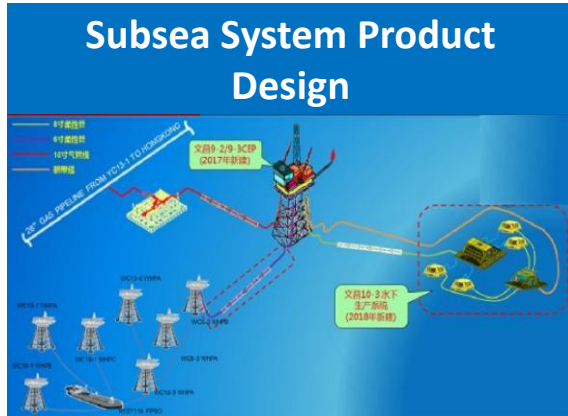


Products Research & Development Subsea Products





COOEC mainly provides a package of SPS solutions for owners, covering system design, product manufacturing and testing, offshore installation and commissioning technical support, operation and maintenance services, etc; Simultaneously providing key products and services such as subsea structures, XTs, and SCM etc. By continuously strengthening capacity building, COOEC is committed to building the world's third SPS one solution general contractor for SPS.



Subsea System Product Design

Domestic Leading

- Subsea Technology & Flow Support Design
- Subsea General & Drilling Center Layout Design
- Subsea Foundation & Structure Design
- Type Selection & Mechanism Design of Subsea Machinery
- Integrated Design of Subsea Control & Umbilical Cable
- Subsea Hydraulic, Electrical & Communications Design
- Subsea Material Selection & Anti-corrosion Design
- Subsea Product Design (Subsea Manifold, Subsea Distribution Unit, etc.)



Subsea Product Assembly & Testing

Domestic Leading

- SCM
- Christmas Tree
- Subsea Center Manifold
- Subsea Suction Pile
- Submarine Pipeline Terminal (PLET)
- Subsea Pig Launcher/ Receiver (PLR)
- Subsea Distribution Unit (SDU)
- Subsea Umbilical Terminal Unit (SUTU)
- Subsea Connector
- Subsear Multiplex Hydraulic Joint (MQC)
- ...



Subsea Facility Installation

1,500 meters water depth level international equivalent

- Subsea Christmas Tree
- Subsea Centre
- Suction Pile Foundation
- Submarine Pipeline Terminal (PLET)
- Subsea Distribution Unit (SDU)
- Subsea Umbilical Terminal Unit (SUTU)
- Subsea Liquid, Electricity, Light, Flying line
- Subsea Protection Structure...
- ...



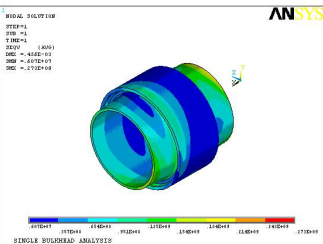
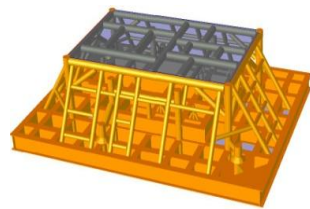
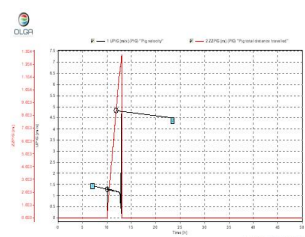
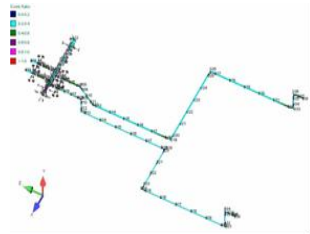
Subsea Engineering Service

Rapid Development

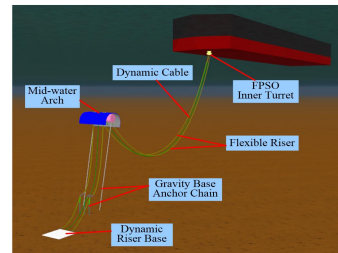
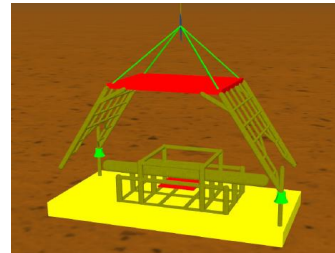
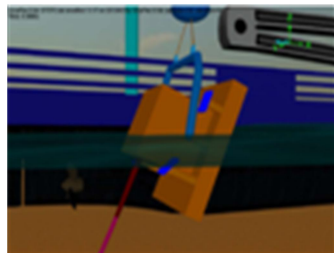
- Subsea Engineering Technical Services
- Subsea Precommissioning
- Digital Delivery and Digital Twinning
- Welding Plugging Soluble Paper Technology
- Subsea MEG Gel Technology
- Subsea Qquipment Test
- Subsea Demolition...

Cover the full development stage of subsea oil and gas field in shallow water, deep water, and ultra deep water, from design, manufacture, assembly to SIT, pr-commission and installation.

Subsea Business—Subsea Products Capacity



- Subsea System Thermal-Hydraulic Simulations
- Hydrate Prediction, Inhibition, and Remediation
- Wax & Asphaltene Management
- Slug Prediction and Slug Catcher Sizing
- Subsea Control System Electrical Analysis
- Subsea Control System Hydraulic Analysis
- Subsea Control System Communication Analysis
- Corrosion Control and Material Selection
- Piping Stress Analysis
- Subsea Structure Analysis
- Foundation Selection and Stability Analysis
- Dynamic Installation Analysis
- Umbilical In-place Stability Analysis
- Umbilical Installation Analysis
- System Cost & Economics Assessment

