Diving support

The technology innovator.
Due to global economic and political developments, the prices of oil and gas are increasing significantly. Energy companies have set up major investment programmes in the search for new reserves. Easily accessible sources are already in production and so this search is focused on less accessible areas. Royal IHC (IHC) responds to these developments with innovative and efficient offshore solutions.

**New technologies**
Business concepts of diving operations have changed significantly. What may once have been considered a record-breaking dive has become a daily routine exercise. The North Sea is emerging as one of the world’s largest oil fields, but it guards its treasures well.

Diving conditions are among the worst encountered in professional diving. Therefore, new technologies are required to perform safer and more efficient operations. Based on years of experience in the field, IHC develops new concepts for safe and efficient diving support solutions.

**In-house expertise**
IHC has in-house knowledge and the experience of offshore diving technologies and the integration of diving equipment. Therefore it is able to offer integrated diving systems including DSV Class notation. This leads to short delivery times and a cost-effective solution.

Due to IHC’s integrated approach, the design is optimised with respect to efficiency and safety. This means that customers only speak to IHC regarding the diving equipment, integration of the diving system, rules and regulations and vessel particulars.

**New generation of vessels**
Current developments in the exploration and production sector require a new generation of diving support solutions. The key factors to be considered are multifunctionality, optimal efficiency and worldwide usability. IHC solutions are designed to support for example, professional diving integration, mission control and de-risking.

**Custom-built and pre-designed solutions**
IHC delivers custom-built diving support vessels, such as the SEVEN ATLANTIC, as well as the pre-designed ready-to-build IHC Supporter® class series with integrated saturation diving equipment. The IHC Supporter® class gives competitive pricing, shorter delivery time and can easily be built at one of IHC’s locations worldwide.

IHC custom-built vessels are designed to accommodate all specific project requirements and customer specifications. They are able to perform the most complex operations and the company’s in-house design team uses its extensive knowledge for the benefit of customers.
Reliable partner for efficient diving support solutions

The Offshore division of IHC strives to deliver the best value to its customers. It is a partner of choice for innovative, sustainable and integrated offshore vessels and equipment. IHC’s offshore solutions are reliable, efficient and flexible to the demands of challenging seabed-to-surface oil and gas projects, and the renewable energy market. With its extensive knowledge and in-house design capabilities, IHC ensures compliance with the latest technological developments, strictest safety regulations and most stringent environmental standards.

Reliable
IHC excels at managing the complexity inherent within the development of 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 has an impressive track record of delivering innovative solutions to major subsea construction companies, ship owners and oil companies.

IHC Hytech is IHC’s specialist in high-quality diving systems and equipment. With a broad customer base that includes various navies, governmental organisations, salvage companies and inshore/offshore diving contractors (both domestic and international), it has extensive experience in designing and manufacturing safe and reliable diving equipment. IHC is also able to integrate diving systems from every reputable supplier.

Partnership
Specific demands require bespoke designs. IHC provides cost-effective products, not only when newly acquired, but also throughout their working lives. The IHC team works closely with the customer and becomes an extension of their organisation, so that both parties can complement each other’s expertise. It can, for example, advise on the design, regulations and structure of the project. This reduces risk and cost to create a smoother process, which leads to better results.

Efficient solutions
IHC constructs custom-built vessels and equipment to meet customer specific requirements, as well as standard vessels with a ready-to-build design, the IHC Supporter® class. Conducting business in an offshore environment is often turbulent. Technical and financial risks are significant, and margins are constantly fluctuating. World oil prices are sensitive to political and monetary events.

The difference between profit and loss for an owner or operator of offshore support ships is greatly influenced by the productivity of these long-term investments. Efficiency, reliability, durability and safety are key factors to success. IHC understands its customers’ needs and has the ability to provide innovative and efficient solutions for a variety of diving support projects, such as subsea installation and construction, maintenance and repair.
Products

Innovative vessels

For diving operations as well as subsea construction, installation and maintenance in the North Sea and other locations worldwide, the customer required a flexible state-of-the-art diving support vessel that could be easily adapted to different tasks on the charter market. In order to be able to work in different geographical regions, the TOISA PEGASUS is large enough to be self-supporting in remote areas. To be cost effective, the design is based on the versatile 22-metre beam of the IHC Type-22.

