DEEP WATER FIELD DEVELOPMENT

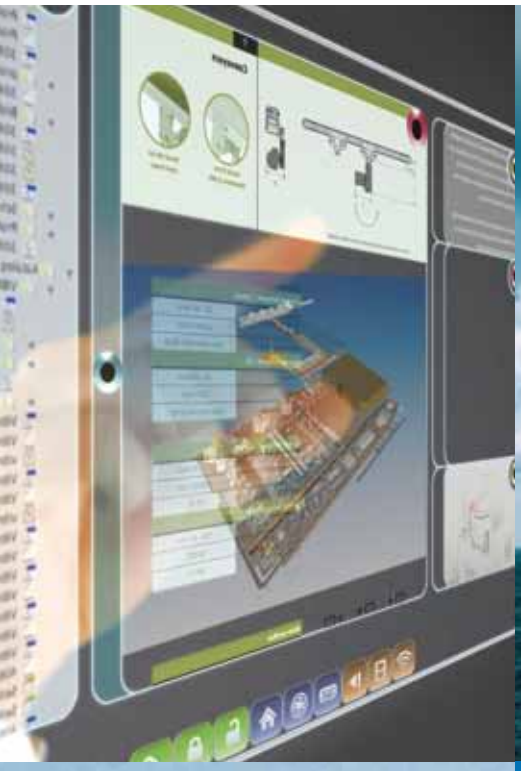
INDEX

SAIPEM TODAY

SAIPEM TODAY IS A WORLD LEADER IN THE GLOBAL SUPPLY OF ENGINEERING, PROCUREMENT, PROJECT MANAGEMENT, CONSTRUCTION AND DRILLING SERVICES WITH DISTINCTIVE CAPABILITIES IN THE DESIGN AND EXECUTION OF LARGE-SCALE OFFSHORE AND ONSHORE PROJECTS.

Saipem has a strong bias towards oil and gas frontiers, namely activities in harsh and remote areas, in deep waters as well as in extremely cold and hot environments, applying significant technological competences in many diverse fields such as gas monetization and heavy oil exploitation.

Saipem is organized in two Business Units: Engineering & Construction and Drilling.



SAIPEM ENGINEERING & CONSTRUCTION

FOLLOWING AN AGGRESSIVE GROWTH STRATEGY, WHICH INCLUDED IN THE LAST DECADE THE ACQUISITION OF MANY CONSTRUCTION, TECHNOLOGY AND ENGINEERING COMPANIES, MOST PROMINENTLY OF SNAMPROGETTI, BOUYGUES OFFSHORE, SOFRESID AND MOSS MARITIME, SAIPEM HAS BECOME ONE OF THE WORLD LARGEST AND MOST COMPLETE ENGINEERING AND CONSTRUCTION COMPANIES IN THE GLOBAL OIL AND GAS MARKETS, ONSHORE AND OFFSHORE.

Ever since its initial steps in the fifties as the construction division of Snam, the pipeline company of the Eni Group in Italy, Saipem has pursued a systematic growth strategy, based on the development of internal assets, expertise and skilled resources, as well as on the acquisition of other players with their own asset bases, such as Micoperi in late eighties, and many others.

In the last decade, Saipem has continued its growth by acquiring Bouygues Offshore and Sofresid in France, Moss Maritime in Norway, IDPE in India and Snamprogetti in Italy, and by carrying out a multibillion investment program into the expansion of its offshore construction and drilling fleets. Since the year 2000, Saipem's market capitalization has grown more than sixfold and its revenues tenfold.(*)

The organizational integration of this considerable asset base, namely the network of engineering centres, fabrication and support yards in several continents as well as the offshore construction fleet, has been completed gradually over the years - most recently with the creation of a unified Business Unit Engineering & Construction, an entity with over 30,000 employees (excluding corporate and BU Drilling staff) from over 100 nationalities, with over 60 permanent establishments and numerous project execution centres around the globe, and with yearly revenues exceeding 10 billion €/y; all held together by outstanding project management skills.

Through the involvement of our global EP(I)C hubs in Milan, Rome and Fano (Italy), Paris (France) and Chennai (India), which operate in connection with a growing number of medium size and smaller regional engineering and project execution centres employing altogether over 7,000 engineers, Saipem balances high project execution quality with a competitive cost and - most importantly - with a major emphasis on local know-how and content.

This well-integrated multicenter approach provides a consistent design and robust execution philosophy on all our projects worldwide. Top priority is provided throughout to all HSEQ aspects.

Saipem therefore offers a complete range of project definition and execution services, offshore and onshore, particularly for the complex "mega-projects" required by the market today: from feasibility and conceptual studies to complex integrated solutions combining design, engineering, procurement, field construction, fabrication and offshore installation; also revamps, upgradings, maintenance, decommissionings, reclamations and decontaminations.

Saipem today operates in virtually every world market, often in remote locations with harsh environmental conditions and challenging logistics, leveraging on its proven experience across the most significant product lines in the oil and gas production onshore, offshore, in deep water; gas and oil transportation via offshore and onshore pipeline systems; midstream, refining, chemicals, power generation from fossil as well as from renewable sources; environmental industries, maritime works and infrastructure.

This new series, therefore, outlines Saipem's integrated references in engineering and construction markets offshore and onshore, according to individual business and technology lines.

(*) Until Dec. 31, 2010

SAIPEM DEEP WATER OIL & GAS FIELD DEVELOPMENT

SINCE ITS EARLY DAYS, SAIPEM HAS HAD A STRONG BIAS TOWARDS FRONTIER PROJECTS, SUCH AS THE EXPLOITATION OF THE SUBSEA OIL & GAS FIELDS, WHICH HAVE BEEN DISCOVERED IN DEEPER AND DEEPER WATERS. TO MATCH THE CHALLENGES OF ULTRA DEEP WATERS AND NEW GEOGRAPHICAL AREAS, OVER THE YEARS SAIPEM HAS DEVELOPED OUTSTANDING ENGINEERING AND PROJECT MANAGEMENT SKILLS, SPECIFIC PROPRIETARY TECHNOLOGIES AND A TOP CLASS DEDICATED CONSTRUCTION FLEET, BECOMING ONE OF THE MAJOR PLAYERS IN THE DEEP WATER FIELD DEVELOPMENT ARENA.

During the last years, the deep water offshore production has represented one of the most dynamic sectors of the entire E&P sector. The overall offshore activity has been increasing both in shallow and deep waters, but the rise in deep waters has been much more rapid.

The average depth of subsea wells installation has fast increased from around 200 m in the early nineties to nearly 1,000 m today, while the record installation water depth has risen from around 500 m of the nineties to nearly 3,000 m of today.

The activity in deeper waters, harsher environments and more remote locations has been a key industry trend over the last decade, thanks to large deep water fields in US GOM, Brazil and West Africa (especially Angola and Nigeria) – the focus of enormous new project developments by NOCs, IOCs and independents alike, all increasingly seeking opportunities in new frontiers for oil & gas development at greater water depth.

The first deep water operations of Saipem date back to the late eighties, when the Saipem 7000 installed subsea structures in 525 m water depths in the Gulf of Mexico for Conoco on the Green Canyon project.

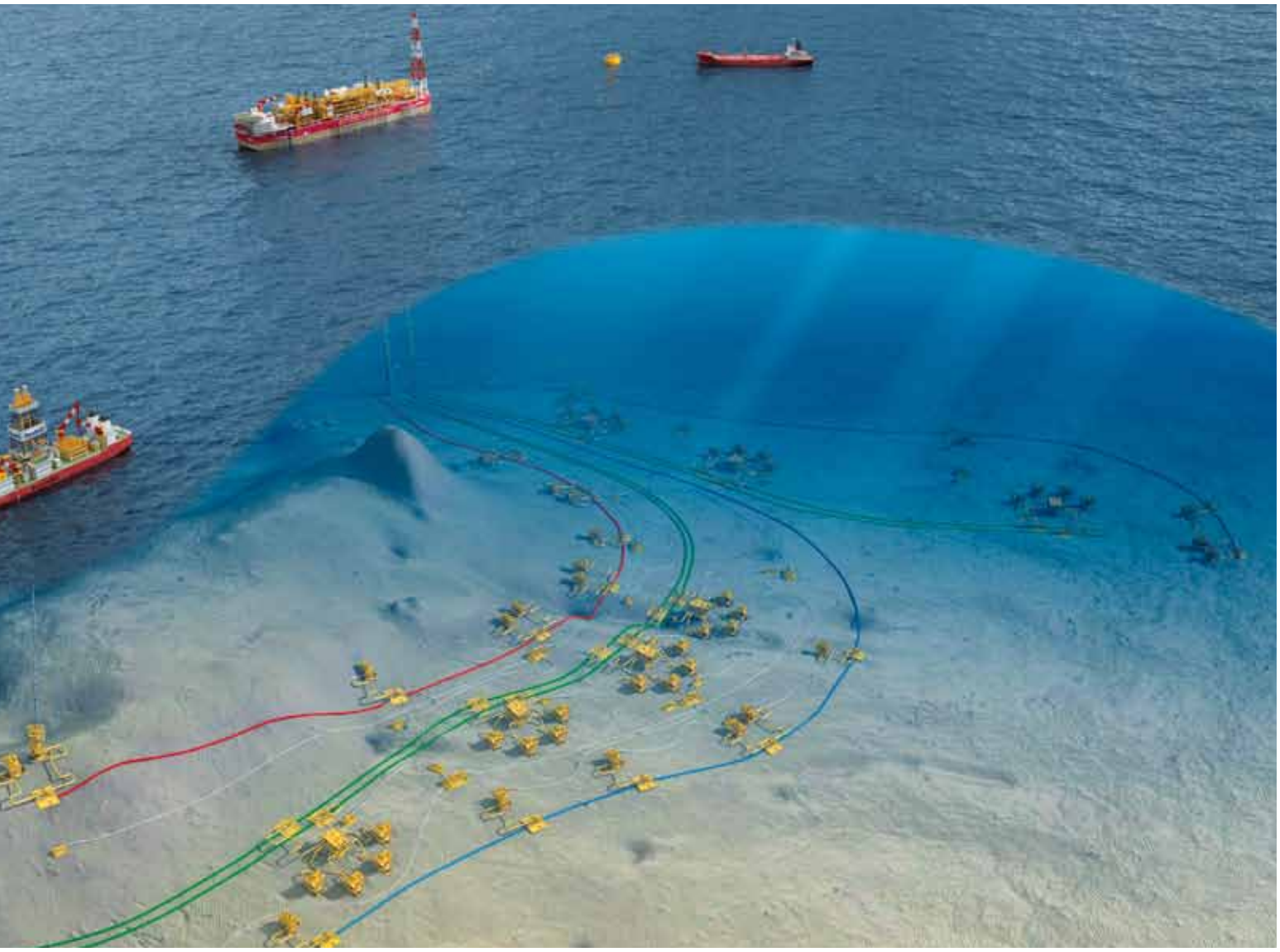
After several North Sea installation projects carried out in 300 m water depth by the same vessel in the nineties, including Saga Petroleum's Snorre TLP template/ moorings and Norsk Hydro's Troll Field subsea structures, as well as after the installation of risers, umbilicals and subsea structures carried out by the Maxita Multipurpose DP Vessel on Eni's Aquila Field in 830 m water depth in the Adriatic Sea, a major milestone was represented by the Diana Hoover Spar and Flowlines project in the Gulf of Mexico awarded to Saipem by Exxon in 1997.

That project included the installation of the spar caisson vessel and topsides (all together weighing more than 50,000 t) as well as flowlines and steel catenary risers in 1,480 m water depth. The heavy lift and laying activities were both performed by the Saipem 7000, which had been newly converted to

Saipem delivered the URF EPIC of the Usan Project for Total (Nigeria)

a combination derrick and pipelaying vessel by the addition of the world's largest J-lay tower for deep water operations.

A new age of deep water field development projects was inaugurated in 1997 with Saipem's acquisition - through its Saibos subsidiary - of the Girassol Field Umbilicals, Risers and Flowlines installation contract from Elf Exploration Angola. Located in a 1,450 m water depth, the project saw the debut of the FDS Multipurpose DP Crane & J-lay Vessel, conceived and designed for deep water field development projects to cover all duties: the installation of seabottom structures/ components and the laying of umbilicals, risers and flowlines, as well as the first ever 16" oil offloading steel lines installed mid-water.
The acronym URF (Umbilicals, Risers and Flowlines) started making its appearance in the subsea market, while the subsea field operators started challenging the contractors with the request for EPIC lump sum contracts assigned after design competitions among a restricted number of contractors. This new market segment grew strongly, particularly in the South Atlantic region, both in West Africa and in Brazil.



A major example of this new approach was represented by the Kizomba A Tie-back System project awarded to Saipem by Esso Exploration Angola in 2001. The complex, integrated project included engineering, procurement, construction and installation of umbilicals, risers and flowlines in a 1,200 m water depth, besides the largest (20") steel Oil Offloading Lines (OOL) ever installed mid water, later overcome by the 24" OOL of the Usan project. The selected riser concept was the original Single Hybrid Risers (SHR) design by Saipem, here applied for the first time.

Saipem built its reputation and continuously increased its strength in the marketplace by combining original riser and flowline designs, suitable for the most diversified scenarios and often patented by Saipem (including pipe-in-pipe solutions for demanding thermal insulation requirements), with powerful installation vessels capable of providing reliability, safety and cost effectiveness. In this way, Saipem was in the position to design and execute an entire integrated deep water field development project within a single EPIC contract.

Kizomba A was then followed by many other outstanding projects based on Saipem's original technologies and installed by the Saipem FDS and/or the Saipem FDS2 Multipurpose DP Crane and J-lay Vessels, often supported by the S3000 for umbilical laying and heavy subsea construction work, such as for example the following breakthrough projects:

- Kizomba B, negotiated by the client with Saipem in 2002, featuring the first Pipe-in-Pipe Single Hybrid Riser, installed in 970 m water depth
- Rosa Field tie-back SURF project in 2003 for Total Angola, including the installation of the heaviest ever Bundle Hybrid Offset Riser (BHOR) tower (4,175 t in 1,200 m water depth) and the world longest and heaviest rigid spool (110 m x 40 t)
- Akpo URF project in 2005 for Total Upstream Nigeria Ltd including the installation of the deepest (1,400 m) Steel Catenary Risers (SCR)
- Usan URF project for Elf Petroleum Nigeria in 2008, based again on SHRs, which saw the debut of the FDS2, featuring the first pre-installable, de-coupled 24" Oil Offloading System and the first large diameter piles (5 m OD) ever driven in deep water (700 m)
- P55 project in 2010 for Petrobras in Brazil, using again SCRs.

The above projects, as well as many others in the South Atlantic, were carried out by Saipem's engineering and project execution center in Paris, with significant local content provided especially in Nigeria and in Angola. As at the same time other geographical areas were introducing similar developments, in order to better serve these newer markets, Saipem exported its experience to other execution centers, such as for example to Fano in Italy. The West Delta Deep Marine EPCI project (phase IV) in 2006, the Sequoia Joint Development project in 2008 and the West Delta Deep Marine project (phase VIIIb) in 2011, all major tie back

projects for Burullus Gas Company in the Egyptian Mediterranean Sea, in depths ranging between shallow waters and 1,100 m, were carried out in this way.

