readiness reached 97.9% before sign-off by EnQuest on 4 May 2026.

TC20SL operating envelope. The conditions were set at a significant wave height of 0.5m or less, and wind below 10 knots. EnQuest's project management team worked with the supply vessel to position it as close as possible to the FPSO hull. Trial manoeuvres were conducted, and the crew practised positioning with an empty hook.



Supply vessel alongside the FPSO.



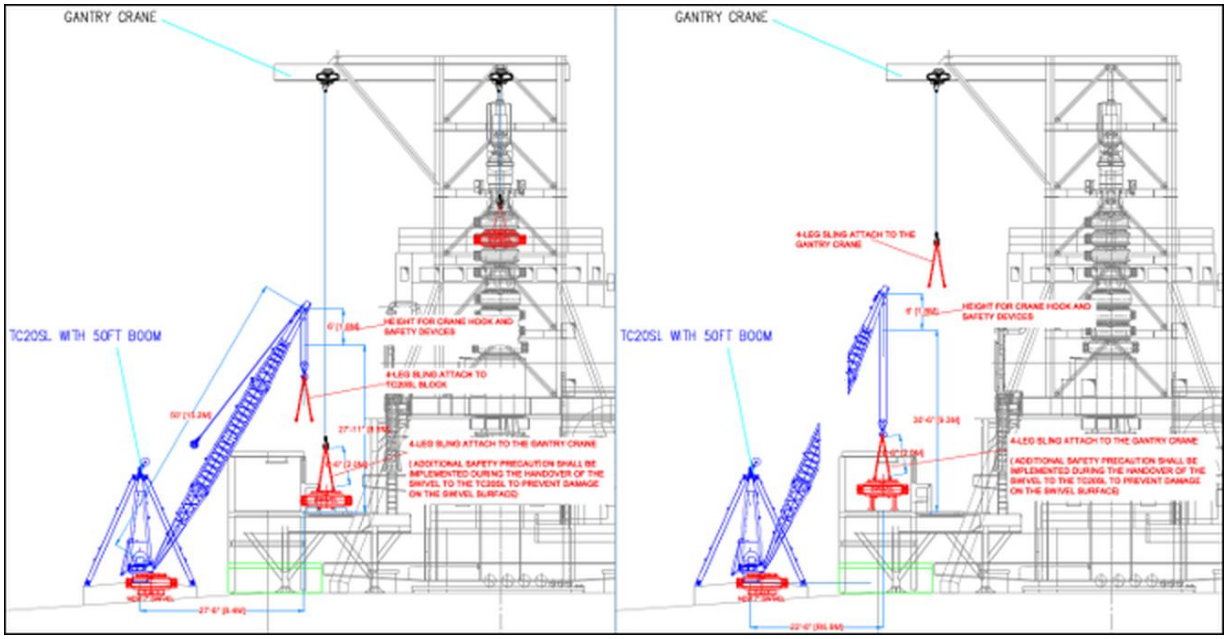
Trial lift from the supply vessel alongside the FPSO.



Swivel module wrapped and rigged on the FPSO deck.

Challenge 5 Handshake transfers

The old fire water swivel could not simply be set down on deck, because of fittings underneath it. Instead, the turret gantry crane lifted the module clear of the stack and passed it to the TC20SL in a handshake transfer.



Lifting plan elevation: the handshake between the turret gantry crane and the TC20SL.

Challenge 6 A tight shutdown window

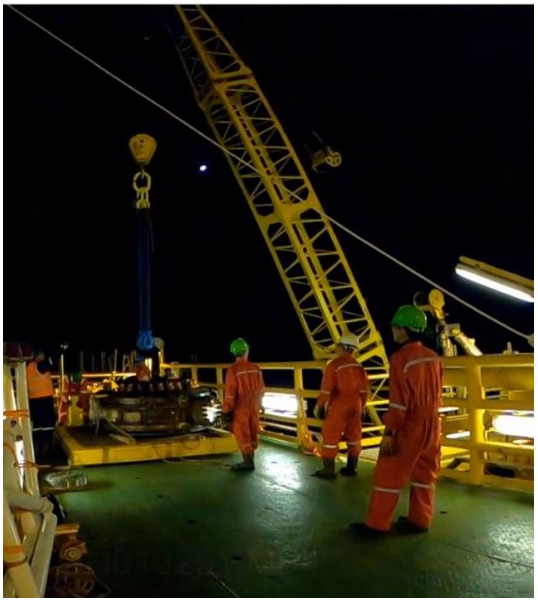
Every day of shutdown is a day without production. EnQuest's initial estimate for the shutdown was 35 days. EnQuest's detailed planning and preparation brought the swivel work down to a 28-day schedule and the business plan to 26 days. This meant all critical teams, including Thunder Cranes, needed to play their part. For us that meant providing reliable, safe lifting support around the clock with the TC20SL.

