### 100 Year Storm

Normally all offshore systems are designed to withstand the 100 year storm i.e. the storm that happens once every hundred years at the location where the system is installed. All locations have different hundred year storm conditions, with the worst storms being in the North Atlantic and the northern North Sea. Exceptionally bad storm conditions can occur in typhoon (hurricane) infested areas, but the storm path is very narrow (about 50 km). Thus, some of SBM’s FPSO mooring systems are designed to be disconnectable, so that the FPSO can temporarily move out of the storm path, and the mooring system only requires to be designed for moderate conditions.

### AAV

**Ambient Air Vaporiser**

Equipment used to regasify liquefied gas by heating with ambient air.

### ALARP

**As Low A Risk as Possible**

Objective for system design safety studies.

### ALP

**Articulated Loading Platform (also known as Articulated Columns)**

Mooring system which stands on the seabed and can incline under mooring force via a uni-join between base and column.

### Atlantis

**American engineering company, suppliers of Seastar Tension Leg Platforms (TLP), acquired by SBM in 2001.**

### Bbl

**Barrels**

Unit of measurement of oil quantities.

1 Barrel = 35 imperial gallons = 159 litres = 42 US gallons.

### Bbl/d

**Barrels/Day**

Unit of production of oil per day (also b/d).

### BOP

**Blow Out Preventer**

Hydraulically operated equipment used to close a well (in an emergency), fitted around a drill string or production riser.

### Brownfield

**An oil or gas accumulation that has matured to a production plateau or even progressed to a stage of declining production. Operating companies seek to extend the economic producing life of the field using cost-effective, low-risk technologies.**
**BTM**

**Buoyant Turret Mooring**

A disconnectable turret mooring system consisting of a disconnectable mooring buoy and a fixed turret structure located in the forepeak of the tanker.

The mooring buoy is fixed to the seabed by catenary anchor legs, supports the crude oil and gas risers and is connected by means of a structural connector to the fixed turret. The fixed turret extends up through the tanker, supported on a weathervaning bearing and contains the reconnection winch, flow lines, control manifolds and fluid swivels located above the main deck.

The system is developed for areas where typhoon, hurricane or icebergs are a danger for the FPSO and primarily for safety reasons rapid disconnection/reconnection is required.

Disconnection and reconnection operations are carried out from the tanker without external intervention. When disconnected, the mooring buoy sinks to neutral buoyancy under water and the FPSO sails away.

**CAM**

**Counterweight Articulated Mooring**

A form of shallow water RTM (Riser Turret Mooring).

**CALM**

**Catenary Anchor Leg Mooring**

A floating buoy that performs the dual function of keeping a tanker moored on a single point and transferring fluids (generally crude oil or refined products) while allowing the ship to weathervane. It consists of a circular floating buoy anchored by means of multiple chain legs fixed to the seabed by either conventional anchor legs or piles. The buoy itself is free to move up and down, sideways and in pitching and rolling motions. The tanker is moored via hawsers to the turntable on the buoy. The tanker is loaded or offloaded by means of flexible marine hoses from the buoy to the vessels manifold. The connection between the piping inside the buoy and the subsea pipeline is by means of flexible hoses.

**CAPEX**

**CAPital Expenditure**

Investment in infrastructure. Disbursed prior to OPEX (Operating Expenditure), which relates to a system or oilfield start up and operation.

**CES**

**Corporate Engineering Standards**

SBM’s system of standards and design practices used throughout the Group.

**Chinese Lantern**

Name given to the most common underbuoy hose configuration for CALM systems. Differs from e.g. Lazy-S or Steep-S configuration.

**Christmas Tree**

Also X-mas tree. Assembly of valves at the top of the tubing of a completed well, to control the flow of oil and/or gas and to enable certain manipulations. If the tree is at the level of the seabed, the well is described as “subsea completed” or “wet tree”. If the tree is on the deck of a platform, the well is described as “surface completed” or “dry tree”.

