



SPT Offshore





Benefits of SPT Offshore

Fast

- The suction pile foundation is an integrated part of the jacket or (sub)structure and **installed in one piece**. Installation of this foundation is in a **couple of hours**, compared to **pile driving** in a **couple of days**, **reducing** the critical offshore installation **duration**
- **No separate leveling operation is required** after the foundation installation, this is performed by selective suction on the individual suction piles **during installation**
- **SPT Offshore** operates its **own high capacity suction pumps**, reducing the critical **installation duration** up to a factor of **5** compared to other suction pile installation methods
- SPT Offshore's deep water pump spreads for suction anchor installation **have an integrated lift and upending frame**, **reducing** offshore **rigging** and **handling time**

Cost Efficient

- **No heavy lift vessel required** for self-installing platforms with suction pile foundations
- Platforms and structures with suction pile foundations **can be easily recovered for relocation or decommissioning** by reversing the installation process
- **No pile drive-, leveling and grout spread** required
- **Substructure fabrication costs are reduced significantly**, since not pile sleeves, -catchers, -centralizers, mud mats and leveling padeyes are required
- **Vent valves and all measuring equipment** for installation are integrated in the **suction pump**, so these are not required on each individual suction pile
- Noise free installation, **no expensive noise mitigation** measures required

Proven

- SIP1, SIP2, SIM and SIWT are **proven proprietary technologies** with several successful installations and relocations
- **Experienced SPT Offshore's operational crew** have installed **over 450 suction pile foundations and anchors**
- **Engineering and installation by one party**, hence SPT Offshore can take over the installation and in-situ **responsibility**

