NAVAL ENGINEERING

TWD
TEMPORARY WORKS DESIGN
Engineered to function

TEMPORARY WORKS DESIGN

TWD is an engineering company specialized in creating custom-designed tools and structures that allow you to perform transport & installation projects safely and on time. You can regard TWD as your problem solver. The reliable partner that creates functional and creative solutions, no matter what the time frame is, or the complexity of the challenge. Our goal is to reinforce your project team's capabilities and complement them where required, so we can together achieve a successful project execution.

FLEXIBLE / **PRACTICAL** / **CREATIVE**

... are the driving forces behind each of our designs

Our thorough knowledge of structural and mechanical engineering, hydro-dynamics, finite element methods and design for offshore conditions, enables us to develop the optimal solutions that meet the wide variety of your demands.

Besides the development of practical installation methods and the design of the required tools, TWD engineers can assist during the procurement, fabrication and mobilization phase. This approach allows us to shorten the required lead times, properly integrate the contributions of different subcontractors and assure that our constructions will function as intended.

This document provides an overview of our track record of safe and robust designs used for Naval Engineering Projects. It provides a selection of projects. References and additional examples can be provided upon request.

PAPA TERRA FIELD
JUMBO OFFSHORE

TWD performed the time domain dynamic analyses using OrcaFlex to determine the D.A.F. and also determine feasable seastates and headings.

MARKETS

- OFFSHORE WIND
- OFFSHORE OIL & GAS
- HEAVY CIVILS
- SALVAGE
- DECOMMISSIONING

SERVICES

- DESIGN
- FABRICATION SERVICES
- NAVAL ENGINEERING
- SPECIAL DISCIPLINES

NAVAL ENGINEERING SERVICES

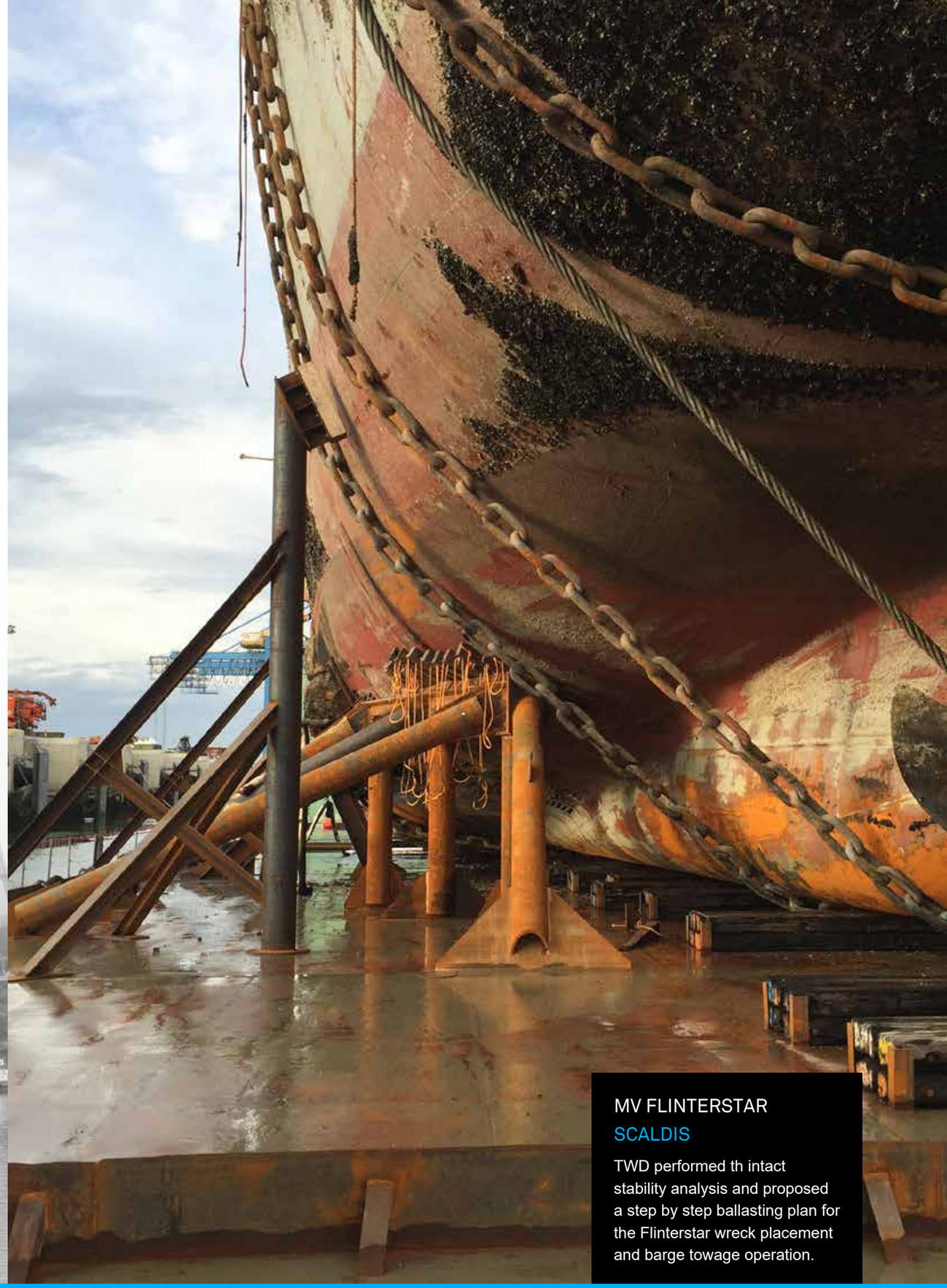
The naval engineering services complement TWD's other services. In a lot of projects the naval engineering analyses form the basis of the designing works. Having both naval engineering and design works at TWD ensures a collaborative team to come up with robust solutions and provide a quick and seamless response to design changes. Vice versa, the broad experience in design for offshore operations at TWD also strengthen our naval engineering works, since there is a knowledgeable basis to rely on. The technical cross-pollination between naval engineering and other TWD disciplines (e.g. mechanical engineering) required for your project will ensure the most operation friendly and cost effective solution will be designed.

RANGE OF OUR NAVAL ANALYSIS INCLUDE

- STABILITY ANALYSIS AND BALLASTING PLANS
- MOTION ANALYSIS
- WORKABILITY STUDIES BASED ON THE DOMAIN SIMULATIONS
- QUASI-STATIC AND FULLY DYNAMIC MOORING ANALYSIS
- BOLLARD PULL CALCULATIONS
- SHIP STRUCTURAL ANALYSIS

Take a look at our website!

TWD.NL
TWD-UK.COM



MV FLINTERSTAR
SCALDIS

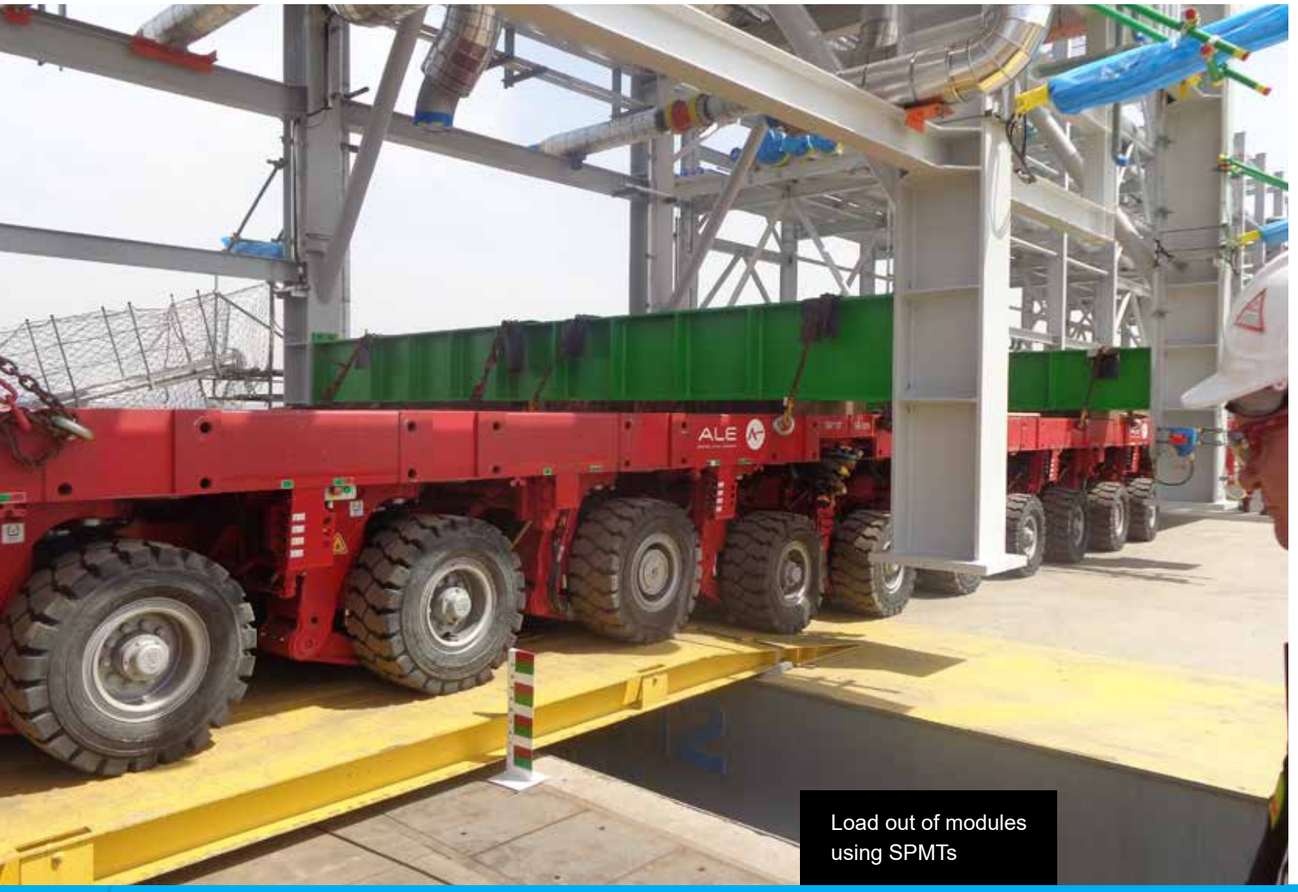
TWD performed th intact stability analysis and proposed a step by step ballasting plan for the Flinterstar wreck placement and barge towage operation.

1. STABILITY ANALYSIS & BALLASTING PLANS

Our team of Naval Architects are competent in performing both intact and damaged stability analysis for a wide range of vessels and structures including jack-ups, ships and barges. Emphasis is put on making detailed and clear reports for the Marine Warranty Survey. The ballast plan drawings, prepared by our draftsmen, are detailed and easy to use by your on-site teams.

OUR STABILITY SERVICES INCLUDE

- INTACT AND DAMAGED STABILITY ANALYSIS TO CLASS AND AUTHORITY APPROVAL
- INCLINING TESTS & LIGHTWEIGHT SURVEYS
- DETERMINE BALLAST PLANS AND BALLASTING SEQUENCE FOR SPMT LOADOUTS
- DETERMINE BALLAST PLANS AND BALLASTING SEQUENCE FOR SEMI-SUBMERSIBLE OPERATIONS



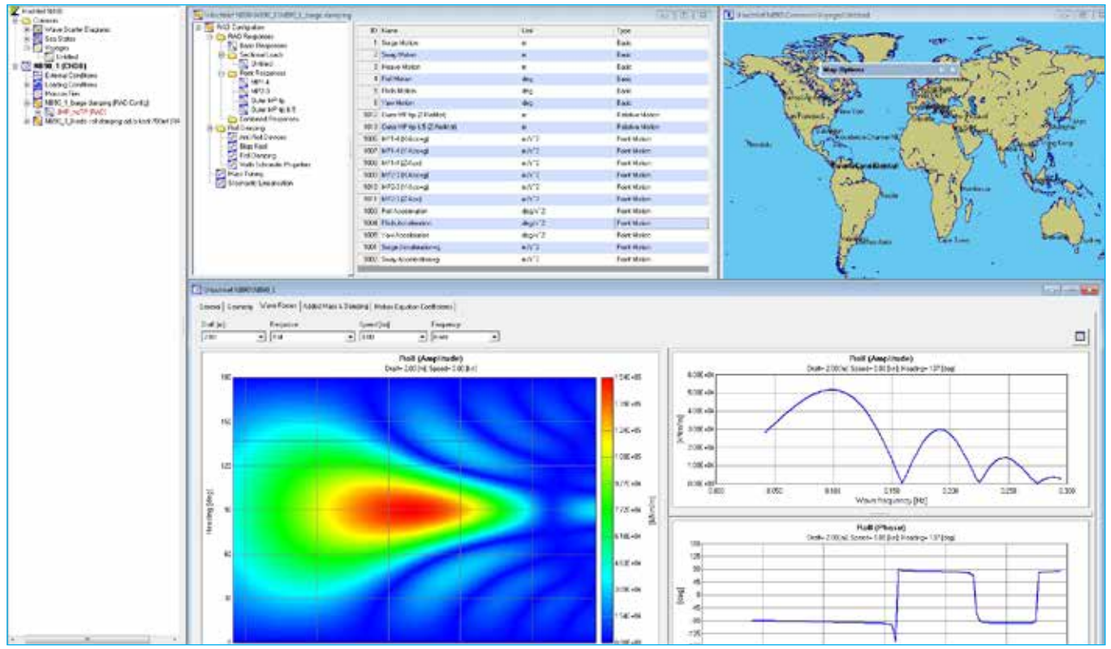
Load out of modules using SPMTs

2. MOTION ANALYSIS

We are specialized in determining wave-induced motions and accelerations for all types of floating structures, including vessels, barges and buoys. Strip theory based motion analysis is used for slender vessels and barges. For more complicated hullforms, our Naval Architects are also experienced in performing motion analysis on a range of diffraction softwares.