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**SBM Offshore | Glossary**
<table>
<thead>
<tr>
<th><strong>CNG</strong></th>
<th>Compressed Natural Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Condensates</strong></td>
<td>Liquids condensed from a gas stream, made up of a range of heavier hydrocarbons. For gas fields, condensate typically refers to the hydrocarbon liquid separated from the well stream fluid, which can be stabilised, stored and exported as a high value liquid product.</td>
</tr>
<tr>
<td><strong>COOL™</strong></td>
<td>Cryogenic Offshore Offloading and Loading (COOL™) systems.</td>
</tr>
<tr>
<td><strong>Crane vessel</strong></td>
<td>A ship-shape vessel or semi-submersible vessel with one or two cranes for lifting platform modules and structures at sea. The crane hoisting capacities are substantial and range from 300 to 14,000 tons. Cranes allow for moving the hook-load vertically and horizontally (in a 360° radius). In medium water depths the crane vessel is anchor-moored. In deepwater areas the vessel is dynamically positioned.</td>
</tr>
<tr>
<td><strong>Cryogenic</strong></td>
<td>Low temperature processing, generally sub zero. For LNG this can be as low as -162°C.</td>
</tr>
<tr>
<td><strong>DCU</strong></td>
<td>Dry Completion Unit (See DTU).</td>
</tr>
<tr>
<td><strong>Deep water</strong></td>
<td>More than 300 meters water depth.</td>
</tr>
<tr>
<td><strong>DeepDraft Semi™</strong></td>
<td>See Semi-submersible</td>
</tr>
<tr>
<td><strong>Desulphatation</strong></td>
<td>The removal of sulphate ions from seawater prior to use as injection water. This operation is required when the formation contains barium and strontium and to a lesser extent calcium to prevent re-agitation of sulphates which will cause plugging of the flow-path of the produced fluids from the reservoir.</td>
</tr>
<tr>
<td><strong>DP</strong></td>
<td>Dynamic Positioning</td>
</tr>
<tr>
<td></td>
<td>A station keeping system for floating units which uses thrusters to compensate wind, wave and current forces in a dynamic controlled mode to keep the unit on a predetermined location and heading at sea.</td>
</tr>
<tr>
<td><strong>Drill ship</strong></td>
<td>A ship-shape vessel for drilling and completing wells in medium to deepwater applications. The drilling equipment onboard of the ship enables drilling the well, running the protective casing in the well (preventing collapse of the drilled hole), and installation of the subsea Xmas tree. In medium water depths, the drill ship uses a conventional anchoring system. In deepwater areas the ship is dynamically positioned.</td>
</tr>
<tr>
<td><strong>DNV</strong></td>
<td>Det Norske Veritas</td>
</tr>
<tr>
<td></td>
<td>One of many classification societies.</td>
</tr>
<tr>
<td><strong>Dry production trees</strong></td>
<td>See Surface (Xmas) trees</td>
</tr>
<tr>
<td><strong>DSV</strong></td>
<td>Diving Support Vessel</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>A dedicated vessel, most frequently dynamically positioned, for assistance of subsea saturation diving and installation work.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>DSCV</strong></th>
<th>Diving Support &amp; Construction Vessel</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>DTU</strong></th>
<th>Dry Tree Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>A floating facility carrying surface completed wells, i.e. the Xmas trees are located above the surface of the sea, on the floater, as opposed to the seabed. The rigid pipes (tubing, casing etc.) that link the trees to the wells require high tension to avoid buckling. The DTU is therefore under constant tension to compensate for the heave motion of the floater. Generally, a DTU also carries basic drilling equipment to allow downhole intervention on a tender assist mode. It can also feature full drilling capability.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>DWT</strong></th>
<th>Deadweight Tonnage</th>
</tr>
</thead>
<tbody>
<tr>
<td>The total weight of cargo, fuel, fresh water, stores and crew that a ship can carry when immersed to her load line.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>E/P or E&amp;P</strong></th>
<th>Exploration and Production.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>ELSBM</strong></th>
<th>Exposed Location Single Buoy Mooring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buoy specially designed for exposed locations, to have a better up-time performance in such conditions.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>EMH</strong></th>
<th>Equipements Mécaniques et Hydrauliques</th>
</tr>
</thead>
<tbody>
<tr>
<td>A French offshore engineering company which developed the Articulated Column Mooring system. EMH was acquired by SBM in 1989.</td>
<td></td>
</tr>
<tr>
<td><strong>EPCl</strong></td>
<td>Engineer, Procure, Construct and Install</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td><strong>EPCl</strong></td>
<td>A form of contracting that provides for turnkey delivery of facilities.</td>
</tr>
<tr>
<td><strong>FEED</strong></td>
<td>Front End Engineering and Design</td>
</tr>
<tr>
<td><strong>FEED</strong></td>
<td>A study used to analyse the various technical options for new field developments with the objective to define the facilities required.</td>
</tr>
<tr>
<td><strong>Flaring</strong></td>
<td>Burning off gas, produced in association with oil, which cannot be utilized for technical or commercial reasons. Flaring of gas is nowadays more and more restricted by government authorities.</td>
</tr>
<tr>
<td><strong>Flash gas</strong></td>
<td>The gas that is separated from the oil flow at the low or medium pressure separators (2nd stage separation).</td>
</tr>
<tr>
<td><strong>Flow Assurance</strong></td>
<td>A number of design and operational measures to ensure that liquids in deepwater flowlines between the well and the production platform (or FPSO) are kept flowing and do not get blocked by hydrate formation, wax deposits or other obstructions.</td>
</tr>
<tr>
<td><strong>Flowlines</strong></td>
<td>Pipelines carrying reservoir fluid on the seabed from wells to risers.</td>
</tr>
<tr>
<td><strong>FPDSO</strong></td>
<td>Floating Production, Drilling, Storage and Offloading system</td>
</tr>
<tr>
<td><strong>FPDSO</strong></td>
<td>An FPSO with capability to drill, complete and workover wells from this facility. The FPDSO is designed to receive and process the production stream from several subsea completed wells and is capable of drilling and intervention on one well while production continues to flow from the others.</td>
</tr>
<tr>
<td><strong>FLP</strong></td>
<td>Floating Loading Platform</td>
</tr>
<tr>
<td><strong>FLP</strong></td>
<td>Basically the same as an ALP, but anchored to the seabed with a catenary mooring system.</td>
</tr>
</tbody>
</table>
FPSO