EPCI Contractor

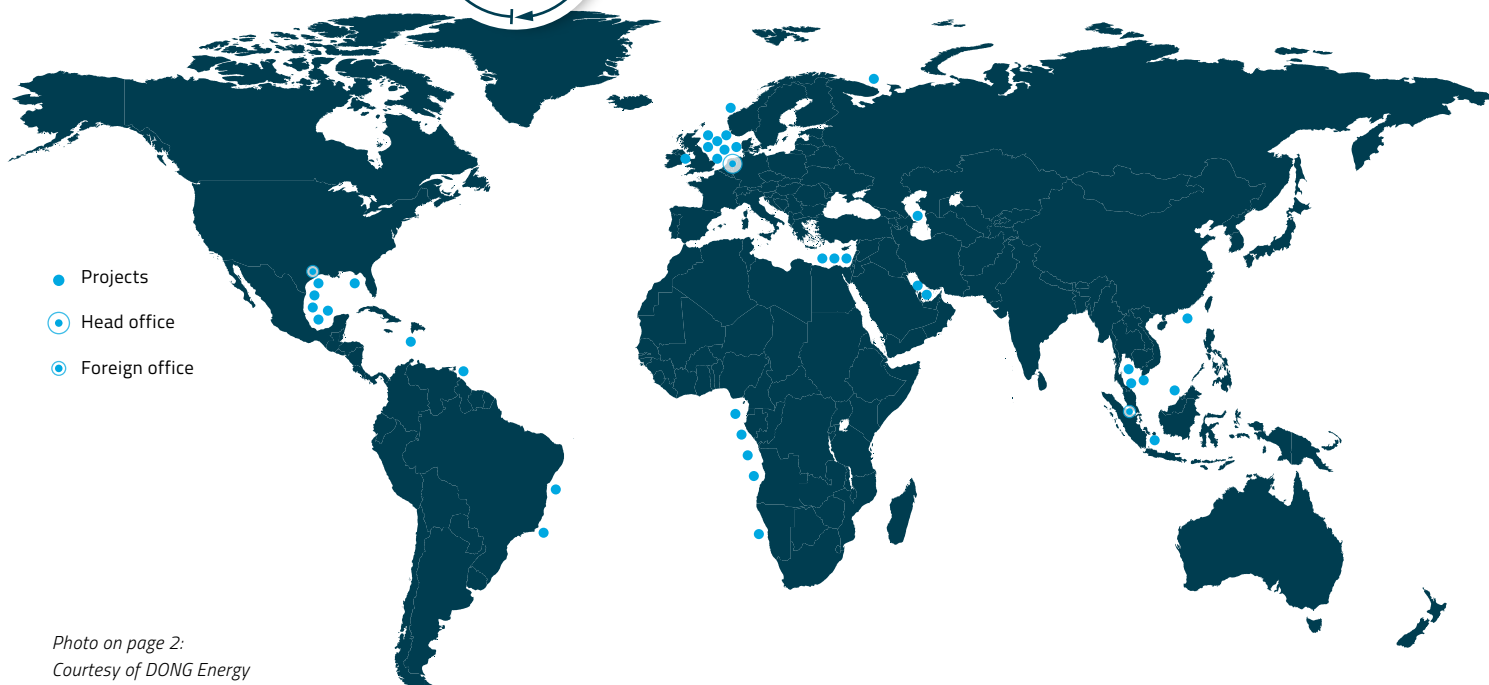


Photo on page 2:
Courtesy of DONG Energy

Products and Applications

SIP1

Self Installing Platform Type 1

- Tripod platform on suction piles
- Up to 1,000 mT deck weight
- Water depth up to 100 m



SIP2

Self Installing Platform Type 2

- A four legged, barge installed platform founded on suction piles
- Topsides weight up to 15,000 ton
- Water depth up to 60 m



SIM

Self Installing Monopile

- Monocolumn founded by a single or multiple suction piles
- Topsides weight up to 1,500 ton
- Water depth up to 120 m



Suction Piles for

WTG Substructures

- A three legged jacket with suction pile foundation
- Water depths up to 60 m
- Applicable for all available wind turbine sizes



Suction Piles for

Jackets

- Traditional jacket with integrated suction pile foundation
- No limits on topsides weight
- Water depths up to 120 m



Suction Piles for

Pipeline Startup

- Suction piles with capacities up to 275 mT readily available for rental
- Suction pile installation to maximum of 3,000 m water depth
- Suction pump lift capacity up to 200 mT



Suction Piles or Suction Embedded Anchors (SEA) for

Moorings

- Installation to maximum of 3,000 m water depth
- No limit on suction pile capacity
- Suction pump lift capacity for suction piles up to 200 mT weight



Suction Piles or –Clusters (SPC) for

Subsea Structures

- Installation to maximum of 3,000 m water depth
- Integrated foundation of 3 or 4 suction piles in the subsea structure
- Suction Pile Cluster (SPC) with 3 bundled suction piles and subsea connector



Company Overview

SPT Offshore has been involved in the EPCI of over 450 suction pile anchors and foundations worldwide.

SPT Offshore is the leading offshore contractor for suction pile anchors and foundations. SPT Offshore undertakes and manages EPCI projects worldwide from suction pile foundations or anchors to complete mooring line assemblies and self-installing platforms. SPT Offshore has a highly qualified staff to manage offshore EPCI projects, including project managers and engineers, geotechnical and structural engineers, naval architects, operational and equipment managers and a team of experienced offshore personnel.

SPT Offshore operates its own well-proven suction pump equipment required for the installation of suction piles and anchors from shallow to deep water. Over the years, SPT Offshore has been involved in the design, fabrication, transportation, installation and/or removal of over 450 suction pile anchors and foundations and various self and barge installed platforms worldwide. Our scope includes the following:

- Geotechnical and structural engineering of suction pile anchors and -foundations
- Structural engineering of jacket structures and self-installing platforms
- Transportation, installation, removal and general project engineering
- Procurement of steel and fabrication of suction pile anchors and -foundations
- Complete offshore transportation and installation of self-installing platforms, platforms and subsea structures with suction pile foundations, suction anchors and mooring line assemblies
- Rental of temporary suction piles including offshore installation and removal services



PetroCanada de Ruyter Development



*Self Installing Monopile (SIM)
Shell Riser Access Tower*



Management and Engineering



SPT Offshore can take over the responsibility for successful installation meeting field life requirements

SPT Offshore is based in Woerden, The Netherlands, from where projects are carefully managed on safety, quality, costs and schedule. SPT Offshore is ISO 9001:2008 and OHSAS 18001:2007 certified, which ensures the highest quality and safety standards.