TYPICAL APPLICATIONS INCLUDE

- PREDICTIONS OF WAVE-INDUCED MOTIONS OF INSTALLATION BARGES FOR USE IN THE DESIGN OF CATENARY MOORING SYSTEMS
- PREDICTIONS OF DESIGN EXTREME MOTIONS FOR USE IN STRUCTURAL DESIGNS FOR TRANSPORTATION
- PREDICTIONS OF MOTION RESPONSES ALONG WITH STATISTICAL ANALYSIS TO DETERMINE DOWNTIME CAUSED BY LIMITATIONS OF EQUIPMENT UTILIZED IN WEATHER-SENSITIVE MARINE OPERATIONS
- DERIVATION OF WAVE- AND MOTION-INDUCED LOADINGS, CARGO SLAMMING, ETC.



Amarcon OCTOPUS interface

3. WORKABILITY STUDIES

TWD has the experience in performing workability/feasibility studies for offshore renewable/oil & gas contractors for a variety of offshore operations such as crane lifts, pipeline installation and upendings through the splash zone. As a result of the dynamic analysis TWD advises its clients on parameters such as maximum allowable significant wave heights, limits of vessel headings etc. Based on the information provided by TWD, clients can prepare a practical & cost efficient plan for the operation.

TYPICAL DESIGN APPLICATIONS INCLUDE

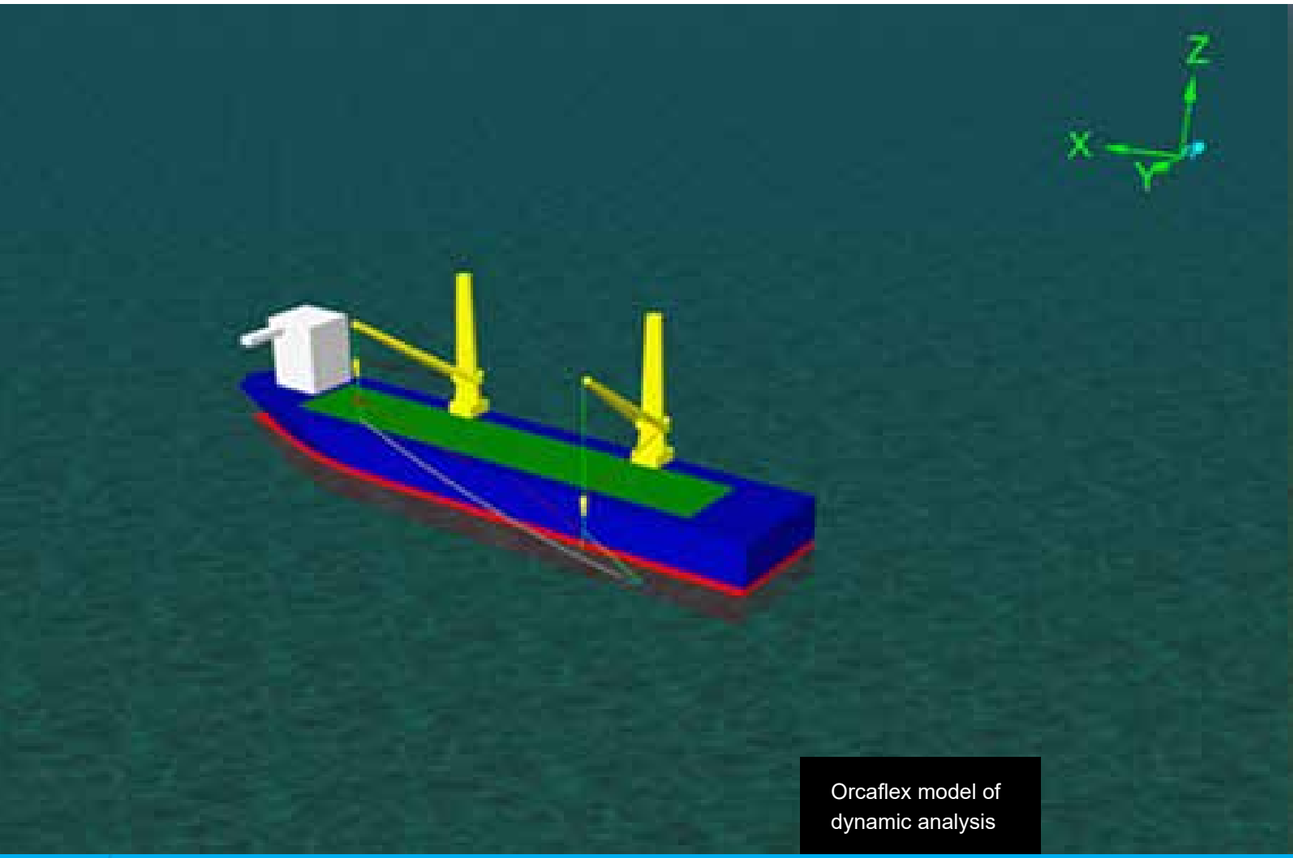
- DETERMINING WORKABILITY TABLES FOR MONOPILE LIFTING, LOWERING AND PILING BASED ON GRIPPER LOADS AND CRANE LIMITS
- DETERMINE WORKABILITY OF FALL PIPE ROCK DUMPING OPERATION BASED ON TOTAL HYDRODYNAMIC FORCES ON THE FALL PIPE

4. MOORING ANALYSIS

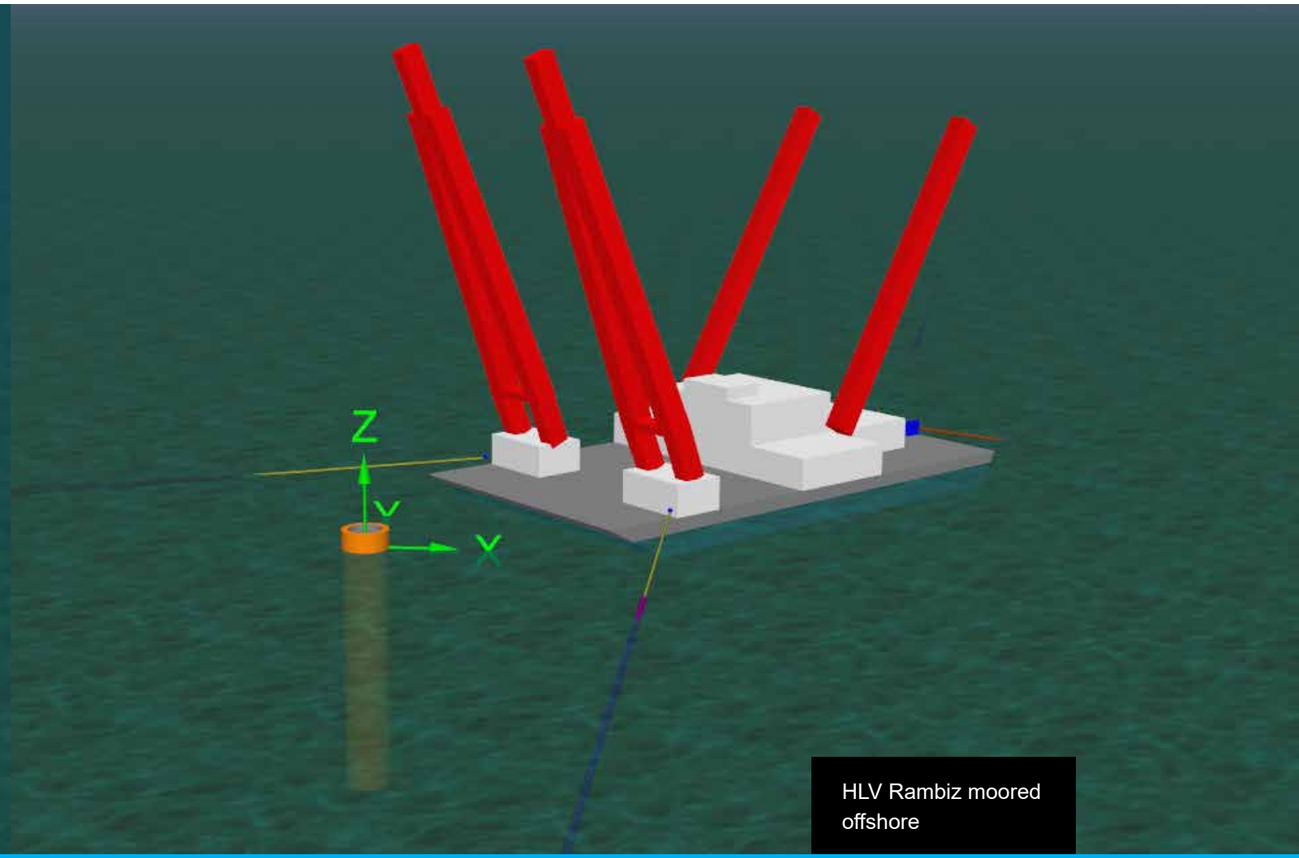
TWD has performed numerous design and analysis of catenary mooring systems & quay mooring systems primarily for the offshore renewable & oil and gas industries. Moorings have been successfully analysed using both quasi-static and full dynamic analysis solutions. TWD uses the software package Orcaflex for mooring analysis.

TYPICAL APPLICATIONS INCLUDE

- DESIGN AND ANALYSIS OF CATENARY SYSTEMS FOR OFFSHORE INSTALLATION VESSELS
- DESIGN AND ANALYSIS OF QUAY MOORING SYSTEMS



Orcaflex model of dynamic analysis



HLV Rambiz moored offshore

5. BOLLARD PULL CALCULATIONS

TWD has performed numerous bollard pull calculations for clients, for the selection of a suitable tug to perform the towing operations successfully. This is done using the in-house developed Excel sheet.

HIGHLIGHTS

- CALCULATION BASED ON ND0030, DNV-OS-H103
- APPROVED BY MWS ON MULTIPLE OCCASIONS
- VERY RAPID ESTIMATION OF REQUIRED BOLLARD PULL

6. SHIP STRUCTURAL ANALYSIS

1D and 2D FEM analysis are often necessary to verify structural integrity of seafastenings on transport vessels, when placing heavy cargo on deck or making vessel modifications.

TWD ROUTINELY PERFORMS STRUCTURAL ANALYSIS FOR ALMOST ALL PROJECTS INCLUDING

- STRUCTURAL INTEGRITY VERIFICATION OF SEAFASTENING STRUCTURE
- STRUCTURAL INTEGRITY VERIFICATION OF TRANSPORT VESSEL DUE TO TRANSPORT OF HEAVY CARGO
- STRUCTURAL INTEGRITY VERIFICATION OF SHIPS/BARGES, WHEN STRUCTURAL MODIFICATIONS ARE MADE TO THE HULL STRUCTURE

EN AVANT 1 towing CS1 barge

Offshore installation vessel Aeolus

WHEATSTONE
BOSKALIS

Module transport for
Wheatstone project

TRANSPORT STABILITY ANALYSES WHEATSTONE

STABILITY ANALYSIS & BALLASTING PLANS - BOSKALIS

Chevron awarded the contract for the first phase of the Wheatstone LNG project in 2009 to Bechtel Oil, Gas & Chemicals, Inc., Dockwise together with Boskalis performed the transportation of all of these modules with a variety of vessels according to different transport methods. Three TWD Naval Architects were actively involved in the Wheatstone project by offering assistance with the stability calculations, ballasting plans for barges and transport analysis during the voyages. In addition, one Naval Architect was sent on site working as a field ballast engineer for the load-outs. Software package GHS was used for the stability calculations in addition to Excel sheets for iterations.