One of the most recent acquisitions of Saipem in this market segment - also thanks to the outstanding capabilities of the new field development ship FDS2 - is the Liwan Subsea Tie-back EPCI project for Husky Oil, which is opening the Chinese market by developing this first deep water field in the South China Sea. The scope of work includes 12" and 22" flowlines, an 80 km long umbilical and the deployment of 400 t of manifold packages, all in 1,400 m water depth.

With the Guara-Lula NE and the P55 SCR/flowlines projects under execution in Brazil, recently joined by the acquisition of the Saphinoá and Cernambi Sul project, Saipem is actually deepening its presence in the Pre-salt area, one of the most promising regions of the world for the whole E&P sector.

Here, Saipem is applying its innovative riser concepts in a highly challenging environment, where its operations are supported by the enhanced engineering organization in Rio de Janeiro and by the new Guarujá yard, primarily dedicated to subsea and floaters structures.

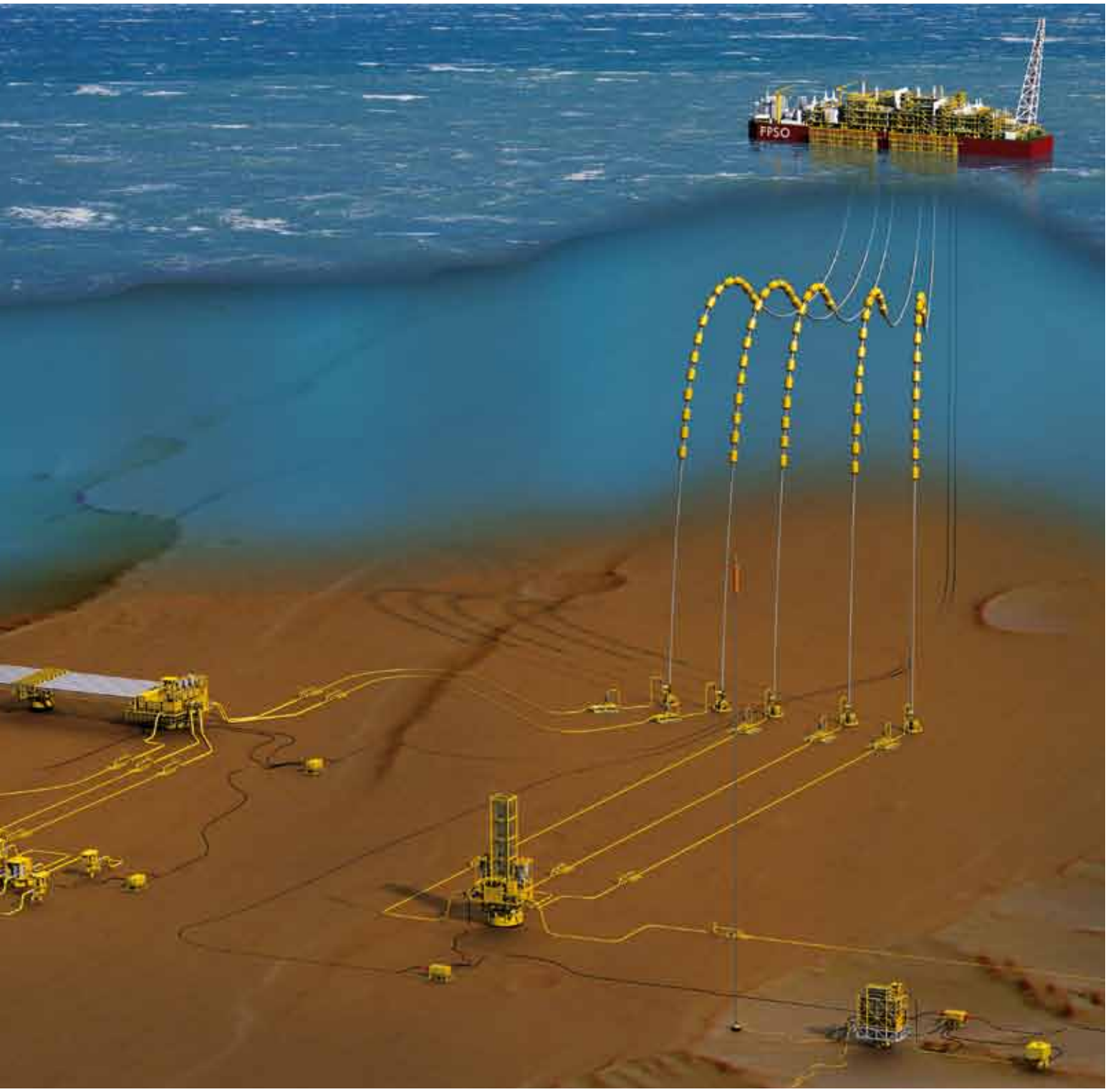
With this unique experience, broad offering of different concepts and a top class fleet of dedicated installation and pipe laying vessels, Saipem is now in the front line to tackle the challenge of the ultra deep water projects in the traditional provinces of the South Atlantic and Gulf of Mexico, and it is ready to provide full project execution capabilities in all major provinces worldwide, including the new deep water areas, such as East India, Indonesia, South China Sea and Western Australia.

SAIPEM: A COMPLETE CONTRACTOR FOR THE MOST CHALLENGING DEEP WATER UMBILICALS, RISERS AND FLOWLINES PROJECTS

FULL RESPONSIBILITY FOR THE ENGINEERING, PROCUREMENT, CONSTRUCTION AND INSTALLATION OF UMBILICALS, RISERS AND FLOWLINES SYSTEMS.

- DESIGN OF THE BEST FIELD ARCHITECTURE FOR THE CLIENTS' NEEDS AND FOR MAXIMIZING THE PROJECT RETURN.
- DEVELOPMENT OF ADVANCED PROPRIETARY SYSTEMS BASED ON INNOVATIVE PRODUCTS AND SOLUTIONS.
- UTILIZATION OF UNIQUE VESSELS, TAILOR-MADE FOR HIGH TECH SOLUTIONS.
- FABRICATION AND INSTALLATION OF SUBSEA DEEP WATER ENGINEERED EQUIPMENT TO COMPLETE THE RANGE OF SERVICES OFFERED TO CLIENTS.

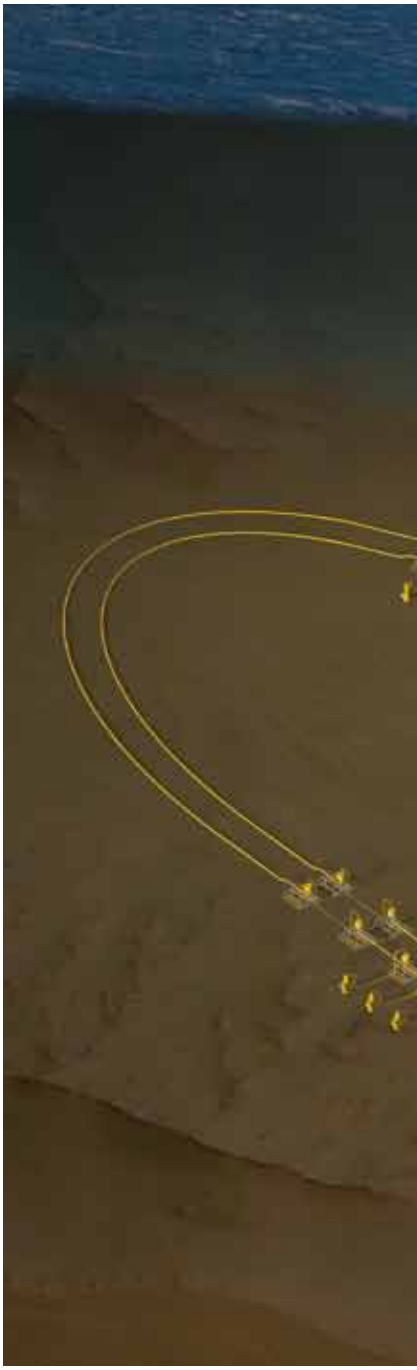
Saipem's proprietary technologies cover the design, supply and execution of even the most complex subsea systems


FPSO

UNIQUE ASSETS: TOP QUALITY ENGINEERING TO ACHIEVE THE BEST FIELD ARCHITECTURE

- INTEGRATING NEW TECHNOLOGIES & ALTERNATIVE FIELD ARCHITECTURES TO OPTIMIZE FLOW PERFORMANCE AND ENHANCE RECOVERY.

- CARRIED OUT IN THE COMPETENCE CENTERS IN PARIS AND FANO (ITALY), AS WELL AS IN NEW ENGINEERING CENTERS, SUCH AS RIO DE JANEIRO AND LUANDA.



An example of a complex field architecture

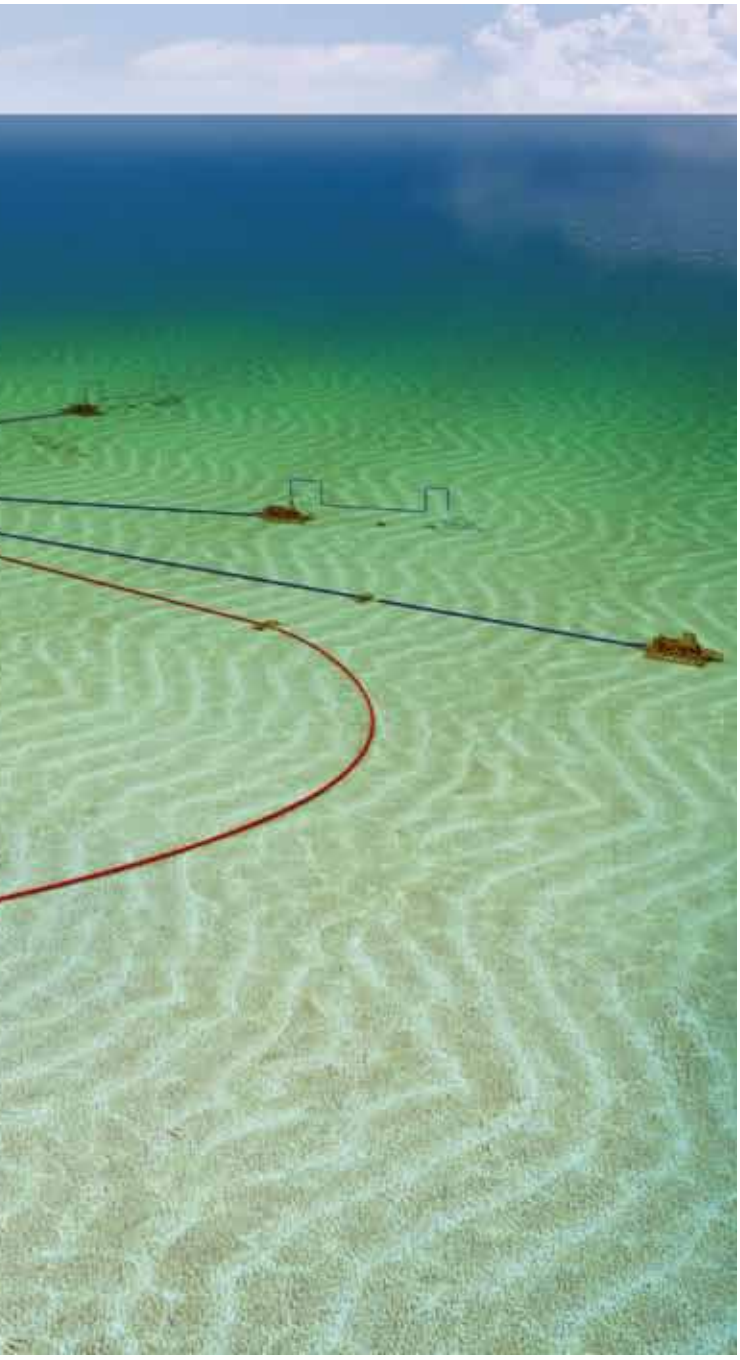
QUALIFICATION OF INNOVATIVE CONCEPTS, SOLUTIONS AND MATERIALS

- The qualification of new concepts, such as the risers systems BIRD, SIR® (*), together with new solutions and materials, strongly contributes to enhance the value added to the project

- Novel technical solutions have been qualified by Saipem for the subsea developments in Brazil, in order to meet specific service requirements with an increased focus on the long term structural integrity of the most critical elements of the field architecture

- Quality is the key driver for continuous developments of high specification materials, from metallurgically bonded clad pipes to alternative novel exotic material solutions, in order to deal with new pipelines requirements including high pressure, high temperature, heavy wall thickness, high steel grade, high fatigue criteria and highly corrosive environment

(*) See Chapter "New Concepts and Systems under development: risers systems"



P55 Project - Brazil
The utilization of cladded pipes in the critical sections of the risers has required the development and qualification of suitable welding and NDT procedures and equipment to ensure the necessary high quality level of both onshore and offshore welding.

UNIQUE ASSETS: ADVANCED VESSELS FOR ADVANCED EXECUTION CHALLENGES

↘ ALIGNMENT OF ORIGINAL TECHNICAL SOLUTIONS WITH DEDICATED, FIT FOR PURPOSE INSTALLATION VESSELS.

↘ HIGH TENSION CAPABILITIES FOR LAYING VESSELS ALLOWING THE ADOPTION OF LARGE THICKNESS PIPES AND PIPE-IN-PIPE (PIP) SYSTEMS.

The multipurpose advanced vessels FDS2 and FDS are equipped to J-lay subsea pipelines in up to 2,000 m of water depth, while the S3000 is specialized in laying flex flowlines and umbilicals and in lifting heavy subsea structures.

The entire fleet covers the full range of typical subsea works, spanning from rigid pipelines, risers, umbilicals and flexibles installation to flying leads/ jumpers positioning, from structures and manifolds to subsea process units and mooring installations.

Smaller construction vessels, ROVs and diving support vessels, in addition to strengthening the global presence in subsea works and providing general support to the projects' activities, expand the services offered by Saipem to Inspection, Maintenance and Repair (IMR) and survey.

URF MAIN VESSELS DEDICATED TO INSTALLATION

FDS2
- The newest vessel, in operation from 2011
- Evolution of its sister ship Saipem FDS
- Capability of J-laying in ultra-deep waters pipes with diameter up to 36"
- Lifting capacity up to 1,000 t
- Dynamic positioning DP3.

FDS
- Capability of J-laying in ultra-deep waters pipes with diameter up to 22"
- Lifting capacity up to 600 t
- Dynamic positioning DP3.

S3000
- Laying of flexible pipelines and umbilicals
- Installing mooring systems and subsea structures
- Lifting capacity up to 2,200 t.

FDS2

FDS

S3000

NORMAND CUTTER
Construction and ROV Support vessel

UNIQUE ASSETS: UNDERWATER INTERVENTION EQUIPMENT

REMOTELY CONTROLLED SUBMERSIBLE VEHICLES (ROV) DEDICATED TO A RANGE OF SUBSEA CONSTRUCTION AND INTERVENTION TASKS, INCLUDING INSPECTION, MAINTENANCE AND REPAIR (IMR) OPERATIONS. SAIPEM ROVS CARRY A VARIETY OF SPECIALIZED TOOLING PACKAGES DESIGNED TO INTERVENE ON SUBSEA EQUIPMENT, SUCH AS SUBSEA MANIFOLDS.

