FPSO
installation and offloading

The technology innovator.
The environment of the oil field determines the requirements of the on-board equipment of floating production systems. Deep-water fields have different requirements to those in shallow water, as do oil fields in calm water or rough seas. Royal IHC is aware of these various needs and delivers safe and efficient solutions.

The market can be divided into several product categories: floating production, storage and offloading vessels (FPSOs), semi-submersibles, tension leg platforms (TLPs) and spars – each with their own characteristics. All are suitable for working in harsh conditions, with high levels of safety and reliability.

**FPSO**

FPSOs are effective in remote or deep-water areas, as they are easy to install and do not require a local pipeline infrastructure to export oil. Most FPSOs are moored by a turret. The environment of the FPSO determines the type of turret used. In calmer waters, spread mooring is often sufficient; in stormy regions, disconnectable mooring systems are used so the FPSO can be removed and replaced when the storm has passed.

**Semi-subs**

As the oil industry has progressed into deeper water and harsher environments, purpose-built production semi-submersible platforms (semi-subs) were designed. In addition to production storage, these installations provide a high carrying capacity for large production platforms. Moreover, one can work with cheaper ‘dry’ Xmas trees instead of expensive subsea solutions that are not applicable to all seabeds. And, like the FPSOs, they can be relocated after field abandonment.

**TLP**

The TLP is also suitable for deep-water development. As it is moored to the seabed with high tensile strength steel tubes, there is very little vertical motion. TLPs are used as full processing platforms or can be used as a platform in combination with an FPSO for processing crude oil, for example.

**Spar**

Another type of floating production system for (ultra) deep water is the spar. Most of the spar facility is located beneath the water surface, providing increased stability. The spar is less affected by wind, wave and currents, enabling the facility to support both subsea and dry tree developments. Additionally, the enclosed cylinder acts as protection for risers and equipment. Also, the hull can provide storage for produced oil or gas.

IHC delivers advanced equipment for all of the above types of floating production systems, including mooring, riser pull-in and offloading systems.
The offshore division of IHC produces innovative, sustainable and integrated offshore vessels and equipment. Its offshore solutions are reliable, efficient and flexible to the demands of challenging seabed-to-surface oil and gas projects. With its extensive knowledge and in-house design capabilities, IHC ensures compliance with the latest technological developments, safety regulations and environmental standards.

IHC excels at managing the complexity inherent within the development of offshore vessels and equipment. Each project is approached with care, creativity and adaptability, so that customers can depend on delivery within the terms of the agreement. IHC is one of the leading global players in its field. In the market for floating production systems, the company has a long track record of delivering innovative solutions.

Before delivery, all systems are thoroughly tested by IHC. The pull-in systems, for example, undergo dynamic and static pull tests. IHC also has its own production facility for winches, which enables the wires to be spooled under pre-tension. These important testing procedures result in the delivery of reliable equipment.

The IHC team works closely with the customer to ensure the most efficient solution is achieved. IHC is a one-stop shop for the best result in system integration, either for new-builds or conversions. It can deliver a completely integrated system or supply equipment as separate components.

All systems can be delivered with IHC hydraulic power packs, electrically or diesel driven. Power packs with and without hydraulic reservoirs, control manifolds, filtration systems, lubrication systems and local control panels can be delivered skid-mounted or completely containerised – even when these are to be used in hazardous areas.

IHC equipment is tailor-made, reliable and safe. It can be produced at the company’s facilities worldwide or in cooperation with one of its partners. This makes IHC a flexible partner, and enables it to comply with demands for local content.

Conducting business in an offshore environment is often turbulent. The difference between profit and loss for an owner or operator in the oil and gas market is greatly influenced by the productivity of these long-term investments. Efficiency, reliability and durability are key factors to success. IHC understands the needs of its customers and has the ability to provide innovative and efficient solutions.

Regulations have become even more stringent than before. Due to its vast experience in this field, IHC has become an authority on rules and regulations. Therefore, all of its equipment meets the latest demands on safety, legislation and quality.
IHC is a reliable partner for the delivery of high-quality mooring line installation systems required to meet the ever-increasing demand for drilling and production in deep water and harsh field conditions.

Mooring systems in particular are custom-made solutions, because the location and characteristics of the oil field determine the requirements. IHC delivers complete on-board mooring systems on a turnkey basis, typically comprising underwater fairleads, chain jacks, pull-in winches, hydraulic power units, skidding and other handling systems.