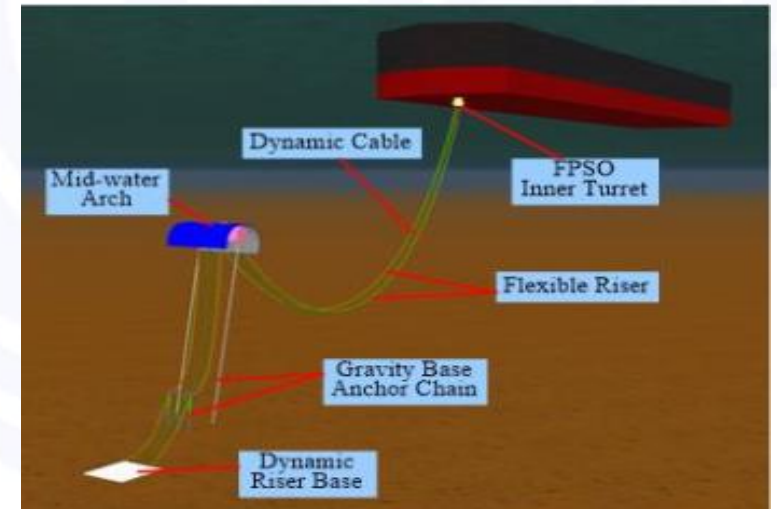
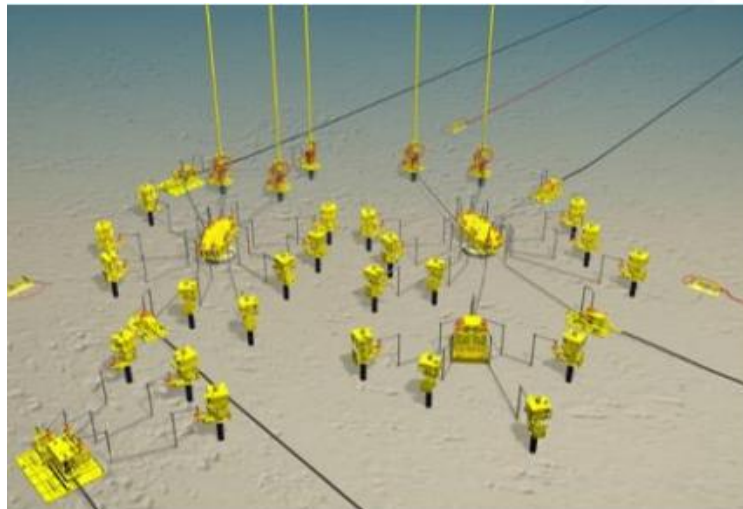


- Hysys
- Pipeflo
- PVT Sim
- OLGA
- SACS
- ANSYS
- Orcaflex
- DNV Spreadsheet Software
- Fluent
- Autopipe/Caesar II
- Offpipe
- Pipelay
- Simulation X
- AMEsim
- Solidworks

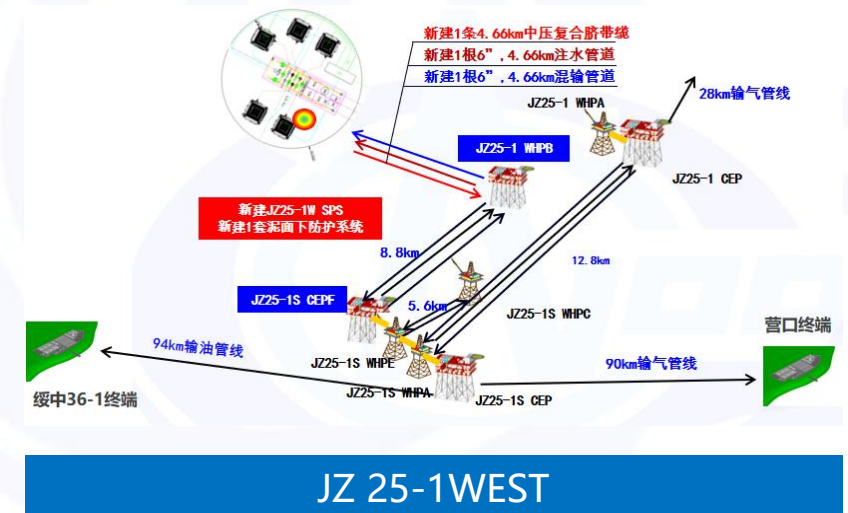


Subsea Business—Subsea Production System

- Provide complete subsea production system solutions for the feasibility study, conceptual design, FEED design, detail design, integration and SIT, including:
- Solutions for integrated subsea production system engineering
- Flow Assurance Analysis (Allying with designing institute)
- Trees+Wells Technical Scheme
- PLR、PLET、PLEM、Manifolds & Templates
- EFL and HFL, Connector Systems
- Subsea Control System and Umbilical
- Subsea Distribution Systems
- Subsea Isolation System (SSIV) and Subsea HIPPS System



- Analysis and design technology for power and communication systems, based on the number and distribution of oilfield group wellhead combined with drilling center layout, underwater electrical equipment window voltage, power consumption, etc., plan system block diagram and topology diagram, and verify the feasibility of communication scheme:
 - CAPS COP and other power line carrier communication analysis;
 - Close range DSL communication scheme; Calculation of attenuation for long-distance fiber option communication based on ITU-T G.654&652 standards;
 - The power calculation capability under extreme working conditions under complex underwater topology conditions;
 - The calculation of various power window parameters of the upper power supply system;
 - Based on the power supply system capability, verify the selection and adjust unreasonable umbilical or flying line parameters.
- Engineering design technology for umbilical.
 - Functional requirement design for umbilical and accessories;
 - Overall layout design and routing design for umbilical
 - Routing crossing design for umbilical near platform
 - Stability Analysis for umbilical-AGA, DNV109
 - Installation Analysis for umbilical-Orcaflex