Our design staff includes pre-dominantly MSc. level engineers including geotechnical, structural, naval and marine disciplines. We use the latest engineering software for our analyses and designs, such as Plaxis, Femap, SACS, MatLab, MatCAD and SolidEdge. Next to that we have developed our own in-house software over the years. By handing over the engineering and actual offshore installation to one party, SPT Offshore can take over the responsibility for successful installation and operational requirements of the suction pile foundation(s), anchor(s) and complete platforms.

SPT Offshore has gained valuable engineering design capabilities for projects and facilities relating to offshore oil and gas and wind power in the following categories:

- Oil and gas fixed platforms
- Subsea structures, such as PLEMs, PLETs and manifolds,
- AC/DC and transformer substations and wind turbine generator substructures
- Mooring lines and anchoring for floating facilities such as FPSO's, FPU's, SPARs, SBMs, offloading buoys, etc.
- Pipelay startup and steel catenary riser (SCR) anchoring

Concept studies and (pre-) FEEDs

SPT Offshore has proven that their early involvement in projects leads to significant cost reductions and schedule improvements in the execution phase of the project. We have been involved in the following works:

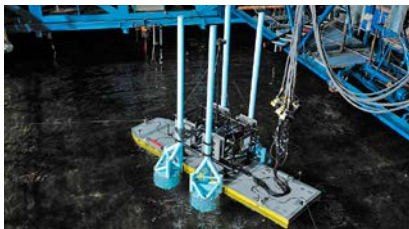
- Field development studies
- Platform concepts including naval and marine analyses
- Concept, basic and detailed engineering of platform substructures and foundations and mooring line anchors
- EPCI cost estimating

Research and development

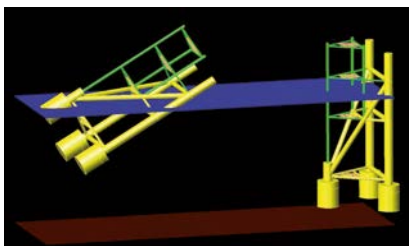
SPT Offshore focuses on the research and development of efficient concepts achieving flexibility and cost reductions for its customers. SPT Offshore has developed the following innovative concepts, which all have been field proven over the years:

- Self Installing Platform Type 1 (SIP1)
- Self Installing Platform Type 2 (SIP2)
- Self Installing Monopile (SIM)
- Suction Installed Wind Turbine (SIWT)
- Suction Pile Cluster (SPC)
- Suction Embedded Anchor (SEA)
- Suction pile double top plate
- Suction pile integrated scour protection system

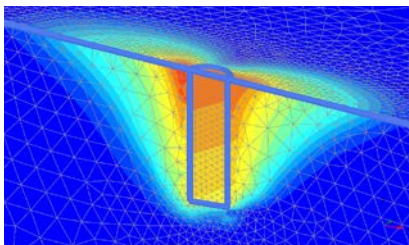
Please refer to the separate leaflets for more details of these concepts.



Centrica F3FA SIP2 scale model test



Platform upend marine analysis



Detailed geotechnical finite element analysis on a suction anchor



Procurement and Construction



SPT has a well-established worldwide network of pre-qualified fabrication yards

SPT Offshore has an extensive track record for the procurement of steel and fabrication of suction pile anchors and foundations. SPT Offshore collaborates with a range of fabrication yards located from the Mediterranean, the Atlantic Ocean to the North and Baltic Sea. Each of these fabrication yards have been selected by SPT Offshore for their high safety standards, quality, reliability and track record.

For projects outside Europe, SPT Offshore has a well-established network of pre-qualified fabrication yards ranging from Brazil, to Dubai, to Malaysia and Vietnam. SPT Offshore has a strict supervision scheme, ensuring safe fabrication works of the highest quality and on time.