Saipem owns an extensive state-of-the art fleet of of about 60 highly sophisticated ROVs:

- Including the heavy duty "Innovator" ROV series, fit to operate in ultra-deep waters up to 3,000 m
- Developed and manufactured in-house with characteristics customized for specific project needs
- Supported by a large, specialized fleet of vessels
- Operating in harsh and challenging environments with the most innovative tools provided by Saipem design and manufacturing capabilities.

The highly versatile and powerful "Innovator" ROV's, owned and operated by Saipem, are entirely designed and built in-house

UNIQUE ASSETS: ENHANCED LOCAL FABRICATION AND CONSTRUCTION CAPABILITIES WITH HIGH TECHNICAL SPECIFICATIONS

- Local design, fabrication and integration in host countries of high tech components in fully owned yards of Soyo (Angola) and Rumuolumeni-Port Harcourt (Nigeria)
- A new yard under construction in Guarujá (Brazil), conceived to support deep water Pre-salt projects
- Excellent quality of local subcontractors, such as Petrojet in Maadia yard (Egypt), thanks to strategic cooperations agreements developed by Saipem

- Fabrication of subsea products and equipment, such as Pipeline End Manifolds (PLEM), subsea manifolds, in-line structures, well-to manifold jumpers, flowline spools and riser base jumpers, as essential complements of URF EPIC projects, allowing maximum extent of local content.

ANGOLA

PETROMAR SOYO YARD

ROSA PROJECT

FABRICATION OF THE MANIFOLD FOUNDATIONS, SUPPORT STRUCTURES, PRODUCTION AND WATER INJECTION FLOWLINES AND PIPE-IN-PIPES; FINAL ASSEMBLY AND TESTING OF THE MANIFOLDS, FABRICATION AND ASSEMBLY OF BHOR RISER TOWER

KIZOMBA A AND B PROJECTS

FLOWLINES COMPONENTS INCLUDING PLETS AND JUMPERS, IN ADDITION TO FINAL ASSEMBLY OF THE BHOR BUOYANCY TANKS

Rosa project - PIP Quad joints fabrication

Rosa project - BHOR Risers Tower

Kizomba A project

Kizomba B project – Gravity base foundations

NIGERIA
RUMUOLUMENI-PORT HARCOURT YARD
USAN PROJECT
FABRICATION OF MAIN COMPONENTS OF THE OFFSHORE URF PROJECT

Rumuolumeni-Port Harcourt yard aereal view

BRAZIL
GUARUJÁ YARD (UNDER CONSTRUCTION)
DEDICATED TO SUBSEA STRUCTURES AND RISERS, IN ADDITION TO FLOATERS, TO COMPLY WITH THE EXTREMELY AMBITIOUS HIGH-TECH LOCAL CONTENT REQUIREMENTS FOR PRE-SALT PROJECTS

- Area of 35 hectares in Guarujá, within the industrial hub of Santos, the largest port and industrial area in Brazil: excellent pool of resources and services

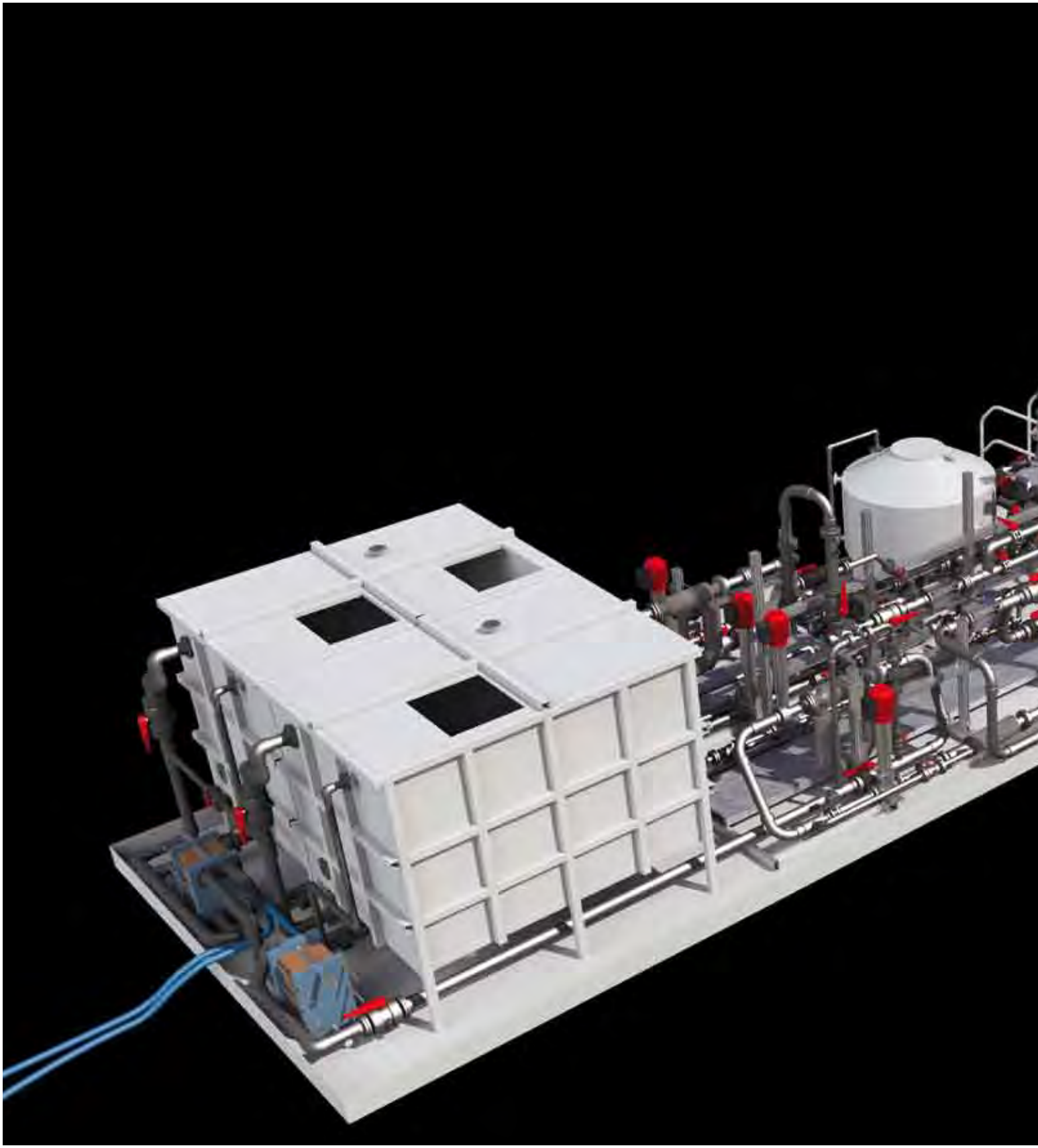
- Strategically located, approx. 350 km from the Santos Basin and 650 km from the Campos Basin, ideal to support development of new ultra-deep water fields.

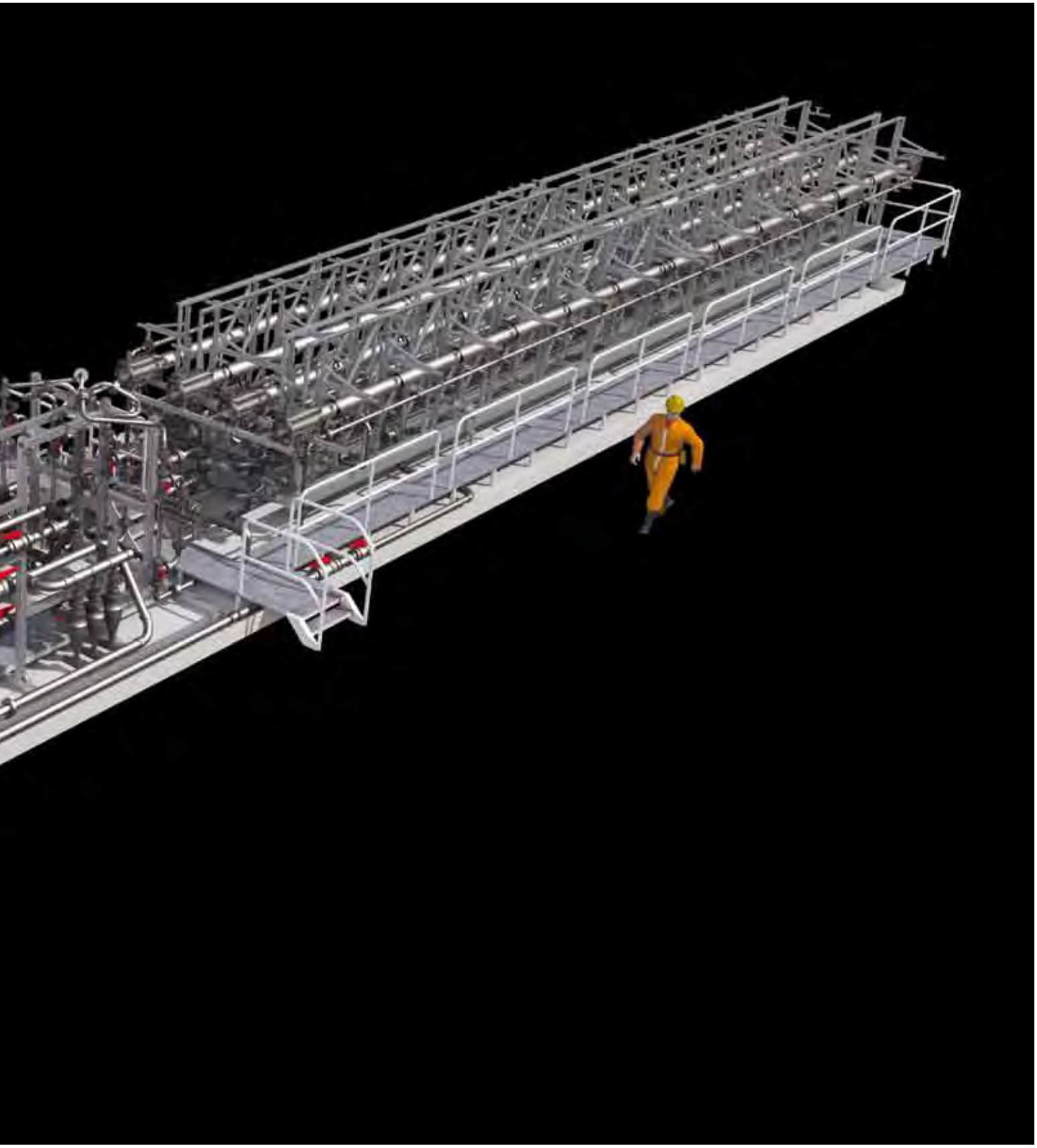
Guarujá yard - Brazil

EGYPT
PETROJET'S MAADIA YARD
WDDM PHASE IV AND PHASE VIII PROJECTS
FABRICATION OF SUBSEA STRUCTURES AND SYSTEM INTEGRATION TESTS

WDDM Projects - Subsea facilities at fabrication yard

SAIPEM'S HIGH TECH PRODUCTS AND ADVANCED PROPRIETARY SOLUTIONS





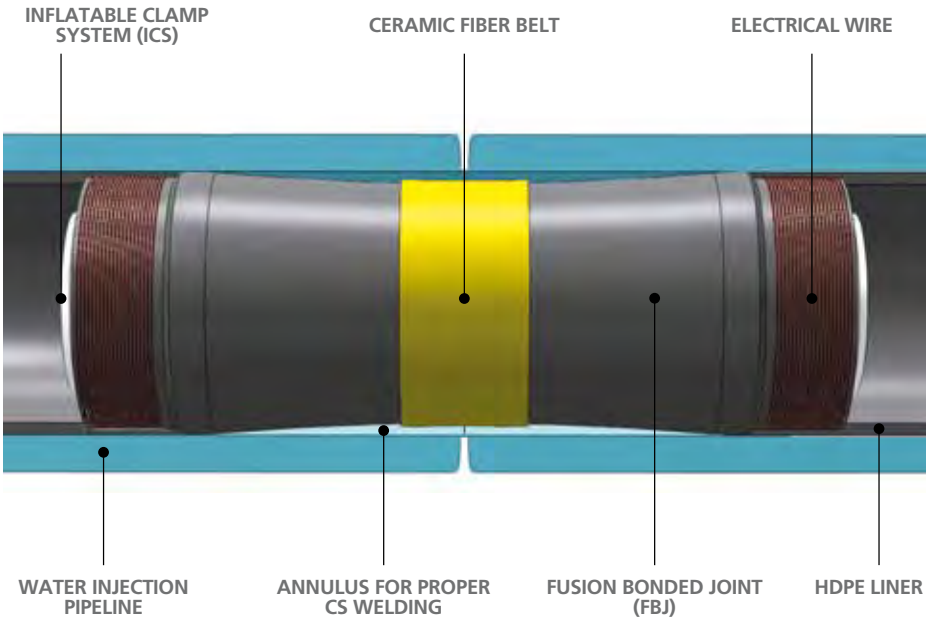
HIGH PERFORMANCE IN-FIELD FLOWLINES FOR DEEP AND ULTRA-DEEP WATERS

HIGH SPEC MATERIALS (LINEPIPE, COATINGS), HIGH TECH SOLUTIONS (PIPE IN PIPE), WELDING AND NON-DESTRUCTIVE TESTING EQUIPMENT FOR THE STRINGENT THERMAL AND DURABILITY REQUIREMENTS OF DEEP AND ULTRA DEEP WATERS.