TC20SL was shipped from Thailand to Vietnam in April, cleared customs, and then transferred offshore via supply vessel. It was then rigged, load-tested and proven with a trial lift and a main lift in early May, before the shutdown started on 22 May. From then it ran 24 hours a day without NPT, without interruption, with a dedicated crew. The TC20SL's lifting scope finished on 29 May, one day ahead of plan.

Component	Weight	Slinging method
Fire water swivel (old, removed)	13,500 kg	4-leg chain sling, M48 ring bolts
New combined gas swivel module	13,700 kg	4-leg chain sling, M48 ring bolts
Combined utility swivel and pedestal	12,000 kg	4-leg chain sling, M54 ring bolts
Utility swivel (standalone)	9,500 kg	Ring bolt, 4-leg chain sling
Utility support pedestal	1,500 kg	Webbing slings
7" top plate, 7" driver arm, M90 bolts	190–500 kg	Ring bolts, chain and webbing slings



Swivel module rigged with a four-leg chain sling during destacking.



Night shift during the fire water swivel changeout.

Thunder Cranes Planning

Planning for the TC20SL crane operation began in 2025 with a site visit by our engineers to confirm where a crane could be rigged and how it would be secured. The resulting site visit report proposed the TC20SL with a 50 ft boom at the forward main deck near module M14, set out the items to prepare (boom scaffolding, removal of obstructions, and stools for the lower king post and outriggers) and offered two foundation options, with and without removal of the mooring bollard.

Engineering followed: reaction-force calculations for the crane at its rated load, verification of the bolted connections and outrigger mounting, and combined lifting plans and HIRAs covering the dynamic lift and the swivel destack and restack. EnQuest's structural engineers and a naval architect assessed the deck and the crane position independently.

The vessel interface was proven early. A trial manoeuvre alongside the FPSO bow in April 2025 confirmed that a dynamic lift was feasible, and the lifting plan set the TC20SL's operating envelope: significant wave height below 0.5 m and wind below 10 knots for dynamic lifts. With so narrow a weather window, the campaign was scheduled for May.

Mobilisation began on 28 March 2026. The crane arrived at PTSC's yard in Vung Tau on 15 April, sailed to the FPSO on 18 April aboard the MV Vung Tau, and reached the FPSO on 20 April with its crew, where a kick-off meeting set out roles and responsibilities between all parties.

Timeline / Milestones

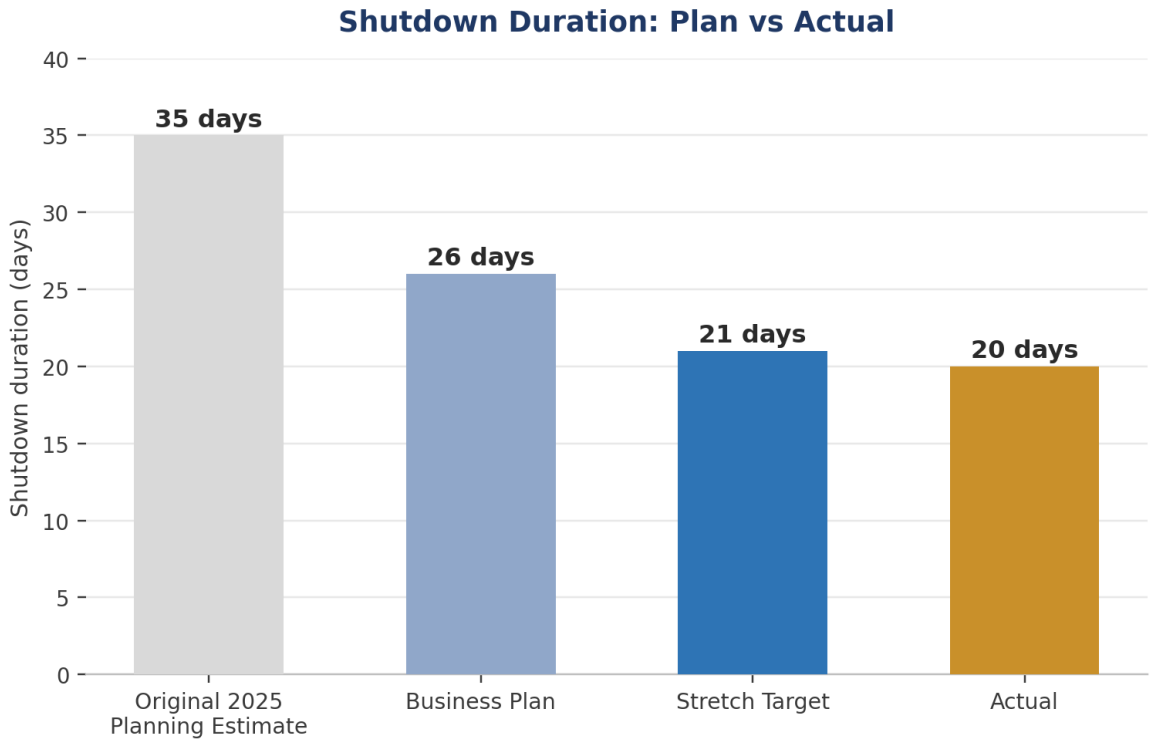
- **2025:** Site survey, rig-up concept and engineering; structural assessment of the deck by EnQuest
- **April 2025:** Trial vessel manoeuvre at the FPSO bow to prove the dynamic lift
- **28 March 2026:** TC20SL mobilised from Songkhla, Thailand
- **15–20 April 2026:** Crane arrives at PTSC's Vung Tau yard, sails to the FPSO and starts site work with a kick-off meeting
- **Late April 2026:** Components landed by the FPSO's pedestal crane and skidded into position; foundation, king posts, outriggers and boom assembled
- **2 May 2026:** TC20SL load-tested to API RP 2D and certified for service
- **Early May 2026:** Vessel trial, trial lift and main lift completed ahead of the shutdown
- **22 May 2026:** Shutdown starts, with 24-hour lifting support from 23 May
- **25 May 2026:** Old fire water swivel passed from the gantry crane to the TC20SL by handshake and offloaded to the supply vessel
- **29 May 2026:** TC20SL lifting scope complete, a day ahead of plan; rig-down 30 May to 5 June
- **11 June 2026:** Production resumes, a day ahead of EnQuest's stretch plan