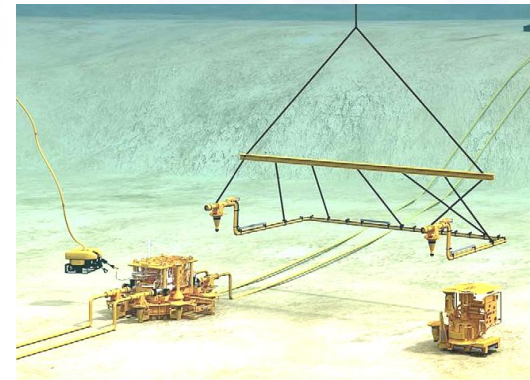
- Product Introduction: Jumper is a part of the subsea gathering and transportation system, which is a connecting channel between subsea production facilities, such as subsea trees, subsea manifold and PLET etc. Typical jumper includes: subsea connectors/flanges, subsea pipe and anodes. According to different function requirements, the jumper also includes VIV strake, insulation, buoyancy module or monitoring facilities.
- Performance Parameters: Max. water depth (1,546m), max. pipe diameter (20"), max. design pressure (38MPa).
- Feature Advantage: Cover series of products, including vertical and horizontal jumper with subsea connectors/flanges.
- Capability: Fully master the technology of design, fabrication, assembly, factory testing, integration testing and offshore installation of Jumpers, the max. water depth of as-built project reached to 1,500m.



Horizontal Jumper



Jumper with VIV Strake



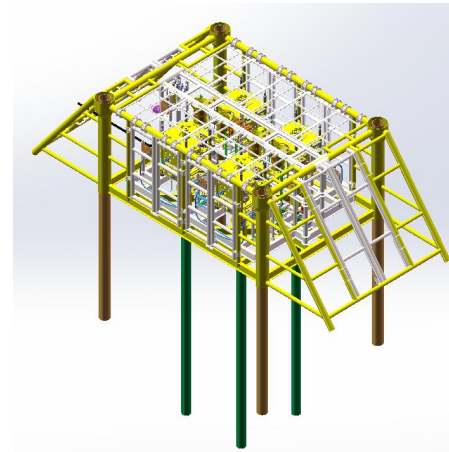
Deep Water Horizontal Jumper



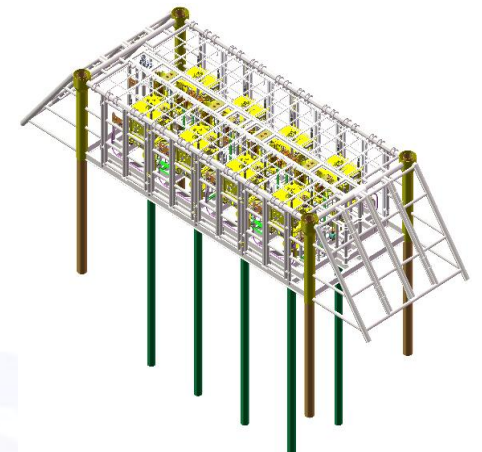
Deep Water Vertical

Subsea Business—Shallow Water Based Manifold

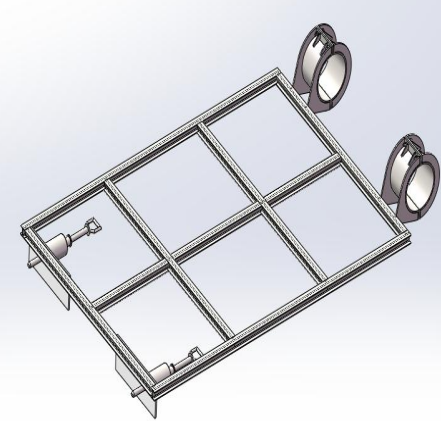
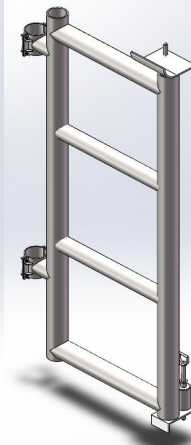
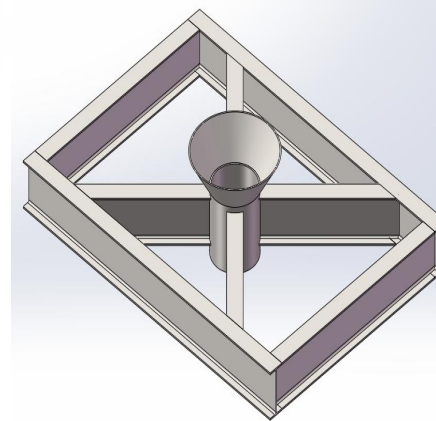
- **Introduction:** Shallow water based manifold is an independently developed by COOEC, suitable for self elevating drilling vessels , with full intellectual property rights.
- **Performance parameter:** Maximum depth (100m) , Maximum design pressure (34.5MPa) , Maximum wells (8 Sets) .
- **Characteristic advantages:** Independent intellectual property rights; Suitable for heavy fishing areas; Suitable for self elevating drilling vessels; Cover Max. 8 wells for one Jack-up elevation ; Standardized component for swift supply; Retrievable module for easy maintenance.
- **System capability:** Compared with traditional manifolds, base plate manifolds are beneficial for centralized drilling to reduce drilling vessel displacement. Meanwhile, centralized protection measures can be adopted to reduce installation cost, improve protection effectiveness, especially suitable for oil and gas field development in fishing operation areas, waterways, and sensitive areas. COOEC has complete underwater manifold design, manufacturing quality assurance system, and testing system; Combining with offshore oil engineering's self-owned underwater oil trees, underwater control modules, main control stations, power supply units and other products, COOEC can provide general contracting services for underwater production systems, reduce interface management for engineering development projects, and reduce management risks.