Development and qualification of tailored welding procedures, Non-Destructive Testing (NDT) procedures and equipment for carbon steel and exotic materials

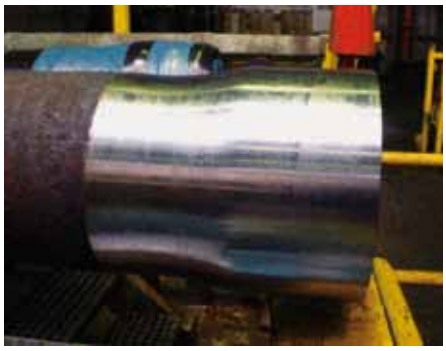
INCONEL FIELD JOINT

FUSION BONDED JOINT



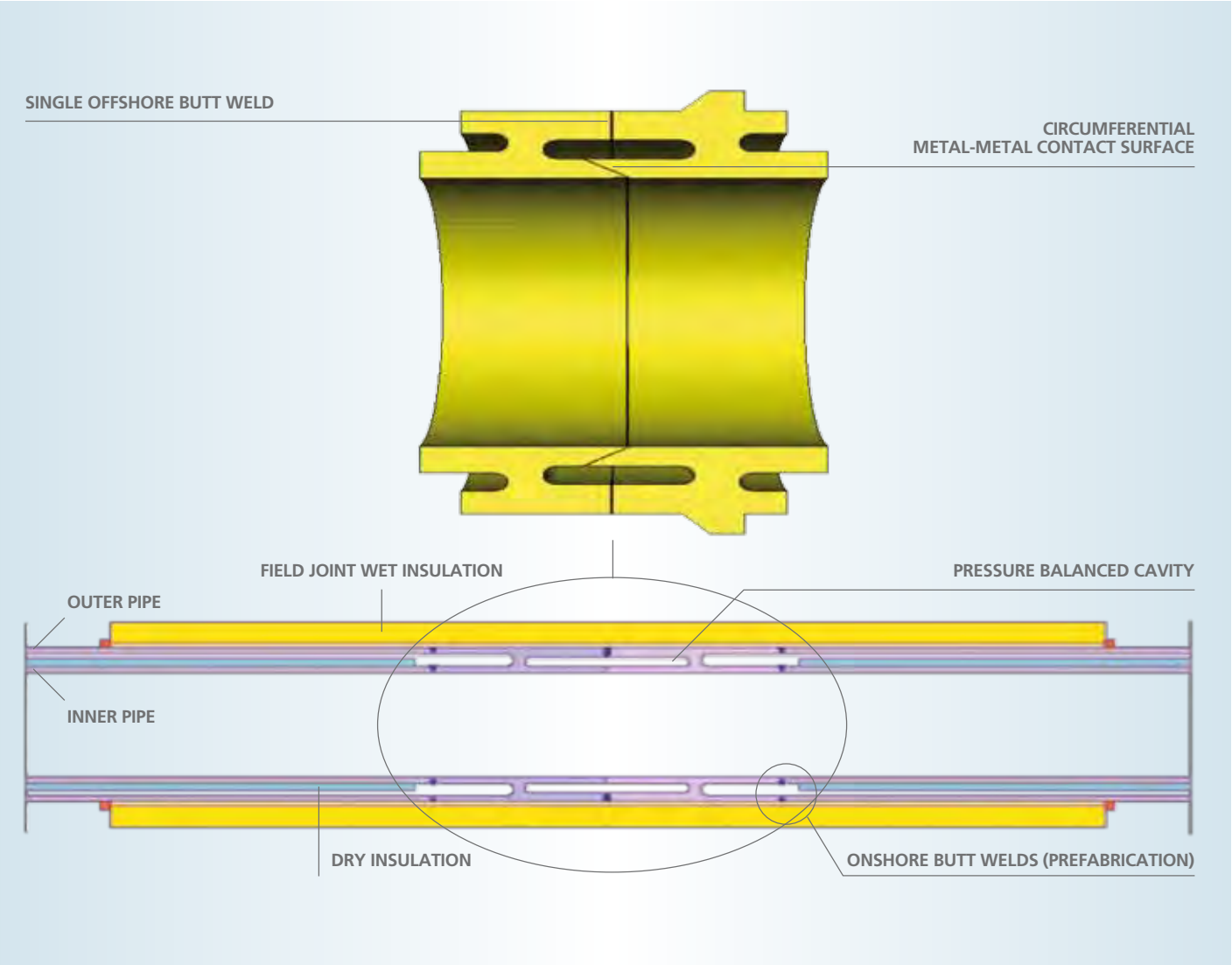
Inconel Field joint and Fusion Bonded Joint are innovative solutions for flowlines protected from corrosion by an internal plastic liner, allowing time-and cost-efficient offshore installation with both J-lay and S-lay methods

Upset & Machined End Pipes are an innovative technology developed and tested with Vallourec & Mannesman Tubes, Germany: enhanced pipe geometry to improve weld fatigue life and remove need for buckle arrestors.



High performance thermal insulation materials and solutions including a low cost gel (here shown during filling test) for water depth down to 3,000 m, easy to fabricate in large quantities also in local yards and adaptable to any shape. This gel, under qualification, can be easily modified to serve also as a low cost buoyancy material.

Forged Ends PIP is an innovative technology for PIP flowlines and risers, allowing an increased fatigue performance and minimization of the offshore installation time and costs.

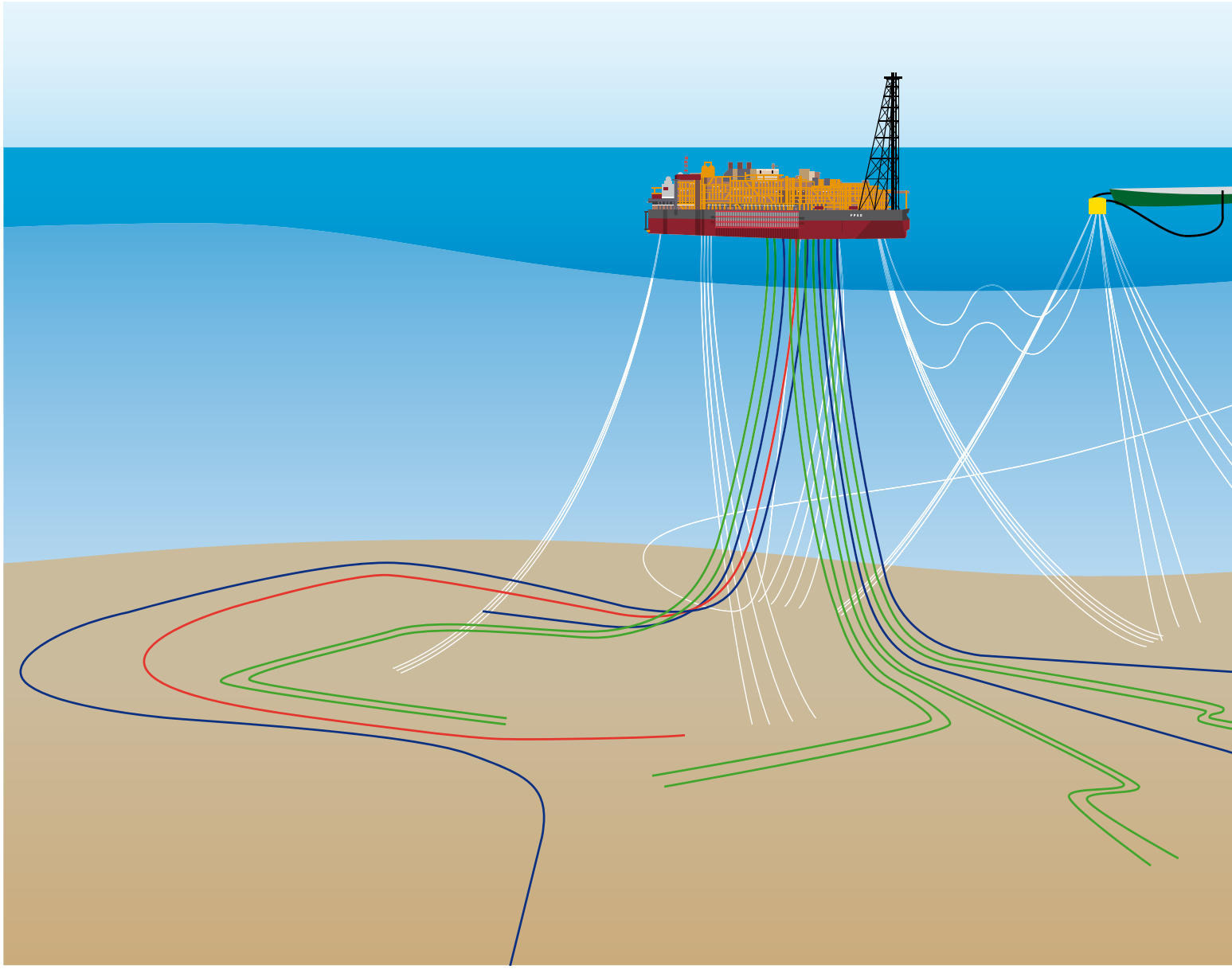


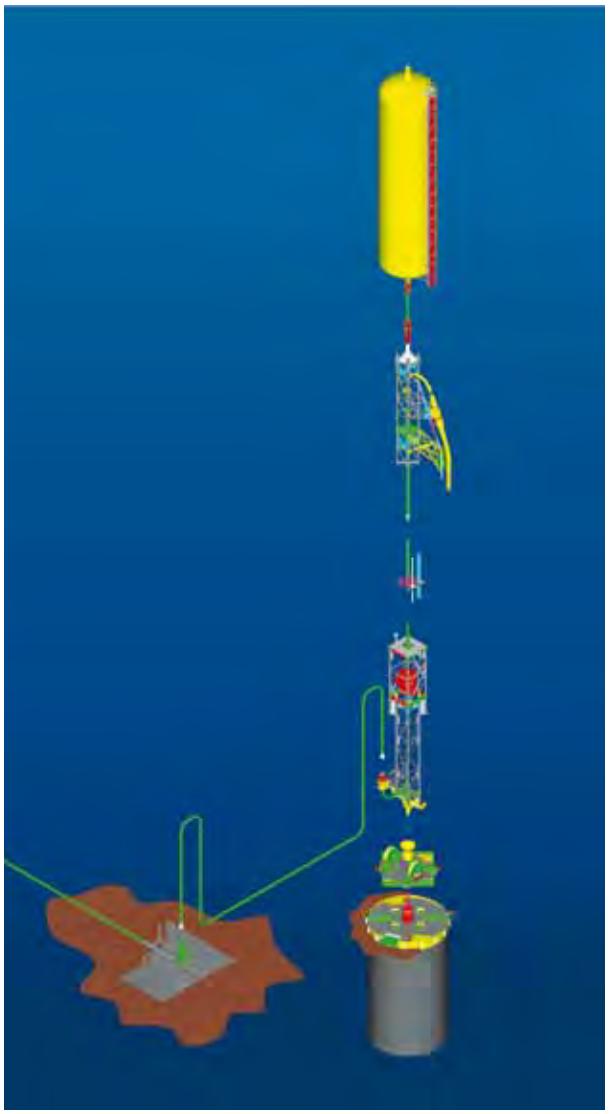
ULTRA DEEP WATER RISERS

FROM STEEL CATENARY RISERS TO SINGLE, PIPE-IN-PIPE OR BUNDLED HYBRID RISERS, FOR:

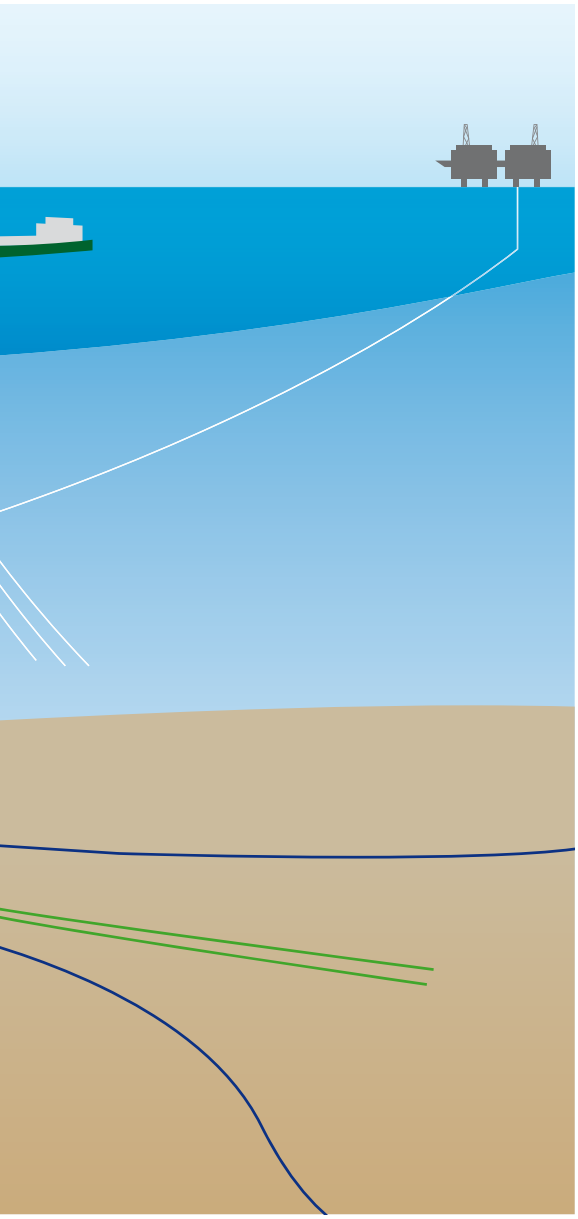
- Difficult environments
- Compact field layouts
- Phased and modular developments
- High thermal performances

The Steel Catenary Risers (SCR) were successfully designed and installed by Saipem in Walker Ridge (USA), P55 (Brazil), Akpo (Nigeria) and Diana Hoover (USA) projects.