Floating Production Storage and Offloading system

An FPSO is a floating facility installed above or close to an offshore oil and/or gas field to receive, process, store and export hydrocarbons.

It consists of a floater, SBM's floaters are either new builds or converted tankers, permanently moored on site. The cargo capacity of the vessel is used as buffer storage for the oil produced. The process facilities (topsides) and accommodation are installed on the floater. The mooring configuration may be of the spread mooring type or a single point mooring system, generally a turret.

The high pressure mixture of produced fluids is delivered to the process facilities mounted on the deck of the tanker, where the oil, gas and water are separated. The water is discharged overboard after treatment to eliminate hydrocarbons. The stabilised crude oil is stored in the cargo tanks and subsequently transferred into shuttle tankers either via a buoy or by laying side by side or in tandem to the FPSO. The gas is used for enhancing the liquid production through gas lift, and for energy production onboard the vessel. The remainder is compressed and transported by pipeline to shore or reinjected into the reservoir.

Fractionation

The process to separate a mixed hydrocarbon stream by distillation, making use of the difference in boiling points of the components to be separated. The lower boiling point components are recovered from the top of the fractionation column, and the heavier boiling point components from the bottom. This process is used in LPG processing systems to separate products such as propane and butane.

FourStar™

See TLP

FSRU

Floating Storage and Re-gasification Unit

A floating vessel that is permanently moored at a site where it can receive LNG from carriers, store and re-gasify the LNG and send it as natural gas to shore via a subsea pipeline at a rate required by the natural gas users.

GAP™

Gravity Actuated Pipe

A concept developed by SBM, consisting of a bundle of mid-water pipes suspended between surface and seabed to minimise pipeline length and temperature problems in deepwater developments. These pipes typically connect a DTU to a floating production facility and carry the flow of gases, oil, water and control signals over large distances. The bundle is stabilised vertically and horizontally by maintaining tension at each end provided by gravity.

Gas and water injection

To enhance the crude oil recovery by maintaining sufficiently high reservoir pressure throughout the production life, water and gas are injected under high pressure in the well to replace produced volumes.
### Gas Lift
To facilitate the flow of live crude from wells, gas is injected at Xmas tree level or down-hole to lower the back pressure on the wells. The lift gas is the associated gas from the field, which is treated, compressed and re-circulated into the flow system.