PROJECT HIGHLIGHTS

- PERFORMED INTACT AND DAMAGE STABILITY CALCULATIONS FOR TUG AND BARGE UNRESTRICTED TOW AND COASTAL TOW
- SEPARATE BALLASTING MANUALS FOR LOAD-IN AND LOAD-OUT
- BALLASTING PLANS FOR TIDAL LOADOUTS CLASSES 1 AND 2

Module loadout for
Wheatstone project

HOBOKEN
MANORA LOGISTICS
Loaded condition jacket structure

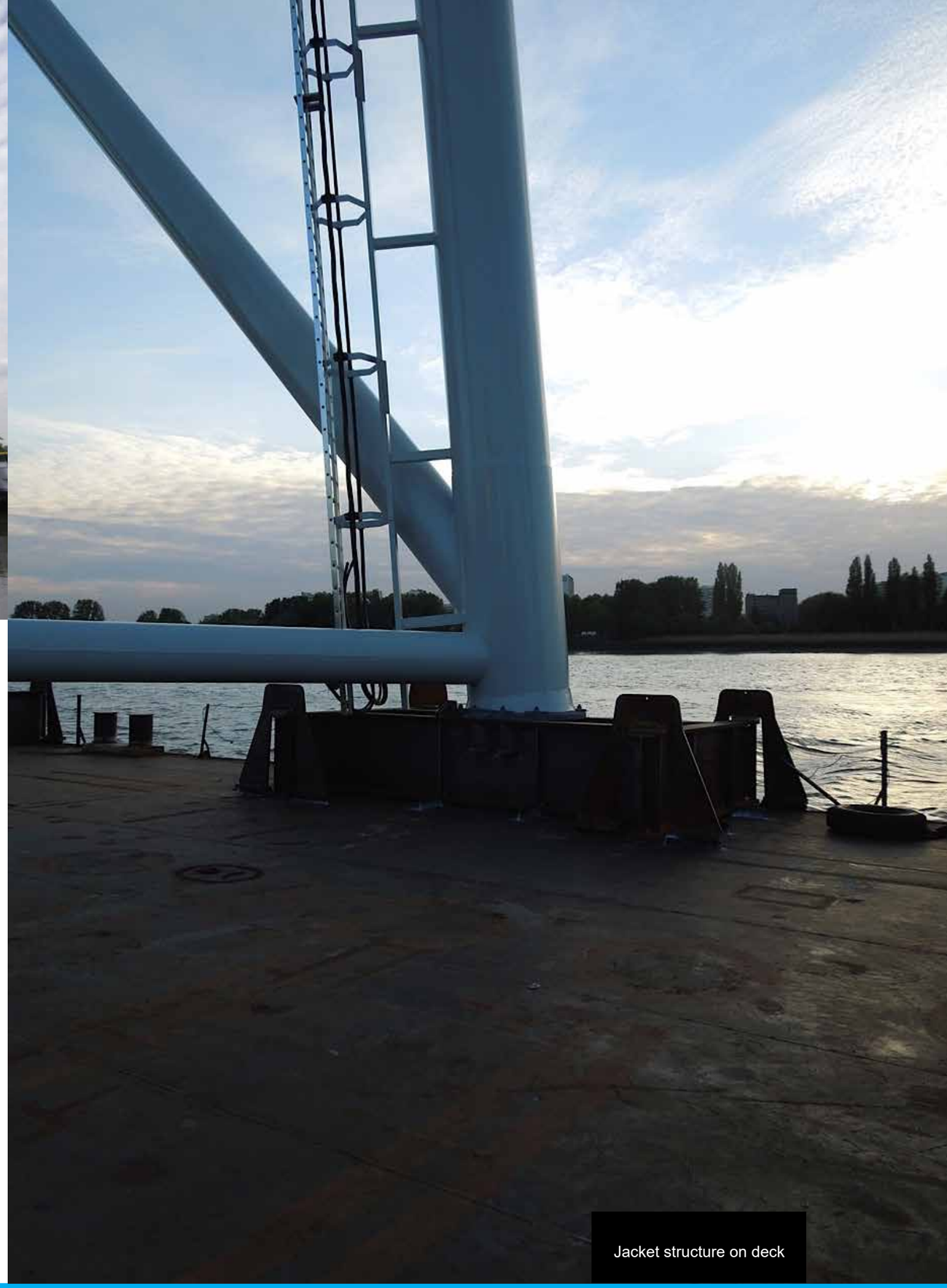
MANORA JACKET TRANSPORT IEMANTS

STABILITY ANALYSIS & BALLASTING PLANS - MANORA LOGISTICS

Manora Logistics was responsible for the transport of a Jacket in three components from Hoboken (Antwerp) to Eemshaven. The jacket was transported on the barge Osprey Trader. TWD was actively involved in the project by having a Naval Architect perform the stability calculations and ballasting plans for barges. Software package GHS was used for the stability calculations.

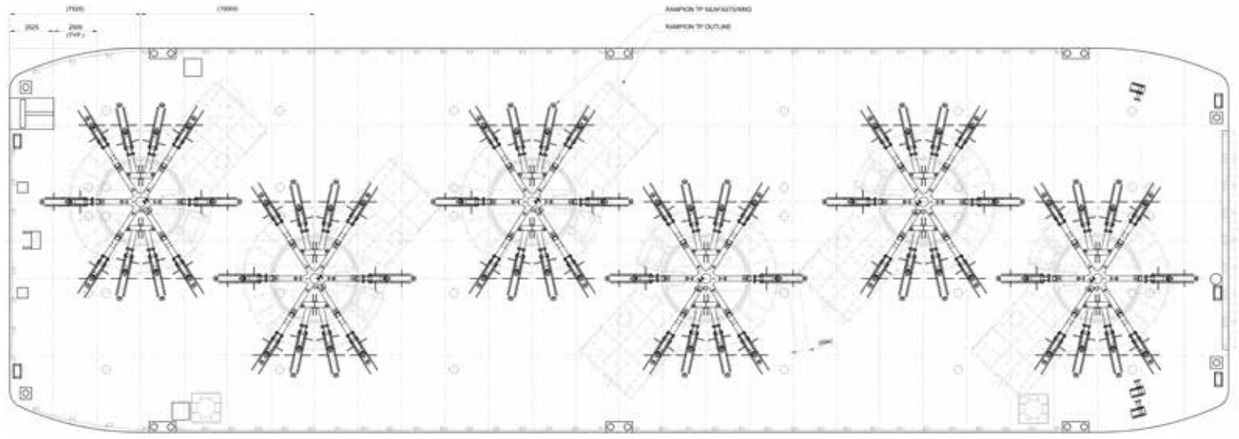
SIMILAR SCOPE PERFORMED ON

- GODE WIND OWF, KENTISCH FLATS EXTENSION OWF, RAMPION OWF, DUDGEON OWF, BURBO BANKS OWF, MV FLINTERSTAR SALVAGE



Jacket structure on deck

RAMPION & DUDGEON OW
MONORA LOGISTICS
Loaded CSI barge with 4 Dudgeon Transition Pieces



Deck layout of the CS1 barge

MODULAR TP TRANSPORT RAMPION & DUDGEON

STABILITY ANALYSIS, BALLASTING PLANS & MOTION ANALYSIS

Manora Logistics was planning to transport the TP's for the Rampion and Dudgeon Offshore Wind Farms from the fabrication yard in Hoboken to the Verbrugge terminal in Vlissingen. TWD was requested to perform the stability, motion and mooring analysis for the voyage.

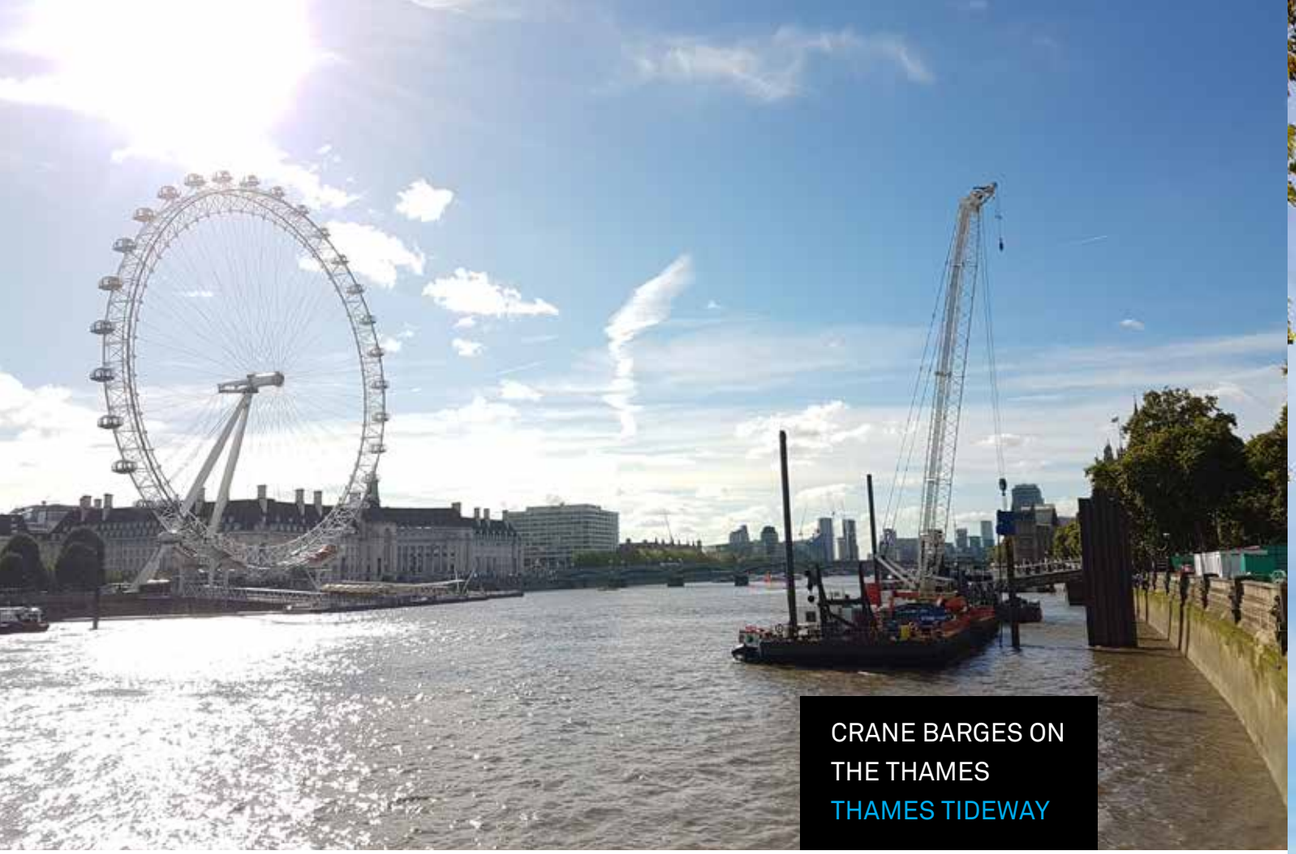
This project is a fine example of a project where most aspects of a barge cargo transport vis a vis the design of seafastening structures, stability analysis for the voyage, motion analysis for the voyage and quay mooring analysis for the TP loadout were all done by TWD. This ensured that any design changes or changes in input parameters could be dealt with in a very efficient manner.