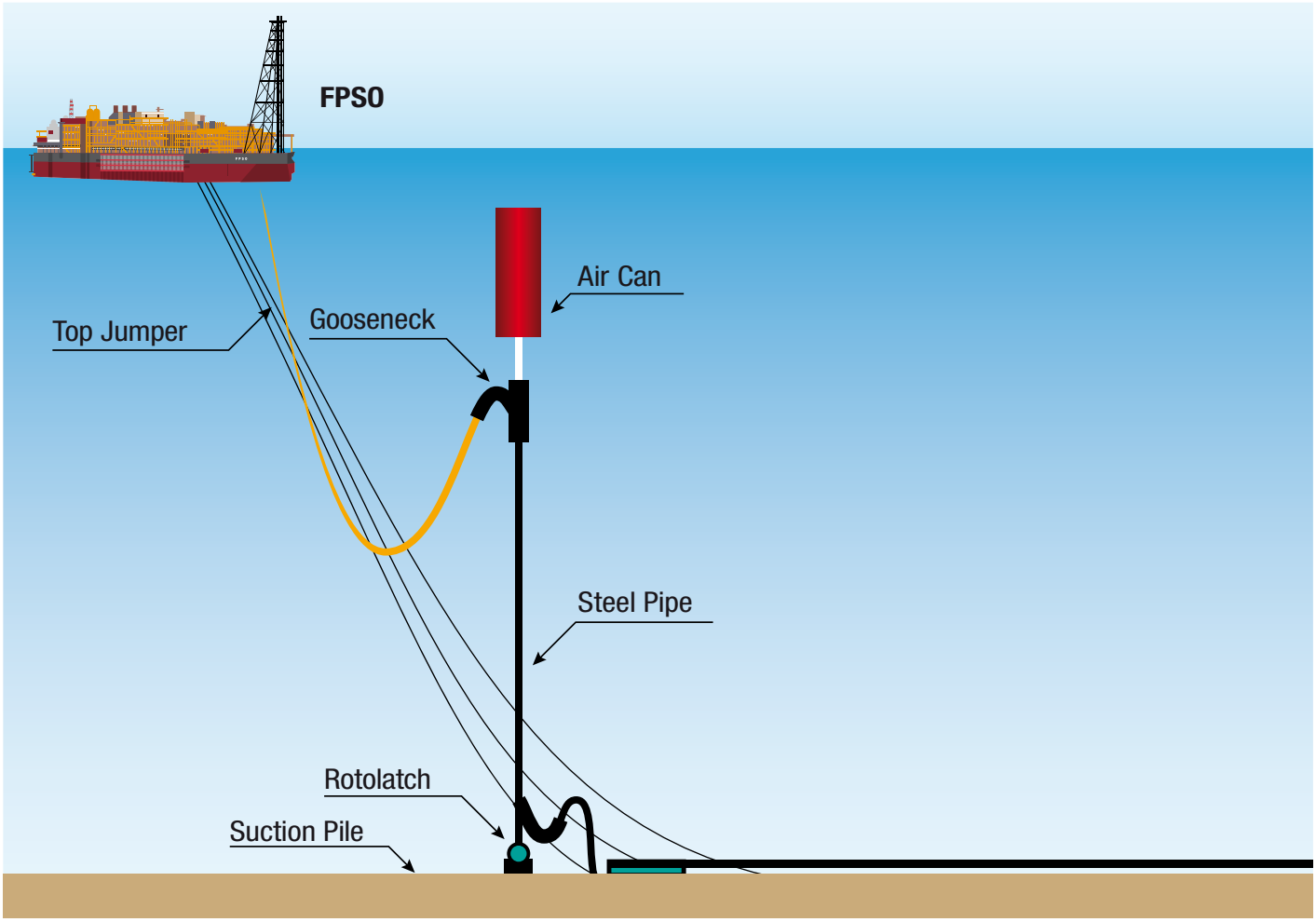




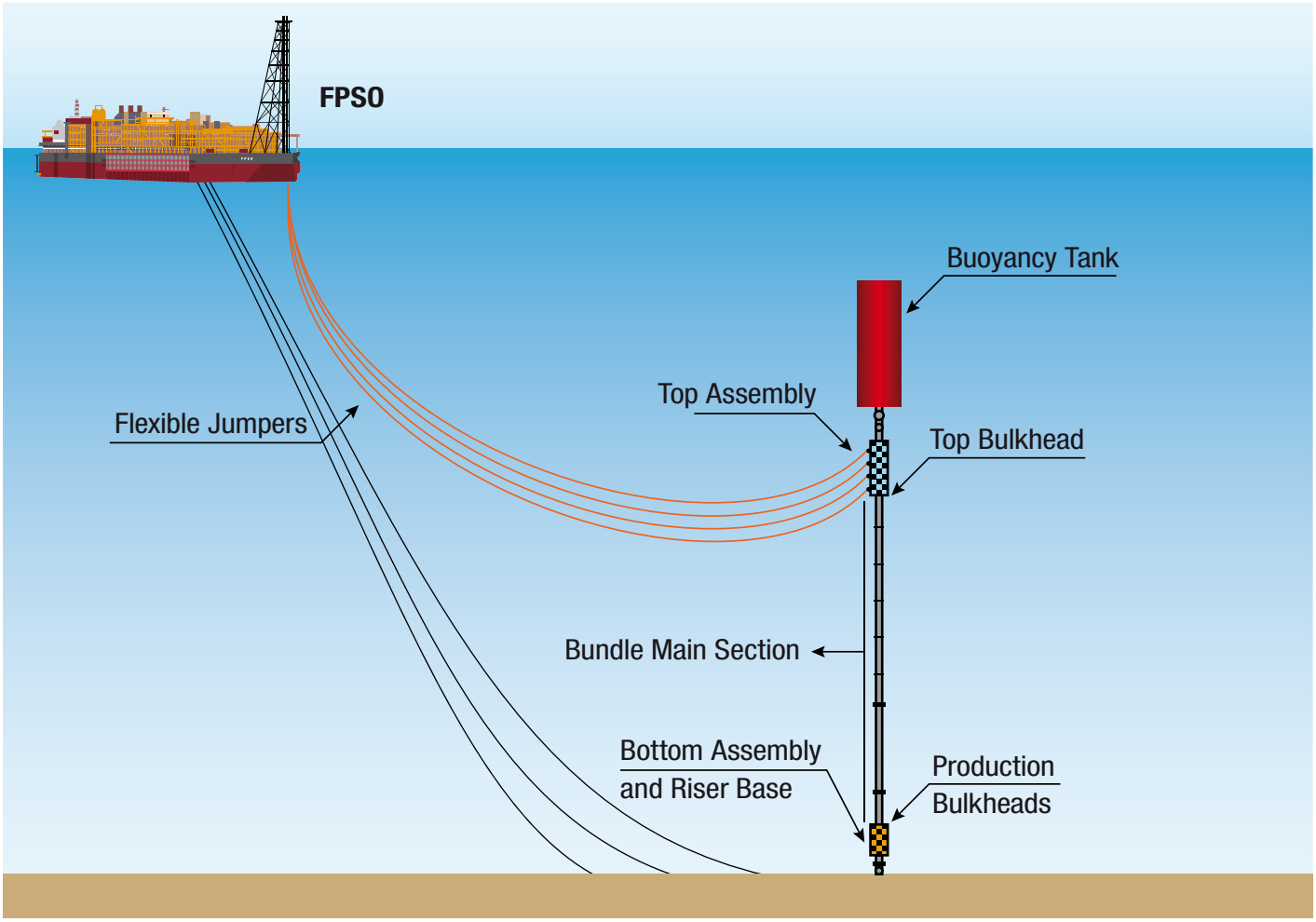
The Pipe-in-Pipe configuration of the SHR (PIP- SHR) allows a double service use in the same riser (e.g. production fluid in the inner pipe and gas lift in the annulus). Designed and installed by Saipem for the very first time on the Kizomba B Project, it has been recently adopted for the Usan Project.

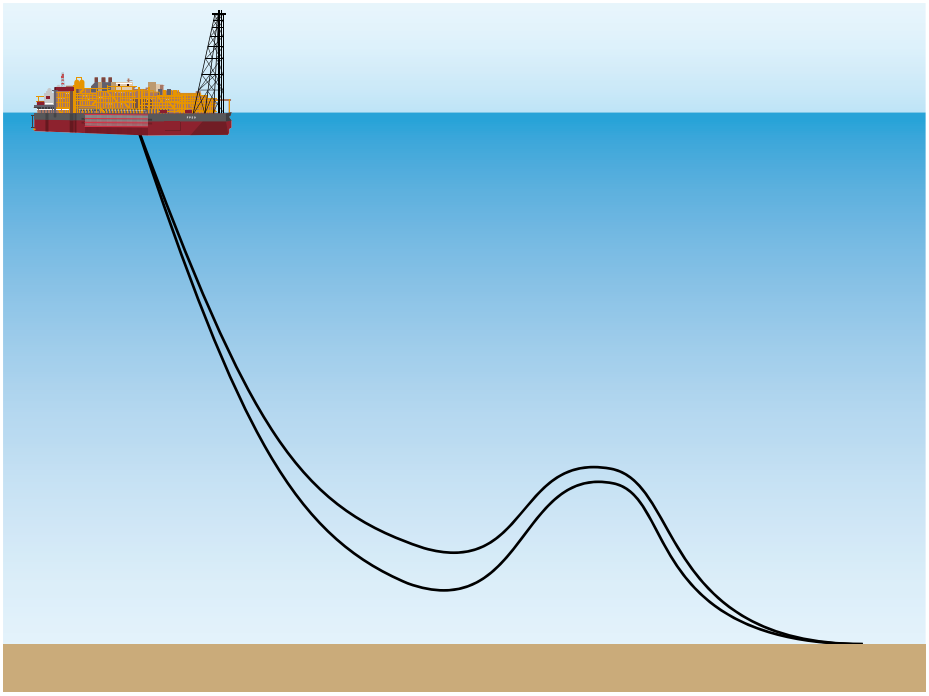


The Single Hybrid Risers (SHR) in its Single or Pipe-in-Pipe versions, decouples the riser from the vessel dynamic motions and allows developments where the conditions are not suitable for SCR. Previously applied by Saipem on the Kizomba A, Kizomba B, Usan and Kizomba Satellites EPC3 Projects, it is now being utilized also for the Gas Export of the Saphinoá Norte and Cernambi Sul Pre-salt fields in Brazil.



The Bundle Hybrid Offset Riser (BHOR) was firstly engineered, fabricated and installed in 2006 on the Rosa field (Block 17 offshore Angola) in 1,460 m water depth ensuring an extremely compact field layout and very high thermal performances. Housing in the same bundle 4 Production, 4 Gas Lift and 2 Water Injection risers, it's one of the biggest Riser Towers ever designed and installed.





The Steel Lazy Wave Riser (SLWR) concept, finally selected for the development of the Saphinoá Norte field (Brazil), relies on a buoyant section in the riser to provide flexibility and enhanced fatigue life, particularly in the touchdown area.

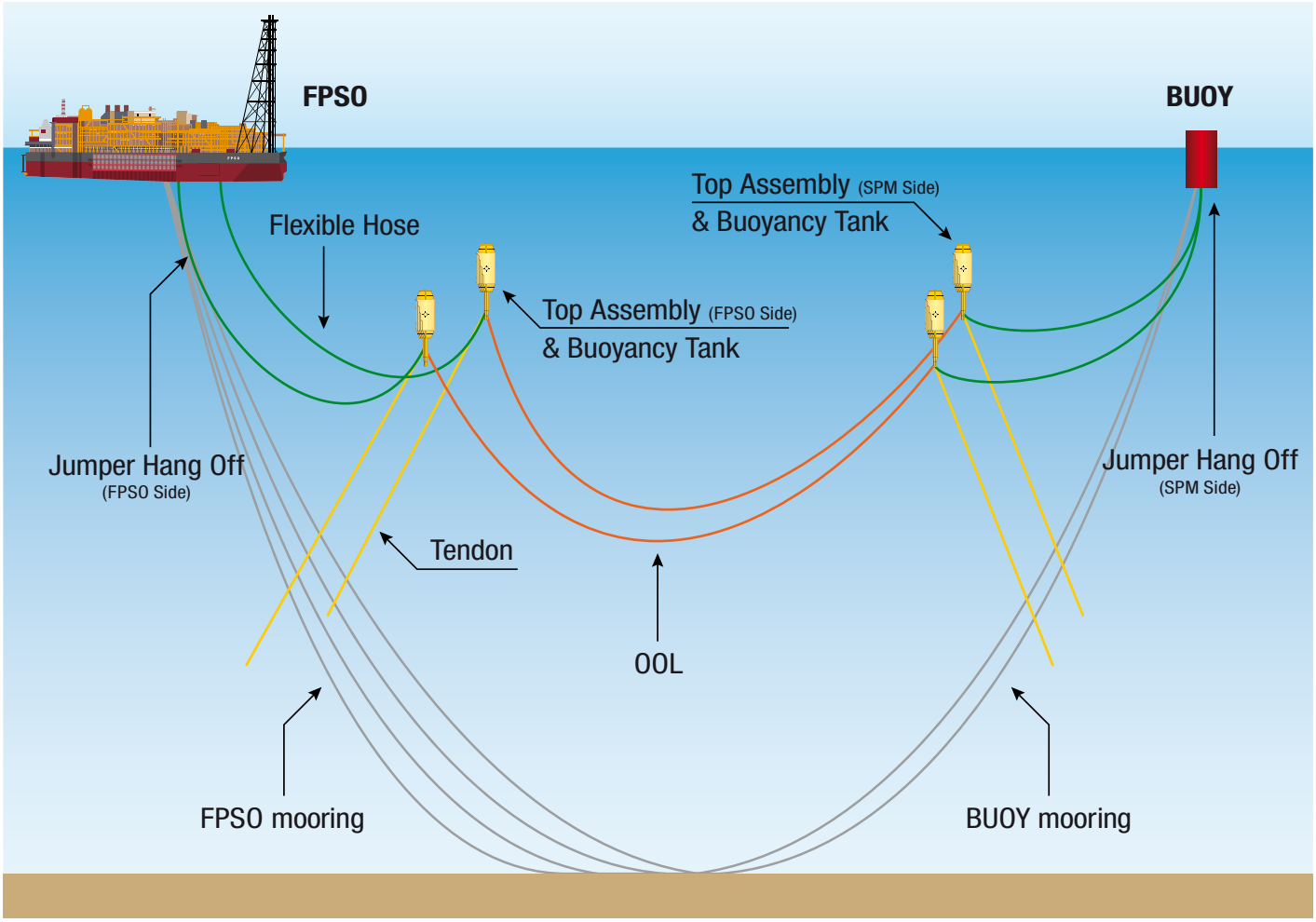
SINGLE POINT MOORING (SPM) AND OIL OFFLOADING LINES SYSTEMS (OOL)

TO ALLOW THE SAFE TRANSFER OF PRODUCED FLUIDS FROM THE FPSO TO THE EXPORT SHUTTLE TANKER.

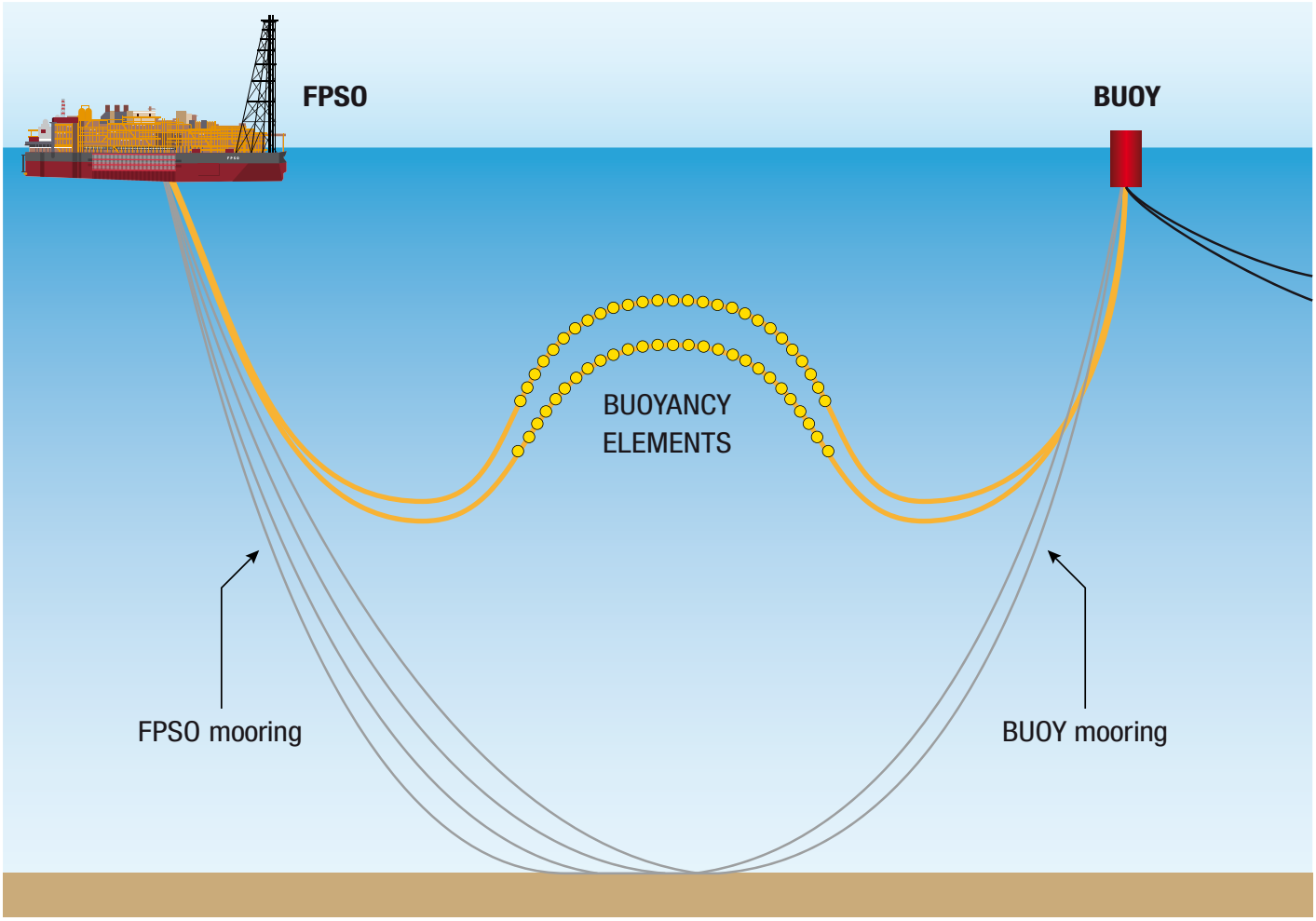
Saipem has developed and further improved this product during the years, establishing several industry records with the installation of:

- The first 16" mid-water OOL in 2000
- The world's largest (20") mid-water OOL in 2003
- The first pre-installable de-coupled 24" OOL in 2011 (Decoupled Hybrid Offloading System, DHOS).