### GMS
**Group Management System**
SBM’s system of procedures and instructions to control administrative, financial, legal and commercial proceedings in the Group.

### GOM
**Gulf of Mexico**
Most important offshore area for USA oil and gas production (like the North Sea in Europe for Western European Countries).

### GTL
**Gas To Liquids conversion**
A process, based on Fischer Tropsch technology, which polymerises several gas molecules into a longer chain hydrocarbon molecule that can exist in liquid phase at ambient conditions. This process is being developed as an alternative to LNG for commercialisation of remote gas reserves.

### Gusto
Name of the yard in Schiedam (Holland), originally owned by the Smulders family, and since 1965 part of IHC, where the first Single Point Mooring buoy was built in 1959, to a Shell design. IHC obtained a licence, and Gusto developed the buoy design. In 1969, a separate company named SBM (Single Buoy Moorings) was registered in Switzerland. Gusto was active on other designs and fabrications for the offshore industry, and accumulated considerable know-how. When in 1978 the Gusto yard had to be closed, their project department continued as an engineering company, and is now a division of SBM Offshore.

### Hawser
Mooring rope between an SPM and the tanker moored to it. Generally about 50 meters long and 40 mm or more in diameter.

### HAZID/HAZOP
**HAZard IDentification/HAZard and OPerability analysis**
Systematic design review methods to identify and address hazards to ensure that the necessary safety measures to eliminate or mitigate hazards are incorporated in the design and operation of the unit.

### Heave Compensation System
To suppress the movements of a load being lifted, in an offshore environment, a mechanical system, often referred to as ‘heave compensation system’, is devised to dampen and control vertical movements. Two methods of heave compensation exist: passive systems and active systems.

### Hydrocarbons
Oil, gas and other chemical components carrying hydrogen and carbon atoms.
| **IHC** | Industriele Handels Combinatie (i.e. Industrial Trade Combination)  
Originally established in 1943 as a loose cooperation agreement between six construction yards in Holland specialised in building dredgers (also for mineral mining) and floating cranes. In 1965 a full merger of 5 yards was agreed and the group IHC Holland obtained a listing on the Stock Exchange in Amsterdam. |
| **Imodco** | International Marine and Development Corporation - a company founded in 1958 in Stockholm (Sweden) to sell, design and build Single Point Mooring systems, based on patents owned by the founders. In 1990, SBM acquired Imodco. |
| **Jacket** | The lower section of an offshore platform which is fixed to the seabed by piles and is mainly below water level. On top of the jacket, the prefabricated topside construction is lifted in place by a very heavy offshore crane. |
| **Jack-up rig** | A mobile unit which can elevate itself well above the sea surface on three or more legs to become a stable seabed-supported platform. |
| | Drilling jack-ups can operate in water depths up to 150 meters. On most jack-up drilling rigs the drill tower is placed on cantilever beams such that wells supported by an adjacent platform can be drilled in workover mode by skidding the cantilever over that fixed platform. |
| **J- lay tower** | A pipe-lay method used in deepwater to allow the pipe to leave the pipe-lay unit at a vertical departure angle. The tower supports the up-ended pipes. |
| **Jumper Hose** | Flexible fluid conducting pipe spanning the moveable portion of a universal joint or a hinge. (A universal joint or uni-joint as it is normally called, is a type of Cardan coupling allowing two parts to move over an angle, relative to each other, in any direction.) |
| **Lazy-S** | Underbuoy hose configuration, resembling an elongated S (other configurations are Steep-S or Chinese lantern.) |
LNG

Liquefied Natural Gas

Natural gas (mainly methane) that is refrigerated to minus 162°C at atmospheric pressure to reach its liquid phase and subsequently its volume is reduced 600 times. In this phase, it becomes suitable for transportation in specialised vessels.

LNG FPSO

Floating Production, Storage and Offloading (FPSO) system for Liquefied Natural Gas (LNG)

An LNG FPSO is a floating facility installed above or close to an offshore gas field in order to receive, process, liquify, store and export natural gas.

It consists of a purpose-built floater containing LNG storage tanks with process facilities, gas treatment, liquefaction train(s) and an accommodation block on the deck.

The LNG FPSO is permanently moored to the seabed by a turret-type mooring system.