As an enhanced sister ship to the TOISA PROTEUS, but with a fully integrated saturation diving system, it can support a wide variety of subsea operations worldwide. This DP3 vessel is capable of meeting high standards in safety, dynamic positioning operations and saturation diving.

It is built with an integrated 18-person twin-bell saturation system. The under-deck configuration allows for a range of equipment to be installed, while the large clear deck area provides enough space for a range of other applications.

The increasing need for subsea construction vessels to accommodate large numbers of personnel has also been addressed. The vessel can accommodate up to 199 people (excluding any divers in saturation), depending on the charterer’s requirements.

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The SEVEN ATLANTIC has been specifically designed for saturation up to 350 metres below sea level and features an integrated saturation diving system. Suitable for worldwide operation, she is the highest class DP vessel capable of operations in severe weather conditions. In order to enhance the FMEA safety case, the vessel is designed with full triplication of all DP, propulsion and manoeuvring related systems and subsystems, which allows the vessel to maintain DP3 operation with a system or component out of service.

The integrated saturated diving system on the SEVEN ATLANTIC has a total capacity of 24 divers: eight diving teams with three members each. The maximum continuous working diver capacity is for divers deployed by two diving bells carrying three divers each. The diving system is designed for operations in depths of up to 350 metres. The vessel has a total of five moon pools, two for the diving bells, two for the observation class ROVs, and one for lowering instruments and tools to the seabed.

The vessel’s stability significantly reduces dependency on port calls for crew change, and as an example, helicopter crew changes of 38 personnel have been safely conducted in force seven conditions. She can also operate at ease in fully developed sea conditions in excess of 4.5m Hz. The SEVEN ATLANTIC has surpassed her design objectives and has received a number of customer commendations, which is testimony to an exemplary design and a committed team, both onshore and offshore.

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Innovative vessels

With an increasing number of ageing wells and shrinking reserves, it is becoming more viable and important to maintain the former and extract the maximum amount of oil. The requirement was to develop a state-of-the-art well intervention and diving support vessel, suitable for operation in the North Sea as well as worldwide.

The WELL ENHANCER is based on the IHC Type-22 design, which makes it a cost-effective vessel of high performance and quality. IHC adapted the design to accommodate a multi-purpose tower (designed and built by Huisman), an 18-person twin-bell saturated diving system and a twin work-class ROV system. She is fitted with coiled tubing and is prepared for upgrading with a flare boom.

Triplicated engine rooms allow the WELL ENHANCER to maintain DP3 operation with one engine room out of service. An innovative multi-purpose tower next to the work moon pool offers flexible hoisting capacity, while maintaining efficient use of deck space. The safety and security during intervention work is guaranteed by a gas closure system using overpressure to protect the vessel’s accommodation. The twin ROV system is integrated into the ship’s design.

**Name** | **Purchaser** | **Delivery year**
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WELL ENHANCER | Helix Energy Solutions | 2008

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<tr>
<th>Description</th>
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<td>Length between perpendiculars</td>
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<tr>
<td>Breadth</td>
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<tr>
<td>Depth</td>
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<td>Design draught</td>
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<td>Scantling draught</td>
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<tr>
<td>Speed</td>
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<tr>
<td>Deadweight</td>
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<tr>
<td>Number of divers</td>
<td>18</td>
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<tr>
<td>Number of dive bells</td>
<td>2</td>
</tr>
<tr>
<td>Operating depth</td>
<td>300m</td>
</tr>
<tr>
<td>Number of work class ROVs</td>
<td>2</td>
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<tr>
<td>Total installed power</td>
<td>15,862kW</td>
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The modular approach for the IHC Supporter® class product range offers a variety of functionalities that suit the customer’s mission requirements. Maximum synergy is obtained by the integration of vessel particulars, a diving system and other equipment into a complete diving support solution. As a result, various diving configurations will be available for the IHC Supporter® class platform.