SIMILAR SCOPE PERFORMED ON

- GODE WIND OWF, RAMPION OWF, DUDGEON OWF

PROJECT HIGHLIGHTS

- DETERMINED AN OPTIMUM BALLAST PLAN FOR THE VOYAGE
- PERFORMED INTACT AND DAMAGE STABILITY CALCULATIONS FOR THE TRANSPORT BARGE
- USING THE SOFTWARE PACKAGE GHS
- DETERMINED THE LOADING SEQUENCE FOR THE TP'S LOADED AT HOBOKEN, ANTWERP
- PEFORMED A MOTION ANALYSIS OF THE BARGE TO DETERMINE THE DESIGN ACCELERATIONS FOR SEAFASTENING
- SOFTWARE PACKAGE OCTOPUS WAS USED TO PERFORM THE MOTION ANALYSIS
- PERFORMED A QUAY MOORING ANALYSIS OF THE TRANSPORT BARGE WHEN MOORED AT HOBOKEN AND AT VLISSINGEN USING THE SOFTWARE ORCAFLEX



CRANE BARGES ON
THE THAMES
THAMES TIDEWAY

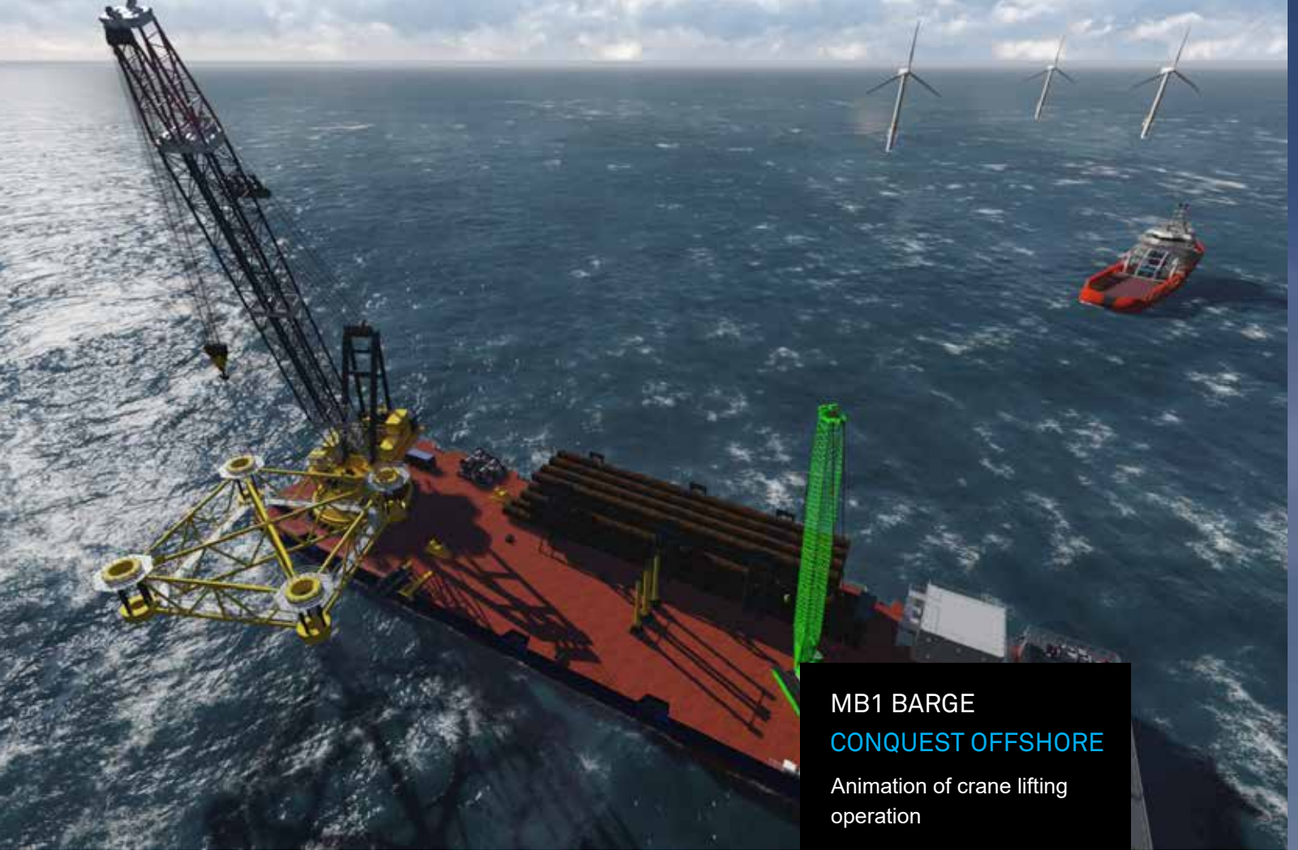
FLO JV TEMPORARY WORKS

STABILITY ANALYSIS

FLO JV, the consortium of Ferrovial Agroman and Laing O'Rourke, is currently working on the Thames Tideway project, where a new sewer for the city of London is being constructed. Part of the works involves the construction of a cofferdam in the Thames at Victoria. The cofferdam is required to construct a 55m deep shaft, connected to the sewers which are currently discharging in the Thames. Finally, the shaft will be connected to the main tunnel in the Thames.

For the construction of the cofferdam, FLO JV is planning to use two barges outfitted with a LR1130 or LR1160 crane. The barges will be moored using spud piles. TWD was requested to analyze the barge stability for the crane barges during roll-on, roll-off of the cranes and operational conditions. Additionally, TWD was requested to compute the maximum allowable lifting loads for the operation.

Barge performing lifting
jobs on the Thames River



MB1 BARGE

CONQUEST OFFSHORE

Animation of crane lifting operation

CONQUEST OFFSHORE CONCEPT STUDIES

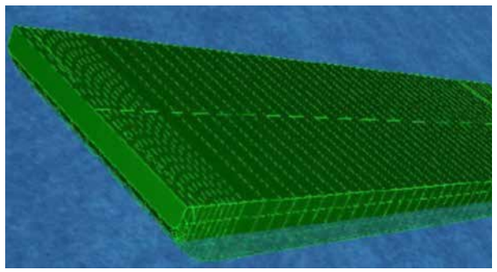
MOTION ANALYSIS

Conquest Offshore requested TWD to perform a motion analysis of the MB1 barge and subsequently identify the limiting sea states & range of vessel headings which result in certain roll/pitch motion angles of the MB35000 crane on their crane barge. The above mentioned angles correspond to the workability limits of the crane for different load configurations. Based on an understanding of the limiting sea states and headings with respect to the crane working limits, Conquest Offshore was able to further explore the feasibility of offshore installation using the MB35000 crane.

Motion analyses were performed using 3D diffraction solver MOSES.

PROJECT HIGHLIGHT

- WORKABILITY PLOTS FOR CRANE PROVIDED TO CLIENT FOR DIFFERENT LOADING CONDITIONS AND DIFFERENT SEASTATES



MOSES barge model

Animation of MB1 barge

CAMELOT FIELD

SCALDIS NV

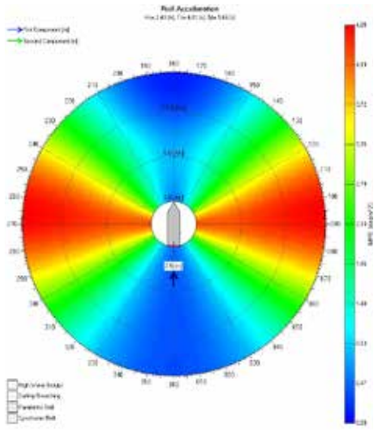
Lifting the topside onto the Osprey Trader barge

SCALDIS TOPSIDE DECOMMISSIONING

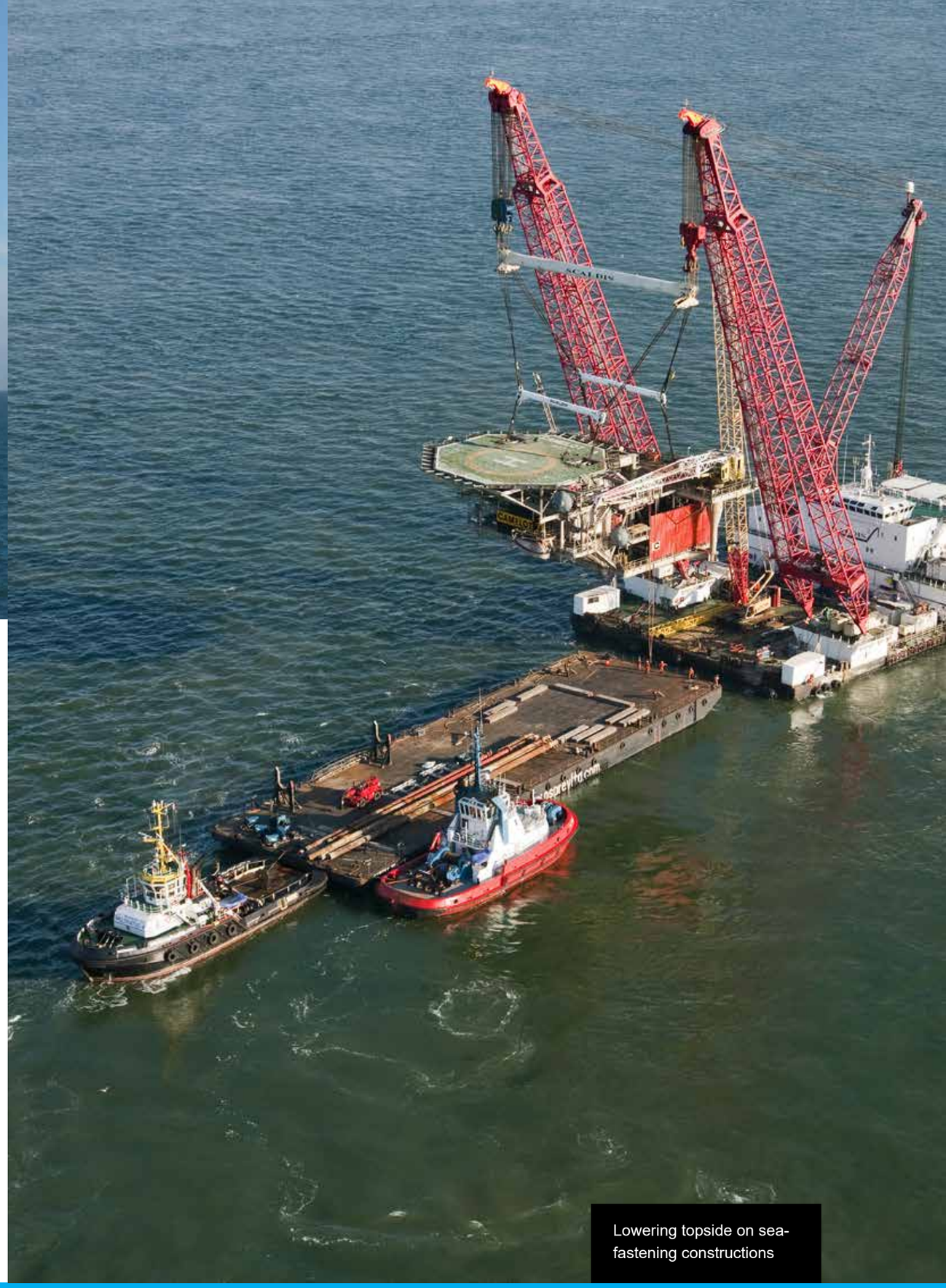
MOTION ANALYSIS

TWD was requested by Scaldis Salvage and Marine Contractors NV to deliver the seafastening designs for the decommissioned topside and the conductor pipes of the Camelot field, onboard the Ospey Trader barge.

TWD performed the motion analysis and provided the accelerations as input for seafastening design of the topside.