The high pressure well stream fluid is delivered from the seabed, via flexible hoses and the swivel, to process facilities on the deck of the LNG FPSO. The process facility, located on the deck, separates the fluid in gas, condensate and water.

The water is treated to eliminate any remaining hydrocarbons and discharged overboard. The condensate is treated and stored in separate crude oil tanks.

The gas is separated in methane for LNG production and propane and butane for treatment into LPG. Methane is then treated and liquefied in one or more of the LNG trains which are also located on the deck. The LNG is finally stored at minus 162°C in the special LNG cargo tanks. On a regular basis the LNG will be transferred from the LNG cargo tanks to LNG shuttle tankers via side-by-side or tandem offloading.

LNG production is by far the largest product on an LNG FPSO, however the FPSO also produces condensate and LPG, which are stored in special LPG and condensate tanks and are offloaded separately via their specific offloading system.

LPG

Liquefied Petroleum Gas

Butane and propane, separated from well fluid stream. LPG can be transported under pressure or in refrigerated vessels (LPG carriers).

MAG

SBM designed and patented anchor. The name is made up of the initials of the surnames of the three engineers who developed the design: van der Meer, Alhayari and Gramet.
<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Manifold</strong></td>
<td>A pipe spool in which a number of incoming pipes are combined to feed to a common output line.</td>
</tr>
</tbody>
</table>
| **MARPOL**        | **MARine POLution**  
International regulations produced by the International Convention for the Prevention of Pollution from Ships, 1973, as adopted by the International Conference on Marine Pollution convened by the International Maritime Organisation, which is the regulatory body in respect of pollution by oil, noxious substances, harmful substances in packaged forms, sewage and garbage. |
| **Mid-water pipe**| A pipeline to transfer fluids or gases suspended between two floating facilities, when ultra-deepwater makes sea bottom pipe configurations uneconomical or technically unacceptable. Typically, a mid-water pipe is configured at a depth of 100 to 300 meters. |
| **MMSCFD**        | **Millions of Standard Cubic Feet per Day**  
A commonly used unit to measure gas flows. |
| **Moon pool**     | A vertical cut out (a tunnel about 6x6 m in the centre of a unit through which riser handling takes place, and drillstrings or diving bells are lowered etc. The purpose of a moon pool is to have a place on a ship where motions are minimal in a rough sea. |
| **MOPU**          | **Mobile Offshore Production Unit**  
A jack-up platform carrying oil, gas and water separation equipment. |
| **MOPUstor™**     | **Mobile Offshore Production Unit with oil storage capacity**  
A jack-up platform carrying oil, gas and water separation equipment integrated with an oil storage tank located on the seabed.  
The produced fluids from the well are delivered via dry tree well heads on the platform. After treatment, the stabilised crude is stored in the storage tank on the seabed and subsequently transferred into shuttle tankers via a subsea tanker loading system. |
### MPV

**Multi-Purpose Vessel**

A dedicated vessel that is able to perform multiple tasks for offshore installations.

### MSC

**Marine Structure Consultants**

An engineering company founded by a number of former Gusto employees in 1976. In 1988, the company was acquired by the IHC group, and is now a part of SBM Offshore.

### MSV

**Multi-Service Vessel**

A dedicated vessel which is able to perform multiple maintenance services on platforms, floaters, subsea wells, pipelines and risers.

### Non-flaring operations

Operations where the produced gas from an oil field is not allowed to be flared and therefore either has to be exported by pipeline used as a fuel source or reinjected into the well.

### N.V.

**Naamloze Vennootschap**

Dutch term for Public Limited Liability Corporation (Limited Company) or French Societe Anonyme (S.A.)

### NOC

**National Oil Company**

### ODA

**Ocean Design Associates**

American engineering company, acquired by SBM in 2003.

### OOL

**Oil Offloading Line.**

### OIM

**Offshore Installation Manager**

Highest authority on board a platform or FPSO, etc. (SBM originally used the title of Unit Superintendent for this function when marine aspects on its FPSOs were still predominant).

### OPEX

**OPerating EXpenditure for a system or oilfield start up and operation. See also CAPEX.**

### OTEC

**Ocean Thermal Energy Conversion**

SBM Offshore monitors the renewables market and is developing a floating OTEC plant concept which transfers wind, tidal and wave energy to a land based power plant.