Different diving support purposes require varying vessel lengths and the integration of different diving systems. Vessel lengths ranging from 81 to 117 metres allow for the integration of diving systems with a capacity of 6, 9, 12 or 15 divers. The systems have a depth rating of 100 and 200 metres of seawater respectively, and are equipped with a single bell launch and recovery system through a dedicated diving moon pool.

Alternatively, diving equipment can be integrated into vessels with other primary mission profiles, such as well intervention. The versatile IHC Supporter® class platform, in conjunction with advanced modular diving equipment, offers a cost-effective offshore diving solution that suits a wide range of mission profiles.

Cutting-edge technology is readily available for condensing into IHC vessels. The automation of the modular design is integrated in the system architecture by IHC’s specialist business unit, IHC Drives & Automation. Double engine rooms allow the IHC Supporter® class to maintain DP3 operation with one engine room out of service.
IHC offers a wide range of advanced equipment to ensure the deep-water diving operations of its customers can be carried out safely and effectively. This includes saturation diving equipment and decompression chambers that allow divers to stay under water for significant periods to complete their work. The company also supplies several diver handling systems and components required for deep-water diving activities, as well as the necessary electrical power and automation systems.

Saturation diving
As well as integrated third-party saturation diving systems for its innovative vessels, IHC also provides other equipment for safe deep-water diving.

Integration of SAT-systems
IHC Hytech is IHC’s in-house centre of competence for offshore diving technologies and integration of diving equipment. By combining experience in vessel integration and advanced equipment with knowledge of diving, IHC is able to offer integrated diving system solutions including DSV Class notation.

Mini SAT-system
A variety of innovative and modular air and mixed gas diving systems are available. These range from basic transportable decompression chambers via air dive basket LARS units to fully integrated mini SAT-diving systems with all the necessary life-support equipment.

All of these systems are built around deck compression chambers, which provide safe and controlled diver decompression. The layout of the deck decompression chambers includes wet-pod facilities (with sanitary provisions) and multiple main locks, depending on customer requirements. A dedicated launch and recovery system allows the divers to be transported to and from the subsea work site with the closed dive bell. This is equipped for two or three divers, depending on system configuration.

The necessary life-support equipment is containerised for easy deployment, including hot water machines, environmental control units and gas management panels. During operation, the dive is supervised and directed from the control room. Depending on the system set-up, this can either be containerised or integrated in the vessel superstructure.

Hyperbaric self-propelled lifeboats
The preferred method for the safe evacuation of saturation divers is by means of a hyperbaric self-propelled lifeboat. IHC is the market-leading supplier of hyperbaric evacuation pressure chambers, complete with the chamber outfitting, and the internal/external life-support and environmental control equipment.

IHC evacuation chamber systems are available for nine, 12, 18 or 24 divers and for depth ranges up to 400 metres of seawater. The interior of the diver evacuation chamber integrated in the self-propelled lifeboats includes a hyperbaric toilet, CO, scrubber systems, environmental control units and a medical lock. The entire unit is DNV and SOLAS approved.

Decompression chambers
The decompression chambers built by IHC are considered to be market leading and suitable for any application. They are the result of divers working together with the design teams, mixing seasoned experience with fresh perspectives. The company believes that decompression chambers should be easy to operate, to avoid possible errors or losing precious time.

IHC manufactures decompression chambers in all types of materials and configurations: aluminium, steel, duplex, stationary, mobile or transportable. They have standard tanks, but are by no means limited to one model. All decompression chambers can be custom-made to fit their applications precisely. Safety and reliability are important features and IHC is able to build decompression chambers according to any standard: Lloyd’s Register, ABS, GL, DNV, IMCA and so on.