4-Slot Template Manifold



8-Slot Template Manifold



Standardized Template Components

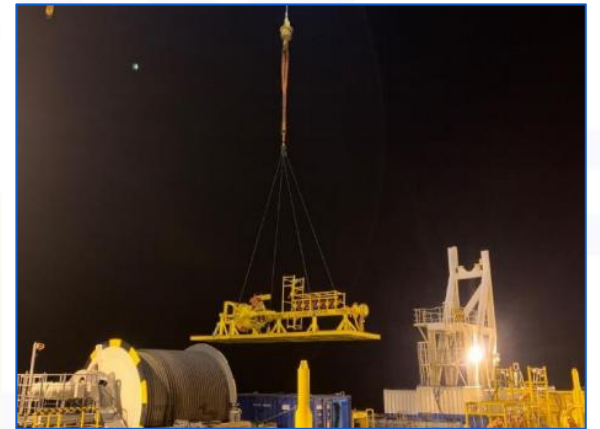
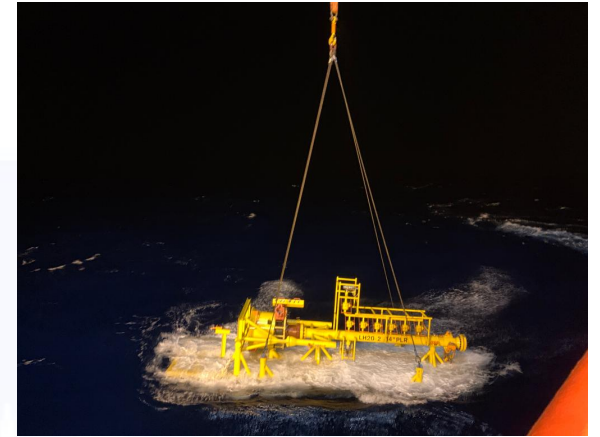
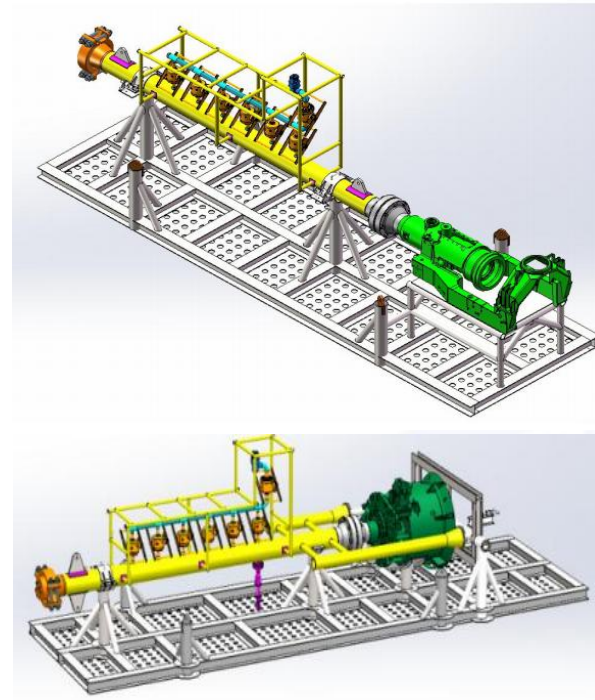
Subsea Business—Subsea Pig Launcher Manifold

- **Introduction:** Subsea pig launcher manifold is developed by COOEC independently, with complete intellectual property rights and DNV certificated. It's a modular designing subsea production, which composed of mudmat, top module and automatic pig launcher. This subsea pig launcher manifold can be automatic controlled by SCM, which not only has the function of collecting and transporting oil, gas and MEG, but also can realize long-term automatic pigging or external intervention pigging operation, effectively reducing the pigging operation cost of subsea oil and gas field.
- **Performance Parameter:** Maximum depth(1,000m),Maximum pipe diameter(20"),Maximum design pressure(38MPa),Pigging Numner(6Sets).
- **Characteristic advantage:** Independent intellectual property rights; Mature design solutions that can quickly customize complete sets of equipment; Compatible with foam ball, straight ball and smart ball; The pipe diameter covers 6 inches to 20 inches; Multiple recyclable modules are more conducive to product maintenance.
- **System capabilit:** Subsea Pig Launcher Manifold can achieve autonomous remote ball serving control underwater, greatly reducing the cost of deepwater oil and gas development, and providing new technological breakthroughs for the economic and efficient development of deepwater oil and gas. COOEC has complete design, manufacturing quality assurance system, and testing system for Subsea Pig Launcher Manifold; Combining with self-own subsea manifold, subsea distribution, subsea tree, master control station, power supply unit and other products, COOEC can provide the total contract service of subsea production system, reduce the interface management of engineering development projects and reduce management risks.



Subsea Pigging Launching and Receiving Device(PLR)

- **Introduction:** The subsea pigging launching and receiving device (PLR) plays an important role in the development and application of oil and gas fields as the necessary equipment for pigging in the pre-commissioning stage and regular pigging in the production process. Typical PLRs include: underwater connectors, ball cylinders, kicking lines, underwater temporary valves, injection interfaces, end flanges, etc
- **Performance Parameter:** Maximum depth(1,546m), Maximum pipe diameter(18"), Maximum design pressure (38MPa).
- **Feature Advantages:** The localization can reach 100%; COOEC has formed a series of multiple types of PLR products, including "one" type, "I" type, "L" type and other forms of PLR and its supporting wet storage framework, which can meet various forms of connection and installation needs.



Patents

Subsea Business—Pipeline End Termination(PLET)

- **Introduction:** PLET located at the end of the subsea pipeline, connecting the subsea pipeline and subsea production facilities through jumpers. According to different installations, Cover series of products that meet the lifting installation, S-Lay, PLS Installation, J-lay and Reel-lay. With different connection methods, there are submarine pipe diver flange connection and no underwater connector connection. The terminal products of offshore oil engineering submarine pipelines have been approved by multiple internationally renowned third-party machinery companies and have obtained product certificates.
- **Performance Parameter:** Max. water depth (1,546m), max. pipe diameter (30"), max. design pressure (38MPa).
- **Characteristic advantages:** The localization rate can reach 100%; Mature and standardized design solutions can meet various installation forms such as hull side, S-Lay, J-Lay, Reel Ray, etc. It can customize various styles such as integrated, split, and folding system capabilities: Comprehensively mastering the terminal of design, manufacturing, final assembly, factory testing, integration testing and Offshore installation technology for shallow water, deep water, and ultra deep water submarine pipelines.