### Payload

Carrying capacity of a floating platform. Similar to deadweight of a vessel.
| **Pipe-lay barge** | A flat-bottom, ship-shape or semi-submersible vessel for the offshore installation of subsea pipelines. Individual pipe joints are welded together on the vessel (to make a continuous string) and subsequently laid onto the seabed in a controlled manner.  
In medium water depths the pipe-lay barge is anchor-moored. In deepwater areas the barge is dynamically positioned. |
|---|---|
| **PLEM** | PipeLine End Manifold  
Termination of an underwater pipeline, with valves, sometimes with pig catchers, and with flange connections for the underbuoy hoses to connect the PLEM to the buoy or the FSO or FPSO. |
| **PPE** | Personal Protection Equipment  
Helmet, gloves, safety glasses, safety shoes, etc. |
| **ppm** | Parts per million  
Unit for measuring small levels of contamination (e.g. oil in water). |
| **Reservoir** | A porous underground rock formation containing oil, gas and water, sealed at the top by a tight layer called a ‘cap rock’. The ratios of oil, gas and water in such a reservoir can be very different. |
| **Risers** | Steel or flexible pipe which transfer well fluids from the seabed to the surface. |
| **ROV** | Remote Operated Vehicle  
A tethered underwater robot which has been designed to perform unmanned installation tasks or inspection in deepwater environments. They are linked to the installation vessel by an umbilical cable. Electrical power, video and data signals are transferred via the umbilical between the operator and the vehicle. High power applications will often use hydraulics in addition to electrical cabling. Most ROVs are equipped with at least a video camera and lights. Additional equipment is commonly added to expand the vehicle’s capabilities. |
RTM
Riser Turret Mooring
A disconnectable riser turret mooring system comprises a disconnectable riser column and a fixed arm which is attached to the bow of the tanker.

The riser column is fixed to the seabed by catenary anchor legs, supports the crude oil and gas risers and is connected by means of a structural connector to the fixed arm.

The fixed arm is located on the bow of the tanker and contains the weathervaning bearing, reconnection winch, flow lines, control manifolds and fluid swivels.

Disconnection is achieved automatically in two stages: first the fluid risers are isolated, then the riser column is disengaged utilising large hydraulically-operated collet-type connectors. Disconnection and reconnection operations are carried out from the tanker without external intervention. After disconnection, the column remains on location and the tanker sails away.

SALM
Single Anchor Leg Mooring
A SALM can be employed as an unmanned tanker loading or discharge terminal with multiple fluid transfer circuits. The configuration of a SALM is highly elastic over a very wide range of water depths. This inherent elasticity enables cargo transfer operations to continue under adverse weather and sea-state conditions. This built-in resiliency also enables the SALM to yield in the event of collision thus minimising impact forces and structural damage.

SALS
Single Anchor Leg Storage
A mooring system developed for the first FPSO (Shell’s “Castellon”). It consists of a base, a riser and a yoke with a buoyancy tank which creates the tension in the riser, thus providing the restoring force. This system solved the problem of CALM or SALM mooring systems requiring long flexible pipes which would be subjected to dynamic loads. In those days (1976), such flexible pipes were not available on the market.

SBS
Single Buoy Storage
A system which basically consists of a CALM buoy and a rigid arm (instead of a mooring hawser) hinged to an FPSO or an FSO vessel. The system was developed to permanently moor a vessel offshore, and thus had to be strong enough to survive the 100 year storm.
<table>
<thead>
<tr>
<th><strong>SCR</strong></th>
<th>Steel Catenary Riser</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A steel pipe hung in a catenary configuration from a floating vessel in deep water to transmit flow to or from the sea floor.</td>
</tr>
</tbody>
</table>

| **SeaStar®**                | See TLP.             |

| **Slug**                    | An accumulation of gas or liquid in a two or three phase (liquids, solids and gas) flow in a pipeline. A slug makes the flow unstable and subject to large pressure fluctuations and disturbs the processing of live crude. A slug of oil in the gas flare line may cause “carry over”, i.e. burning oil slugs coming out of the flare tip and falling (burning) on deck, thereby creating a hazardous situation. |