Fabrication of 22 suction piles in Brazil for the Chevron Frade project



Three of four suction piles for the Statoil Dudgeon Substation ready for loadout to the jacket assembly yard



Fabrication of the suction pile foundation for the Centrica F3FA SIP2



Transportation and Installation



SPT Offshore performs transportation and offshore installation of platforms and moorings

SPT Offshore has a vast experience in the transportation and installation of suction pile anchors and foundations and self installing and floatover platforms, operating from its own transportation and installation spread.

Self Installing Platforms (SIP) and other suction pile founded structures

SPT Offshore's SIP1, SIP2 and SIM are designed such, that only a minimal offshore marine spread is required for the installation of these structures. A SIP1 or SIM can be wet towed to site, where a relatively small Offshore Construction Vessel (OCV) or Dive Support Vessel (DSV) is required for the complete installation.

Transportation of a SIP2 is performed using a traditional cargo barge and tugs. If multiple field relocations are expected, it can be more cost efficient to incorporate buoyancy underneath the topsides, making it self-floating. Installation of a SIP2 will be supported, just like a SIP1 and SIM, with an OCV or DSV.

If a traditional jacket structure is required, a suitable lift vessel or sheerleg can be the most cost efficient installation procedure. Since several days of critical vessel time will be saved by using a suction pile foundation instead of a driven pile and grouted foundation, this can lead to significant cost savings.

Suction pile anchors and mooring line installations

For the installation of suction pile anchors and mooring lines for FPSO's, FPU's or other offshore floating facilities, SPT Offshore will operate a tailored Offshore Construction Vessel (OCV) and/or Anchor Handling Tug (AHT), pending on the suction pile dimensions and weight, properties of the mooring line and the water depth.

Suction pile installation services from Company's vessel

SPT Offshore has executed numerous suction pile anchor and foundation installations from Company's vessels. SPT Offshore monitors and controls the suction operation from the SPT control container on the vessel's deck. During this operation, the essential installation variables are monitored, such as the pressure differential, the internal plug uplift and inclination of the pile or structure. Our offshore services will guarantee a proper, swift and safe suction pile installation and retrieval.



Integrated bulls eye on the SAPS-003 measures the verticality of the suction pile



SCR anchor suction pile installed at 1,100m water depth in the Frade field, Brazil



Subsea manifolds and their Suction Pile Cluster (SPC) foundations on a barge



Equipment

Shallow water pump skids

4x SAPS-001

- Electrically powered via umbilical
- Full redundant system
- Water depth up to 150 m
- Maximum water flow: 300 m³/hr
- Maximum differential pressure: 5 bar
- X/Y inclination
- Pile heading by optional gyro
- Ambient and internal pressure measurement
- Control container

4x SAPS-004

- Electrically powered via umbilical
- Full redundant system
- Water depth up to 150 m
- Maximum water flow: 400 m³/hr
- Maximum differential pressure: 7.5 bar
- X/Y inclination
- Pile heading by optional gyro
- Echo sounder for soil plug height
- Ambient and internal pressure measurement
- Control container

4x SAPS-007

- Electrically powered via umbilical
- Full redundant system
- Water depth up to 150 m
- Maximum water flow: 300 m³/hr
- Maximum differential pressure: 5 bar
- X/Y inclination
- Pile heading by optional gyro
- Echo sounder for soil plug height
- Ambient and internal pressure measurement
- Control container

1x SAPS-006

- Hydraulically powered via hydraulic hose
- Full redundant system
- Water depth up to 120 m
- Maximum water flow: 150 m³/hr
- Maximum differential pressure: 5 bar
- Ambient and internal pressure measurement