Polar plot of roll motion of barge



Lowering topside on sea-fastening constructions

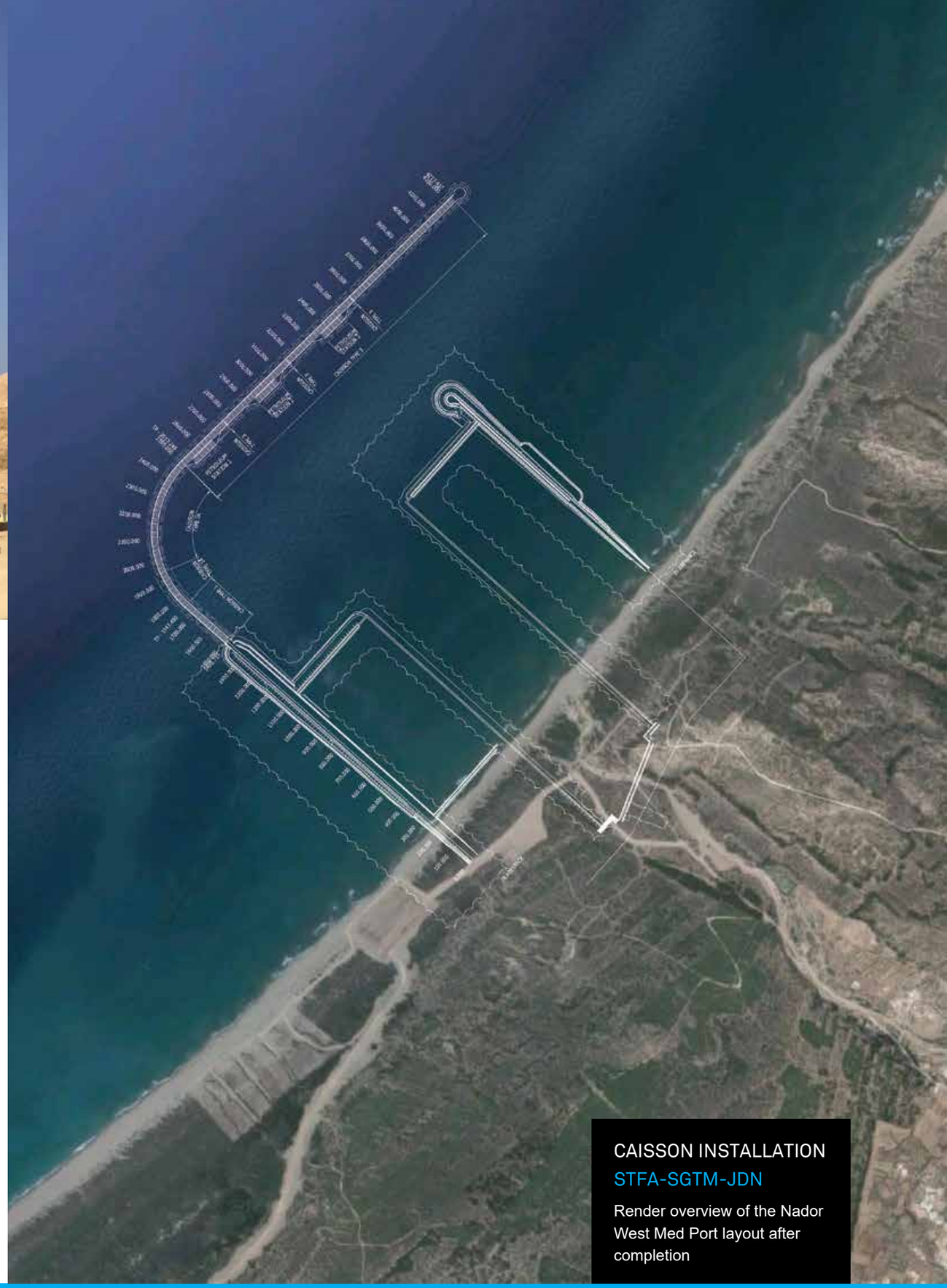
CAISSON INSTALLATION
STFA-SGTM-JDN
The Nador caisson factory

QUAYS, BREAKWATERS & PORT DEVELOPMENT

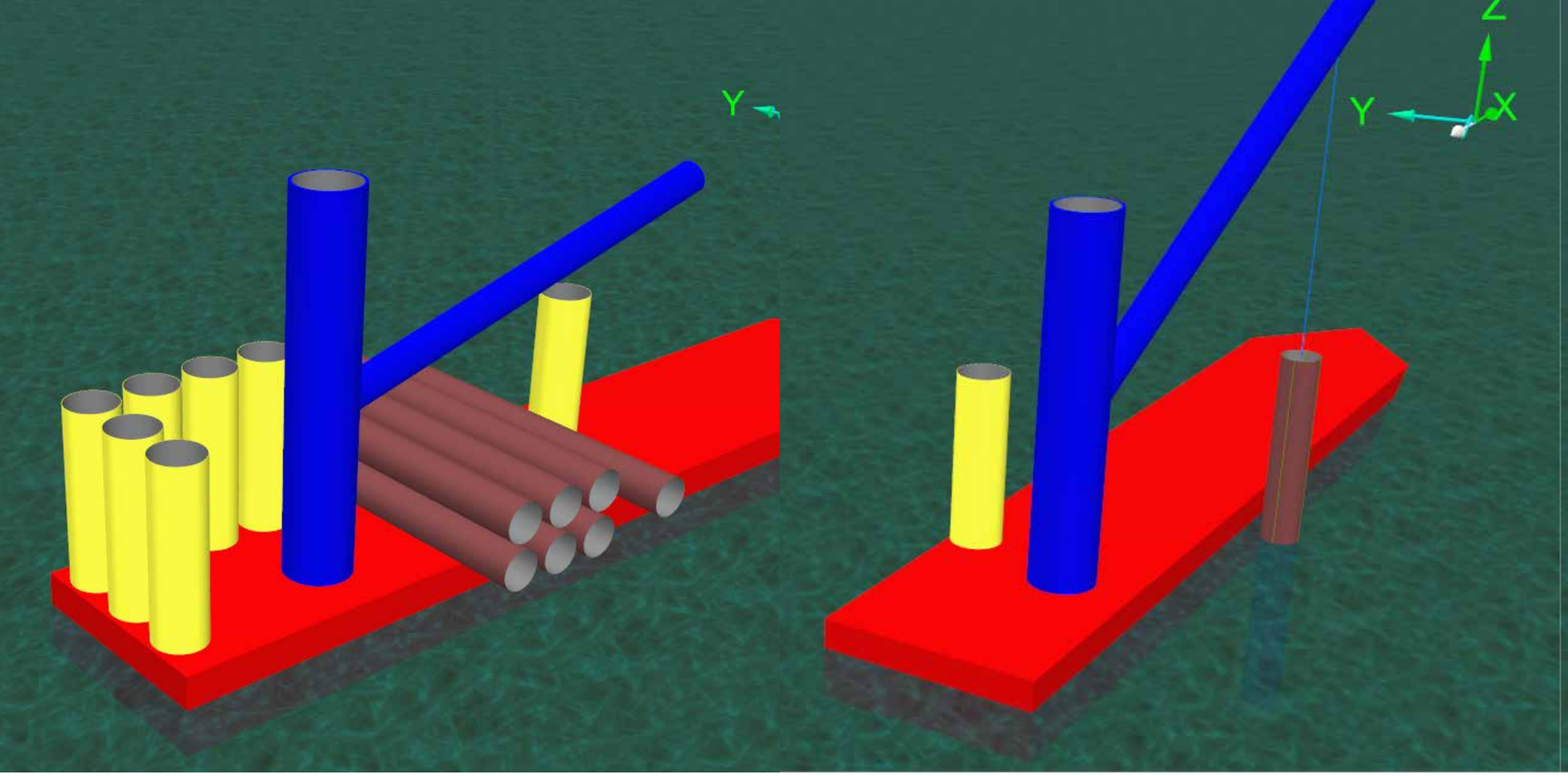
BALLASTING SEQUENCE, MOORING ANALYSIS & MOTION ANALYSIS

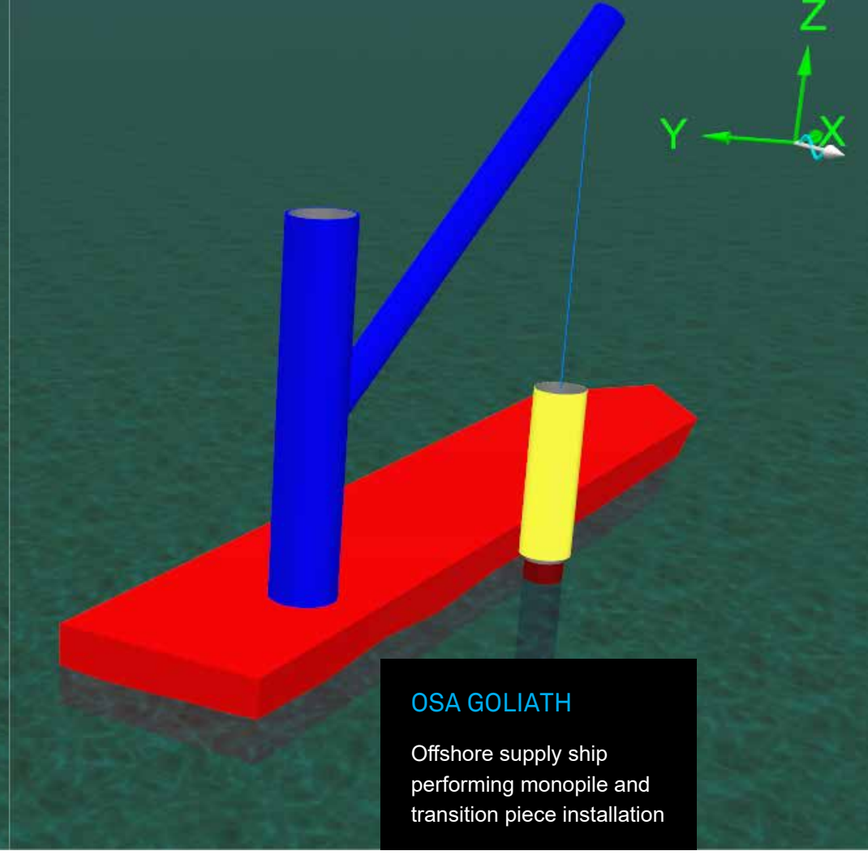
The consortium STFA-SGTM-JDN is constructing the new port of Nador West, Morocco. A total of 253 caissons, weighing up to 9000 tons, are to be fabricated. These caissons are installed during the first stage of the project that includes the construction of 2 breakwaters, petroleum stations and a container terminal. The TWD Naval architects & marine operations team advised STFA-SGTM-JDN about best practice for marine operations and performed all necessary marine engineering analysis.

Our naval department prepared the installation procedure encompassing every step of the operation from the loading of each caisson on the semi-submersible barge, towage, barge submergence, caisson float-out, caisson towage to the final installation and installation. An optimized barge and caisson ballasting sequence was prescribed taking into account the longitudinal strength of the barge, ballasting arrangement and operational requirements. TWD designed an efficient mooring arrangement for the semi-submersible barge and the caissons. In order to precisely model the hydrodynamic interaction between the barge and caisson when the barge is submerged and the caisson floats off, a multi-body diffraction study was performed in ANSYS AQWA. TWD also recommended the workable sea states for the caisson installation operation. Additionally TWD provided on-site engineering and operational assistance at the site in Morocco.



CAISSON INSTALLATION
STFA-SGTM-JDN
Render overview of the Nador West Med Port layout after completion





OSA GOLIATH

Offshore supply ship performing monopile and transition piece installation

FLOATING MP & TP INSTALLATION

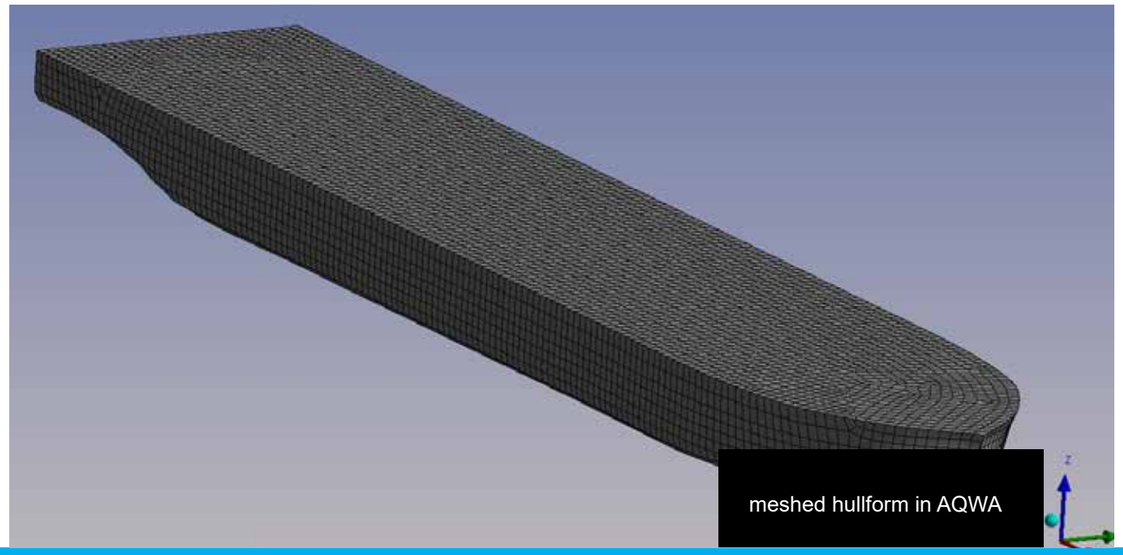
MOTION ANALYSIS & WORKABILITY STUDIES

Our client requested TWD to prepare a proposal for floating installation of Wind turbine foundations for offshore wind farm using their DPIII vessel . The project consists of the transportation and installation of 108 foundations, each consisting of one monopile (MP) and one transition piece (TP). TWD was requested to establish the operational limits for installation and transit condition. The Naval department performed the workability analysis for the installation of the MP's and TP's. A detailed description of the analysed installation steps was provided to the client along with timeframes for each specific stage of the operation. This enabled the client to submit their proposal for future windfarm installation projects.