The first DHOS was developed and installed by Saipem in 2011 for USAN Project.



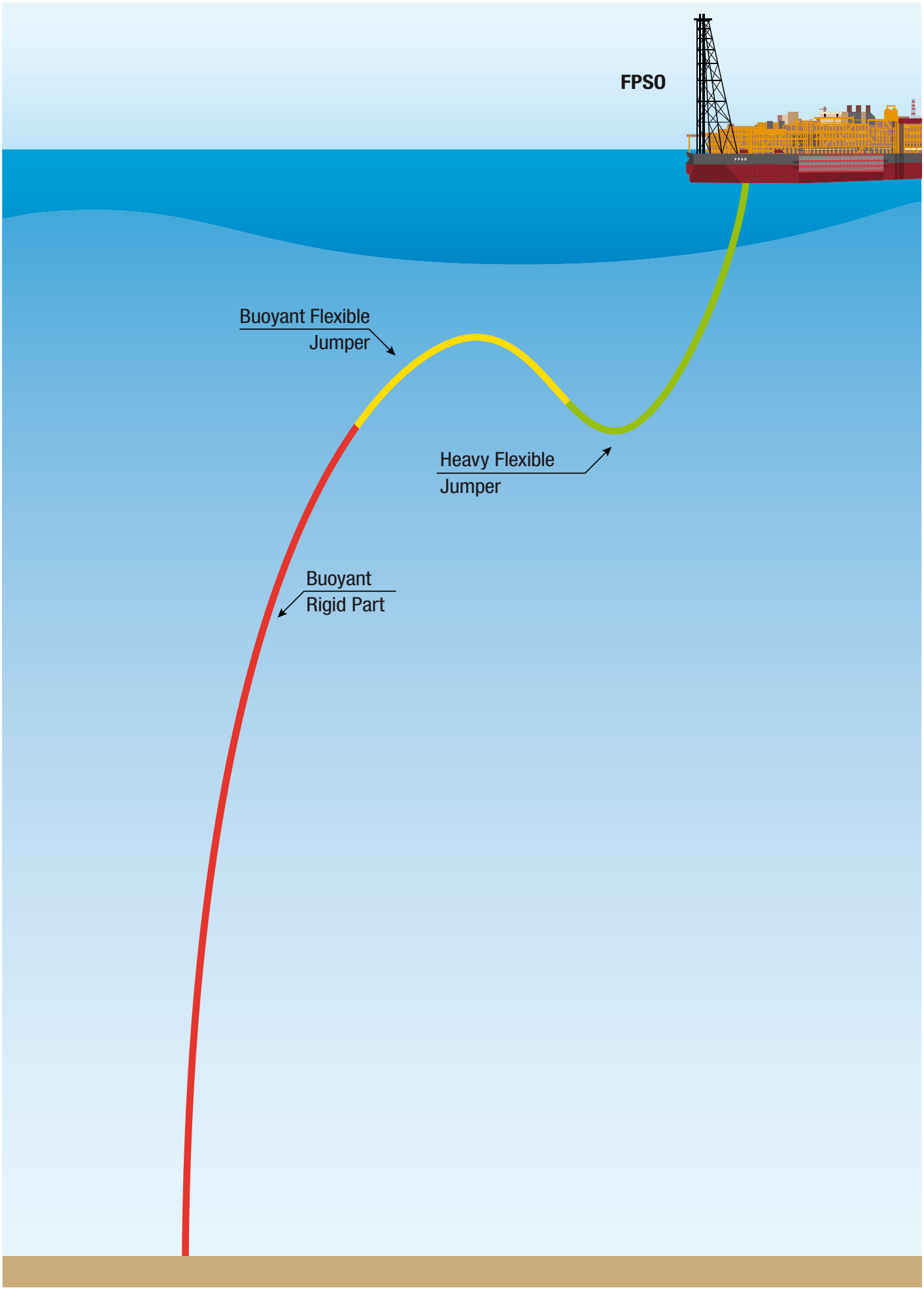
The installation midwater of the 20" Oil Offloading Lines of the Kizomba A project was a world record. The same concept is adopted for Akpo, Kizomba B and Girassol projects.



NEW CONCEPTS UNDER DEVELOPMENT: RISER SYSTEMS

THROUGH ITS MULTIDISCIPLINARY COMPETENCES, KNOW-HOW AND PROPRIETARY TECHNOLOGIES, SAIPEM IS DEVELOPING NEW RISER SOLUTIONS TO ADDRESS DEEPER WATERS AND MORE DIFFICULT ENVIRONMENTAL CONDITIONS, FOR THE MOST CHALLENGING APPLICATIONS.

The BIRD Riser Tower Concept, patented by Saipem, offers a very compact field layout, a long service life (low fatigue), optimized fabrication and installation arrangement contributing to a cost effective solution.



The Single Independent Riser (SIR®) Concept excluding the need of a buoyancy tank, constitutes the natural evolution of the top tensioned riser (SHR), further improving the dynamic behavior of the risers under extreme environmental conditions and ensuring a long service life and an easy maintainability.

NEW CONCEPTS UNDER DEVELOPMENT: SUBSEA PROCESSING

FOCUSING ON DEEP WATER AND HIGH PRESSURE APPLICATIONS.

GAS/LIQUID SEPARATION

The Vertical Multi-Pipe Separator is a robust technology based on several parallel pipes with reduced wall thickness for easier fabrication compared to a conventional gravity separator. Manifolds and pump modules are retrievable.

A Joint Industry Program is on-going with Total, Petrobras and Eni, including the definition and qualification of the whole subsea station as well as additional flow performance tests.

SUBSEA LIQUID/LIQUID SEPARATION AND PRODUCED WATER TREATMENT

SpoolSep for bulk water gravity separation with long residence time for better efficiency. Several pipes, working in parallel, are installed independently as standard spools: modular design allows easy maintenance and intervention.

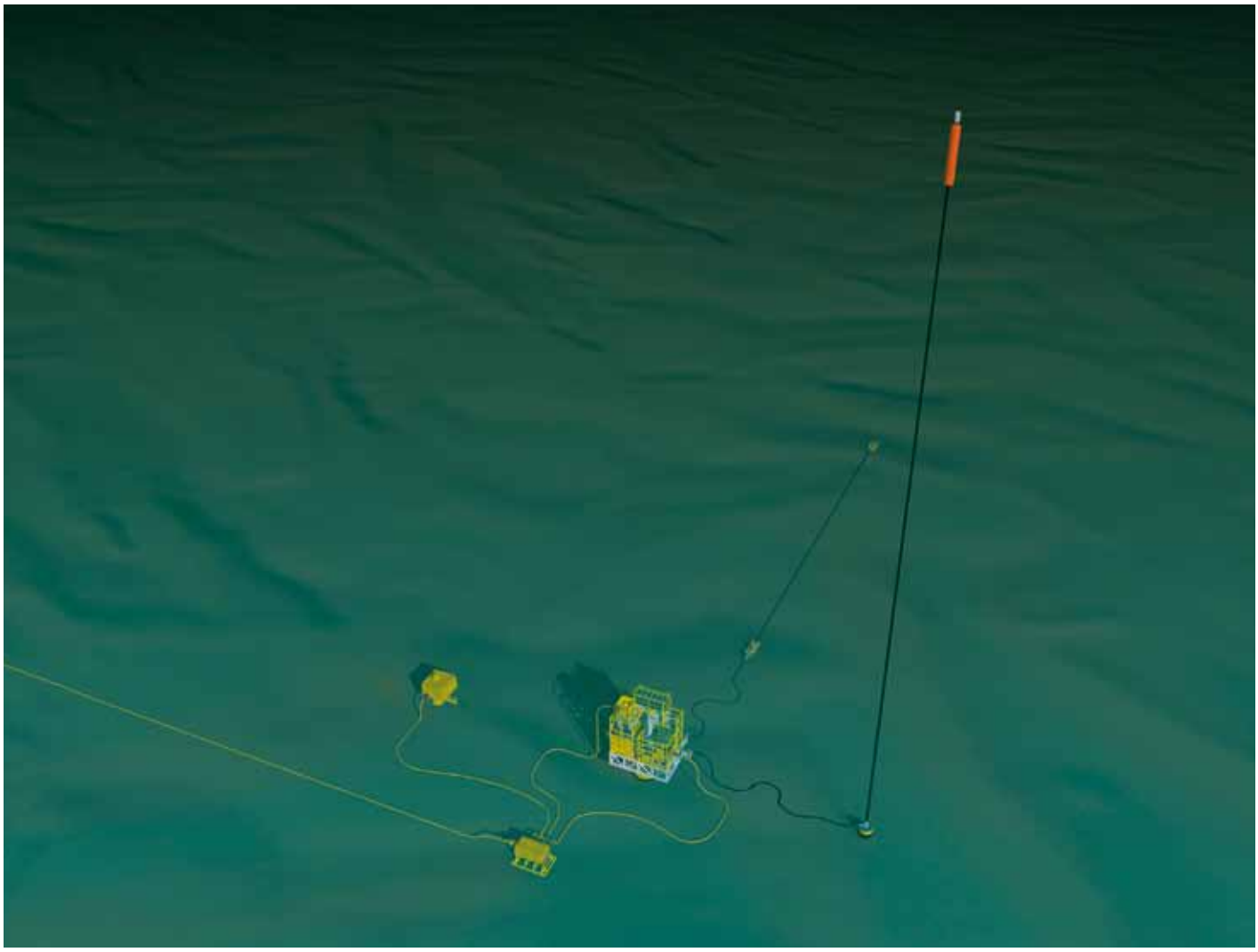
Qualification tests under way for water separation and sand management.

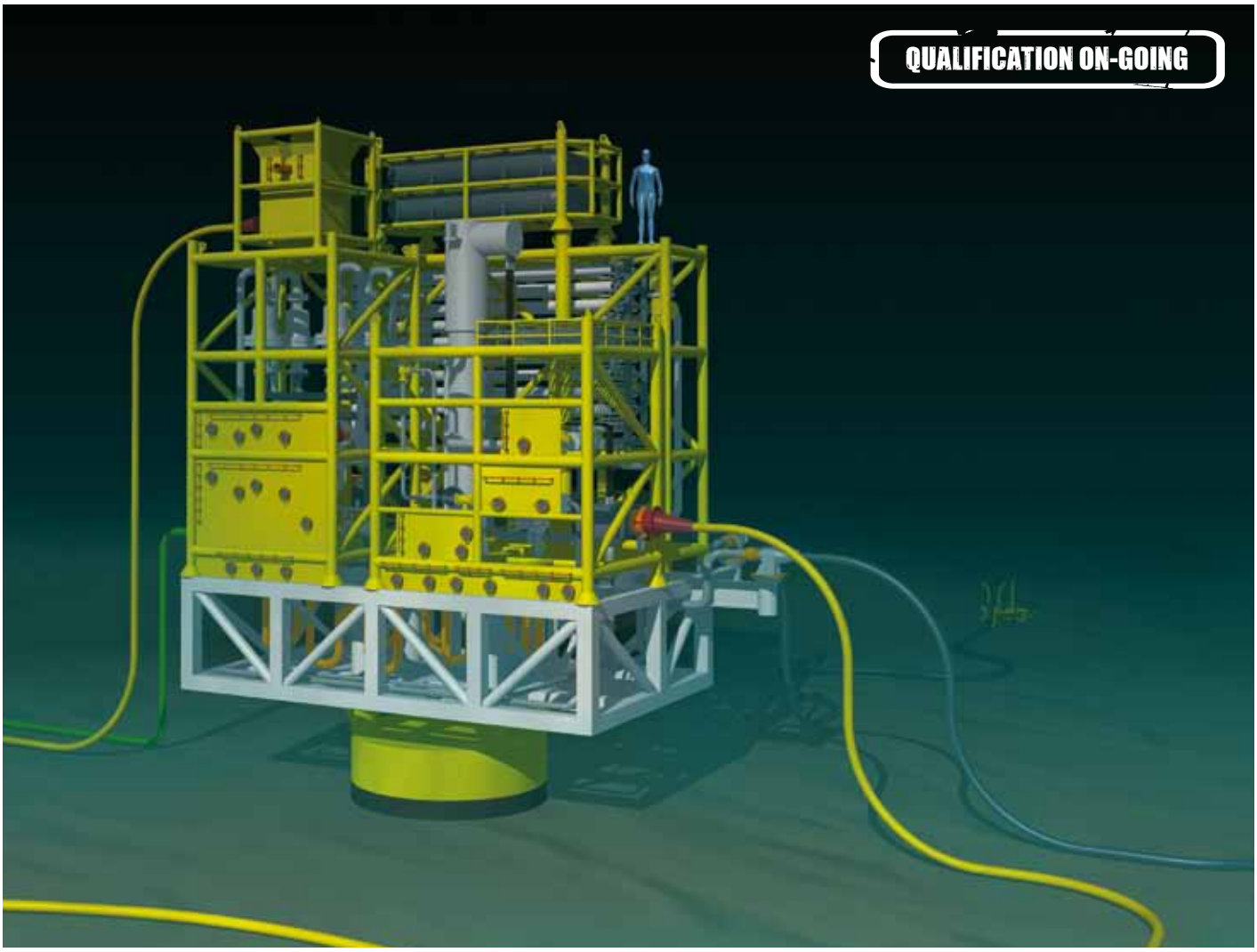
Subsea water debottlenecking station including bulk water separation with a spoolsep followed by water deoiling and desanding modules.