SAPS-007 suction pump



Deepwater pump skids

1x SAPS-002

- For a maximum 1,200 m water depth
- Integrated lift frame for suction pile (cluster) lifting up to 150 mT
- Electrically powered via umbilical
- Full redundant system
- Selective suction on one or multiple to a maximum of four suction piles
- Maximum differential pressure: 7.5 bar
- X/Y inclination
- Pile heading by optional gyro
- Echo sounder for soil plug height
- Ambient and internal pressure measurement
- Control container

3x SAPS-003(s)

- For maximum 3,000 m water depth
- Integrated lift frame for suction pile lifting and upending up to 200 mT
- Hydraulically powered via ROV hotstab
- Full redundant system
- Maximum differential pressure: 5 bar
- X/Y inclination
- Pile heading by optional gyro
- Echo sounder for soil plug height
- Ambient and internal pressure measurement

Rental suction piles

4x suction piles:

- 3.4 m outer diameter
- 6 to 12 m length
- Capacity 120 – 150 mT

2x suction piles:

- 6 m outer diameter
- 6 to 9 m length
- Capacity 250 mT

1x twin suction pile:

- 2x 3.4 m outer diameter
- 11m length
- Capacity 180 mT

Supporting equipment

8x powered umbilical sheaves

2x hydraulic powerpack for SAPS-003 and SAPS-006

1x hydraulic hose reel and power pack for SAPS-005

1x autolock sheave 250 mT

1x 1,500 m umbilical winch

Experience



SIP1
Self Installing
Platform Type 1

Wintershall L-6B, Ithaca Jacky, COOEC CLP Met Mast



SIP2
Self Installing
Platform
Type 2

Centrica F3FA, ConocoPhillips Calder, ConocoPhillips Millom West



SIM
Self Installing
Monopile

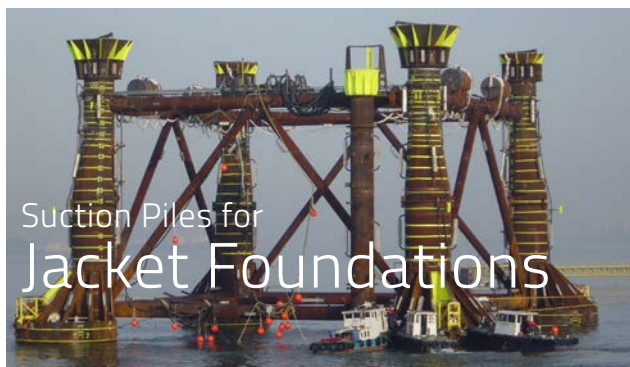
Shell Riser Access Tower, Talisman Bunga Raya Platform Extension