Outcome

The shutdown finished in **20 days**: 15 days shorter than the 35-day initial estimate, six days ahead of the 26-day business plan and one day ahead of the stretch target. EnQuest's close-out review listed the rental crane among the reasons the target was beaten and recorded that the swivel scope was impossible to achieve within the time frame without it. Bluewater completed its swivel scope in 8 days, against 20 days on a comparable North Sea replacement, and named the use of the Thunder Crane among the reasons.

On our side, the TC20SL completed its lifting scope a day ahead of plan, including the dynamic lift at up to 93% of its rated capacity and the handshake transfer, and our crew hours came in at 2,508 against 3,132 planned. Across the wider shutdown EnQuest recorded around 5,800 man-days worked without harm to people or the environment.

> *"It was an absolute pleasure to prepare and execute the job, and in my 20 years of experience in this work this has been the best prepared job I have done. The brainstorm sessions with EnQuest about the job execution and work methods reduced the original schedule of 28 days to only 14. During the execution the support from EnQuest, POS and Thunder Crane has been outstanding, and this is what led to this remarkably good result."*
>
> **— Project Manager, Bluewater**



Conclusion

The campaign finished in 20 days: six days ahead of the business plan and 15 days shorter than the original 35-day estimate. Two things stand out behind that result. The first is the standard of the project team's planning and preparation. They started more than a year ahead, proved the supply vessel interface, had the turret gantry crane overhauled and re-certified before the campaign, and refined the schedule with Bluewater and the contractors until the lifting, the interfaces and the sequence were agreed well before the shutdown began. The second is their decision to bring in a Thunder Cranes TC20SL modular crane, which gave them the lifting capability the FPSO itself lacked.

With a right-sized modular crane rigged and proven before the shutdown began, EnQuest and Bluewater had a safe way to move 13.5-tonne swivel modules between the supply vessel and the deck, without strengthening the deck, removing the cable tray or adding a lift vessel. The TC20SL's engineering, rig-up and lifting scope was one part of a shared effort between EnQuest, Bluewater, POS and the vessel crew, and it was the part that made the swivel scope achievable inside the shutdown window.

Finally, by finishing 6 days ahead of schedule on an FPSO producing 6,000 barrels a day, the result returned 36,000 barrels to production above plan.

Why the TC20SL

- **Self-contained:** powered by its own Zone-2 hydraulic power pack, independent of the FPSO's utilities
- **Built to standard:** designed and maintained to API standards and load-tested to API RP 2D before the shutdown
- **Easy to mobilise:** shipped by standard freight in modules light enough for the FPSO's own pedestal crane to land
- **Right-sized:** a lower mobilisation cost and day rate than a lift vessel or barge, and steadier in bad weather

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