The hydrodynamic properties of the vessel were determined by 3D diffraction analysis in ANSYS AQWA which is an industry acknowledged software using 3D diffraction theory for determination of the hydrodynamic coefficients. The Response Amplitude Operators (RAO) obtained by AQWA were used for time domain analysis in OrcaFlex. A total of 1000 plus simulations were performed to analyse workability. Specific recommendations with respect to feasible seastaes and headings were provided to the Client.

Orcaflex analysis were performed to determine feasible seastates to commence the lifting & upending operations and thereafter to find the DAF's on the crane slings when performing the installation operation. The Orcaflex dynamic analysis was done in phases: lifting from deck, overboarding, splash zone & placement on seabed.

The domain knowledge of TWD on the subject of Offshore Wind Farm installations combined with the in-house Naval Engineering Expertise enabled TWD to complete above said works is a short period of time.



meshed hullform in AQWA

PAPA TERRA FIELD

JUMBO OFFSHORE

Fairplayer jack-up vessel mobilized for TLWP installation

JUMBO PAPA TERRA

WORKABILITY STUDIES

TWD assisted Jumbo Offshore with transporting and handing over Tension Leg Wellhead Platform (TLWP) anchoring equipment consisting of 8 foundation piles, 134 tendon segments, and 8 tendon buoyancy modules (TBM).

TWD designed and calculated the pile grillage for the 320 t, 103 m long piles and assisted Jumbo Offshore in designing the entire installation sequence. This included loading, upending, and offshore hand-over to the client's vessel. Furthermore, designs and calculations for the seafastening of the 130 t TBM's were provided.

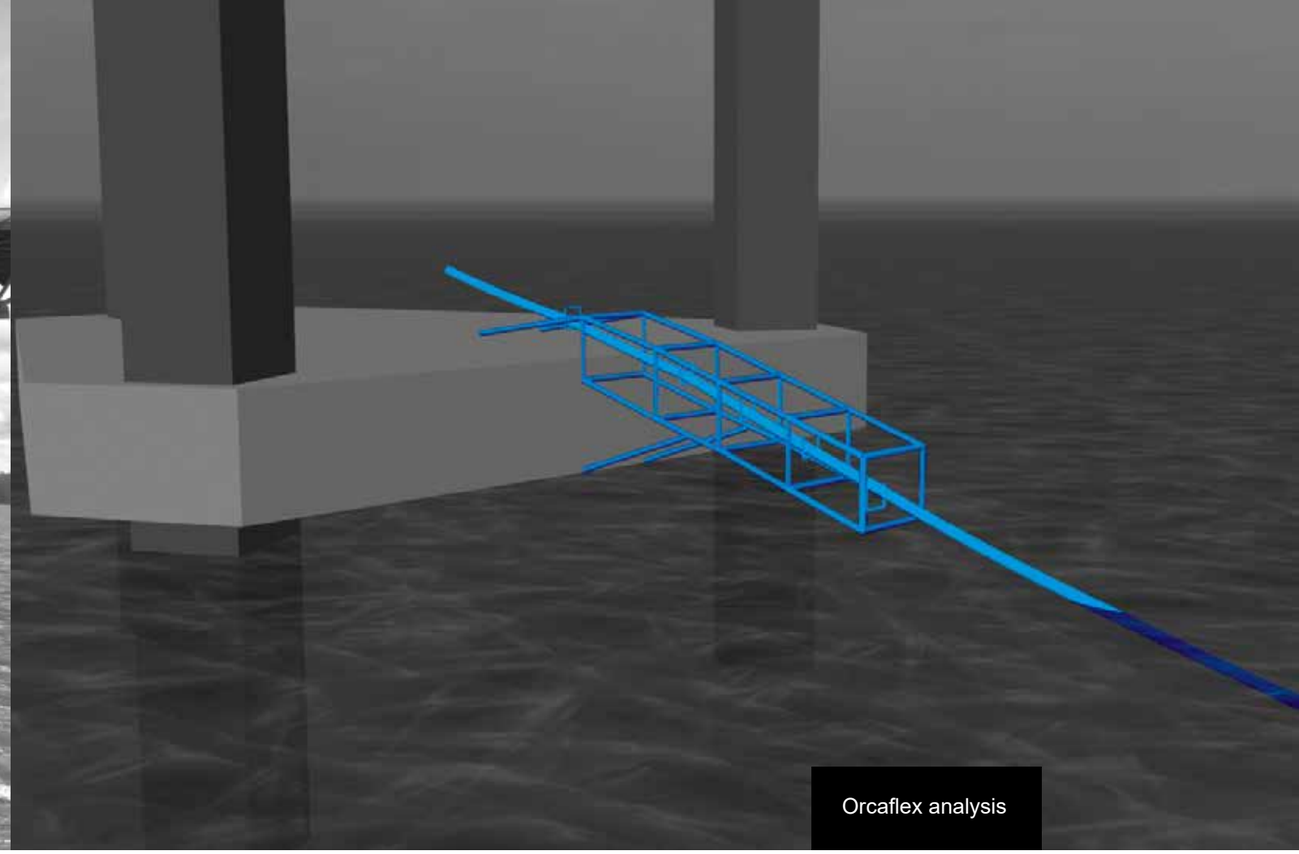
Orcaflex analysis were performed to determine feasible seastates to commence the lifting & upending operations and thereafter to find the DAF's on the crane slings when performing the lifting and upending operation. The Orcaflex dynamic analysis was done in phases: lifting from deck, overboarding, upending, splash zone & placement in hang-off frame.

Jumbo Javelin at installation site

COOK INLET, ALASKA

HEAVY LIFT AT SEA

Installed stinger on board the jack-up vessel



Orcaflex analysis

STINGER DESIGN FOR PIPELINE PROJECT

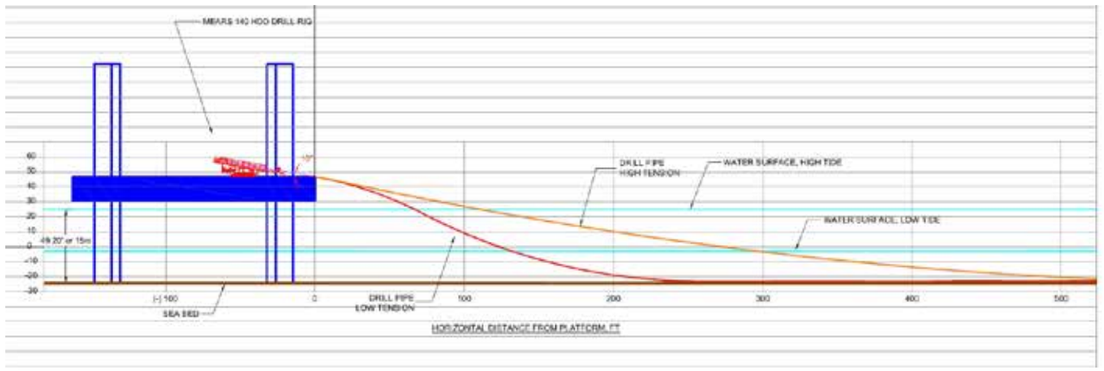
WORKABILITY STUDIES

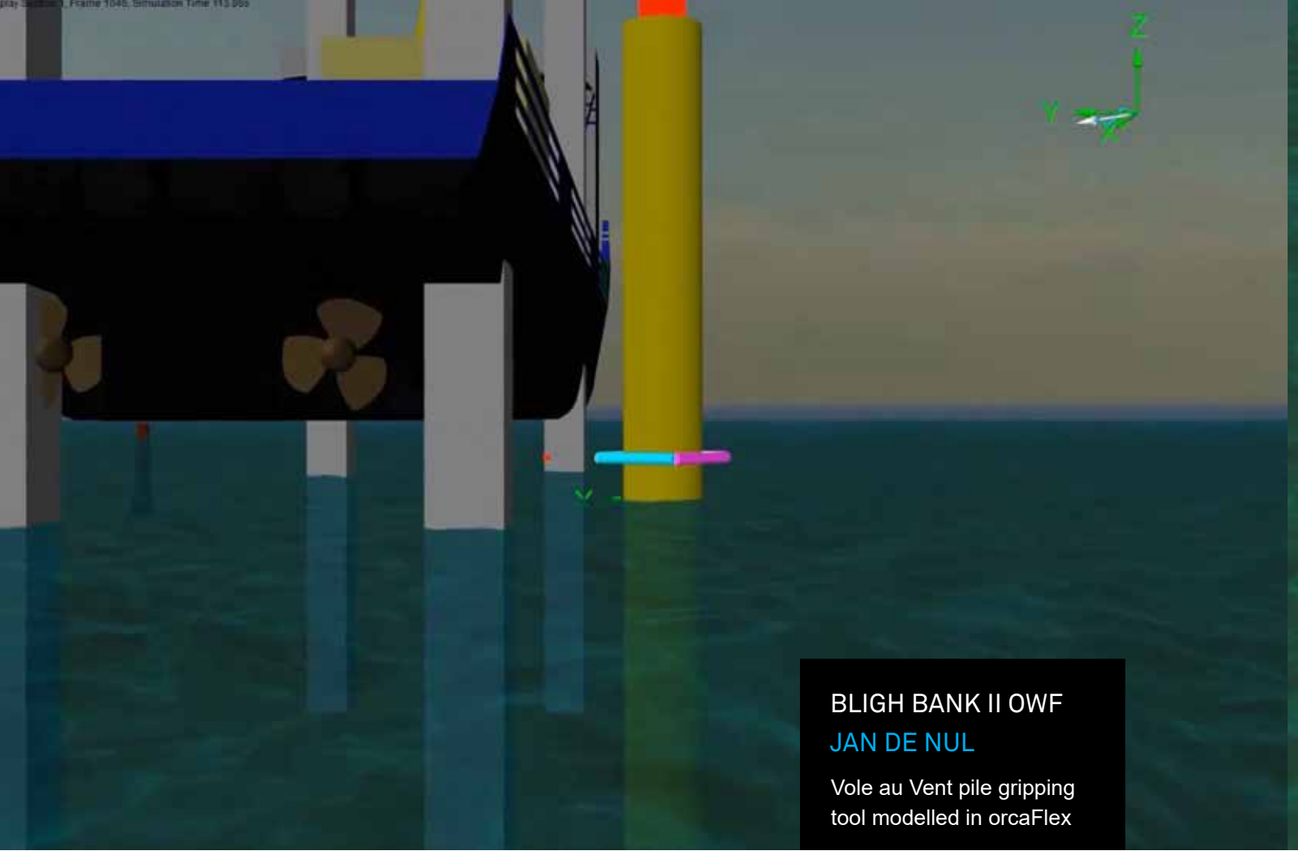
Heavy Lift At Sea GmbH (HLAS) was planning to install a stinger on the Spartan 151 jack up rig for an offshore pipeline in Nikiski AK, South West of Anchorage, Alaska. TWD was requested to design the stinger and investigate the stresses in the drill pipe when placed on the stinger. This report investigated the stresses on the drill pipe, when placed on the stinger and when tensioned during the reaming operation.

TWD identified the optimal roller support points on the stinger and provided roller support reactions, when the drill pipe is placed on the stinger. In addition, TWD investigated the sagbend/overbend stresses on the drill pipe when placed on the stinger.

This is another example of a project where the Naval engineering team worked efficiently with the structural design team to complete the stinger design and provided initial set of fabrication drawings to the fabricator in a span of just 8 days.