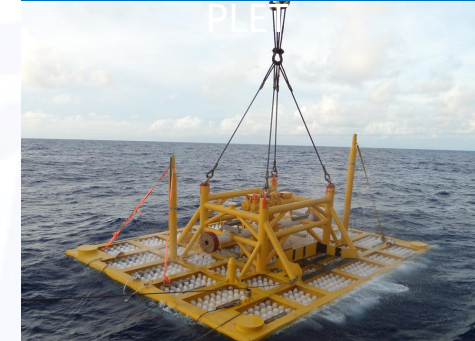
1,500m J-lay PLET



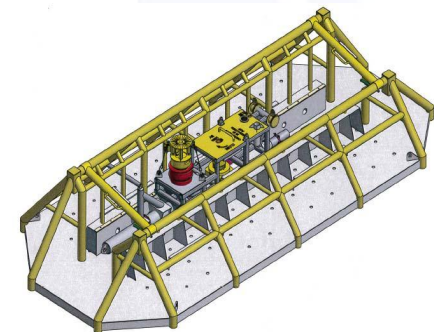
1,500m PLS Installation



14in S-lay Folded PLET



PLET Installation by Lifting



PLET with Separated Foundation



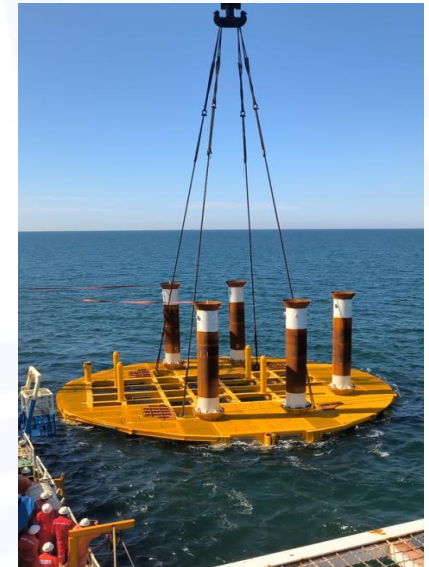
4.5in S-lay Folded PLET
1,500m depth

Subsea Business—Steel Cylinder Protection

- **Introduction** : Product:Steel cylinder protection is a type of steel cylinder device that provides protection for subsea production systems below the seabed surface. It is suitable for oil and gas field development plans in restricted areas such as navigation areas, avoiding sea use issues. The subsea production system is moved to the space below the seabed surface, and all engineering facilities are not higher than the seabed surface.It can protect the subsea production systems internal of the Steel cylinder to avoid the risk of ship anchoring and falling objects.Including four parts: cylinder body, inner base, top-cover and hatch cover.
- **Performance Parameter** :The maximum diameter of the applied cylinder is 24 meters, which can withstand a peak pile shoe squeezing pressure of 150KPa, and it can meet the requirements of 12 APE600 vibration hammers for vibration settlement;The maximum anchor protection capacity is 18.4t, and the anchor dropping speed is 7.64m/s.
- **Feature Advantages**: The steel cylinder can sink below the seabed surface, moved to the space below the seabed surface to avoid sea use issues;High strength steel cylinder, and can withstand a certain amount of soil squeezing pressure from the pile shoes of the drilling vessel and the settling force of the vibration hammer;High strength top cover, and can withstand a certain amount of anchor load, and has sediment prevention function;The internal template can provide a foundation for subsea production systems and has the function of guiding and positioning the installation of conductors;The cylinder and the template, as well as the cylinder and the top cover, have assembly guide designs for easy subsea installation.