A standard decompression chamber comes with two compartments: the main chamber and an entry lock. The chamber is skid-mounted and has large lifting lugs for increased mobility. The tank will go wherever the diving operation is located.

The interior and exterior of the chambers are covered with a special coating. Working pressures usually range from 50, 70 or 100 metres of seawater for surface-supplied diving activities for air and mixed gas operations. Chambers with working pressures of up to 400 metres of seawater can however also be provided for saturation diving operations.

For integration in existing systems, the chambers can be supplied with connection flanges to fit any bell or auxiliary chamber. The skid can be used to integrate the air cylinders required to provide maximum operational independence. The pressure hull has a number of spare penetrators that allow additional systems to be installed. A large-size medical lock is a standard feature. View ports with a diameter of 150mm allow observation of both compartments.

DART and ATEL
DART stands for Diver Attendant Recompression Transportable, which is a type of transportable decompression chamber, large enough to accommodate two people (one patient and one attendant). Due to its special shape and size, the DART is spacious enough to allow for extended transportation or treatment times if necessary.

Compact and lightweight, the DART is ideal for transferring divers under pressure to a hyperbaric medical facility. It is fitted with a rotating STANAG male flange, which allows it to be connected to a large number of hyperbaric facilities. It is also possible to use adaption flanges to connect the DART to hyperbaric facilities using other connection flanges. The DART transportable decompression chamber can be installed in an ISO norm container.

ATEL stands for Attachable Transportable Entrance Lock. This is an additional chamber compartment, which can be used in combination with the DART, allowing attendant entry to the DART. The ATEL is provided with a special STANAG female flange, which makes it possible to link the ATEL to the DART, creating a two-compartment chamber.
Diver handling systems
To ensure the safe transportation of divers, several diver handling systems are available from IHC’s specialist business unit, IHC Hytech.

Launch and recovery systems
Divers can be transported to and from the subsea work site using the Launch and Recovery System (LARS). This is a diver handling system designed for a dive cage with two divers and two 50-litre air bottles, with a deployment depth of 100 metres. The diving control station is located in one of the containers. Deliveries include the complete diving gear, such as helmet lights, video communication and the surface umbilical connections.

The benefits of IHC launch and recovery systems are as follows:
• easy to transport and operate
• guaranteed safety
• the clamp winch can raise a manned cage in case of emergency (secondary back-up)
• certified by Lloyd’s Register and meets IMCA guidelines
• marine working environment
• heavy-duty parts.

Wet bell
The WBIHS3-100 is an open wet-bell handling system that allows three divers to work at a depth of up to 100 metres. The system consists of an open wet bell with an internal diameter of 1,500mm (approximately 5ft), an A-frame with sheaves, a top frame with hydraulic winches to hoist the bell and its clump weight, and a Dive Control Container (DCC).

A dive control panel, and the controls for communication, illumination and camera systems are inside the DCC. The system can be completed with a containerised decompression chamber (20ft container), and such diving materials as hot water suits, a hot water supply unit, diving suits and helmets, and various underwater tools.

High-quality components
IHC manufactures and delivers a wide range of high-quality components, which are designed to meet the toughest standards in the industry. Examples include gas control panels, LED helmet lights, flow fuses and scrubbers.

Portable three-diver, two-diver and one-diver panels are also available. The three-diver panel is a surface-supplied diving system designed to simultaneously support three divers working at a depth of 70 metres of seawater (optional 100 metres) on all types of underwater tasks, including surveys, maintenance, defect rectification, cutting and welding.

IHC also designs and produces containerised gas production and control systems. The containerised self-supported oxygen production system features the following:
• diesel-driven generator
• low-pressure compressor
• high-pressure compressor
• pressure-swing absorption system
• booster pumps
• gas-mixing control panel.

Electrical power and automation systems
In addition to vessels and equipment, IHC delivers total systems for efficient offshore operations. With IHC Hytech as the in-house diving competence centre, IHC Drives & Automation supplying the complete electrical installation and automation, and IHC Offshore & Marine with its experience on integrated vessels, all disciplines are under one roof to provide the ultimate integrated solution. Tailored to meet the performance requirements of customers, the latest technology in electrical drives and platform automation optimises the design, construction and operation of these complex working vessels.