PROFILE VIEW OF PIPELINE & JACK-UP VESSEL

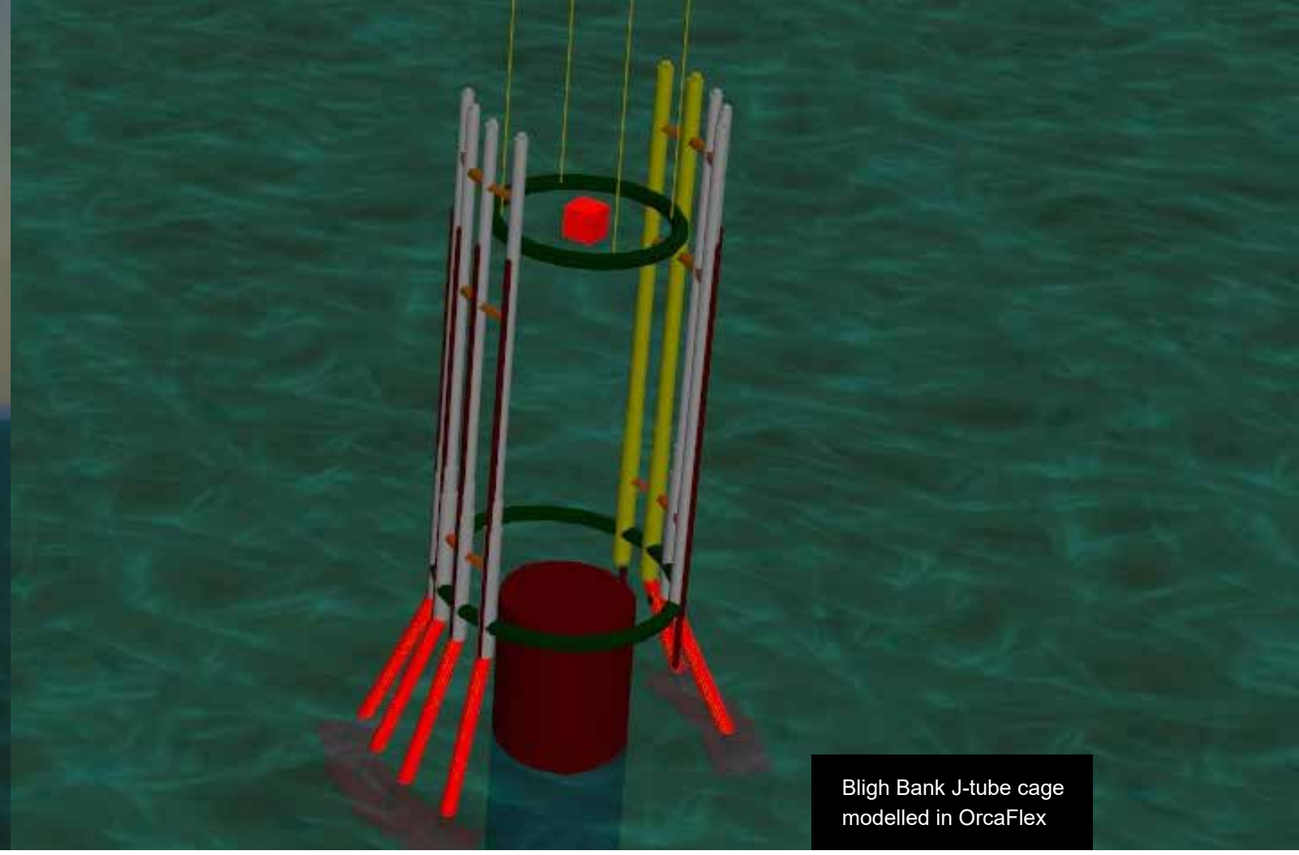




BLIGH BANK II OWF

JAN DE NUL

Vole au Vent pile gripping tool modelled in orcaFlex



Bligh Bank J-tube cage modelled in OrcaFlex

DYNAMIC LOWERING ANALYSIS

WORKABILITY STUDIES

Jan De Nul will installed 51 monopiles and transition pieces for the Bligh Bank II Offshore Wind Farm. To determine the dynamic loads on the crane and pile gripping frame, a dynamic analysis of the monopile and J-tube cage lowering operation was necessary.

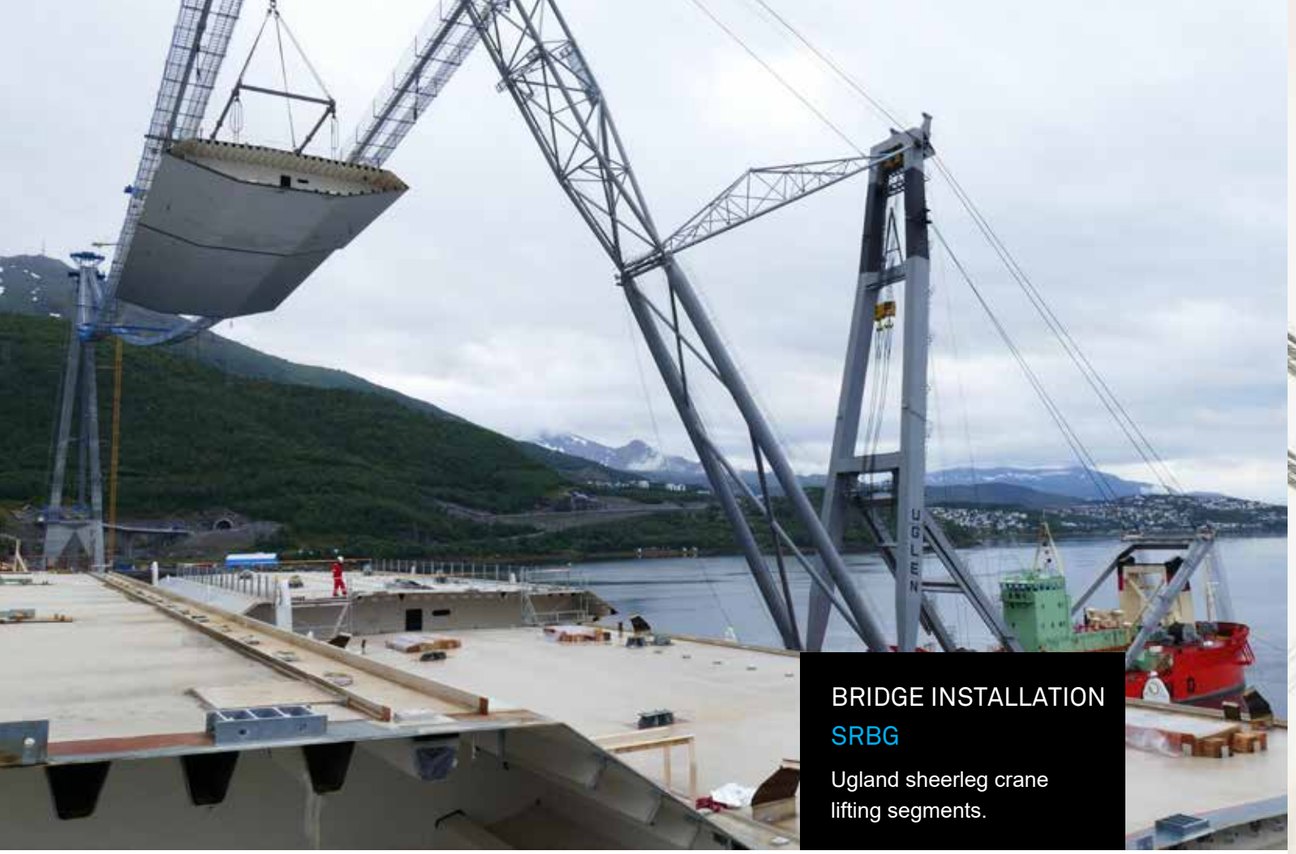
TWD was requested to perform the dynamic analysis of the lowering operation for a range of monopiles and a single J-tube cage. The findings, including recommendations on limitations of environmental parameters such as significant wave heights, wave peak periods, current and wind speed, to ensure a safe installation operation were communicated to the Client. A dynamic analysis was crucial to capture the actual behaviour of the monopiles during lowering.

Based on close to a thousand simulations performed using the dynamic analysis software OrcaFlex, TWD determined the workability of the monopile lowering and monopile piling operation for a range of monopile diameters and lengths based on DAF (dynamic amplification factor) on the crane and dynamic forces on the Pile Gripper Tool. Additionally, TWD performed simulations for the J-tube cage to determine the behavior of the J-tube cage in the splash zone.

A 3D diffraction analysis was performed on large diameter monopiles to presisely estimate the wave loads acting on the monopile, since morison equation is not valid for all combinations of wave periods and monopile diameters.

RECOMMENDATIONS RELATING TO THE FOLLOWING ASPECTS OF THE OPERATION

- OPTIMUM LIFTING RADIUS OF THE CRANE
- LIMITING VALUE OF SIGNIFICANT WAVE HEIGHS (HS), WAVE PEAK PERIODS (TP) AND HEADINGS
- NATURAL PERIOD OF LOWERING SYSTEM AND CRITICAL LOWERING DEPTH
- SEQUENCE OF LOWERING OPERATION



BRIDGE INSTALLATION
SRBG
Ugland sheerleg crane lifting segments.

RAIL, HIGHWAY & BRIDGE CONSTRUCTIONS

MOORING ANALYSIS

Just above the Arctic Circle, near the Norwegian town of Narvik, a 1200-meter-long suspension bridge over the Rombaksfjord had to be constructed to improve traffic on the E6. The contractor, SRBG, suspended 30 steel deck segments from two main cables resting on two 175-meter-high concrete pylons.

TWD assisted SRBG with the installation of the deck segments. They were fabricated in China and stacked on a supply vessel for transport to Norway. Each unique segment weighs up to 250 tons. Once all segments were connected to the suspension wires, final welding could commence.

Together with SRBG and crane operators TWD designed an efficient mooring system; using the supply vessel as a giant buoy to which the crane vessel was moored. With winches connected to the two pylons, the setup was able to move along the length of the bridge. With 4 additional anchors in the 300-meter-deep fjord the crane and supply vessel were kept precisely located underneath the bridge. By doing this, TWD combined the knowledge of our naval architects with our constant focus of optimizing operations, to deliver a fast and safe installation method. Besides the mooring studies TWD made a design to temporarily connect the steel segments and setup all rigging and lifting plans to make sure no clashes between the crane vessel and the bridge wires occurred.

BRIDGE INSTALLATION
SRBG
Supply and crane vessel moored in fjord.

Heavy Lift Vessel Rambiz

SCALDIS AMRUNBANK SUBSTATION INSTALLATION

MOORING ANALYSIS

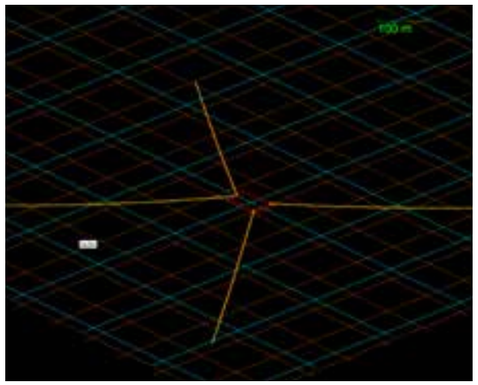
Scaldis contracted TWD for assistance in installing a substation at the Amrumbank Offshore Windfarm West. The substation was to be installed with the Heavy Lift Vessel Rambiz. TWD was requested by Scaldis to analyse the proposed mooring spread of the HLV Rambiz.

The mooring analysis was performed using the program OrcaFlex and the results of the mooring line loads, maximum vessel translations & anchor uplift were presented to Scaldis.

SIMILAR SCOPE PERFORMED ON

- RENTEL OWF

At the left you see a model of a mooring spread. The payout length of the winches is chosen such that the static line tension is approximately 350kN.



Screenshot of Orcaflex analysis

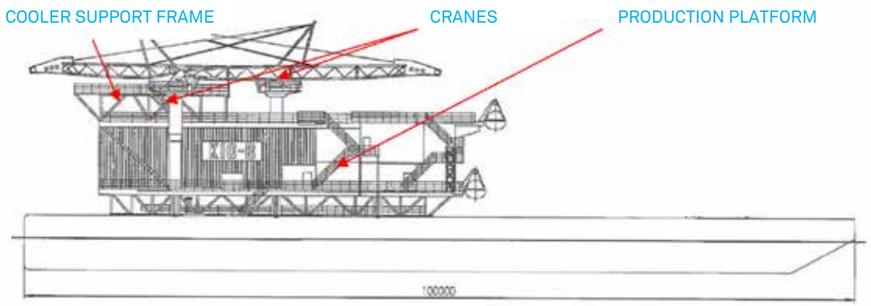
WINTERSHALL
SCALDIS NV
Removal and disposal of the K10-B gas platform