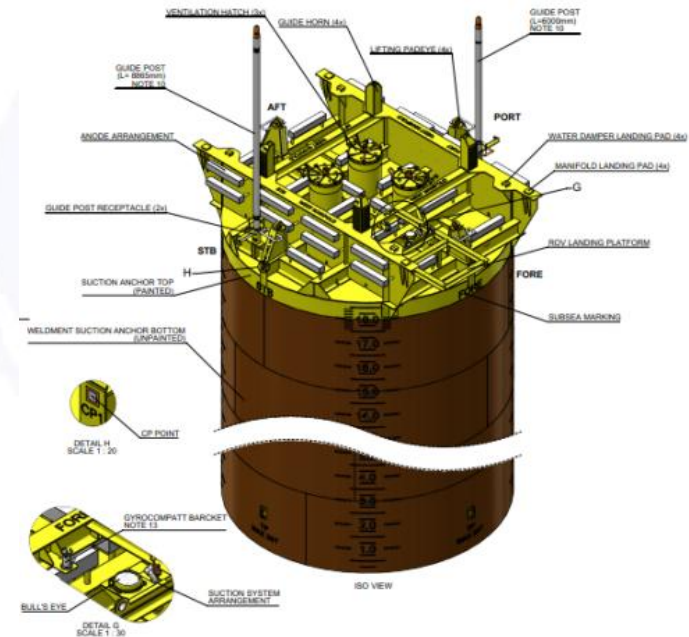


Steel cylinder protection
Under Mud

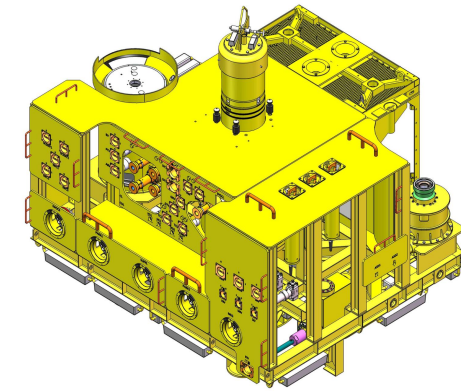


Subsea Business—Suction Pile Foundation

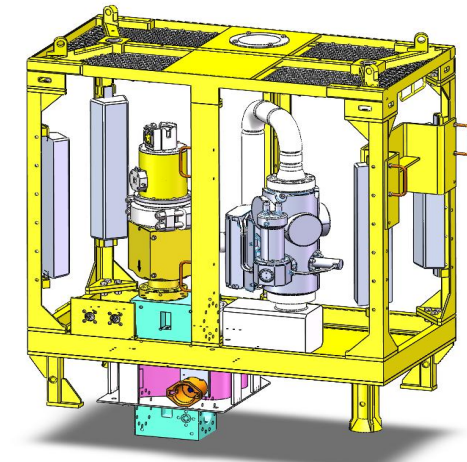
- Introduction of the Product: Suction pile foundation is among the most popular foundation types for subsea production facilities. Unlike mooring suction anchors, which are mainly subjected to lateral and upward pull forces, suction piles for subsea production facilities are mainly subjected to compression and lateral and torsional loads.
- Advantages of the Product: Deep-water seabeds are often covered with very soft clay soils and require a matching type of subsea foundation to ensure the safe and reliable operation of large-scale underwater processes. Suction pile foundation can access deeper soil layers with higher strength which can provide stronger geotechnical support. When the settlement of the mudmat foundation scheme is too large or its calculated mudmat size exceeds the installation vessel allowance, the suction pile foundation scheme can be considered.



- **Introduction:** It is a subsea horizontal tree, independently developed by COOEC for 2,000-meter depth oil and gas fields, of which core components are self-developed with complete intellectual property rights and The core components and assemblies of the Subsea Tree are certified by DNV.
- **Performance Parameter:** Maximum water depth (2,000m) , Design pressure (69MPa) , Control Model (Electro-hydraulic Control) , Recyclable Module (SCM, FCM, CIMV×3, ASD×1) .
- **Feature Advantages:** The localization can reach 95%; Mature standardized modules enable to rapid customize complete sets of equipment; The vertical channel of the tubing hanger can be adjusted between 4 " to 7 " , and the 4 " and 5 " channels can carry dual electric submersible pumps; Able to provide up to 10 underground electrohydraulic crossing functions; Multiple recyclable modules are more conducive to product maintenance.
- **System Capability:** Complete manufacturing quality assurance system, and testing system for Subsea Trees; By combining the subsea manifold, subsea distribution, subsea routing, MCS, EPU and other products of offshore oil engineering projects , we can provide general contracting services for subsea production systems, reduce interface management in engineering development projects, and reduce management risks.