**Chain fairleads**

IHC’s chain fairleads are designed according to the latest standards applicable to the customer’s floater project. As well as compliance to these standards, the custom-made design incorporates limited maintenance requirements, minimum motion impact on top chain, optimum pocket design to minimise chain wear, chain fatigue, and extensive corrosion protection systems.

IHC’s chain fairleads are characterised by the following:

- suitable for underwater applications
- seven-pocket API design sheave (five-pocket optional)
- designs for 100mm chain size and upwards
- cast or steel-fabricated sheave
- available in several styles as flagging, bull’s eye etc.
- minimal moving parts
- ultra-low friction bearings (minimum impact on top chain)
- tested according to any customer requirement
- optional integrated chain stoppers.

**Chain stoppers**

As part of complete mooring installation systems, IHC provides dual pawl chain stoppers, for supporting and holding mooring chains.

The chain stoppers typically feature:

- a design load equal to breaking strength of mooring chain
- vertical or horizontal chain lead
- fabricated or cast alloy base frame (weld or bolt-on type)
- dual pawl design for minimum contact stress in chain
- hydraulic or manual pawl release mechanism
- high-alloy pawl pin materials
- load pins for tension monitoring.

**Chain jacks**

IHC’s chain pull-in systems are designed to safely hook-up and (pre-)tension mooring lines for spread-moored FPSOs, floating production units (FPUs), and semi-submersible rigs, as well as for tether-moored subsea buoyancy support frames.

Depending on the project mooring configuration, IHC delivers surface chain jacks, removable subsea chain jacks, chain winches (windlasses), traction winch systems or combination winches as standalone items, or in combination with other mooring equipment for both shallow and deep-water field applications.

**Chain handling systems/trolleys**

IHC delivers multi-functional, custom-made, movable chain handling systems. They are used to handle heavyweight cut-off chain parts safely, and have the capability to lift the deadweight of a chain jack or carry the weight of a chain pull-in winch, and skid it above a number of mooring slots.

The features of IHC chain handling systems include:

- minimum level of manual labour (maximum safety)
- driven chain wheel for chain pre-tension during jacking operations
- hydraulic tugger winch (5-25mT SWL)
- extendable chute for directional chain guidance
- skid system for translation of chain jack assembly from point to point
- cable and hose drag chains for guidance while skidding
- local or remote control panels.

**Pull-in winches**

IHC delivers reliable pull-in winches, according to our customers’ requirements, which can be used as an auxiliary winch for chain jacks or as a main winch for turret moored FPSOs.

**Extras**

All of the packages can be expanded with the following accessories:

- installation chains
- messenger chains
- wire ropes
- chain winches
- mooring load monitoring system.
Riser pull-in systems

IHC supplies tailor-made complete riser pull-in equipment packages comprising custom-made pull-in winches, turn-down sheave trolleys, winch skidding systems, traction winch systems, hydraulic power units and dedicated control systems.

Turn-down sheave trolleys

IHC’s turn-down sheave trolleys are custom-built installations that combine several of the company’s technologies into one autonomic system dedicated for riser handling. The trolley position can be adjusted in a longitudinal direction alongside the vessel to ensure vertical riser pulling on multiple riser slots, which are predominantly found on spread-moored FPSO vessels.

Pull-in winches

With years of experience in designing and manufacturing winches, IHC produces a wide range of winch systems. All IHC rotary drum winches are custom built and available up to a line pull of 550mT – 600mT in a horizontal or vertical pulling direction, single or multi-layer, with or without spooling device, flat or (LEBUS) grooved drums, with or without control consoles, including or excluding (synthetic) wire ropes, electric or hydraulic motor drives, and with or without class certification. IHC can supply any winch to meet the requirements of its customers, designed for the harsh conditions of the offshore industry.

The water-depth limits for offshore field development are extending continuously. This means that the limits for IHC winches are constantly evolving as well. The company’s answer is a new generation of traction and storage winches. Both have a relatively compact design, are extremely reliable and are smooth for the wire rope to safeguard continuity of operations. IHC’s expertise of swell compensation systems, together with its new generation traction winches, enables it to also provide customers with complete deep-water lowering systems.

Winch skidding systems

IHC’s deck-skidding arrangements are designed for safe storage and horizontal transportation on board. Particular attention is paid to robust design and flexible configurations to ensure low integration costs and extended lifetime of the equipment. The main objective is to ensure maximum safety during severe offshore weather conditions. A winch can be placed on top of the deck-skidding system.