An integrated approach
IHC Drives & Automation excels in the integration of a variety of systems, such as navigation functions, communication, energy management, high crane operation, offshore handling and propulsion control. The approach ensures high system availability, sustainability and maintainability.

The specialists at IHC design and deliver generators, electric/submersible motors, main switchboards, variable frequency drives for low and medium voltage, transformers and inverters, DP2 and DP3 systems, as well as artificial intelligence-based platform automation systems. Complete electrical installations and additional equipment integrate all features. Training and life-cycle support help to reduce the cost of ownership for customers.

High level of performance
Electrical power systems are becoming increasingly important on board. A growing number of electrical systems enables a more flexible vessel layout and, in most cases, greater efficiency in the application of energy. The modular design of IHC vessels in general and their innovative frequency drives provide a high level of system performance.

The integration of an in-house developed platform automation system is mainly provided in three product lines, accompanied by complete electrical installations:
• Alarm and Monitoring Systems (AMS) with principal design appraisal of classification societies
• Vessel Management Systems (VMS) for the integration of all platform functions, including PMS and offshore operation systems
• Condition Monitoring Systems (CMS) for the support of maintenance and logistical decisions.

IHC offers the optimal integration of electro-technical and automation knowledge with naval and mechanical engineering to its customers. This results in enhanced control of the vessel, improved safety for divers, redundancy in system design and a higher level of performance.
IHC customers rely on the unrivalled level of commitment that is offered to them through dedicated and comprehensive life-cycle support services. These help to maximise the equipment’s availability and the return on investment, and therefore reduces the total cost of ownership.

The cycle can be entered at any of its five integrated stages:

**Design**
The design phase encompasses the entire trajectory, from the first point of contact about a potential offshore challenge, to the last drawing or calculation, directed to offer a practical solution.

**Build**
Irrespective of the actual location, the building stage integrates the procurement, manufacturing, commissioning and testing of the vessels’ and equipment’s hardware and software. Their future utilisation and operational efficiency are enhanced and ensured by the life-cycle support services. Examples of the services are project management, works and site supervision, commissioning and technical support.

These services improve the quality, sustainability, durability, ease of maintenance, compliance to regulations, and awareness of systems and operations. Depending on the type of equipment and/or contract, they are – partly or wholly – integrated in the scope of delivery, but they can also be offered separately to customers worldwide.

**Operate**
The operational stage of a system either embraces the period from the day of delivery of vessels and/or equipment until its functional withdrawal, or a full lease/rental period. During this trajectory, the aim is to preserve the system’s vital functionality and efficiency under prevailing or changing operational conditions.

**Maintain**
At this stage, the aim is to optimise the system’s availability in a cost-effective manner. This is achieved by intelligently maintaining its technical functionality with regard to prevailing operational circumstances – and by a quick response in the event of an unexpected technical defect.

**Upgrade**
This stage facilitates several options for the necessary overhaul and/or replacement of major or structural systems and subsystems. These are based on economic considerations, continuing compliance to regulations or changing operational requirements.

The technology innovator’s highly qualified experts design and build innovative vessels and advanced equipment based on their vast worldwide experience of the dredging, mining and offshore industries.

The company offers a complete spectrum of high-quality and up-to-date services to ensure that crews operate in a highly skilled and efficient manner to achieve optimum levels of productivity. IHC life-cycle support also allows operators to maintain the durability and reliability of their systems through a range of specialist services.

Furthermore, an upgrade by means of renovation, modification or update of the existing systems, components and/or software can extend the working life of the vessel and equipment. With the expertise to research, engineer and install to the highest possible standard, the IHC team will also utilise complex processes, knowledge and experience to maintain the correct and safe operation of all its products on board.

**Your performance is our challenge**