SPRINGS: SUBSEA SEAWATER TREATMENT FOR OIL FIELD WATER INJECTION

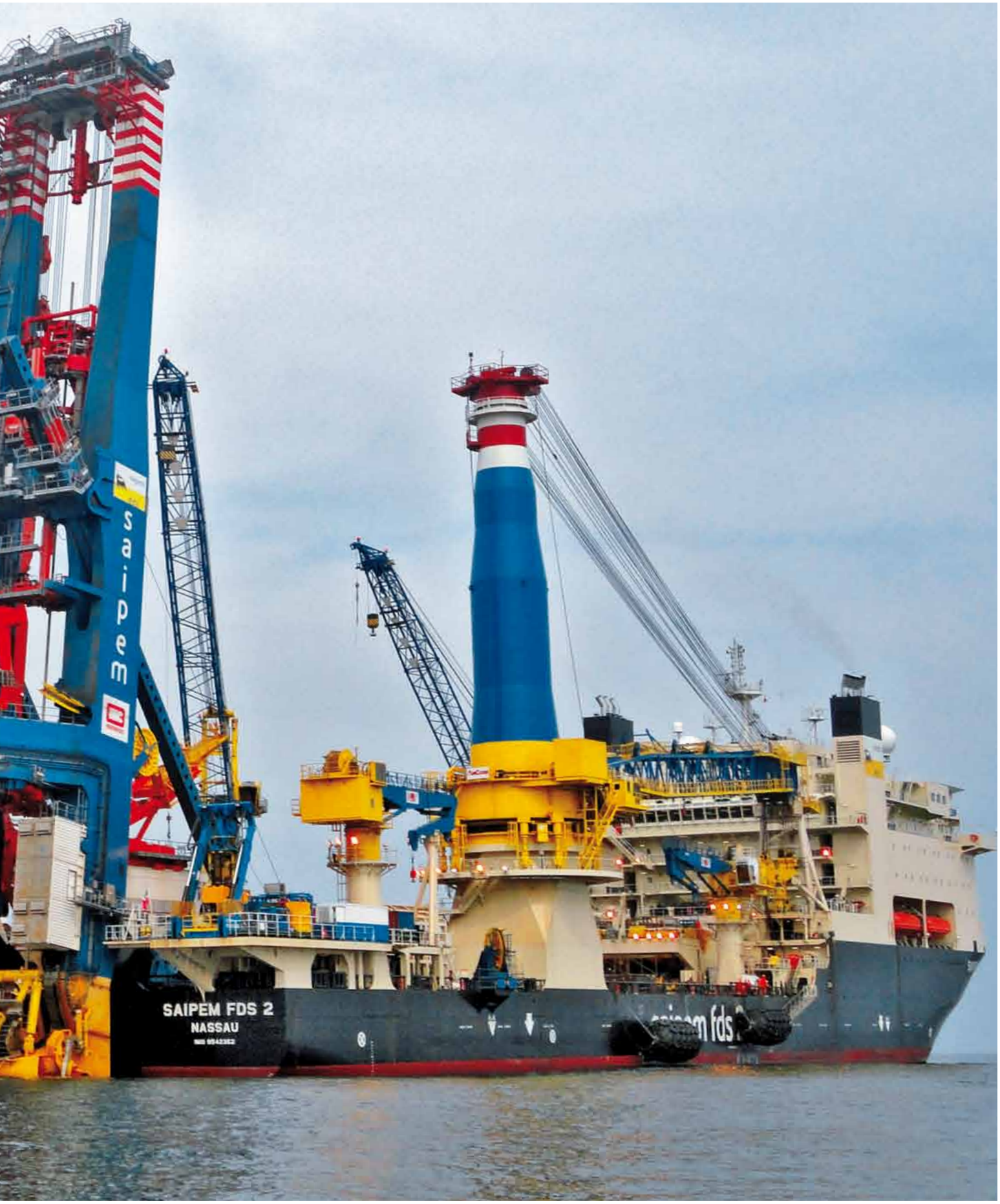
Collaboration program since 2007 between Total, Saipem, Veolia and Westgarth, SPRINGS improves the economics of marginal fields by suppressing the water injection network and minimizing modifications on the existing platform.

Designed for 3,000 m water depth, the SPRINGS 20,000 bwpd standard unit corresponds to the capacity of 1 or 2 water injection wells with a water specification of less than 40 ppm residual sulfates.




QUALIFICATION ON-GOING

DEEP WATER FIELD DEVELOPMENT PROJECT REFERENCES


saipem
SAIPEM FDS 2
NASSAU

PETROBRAS
SAPHINOÁ NORTE AND CERNAMBI SUL COLLECTION AND EXPORT SYSTEMS (BRAZIL)

Scope of work: Design, construction and installation of SLWR (Steel Lazy Wave Riser) for the collection system at the Saphinoá Norte field and Single Hybrid Riser (SHR) for the gas export systems at the Saphinoá Norte and Cernambi Sul fields, in water depths of about 2,200 m

Highlights:

14 km of 18" gasline

5,5 km of 20" gasline

4 PLETS

Contract: EPIC

Vessels employed: FDS2

Contract award: October 2012

Under Execution

↘ Utilization of the Guarujá yard for the fabrication of part of the risers system equipment.

BURULLUS GAS COMPANY
WDDM PHASE VIIIB DEVELOPMENT PROJECT
(EGYPT)

Scope of work: Expansion of the existing West Delta Deep Marine (WDDM) infrastructure with further seven wells in water depths ranging from 400 m to 1,100 m
Highlights:
38 km of 10" rigid pipelines
43 km of umbilicals
Fabrication of subsea structures - 1 manifold, 13 PLETs, 19 jumpers
Contract: EPIC
Vessels employed: FDS - Normand Cutter
Contract award: May 2011
Under Execution

Execution model replicating the concept already adopted successfully in previous projects:

- Project Management located in the Project Execution Center of Fano during the detailed engineering phase and then partially relocated to Egypt during the local fabrication phase

- Engineering team result of a combination of resources and skills from the Subsea Field Development Groups located in Fano and Paris.

HUSKY OIL CHINA LTD
LIWAN 3-1 GAS FIELD DEVELOPMENT (CHINA)

Scope of work: Subsea flowlines system, umbilical system, subsea structures in a water depth reaching about 1,400 m
Highlights:
2 main 22" gas export lines, 79 km long each, from 200 m to 1,400 m water depth
4 infield production flowlines for a total length of 13 km, from a water depth of 1,330 m to 1,440 m
1 infield production flowline 23 km long in an additional field
2 umbilical sections for a total of 79 km
Contract: EPIC
Vessels employed: FDS – FDS2
Contract award: April 2011
Under Execution

- First deep water project in South China Sea
- Heavy subsea construction tasks executed by the new vessel FDS2 to deploy approx. 400 t of manifold packages in 1,400 m water depth
- Numerous climatic challenges, from typhoons to high sea currents.

PETROBRAS
GUARA - LULA NE PIPELINES
(BRAZIL)

Scope of work: Rigid gas export pipelines, PLEMs, PLETs, jumpers at water depths up to 2,130 m
Highlights:
54 km, 18" pipeline connecting the FPSO Guara to FPSO Cidade de Angra dos Reis
22 km, 18" pipeline connecting the FPSO Lula NE to FPSO Cidade de Angra dos Reis
Contract: EPIC
Vessels employed: FDS2 - Normand Cutter
Contract award: April 2011
Under Execution

- Novel technical solutions focusing on structural long term integrity of the most critical elements of the field architecture, like the riser systems

- Utilization of exotic materials to prevent corrosion.

ENBRIDGE OFFSHORE FACILITIES LLC
WALKER RIDGE - BIG FOOT OIL EXPORT LATERAL PIPELINE (USA)

Scope of work: Oil export pipeline from Big Foot field development in Walker Ridge to a subsea tie-in in Amberjack Tahiti - Green Canyon; SCR, PLET in max water depth of 2,130 m
Highlights:
20" export line approx. 60 km long
1 SCR approx. 3 km long
Contract: T&I
Vessels employed: Castorone
Contract award: March 2011
Under execution

↘ First application worldwide of the new giant pipelayer Castorone.

PETROBRAS
P55 STEEL CATENARY RISERS AND FLOWLINES (BRAZIL)

Scope of work: Subsea system inclusive of subsea inter-connections (spools), SCRs and flowlines in water depths ranging from 1,500 to 1,900 m

Highlights:

16 SCRs - Each SCR is associated to a corresponding flowline section for a total of 50 km of risers and 25 km of flowlines

Contract: EPIC

Vessels employed: FDS2

Contract award: July 2010

Under execution

- Development and qualification of suitable welding and NDT procedures and equipment to ensure the necessary high quality of both onshore and offshore welding.

TOTAL UPSTREAM NIGERIA
EGINA FLOWLINES, RISERS, OFFLOADING SYSTEMS AND OFFSHORE WORKS (NIGERIA)

Scope of work: EPCI of the Umbilical, Riser, Flowline project scope and of the FPSO mooring system within the Egina field, located in the Nigerian block OML 130 at a water depth of maximum 1,750 m.

Highlights:

Five 23-29 km x 12"-14" Production and Water Injection flowlines
20 km x 14" Gas Export pipeline
8 Single Hybrid Risers (4 Pipe-in-Pipe) with related riser integrity monitoring system
2 unbounded 2 km x 20.5" w-shaped flexible oil offloading lines
16 FPSO suction piles anchors and 9 OLT buoy suction piles
3 umbilical arches systems with riser integrity monitoring systems
49 subsea structures, spools, jumpers

Contract: EPIC
Vessels employed: Saipem FDS 2, Saipem 3000
Contract award: April 2013
Under execution

↘ One of the most important field developments currently on-going in the Gulf of Guinea.

ESSO EXPLORATION ANGOLA
KIZOMBA SATELLITES EPC3 TIEBACKS PHASE 2 (ANGOLA)

Scope of work: Tieback of 3 new drill centres to the existing Kizomba B and C FPSOs in Angolan Block 15, in 1,350 m of maximum water depth.
Highlights:
37 km of production pipe-in-pipe flowlines
21 km of water injection flowlines
PLETS, FLETS, suction piles, jumpers
43 km of umbilicals
Contract: EPIC
Vessels employed: Saipem FDS, Saipem 3000
Contract award: December 2012
Under execution

↘ A further development of the Kizomba project series.

BURULLUS GAS COMPANY
WDDM PHASE IXA DEVELOPMENT PROJECT
(EGYPT)

Scope of work: In 850 m of maximum water depth, the project includes rigid flowlines, flexible flowlines, umbilicals, power and communication cables, manifold, jumpers, PLETS, tie-in spool bases, goose-necks, flying leads and other subsea structures.
Highlights:
57 km x 10"-12" rigid flowlines
2 km x 8"-14" flexible flowlines
80 km of umbilicals, 56 km of power and communication cables
1 manifold, 15 PLETS, 90 flying leads
Contract: EPIC
Vessels employed: Saipem FDS
Contract award: March 2013
Under execution

↘ A further development of the West Delta Deep Marine project series.

CHEVRON
WALKER RIDGE - JACK & ST. MALO EXPORT PIPELINE (USA)

Scope of work: In the Gulf of Mexico ultra-deep water plays at 2,140 m w.d., oil export pipeline from the Jack & St. Malo fields located about 500 km south of New Orleans.
Highlights:
24" export line approx. 230 km long
20" SCR approx. 4 km long
2 ILS
Contract: T&I
Vessels employed: Castorone
Contract award: November 2010
Under execution

↘ Castorone's debut in the Gulf of Mexico.

↘ Utilization of S-lay installation method in ultra-deep waters.

SHELL NIGERIA E&P
BONGA NORTHWEST – OPL 212
(NIGERIA)

Scope of work: Development of 12 subsea wells of Bonga Northwest, tied back into the Bonga main infrastructure, in water depths between 900 m and 1,200 m

Highlights:

4 production flowlines Pipe-in-Pipe for a total of 13 km

4 umbilicals for a total of 15 km

4 production manifolds

Contract: EPIC

Vessels employed: FDS - S3000

Contract award: Sept. 2009

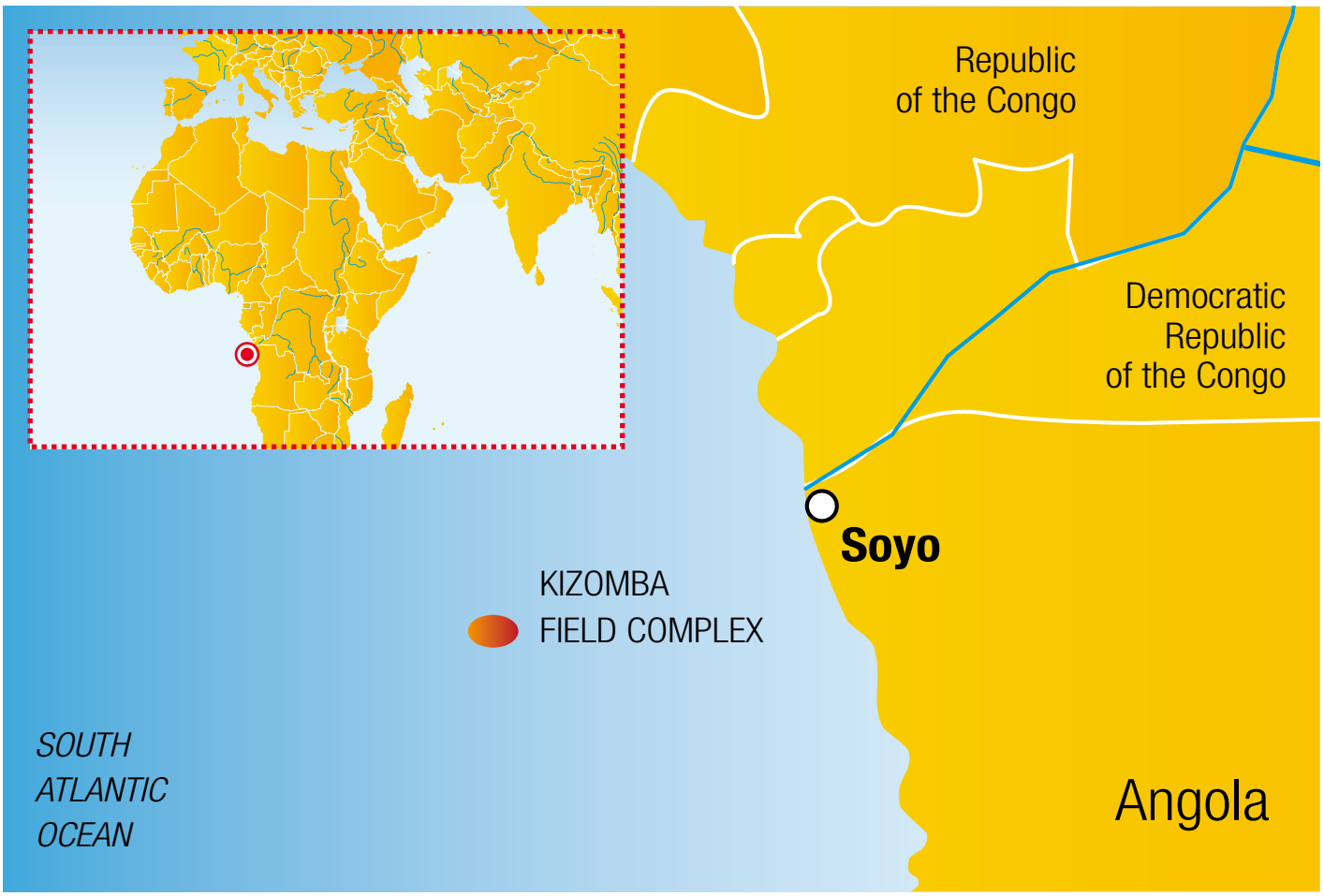
Under execution

- First deep water project awarded by Shell to Saipem in Nigeria
- First tie-in into the Bonga Main Infrastructure
- Entire Project Execution carried out in Nigeria.