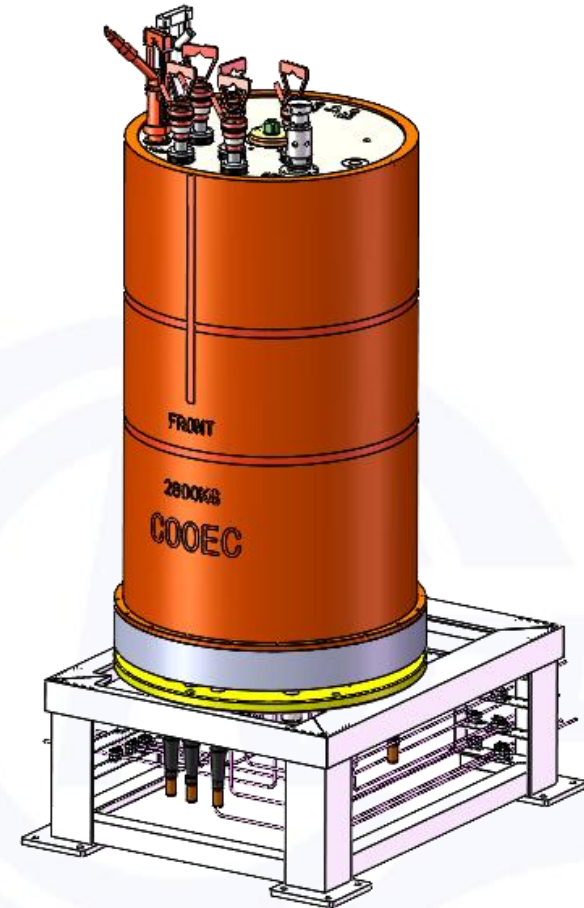


1810A1-Subsea Tree

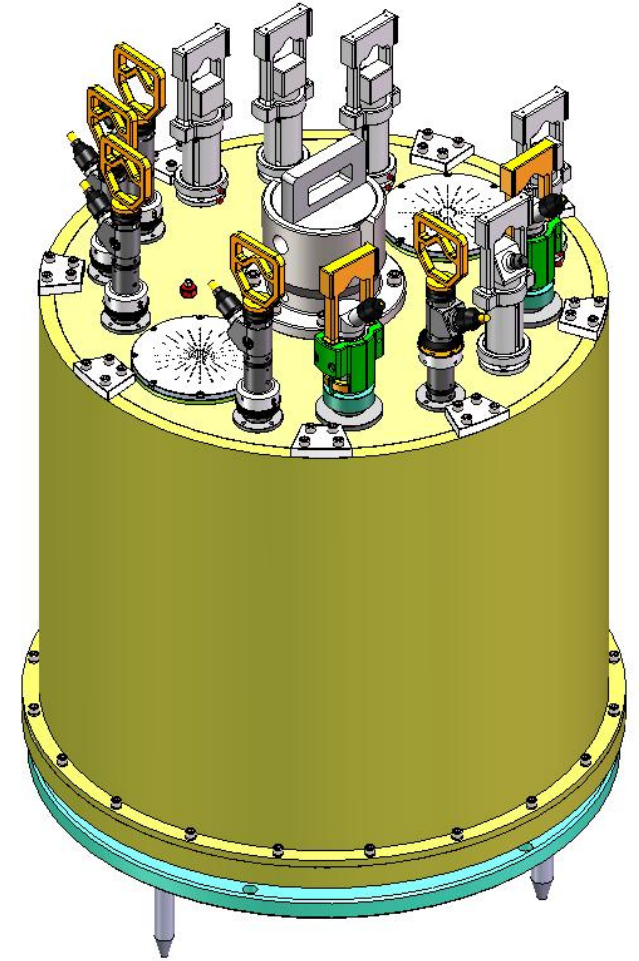


Recyclable Fluid Metering and Regulation Module

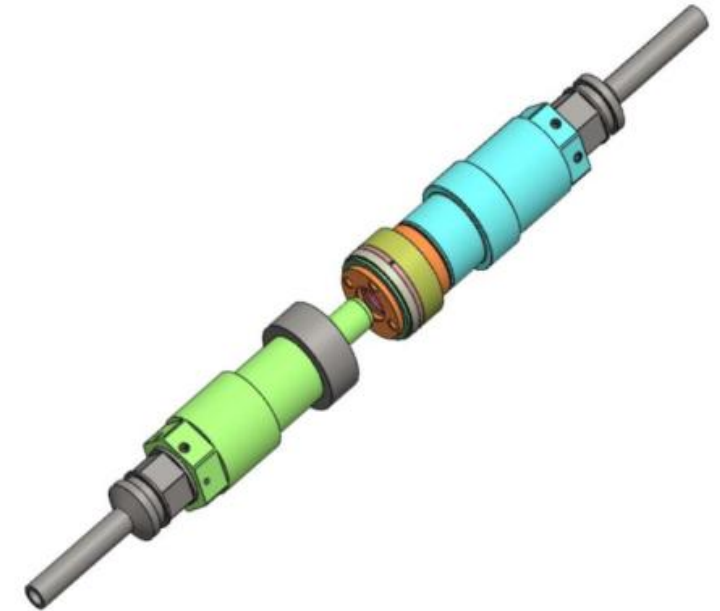
- Product introduction: Smart-G1 Subsea control module is a subsea tree control module independently developed by COOEC for oil and gas fields with water depth of 2,000 meters. The core components are independently designed, with complete intellectual property rights. The core components and assemblies of the subsea control module are certified by DNV and CCS.
- Performance parameter: Water depth (2,000m) , Hydraulic output (2 channels 10,000psi, 16 channels 5,000psi (including 2 standby channels)).
- Characteristic advantage: Mature standardized modules enable quick customization of complete equipment; The localization rate is over 85%; SEM card localization; Supports card and I/O port self-diagnosis; hydraulic control function is not less than 20 channels; Supports optical fiber communication and carrier communication.
- System capability Complete subsea control module manufacturing quality assurance system and test system; Combined with offshore oil engineering's subsea manifold, subsea distribution, subsea tree, master control station, power supply unit and other products, it can provide the total contract service of subsea production system, reduce the interface management of engineering development projects and reduce management risks.



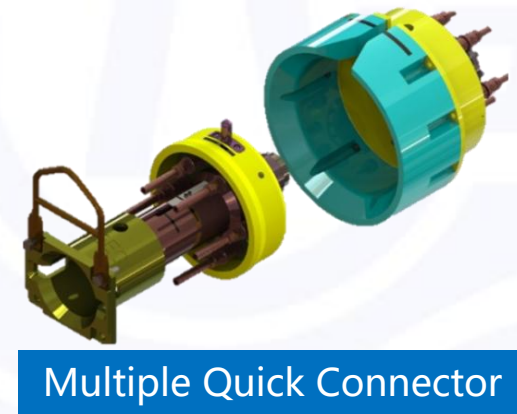
- **Introduction:** SRM is a subsea routing module independently developed by COOEC for oil and gas fields with water depth of 2,000m. The core components are independently designed and have complete intellectual property rights. The core components and assemblies of the subsea routing module are certified by DNV.
- **Performance parameter:** Water depth(2,000m), Maximum load power 2,600W (8 power supplies output at the same time).
- **Feature Advantages:** The effective distance of optical fiber communication is not less than 100km; Full water can work for one year; Provides up to 4 SCM power supply and communication functions; Localization rate of more than 95%; Configurable and modular design; Good seawater corrosion resistance; ROV retrievable installation structure design facilitates product maintenance.
- **System capability:** Complete subsea routing module manufacturing quality assurance system and test system; Combined with offshore oil engineering's subsea manifold, subsea distribution, subsea tree, master control station, power supply unit and other products, it can provide the total contract service of subsea production system, reduce the interface management of engineering development projects and reduce management risks.



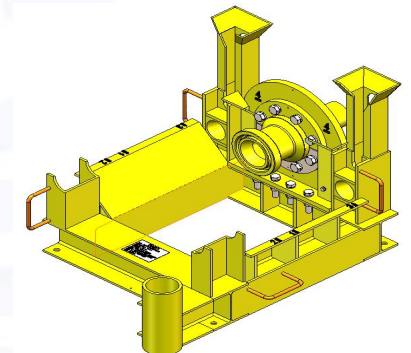
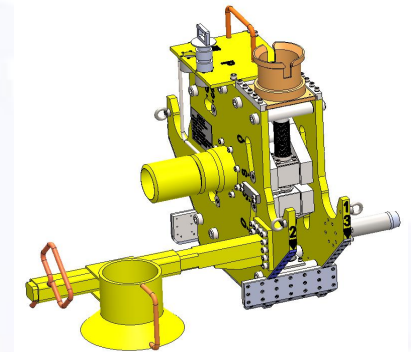
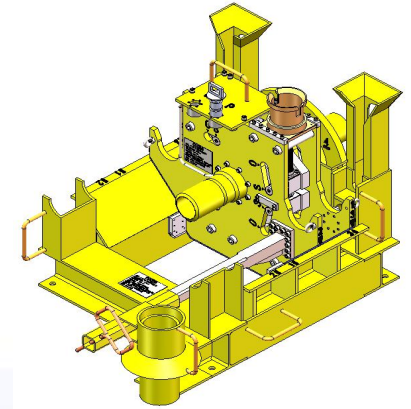
- **Introduction:** Subsea Hydraulic Connector is independently developed by COOEC, with complete intellectual property rights and certified by DNV . It can be divided into three product series, which are suitable for application scenarios such as panel installation, embedded installation, and compensatory underwater heart sealing.
- **Performance Parameter:** Maximum Water depth (3,000m) , Maximum design pressure(69MPa), Main sealing(metal seal).
- **Feature Advantages:** The localization rate exceeds 95%; High reliability metal+non-metal triple element residual composite seal; Suitable for rear installation, easy to disassemble and assemble; Hydraulic plugs have a capacity compensation function.
- **Feature Advantages:** Around underwater application scenarios of Subsea tree, SCM, MQC, etc. ,COOEC can provide a comprehensive solution from underwater system design/optimization , underwater equipment configuration to product matching design, as well as product processing and manufacturing, final assembly integration testing, offshore installation, and full life cycle maintenance and upkeep. COOEC can also provide personalized customization according to customer needs.