| **Soft Yoke**               | A mooring system design, often used instead of an SBS. It is cheaper, as it does not have the expensive hinges between mooring system and vessel. Also, in shallow water, it may create the necessary flexibility in the system with lower mooring forces. |

| **Sour Crude**              | Crude oil that contains more than 1% sulfur or derivates. |

| **Semi-submersible**        | A floating unit, with its deck supported by columns to enable the unit to become almost transparent for waves and provide favourable motion behaviour. The unit stays on location using dynamic positioning and/or is anchored by means of catenary mooring lines terminating in piles or anchors. |

|                             | A DeepDraft Semi™ is a semi-submersible unit fitted with oil and gas production facilities in ultra deepwater conditions. The unit is designed to optimise vessel motions to accommodate SCRs. |

|                             | A Semi-submersible Drilling Rig is fitted with drilling facilities and DP for deepwater drilling. |
**SQM**

**Soft Quay Mooring (SQM)**

This system consists of a weighted quay suspended from articulated arms held 10 to 15 meters away from the side of the FSRU. This quay holds the carrier at a much greater distance than possible with normal side-by-side mooring fenders, and such distance provides ample space to avoid contact between the LNG carrier and the FSRU, both during berthing and offloading operations. Should the berthing carrier approach the SQM too fast, the articulating arms will deflect and absorb the carrier momentum without suffering any damage.

The SQM system has been developed to increase both the safety of the berthing operation as well as the offloading sea state threshold.

The SQM can be used in more traditional types of quayside berthing which would allow for offloading in less protected areas.

**Spar**

A deep-draft cylindrical and vertical floating production unit (single column). This facility, although not heave-restrained, can accommodate surface completed wellheads.

**SPM**

**Single Point Mooring**

A mooring system which enables the vessel to weathervane whilst it loads or unloads hydrocarbons, chemicals or fresh water. The two categories of SPMs are as follows:

- a single point mooring buoy or tower that is designed for use by any trading tanker, and is thus independent of the vessel;

- a system, such as a turret mooring, that is incorporated within a vessel such as an FSO or FPSO.

**Spread mooring**

In the case of a spread moored FPSO/FSO, the tanker or process barge is moored in a fixed heading with anchor lines distributed over the bow and stern of the vessel to anchor points situated on the seabed. The heading is determined by the prevailing sea and weather conditions. The spread moored FPSO/FSO can only be used on locations where currents, waves and winds are very moderate or normally come from a prevailing direction.

With this type of FPSO/FSO, no turret or swivel stack is required, as the vessel does not change heading in relation to the risers connecting the tanker with the wells on the seabed. To offload crude from a spread moored FPSO/FSO, a separate tanker loading facility should be provided as the shuttle tanker cannot safely moor in tandem to the FPSO/FSO due to changing current, wind and wave direction, possible interference with the FPSO/FSO anchor lines, and high risk of collision.

The deepwater CALM buoys have been designed as offloading facility for deepwater spread moored FPSOs.