ESSO EXPLORATION ANGOLA
KIZOMBA SATELLITES PROJECT EPC3 TIEBACK (ANGOLA)

Scope of work: Tieback of 4 new drill centers to the existing Kizomba A and B installations (Block 15) in water depths ranging from 1,000 m to 1,350 m
Highlights:
5 PiP 16"-10" production pipelines for a total of 49 km
4 water injection pipelines for a total of 38 km
2 PiP SHRs connected to Kizomba A FPSO and Kizomba B FPSO
18 FLETs and PLETs
Contract: EPIC of risers and flowlines; T&I of umbilicals, optical cables, manifolds
Vessels employed: FDS - FDS2 - S3000
Execution: 2009-2012

- Further development of the Kizomba A/B and Marimba Projects
- Construction activities in Ambriz, Soyo (Petromar) and Italy (Intermare Sarda)
- About 110 quad joints produced in Soyo for a total lenght of pipelines of approx. 52 km.



TOTAL E&P ANGOLA
BLOCK 17 GAS EXPORT PIPELINE PROJECT – PHASE 1 (ANGOLA)

Scope of work: Gas Export Pipeline system to transport associated gas from Block 17 Dalia and Girassol loop (1,200 m water depth) to an injection platform in Block 2 (40 m water depth), PLEMs, Tie-ins
Highlights:
24" pipeline 43 km long
16" pipeline section 67 km long
Contract: EPIC
Vessels employed: FDS, S3000, Normand Cutter
Execution: 2008-2012

↘ First high-pressure gas exporting system built entirely in deep waters and connected to another subsea system already in production (Gas Gathering Project).

ELF PETROLEUM NIGERIA
USAN
(NIGERIA)

Scope of work: URF system in a project consisting of subsea wells tied back to a moored FPSO in water depth ranging from 730 m to 800 m

Highlights:

More than 60 km of production and water/gas injection flowlines
7 SHRs, including PiP-SHRs
72 km of main umbilicals
Oil Loading Terminal - SPM Buoy and 2 Offloading lines
16 2 km long FPSO anchor lines

Contract: EPIC

Vessels employed: FDS - FDS2 - S3000 - Bourbon Pearl

Contract award: March 2008

2008-2012

- Record achieved: First Pre-installable De-coupled 24" Oil Offloading System

- First contract for the new FDS2 field development ship.

ENI E&P
FIRENZE FPSO
(ITALY)

Scope of work: installation of the mooring system of the Firenze FPSO, of flexible flexible risers and umbilical system in the Aquila field at water depths of 815 m

Highlights:

Installation of both the FPSO and the SURF system

Contract: Supply and Installation

Vessels employed: Normand Cutter

Execution: 2009-2011

↘ Subsea tie-in campaign and FPSO hook-up operations under difficult weather conditions.

PETROBRAS
URUGUA-MEXILHAO GAS PIPELINE
(BRAZIL)

Scope of work: Transportation of gas from FPSO Cidade de Santos in Urugua Field, in approx. 1,300 m water depth, to the Mexilhao Platform, in approx. 170 m water depth
Highlights:
Gas pipeline 175 km long, 18"
PLEM, PLET, tie-in spools
Contract: Engineering, installation and pre-commissioning of the 18" gas pipeline; EPIC of tie-in spools; supply of materials
Vessels employed: FDS, Normand Cutter
Execution: 2008-2010

↘ Important step for the Saipem presence in Brazil.

BURULLUS GAS COMPANY
SEQUOIA JOINT DEVELOPMENT PROJECT
(EGYPT)

Scope of work: Subsea equipment, umbilicals, flowlines, jumpers and spool pieces in water depth ranging from 70 to 570 m
Highlights:
5 flowlines 10" totalling 29 km
5 infield umbilicals totalling 29 km
1 main pipeline 24 km long, 22" - South Manifold to Rashid
1 main umbilical 24 km long
Contract: EPIC
Vessels employed: FDS - Bourbon Pearl - Normand Cutter
Execution: 2008-2009

- Very tight project schedule
- Many offshore operations to be performed simultaneously, because of the schedule constraint
- New facilities to be installed in a very congested area.

TOTAL UPSTREAM NIGERIA LTD
AKPO
(NIGERIA)

Scope of work: URF, mooring system, oil export system and gas export pipeline in max water depth of 1,350 m
Highlights:
16" gas export line 150 km long
10 infield lines for a total of about 35 km - as part of 4 production loops
4 water injection flowlines for a total length of 30 km
14 SCRs connected to FPSO
37 FLETs
31 spools
Offloading Buoy with its mooring system
2 export OOLs 2.7 km long each
Contract: EPIC
Vessels employed: FDS - S3000 - Bourbon Trieste - S355
Execution: 2005-2009

↘ Record achieved: Designed and installed the deepest (1,400m) Steel Catenary Riser (SCR) connected to a FPSO in West Africa.

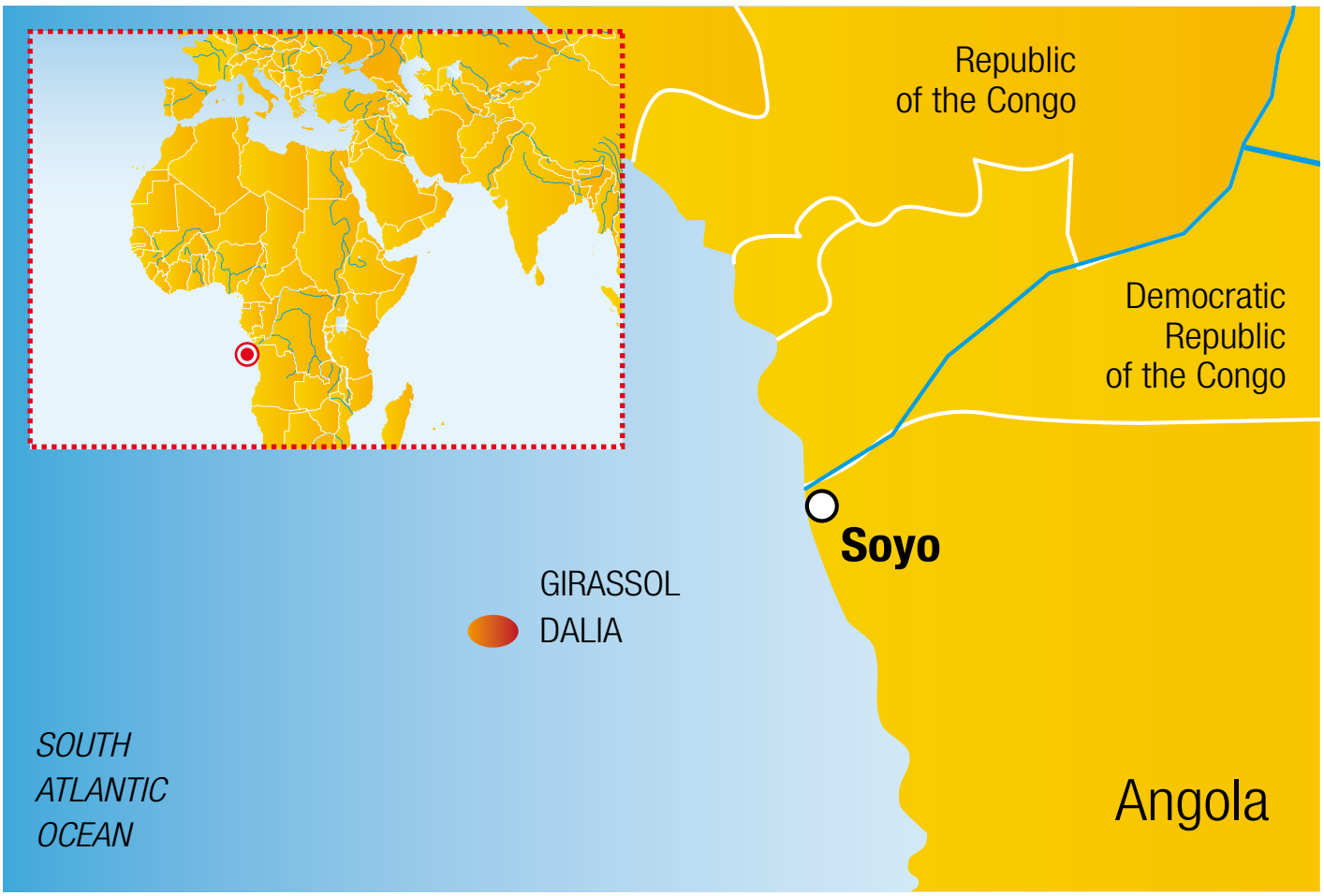
BURULLUS GAS COMPANY
WEST DELTA DEEP MARINE PHASE IV EPIC PROJECT (EGYPT)

Scope of work: Subsea facilities and control system for 8 additional wells to the existing Scarab/Saffron and Simian development fields in water depth from 400 m to 1,000 m.
Highlights:
7 coated flowlines with PLETs for a total length of 61 km
8 infield umbilicals for a total length of 68 km
2 manifolds
25 jumpers
Contract: EPIC
Vessels employed: FDS - Grampian Surveyor - Normand Cutter
Execution: 2006-2008

- Very tight project schedule
- Many offshore operations to be performed simultaneously because of the schedule constraint
- New facilities to be installed in a very congested area
- First deep water EPIC project executed in Egypt with an initial task force in Fano integrating the Group's capabilities.

TOTAL E&P ANGOLA
BLOCK 17 GAS GATHERING PROJECT
(ANGOLA)

Scope of work: Gasline and umbilicals to collect gas from Blocks 17 and 18 in water depths ranging from 1,150 to 1,370 m
Highlights:
Flowline 12", 9 km long
Umbilical about 3 km long
2 FLETs
4 Spools
Contract: EPIC
Vessels employed: FDS
Execution: 2007



ESSO EXPLORATION ANGOLA
MARIMBA NORTH EPC3 TIE-BACK-SYSTEM (ANGOLA)

Scope of work: Subsea tieback system of Marimba North field (Block 15) to the FPSO/TLP Kizomba A systems, including: flowline, water injection pipeline, gas injection pipeline, subsea umbilical, in water depth of 1,300 m

Highlights:

10/16" pipe-in-pipe production lines, two 10" injection lines with their respective jumpers for a total lenght of about 30 km

6 FLETs

Contract: EPIC

Vessels employed: FDS - S3000

Execution: 2005 - 2007

↘ Intermediate structures for the gas injection systems, FLETs and jumpers fabricated in Petromar yard (Soyo).

TOTAL E&P ANGOLA
ROSA SURF DEVELOPMENT
(ANGOLA)

Scope of work: URF contract for a tie-back to Girassol in water depth of 1,400 m
Highlights:
Production lines for 55 km
Water injection lines for 40 km
1 BHOR
Production umbilicals from FPSO to manifold for a total of 60 km
Approx. 23,000 tons of linepipes
Vessels employed: FDS - S3000
Contract: EPIC
Execution: 2003 - 2007

- Record achieved: Heaviest Bundle Hybrid Offset Riser tower ever installed (4,175 t), at a 1,200 m water depth

- Record achieved: World longest and heaviest rigid spool: 80/110 m - 30/40 t.

ESSO EXPLORATION ANGOLA (BLOCK 15) LTD KIZOMBA B TIE-BACK SYSTEM (ANGOLA)

Scope of work: URF, Oil Offloading system, FPSO mooring, control lines and manifolds in water depth up to 1,200 m
Highlights:
5 SHRs, including PiP-SHRs
25 km of Pipe-in-Pipe flowlines
SPM Buoy
2 OOLs diam 20"
Contract: EPIC
Vessels employed: FDS
Execution: 2002 - 2005

↘ Record achieved: First Pipe-in-Pipe Single Hybrid Risers (PIP - SHR), weighing 400 t, designed and installed in 970 m.

ESSO EXPLORATION ANGOLA (BLOCK 15) LTD KIZOMBA A TIE-BACK SYSTEM (ANGOLA)

Scope of work: URF, Oil Offloading System, FPSO mooring, control lines and manifolds in max water depth of 1,200 m
Highlights:
6 SHRs
6 flowlines totalling 17 km
SPM Buoy
2 OOLs diam 20"
Contract: EPIC
Vessels employed: FDS
Execution: 2001 - 2004

- Record achieved: First Single Hybrid Riser (SHR) designed and installed

- Record achieved: World largest Oil Offloading Lines (20-inch) installed midwater.

ELF EXPLORATION INC.
CANYON EXPRESS
(USA)

Scope of work: Flowlines and jumpers in water depths from 100 to 2,210 m
Highlights:
2 flowlines for a total length of 176 km
Contract: Detailed Engineering (Partial), Procurement (Partial), Transportation, Installation, Pre-Commissioning
Vessels employed: FDS
Execution: 2000 - 2002

↘ Record achieved: Deepest sealine laid in the Gulf of Mexico at 2,210 m water depth.

ELF EXPLORATION ANGOLA GIRASSOL (ANGOLA)

Scope of work: Export lines, jumpers, umbilicals in water depth of about 1,450 m
Highlights:
5 production umbilicals for a total of 29 km
Contract: T&I
Vessels employed: FDS
Execution: 1998 - 2001

- Record achieved: First 16-inch steel Oil Offloading Lines (OOL's) installed mid-water

- First job for the new FDS vessel, a ship specialized in new field developments.

EXXON COMPANY USA
DIANA HOOVER SPAR (DDCV) & FLOWLINES (USA)

Scope of work: Spar, pipelines and SCR installation in water depth of approx. 1,480 m
Highlights:
12 suction piles and mooring lines.
Connection of DDCV to mooring system.
Two 10" flowlines 15 km long.
One 6" flowline 15 km long
Five SCRs with diameters of 6"-10"-18".
Contract: EPIC
Vessels employed: Saipem 7000
Execution: 1997 - 2000

- Highest standards of safety achieved
- DDCV Hull weighting 34,000 t
- Installation of 2 Topsides modules for a total of about 16,000 t.

AGIP
FIRENZE FPSO
(ITALY)

Scope of work: Installation and hook-up of risers, umbilicals, subsea structures and tie-ins in max. water dephts of about 830 m for the Firenze FPSO in the Aquila field
Highlights:
ROV services
Contract: T&I
Vessels employed: Maxita
Execution: 1997 - 1998

↘ Firenze FPSO: 138,000 DWT vessel, moored by an 8-legged catenary system.

NOTES