SCALDIS WINTERSHALL K10 TOPSIDE TOWING

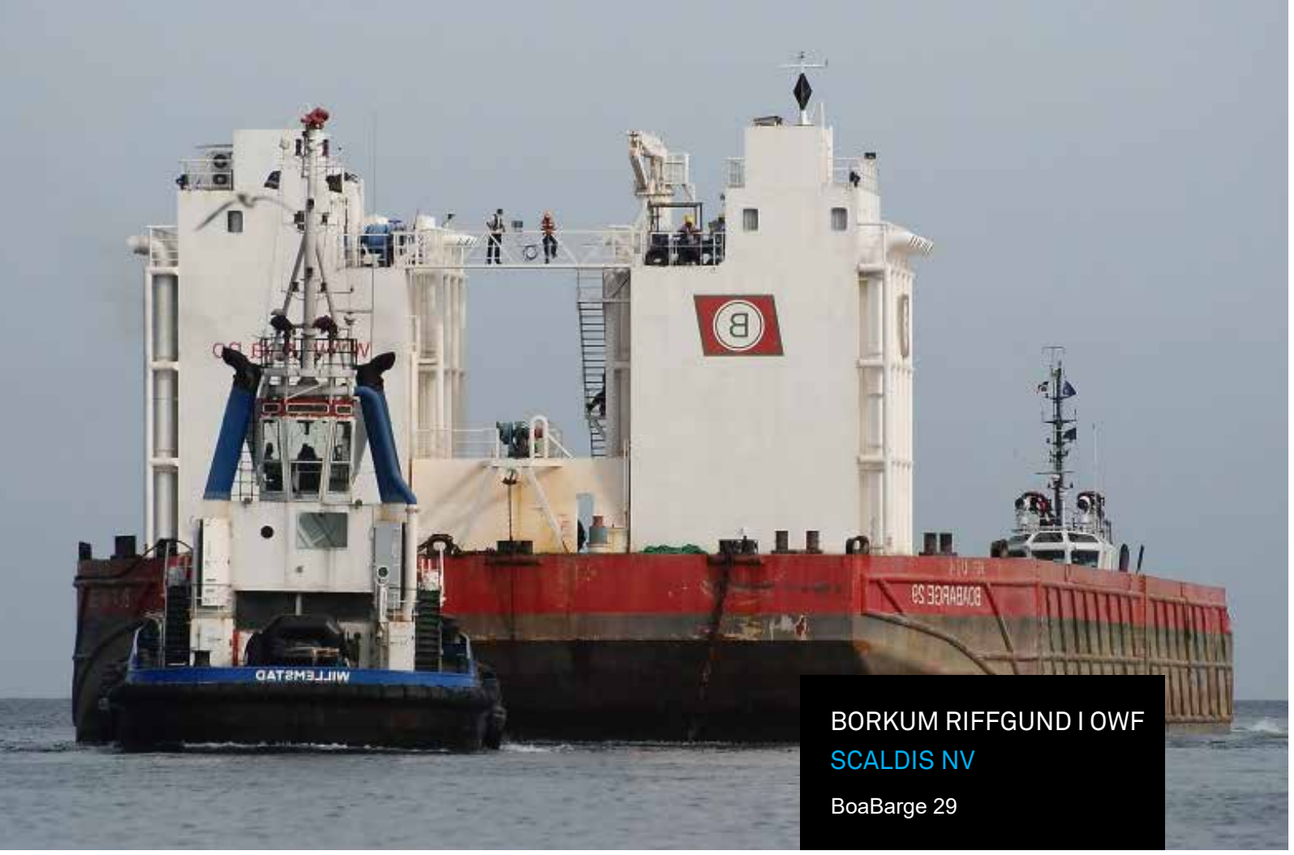
BOLLARD PULL CALCULATIONS

Scaldis Salvage and Marine Contractors NV performed the removal and disposal of the K10-B gas platform in the Northsea. TWD was requested to calculate the required bollard pull capacity of a tug. TWD performed the bollard pull calculations based on an in-house developed Excel sheet, based on Noble Denton guidelines.

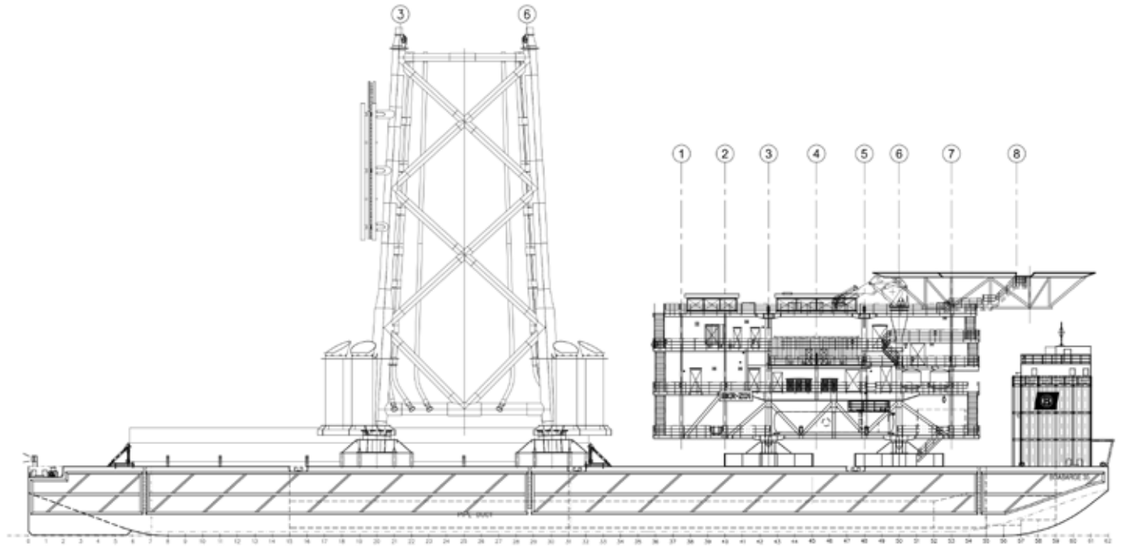
DECK LAY-OUT WAGENBORG 7



Lifting the topside onto the Osprey Trader barge



BORKUM RIFFGUND I OWF
SCALDIS NV
BoaBarge 29



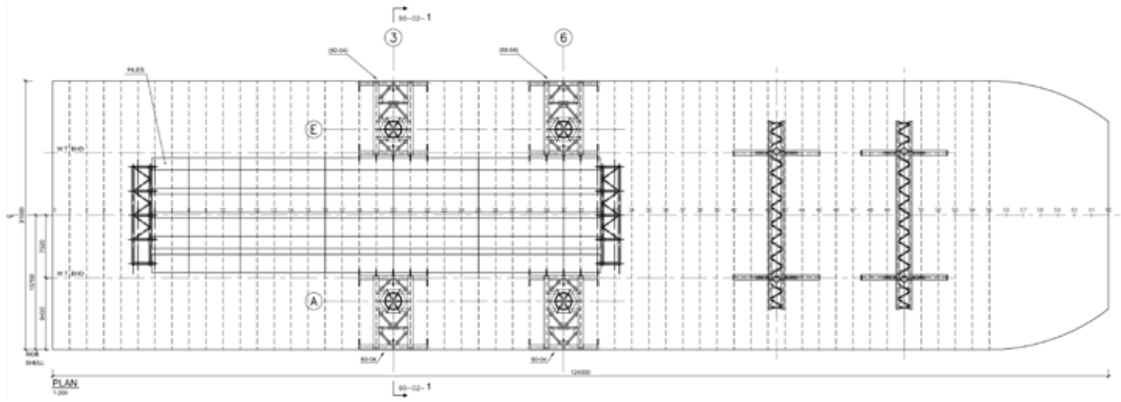
BOLLARD PULL CALCULATION BORKUM RIFFGUND

BOLLARD PULL CALCULATIONS

The BoaBarge 29 was involved in the Borkum Riffgrund I Offshore Wind Farm (BRK01) sea transport and transported the jacket, topside and 8 piles. TWD was requested by Scaldis Salvage and Marine Contractors to provide a bollard pull calculation for the transport.

SIMILAR SCOPE PERFORMED ON

- WHEATSTONE FIELD, BURBO BANKS OWF, MV FLINTERSTAR, RAMPION OWF

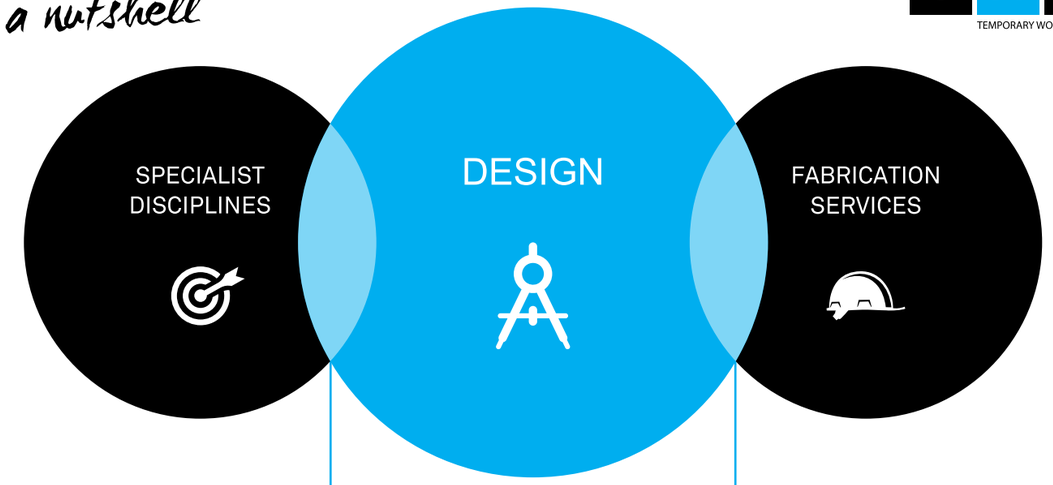


Deck lay-out of BoaBarge 29

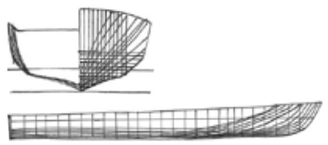
TEMPORARY WORKS DESIGN

In a nutshell

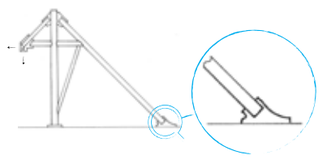
TWD
TEMPORARY WORKS DESIGN



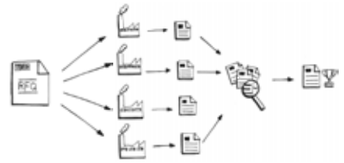
NAVAL ENGINEERING



STRUCTURAL ENGINEERING

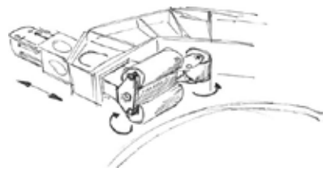


PROCUREMENT ASSISTANCE



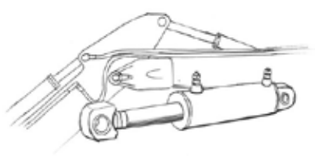
3D VISUALIZATIONS

MECHANICAL ENGINEERING

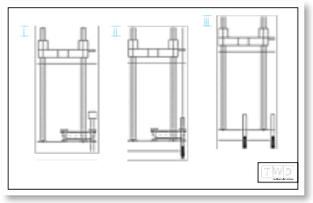


FABRICATION ASSISTANCE

HYDRAULIC ENGINEERING

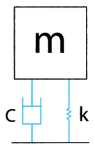


INSTALLATION ENGINEERING

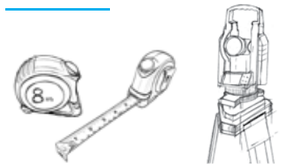


FIELD ENGINEERING

DYNAMIC ANALYSIS



MEASUREMENT SERVICES



NAVAL ENGINEERING SOFTWARE

TWD has developed several calculation tools for reliable and efficient calculation of pad- and lashing eyes, kicker plates, current and wave loading, loading capacity of deck constructions, and forces acting on cargo due to vessel motion. Furthermore, we are skilled in working with the following, widely recognized software packages:

SOFTWARE

- **AMARCON OCTOPUS**

  Accurately determining vessel motions based on strip theory. By calculating vessel and cargo motions, the resulting seafastening loads can be accurately determined. Additionally, our Naval Architects are competent in working with SAFETRANS.

- **AUTODESK AUTOCAD**

  Industry standard 2D- and 3D drafting software used to create design drawings.

- **DELFTSHIP**

  Software which allows for fast and accurate hull modelling and hydrostatic analysis.

- **DLUBAL RFEM**

  Finite element method structural analysis software with 1D, 2D, and 3D analysis capabilities.

- **GENERAL HYDRO STATICS (GHS)**

  Analyses the intact/damage stability of floating structures systems by simulating the station keeping behavior and line tensions for catenary moored vessels.

- **ANSYS AQWA**

  AQWA is a 3D diffraction software capable of performing hydrodynamic analysis of all types of offshore platforms and vessels. It is widely used for simulating and analyzing transportation and installation of offshore structures as well as performing design and in-place calculations on floating offshore systems. Additionally, our Naval Architects are competent in working with MOSES.

- **ORCAFLEX**

  Marine multibody dynamics program for static and dynamic analysis of a wide range of offshore systems, including all types of marine risers (rigid and flexible), moorings, offshore installations and towed systems.

GET IN TOUCH

TEMPORARY WORKS DESIGN

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