The main features of IHC deck-skidding systems include:
- Skidding of loads weighing up to 1,100t
- Integrated or on-deck skid rails
- Longitudinal and transverse rail combinations
- Stackable skidding carriages for storage
- Sea-fastened skidding carriages
- Push-pull, rack and pinion, or winch-driven carriages
- Manual or full remote operation.

IHC engineers and delivers complete offloading systems, comprising of a hose reeling system, hawser reeling system and quick-release mooring mechanism. Offloading systems are also known as fluid transfer systems or stern discharge systems. IHC’s comprehensive and fully integrated offloading systems are reliable, easy to operate and tailored to meet specific customer requirements. Special attention has been paid to the easy and safe maintenance of offloading hoses, and their replacement, while the FPSO is moored in her offshore field.

To complement these products, IHC can also deliver complete integrated systems, incorporating advanced power, control and monitored systems. To suit specific applications and installations worldwide, various custom-made hose storage reels, emergency loading chutes or outboard platform stations are available.

Tandem mooring systems

For safe and efficient operations between the F(P)SO and a shuttle tanker, IHC delivers complete and tailor-made tandem mooring systems. These contain the means for storage, deployment and recovery of the mooring hawser assembly and integrated mooring point, with a full load quick-release facility. In addition, hydraulic power, control utility and load monitoring and data-logging equipment can be incorporated. They can be configured and designed to meet specific demands for projects worldwide, and complement the offloading systems by utilising common power and control arrangements.

Hydraulic power unit

A central or dedicated hydraulic power unit can be used to smoothly operate the hose and hawser reel. A power unit, which is driven by electric power from the FPSO distribution board, generates the hydraulic supply. The drive with an integrated hydraulically operated fail-safe parking brake is controlled by a local console. It is possible to vary the speed of the reels and spooling device using proportional hydraulic valves.
IHC customers know that they can rely on a dedicated and comprehensive global service offering for the life cycle of their investment. This not only helps to extend the lifespan of the vessel or equipment, but also to maintain the correct and safe operation of all IHC products on board. As the technology innovator, IHC has the ability to enhance the reliability and efficiency of its systems, which in turn boosts the productivity of its customers’ investments. The company’s life-cycle support maximises the uptime and return on investment, and therefore reduces the total cost of ownership.

Concepts, design and building
IHC’s highly qualified life-cycle support personnel can provide new or improved concepts for complete systems and components, as well as project evaluation and advice on the selection of equipment. The company’s team of experts designs optimal vessels and equipment based on customer requirements and their design, building and operational experience.

Training
In the months leading up to delivery, IHC enables its customers to bring their crew on board and become acquainted with the vessel, and gradually assume control. As a result, the vessels are fully deployable from their maiden voyage, maximising the value of IHC customers’ investments. Training is offered with the use of simulators to allow crew members to become familiarised with all of the equipment on board, ranging from the complete vessel management and DP systems, to the safe and efficient use of the mission equipment.

Maintenance management
IHC aims to assist offshore operators by improving their system availability in the most efficient way. This can be done with a single service offering, such as condition monitoring, technical surveys or other maintenance tasks. It can also be achieved by an integration of several different services from the company’s life-cycle support programme.

Spare parts and component repair
IHC wants to be prepared for every eventuality and provide limitless logistical support to its customers. This includes attention to system availability with the immediate supply of spare parts and repair of components. With this approach, the complete IHC global network of qualified service technicians, sourcing officers and stock locations is available to all customers.

Dry docking and ship repair
IHC’s team of experts offers a high level of knowledge and expertise to manage dry dockings, ranging from supervision of the repair yard to the performance of complete dockings and ship repairs. All dry docking services are focused on keeping the period of work as short as possible according to forecasted budgets and planning. Experience shows that the correct scope of work and solid preparation – especially for major repairs and dry dockings – are essential for efficient performance.

Renovations
The renovation of vessels and equipment is a complex process. IHC possesses expert knowledge to research, engineer and install to such a high standard that these measures will optimise the equipment. This results in the start of a new life cycle for the vessel or the extension of the existing life cycle.

Life-cycle engineering
With all vessels fully engineered in 3D-models and a full set of engineering documents available, IHC has a unique starting position to accurately and quickly provide engineering support for all requests. IHC engineers can liaise with original vessel designers regarding complex engineering issues.