Suction Piles for
WTG Substructures

Courtesy of DONG Energy

DONG Energy Borkum Riffgrund



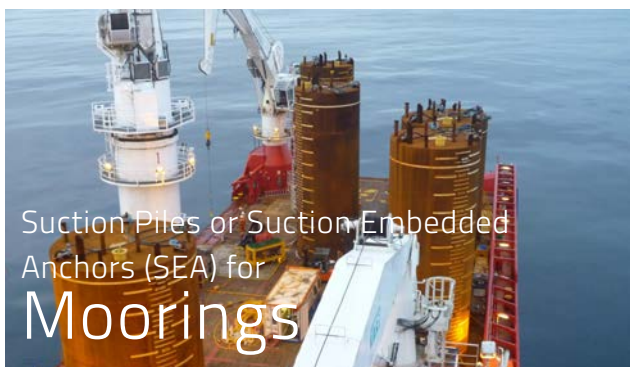
Suction Piles for
Jacket Foundations

Gas de France Q13-A, Talisman Bunga Raya, Chevron North Nemba



Suction Piles for
Pipelay Startup

PEMEX Line 1 & 3, Statoil Asgard, Shell BC-10



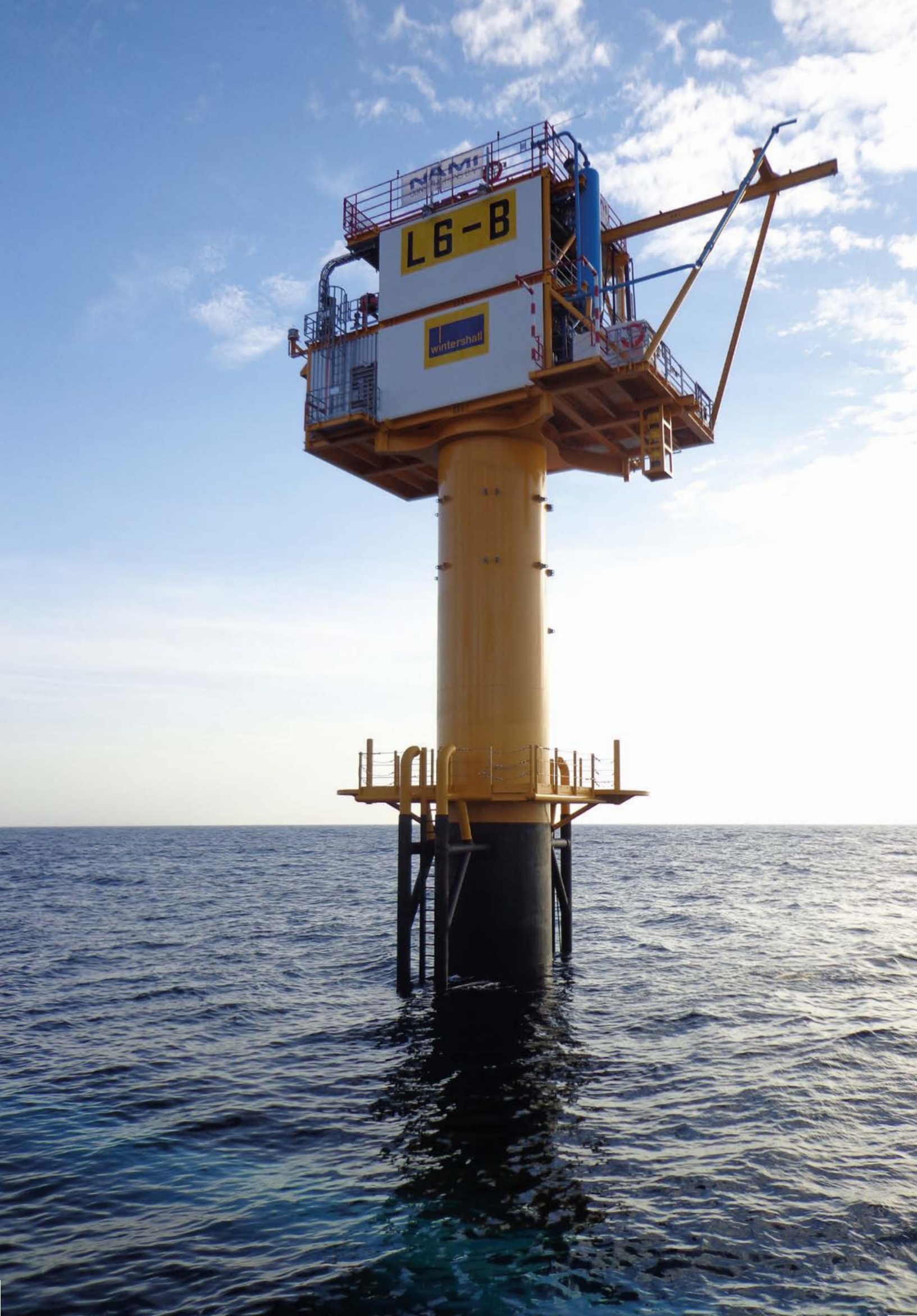
Suction Piles or Suction Embedded
Anchors (SEA) for
Moorings

EON Huntington FPSO, Noble Hadera Oil Offloading Buoy, Athena FPSO



Suction Piles or Clusters (SPC) for
Subsea Structure
Foundations

ENI Rosetta, PetroCanada de Ruyter, Amerada Hess Ceiba



Clients



Agents



Bizworth Oil and Gas, Malaysia

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