**STL**

**Submerged Turret Loading**

**STP**

**Submerged Turret Production**

**Subsea facilities**

Subsea Xmas trees, manifolds, control boxes, valves, pipelines, risers, umbilicals, cables, etc.
<table>
<thead>
<tr>
<th><strong>Subsea (Xmas) tree</strong></th>
<th>The Xmas tree completing the well is located on the seabed.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Suction pile</strong></td>
<td>A suction pile is a large diameter steel pile installed by creating a vacuum inside the pile by suction. These piles are used to secure anchor lines, SPM systems and spread moored systems.</td>
</tr>
<tr>
<td><img src="image" alt="Suction pile" /></td>
<td></td>
</tr>
<tr>
<td><strong>Surface (Xmas) tree</strong></td>
<td>The Xmas tree completing the well is located either on a fixed platform (shallow water) or on a floating platform (deepwater DCU) such as a SeaStar®, Spar, TLD or TLP.</td>
</tr>
<tr>
<td><strong>Swivel/Swivel stack</strong></td>
<td>Swivel</td>
</tr>
<tr>
<td></td>
<td>Mechanical component consisting of a fixed and a rotating part, connected by means of a roller bearing and a sealing arrangement, allowing fluids to pass between the stationary and the weathervaning part of a Single Point Mooring system.</td>
</tr>
<tr>
<td></td>
<td>Swivel Stack</td>
</tr>
<tr>
<td></td>
<td>An arrangement of several individual swivels stacked on top of each other to allow on a weathervaning FPSO the continuous transfer of fluids, gasses, controls and power between the risers and the process facilities on the FPSO deck.</td>
</tr>
<tr>
<td><strong>SYMO™</strong></td>
<td>Soft Yoke Mooring and Offloading</td>
</tr>
<tr>
<td></td>
<td>Combines a solid structural mooring with a hard-piped/swivels fluid transfer system. It can be connected and operated in much higher sea states than other LNG offloading systems. The SYMO™ can be used in a variety of LNG transfer applications such as:</td>
</tr>
<tr>
<td></td>
<td>• to moor an LNG carrier in tandem to the stern of an FLNG (Floating LNG production system) offshore or at the stern of an FSRU near shore;</td>
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<tr>
<td></td>
<td>• to temporarily moor an LNG carrier to an import terminal in shallow water. LNG is either transferred to shore via a cryogenic pipeline or alternatively re-gasification takes place on the terminal allowing high-pressure gas to be exported.</td>
</tr>
<tr>
<td><strong>TLP</strong></td>
<td>Tension Leg Platform</td>
</tr>
<tr>
<td></td>
<td>A floating production platform positioned and stabilised by at least three separated, vertical tendons anchored to the seabed. The tendons are tensioned using the buoyancy of the underwater hull of the platform. Subjected to wave, wind and current action, the platform moves sideways, but remains horizontal due to the parallel actions of the tendons. The vertical motion (heave) is eliminated and the facility is therefore suitable for surface completion of the wells.</td>
</tr>
</tbody>
</table>
SeaStar®
TLP developed by Atlantia, is the state-of-the-art example of a TLP, using a mono-column structure as opposed to multi-column (typically four). This TLP can accommodate wet or dry tree developments up to payloads of 11,000 tons for deepwater developments.

FourStar™ TLP
A four-leg battered-column design will support full deepwater drilling and production payloads. The design allows for efficient quayside integration of topsides and hull systems.

TLU
Tanker Loading Unit

Topsides
See FPSO.

Trelline™
The Trelline™ is a remote export system for deepwater projects comprising a large diameter reinforced bonded rubber hose that is suspended in a simple wave of about 2 km between an FPSO and a deepwater CALM buoy.

Turnkey supply
Design, construction, installation and delivery of an operational system.
| **Turret Mooring** | The turret system is integrated into or attached to the hull of the tanker, in most cases near the bow, and allows the tanker to weathervane around it and thereby take up the line of least resistance to the combined forces of wind, waves and current. |
| **Internal turret** | A high pressure oil and gas swivel stack is mounted onto the mooring system. This swivel stack is the connection between the risers from the subsea flowlines on the seabed to the piping onboard the vessel. It allows the flow of oil, gas and water onto the unit to continue without interruption while the FPSO weathervanes. For reasons of size and cost, the number of swivels is kept to a minimum, and therefore the flow of oil and gas has to be manifolded in the turret area, particularly when the system produces from a large number of wells. |
| **External turret** | The turret mooring and high pressure swivel stack are thus the essential components of an FPSO. |

| **Ultra-deepwater** | More than 1,000 meters water depth. |
| **Umbilicals** | Flexible cables carrying electrical and instrument wiring, hydraulic tubing and chemical tubing. |
| **Uni-joint** | Universal joint A type of Cardan coupling used to connect two parts (of a mooring system), allowing them to move over an angle relative to each other in any direction. |
| **Upstream** | Activities related to crude oil or gas exploration, production and transportation. Downstream activities cover refining, sales and distribution. |
| **VLCC** | Very Large Crude Carrier Oil transportation vessel from 200,000 to 320,000 DWT. |
| **Weather-vaning** | Freely rotate in any direction, in accordance with the prevailing environmental conditions. |
| **Workover rig** | Equipment installed temporarily over a wellhead to restore or stimulate production from the well, by cleaning out accumulated sand, silt, wax, etc. or to install and/or repair downhole instruments. |
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The sole intention of this brochure is to share general information.

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