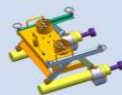




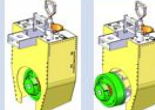


- Introduction: Hydraulic Flyinglead and MQC is a series of products developed by COOEC, with complete intellectual property rights and passed DNV certification. The product can be applied to oil and gas fields with water depth of 2000 meters, which is mainly used for the connection of alcohol injection path, chemical path and hydraulic control path between subsea tree, manifold and SDU, and is one of the essential critical equipment in the development and operation of subsea oil and gas fields.
- Performance Parameter: Water Depth(2,000m) Pressure rating (10,000psi), Operation Interface (API 17D CLASS4) .
- Characteristic Advantages: Localization Rate Exceeds 95%; Compact structure, Light weight, Large bearing; High Installation Efficiency, Docking Accuracy Up to 0.4mm; Patent emergency unlock, help the oil field to quickly resume production.
- System Capability: Focusing on Hydraulic Flyinglead and MQC products, COOEC can provide a package solution from subsea system design/optimization, subsea equipment configuration to product matching design, to product processing and manufacturing, final assembly integrated testing, offshore installation, and full-life cycle maintenance. And according to customer needs, combined with subsea manifold, SDU and other subsea products, shorten the product construction cycle, optimize the interface management risk.



- Overview: subsea pipeline connector is a 6-inch horizontal clamp connector, independently developed by COOEC for 2,000m depth oil and gas fields, with complete intellectual property rights, DNV certificated. This type of connector is mainly suitable for pipeline connection between PLET, subsea manifolds, tree and other equipment.
- Function Parameter: Water Depth(2,000m), Pressure rating(5,000psi, 34.5MPa), Operation Interface(ISO 13628-8 CLASS 4).



<p><i>Guide Post</i></p>	<p>Dimension: Φ140mm×3.3m (Adjustable according to project requirement) Weight: 450kg (dry weight) Function: Guiding for termination initial orientation Feature: Installation and retrieval convenient and efficient</p>		<p><i>Short-term Pressure Cap for Termination</i></p>	<p>Dimension: 0.32m(L)×0.32m(W)×1.2m(H) Weight: 56kg (Dry weight) Function: 1. Short-term protect the termination on jumper during transportation and installation 2. Injecting and sealing liquid, such as MEG, in jumpers. Feature: Design pressure 5 Mpa, non-metal seal, retrieval conveniently</p>	
<p><i>Stroke Tool</i></p>	<p>Dimension: 1.1m(L)×1.1m(W)×0.8m(H) Stroke: 0.57m (Working) /0.98 (Limit) Weight: 225kg (dry weight) Function: Pull in or push out termination for positioning Feature: Working by double hydraulic cylinders synchronously.The maximum pulling force is 25t, and the maximum pulling speed is 10mm/s</p>		<p><i>Long-term Pressure Cap for Porch</i></p>	<p>Dimension: 0.94m(L)×1.2m(W)×1.2m(H) Weight: 720kg (dry weight) Function: 1. Long-term protect the porch when subsea wet storage; 2. Land pressure test for manifold, PLET and other facilities Feature: Design pressure 34.5MPa, metal seal, retrieval conveniently</p>	
<p><i>Seal Replace Tool</i></p>	<p>Dimension: 0.4m(L)×0.6m(W)×0.6m(H) Weight: 31kg (dry weight) Function: Recycling the old seal and replacing a new one for termination Feature: Cooperate with the strole tool to complete the relacement of the seal</p>		<p><i>Flooding Cap for Porch</i></p>	<p>Dimension: 1.5m(L)×1.2m(W)×1.2m(H) Weight: 940kg (Dry weight) Function: 1. Protect the porch on PLET or other facilities; 2. Realize internal and external pressure balance of manifold, PLET and other fcilities Feature: Design pressure 34.5MPa, metal seal, retrieval conveniently</p>	
<p><i>Long-term Pressure Cap for Termination</i></p>	<p>Dimension: 0.32m(L)×0.32m(W)×1.2m(H) Weight: 62kg (dry weight) Function: 1、 Long-term protect the termination on jumper when subsea wet storage; 2、 Fctory pressure test for jumper Feature: Design pressure 34.5MPa, metal seal, retrieval conveniently</p>		<p><i>Cleaning Tool</i></p>	<p>Dimension: 0.49m(L)×0.28m(W)×1.1m(H) Weight: 72kg (Dry weight) Stroke: 192.5mm (Working) /221.5mm (Limit) Function: 1、 Cleaning sealing surface before replacing the seal Feature: Disc feed by T-thread, disc cleaning seal surface by hydraulic driven, elastic scraper disc with good fault-tolerance performance; light weight, simple operation, installation and retrieval conveniently</p>	

Subsea Business—Underwater Data Center (UDC)

- Product Introduction: Underwater Data Center (UDC) generally consists of onshore station, subsea switch station(SSS), data center module and foundations(DCM). The SSS is mainly responsible for supplying power to DCMs. DCM as the core module of the UDC mainly includes the following components: base and main structure, data vessel, distribution vessel, condenser module, and pump module.
- Performance Parameters: Max. water depth(34m), Max. weight (550MT) .
- Feature Advantage: The world's first commercial UDC manufacturer.
- Capability: Fully master the technology of design, fabrication, assembly, factory testing, integration testing of UDC.



SSS



DCM

卓越工程 赋能未来

Empower the Future with Excellent Engineering

THANKS

谢谢

