



**Out there
to outperform**

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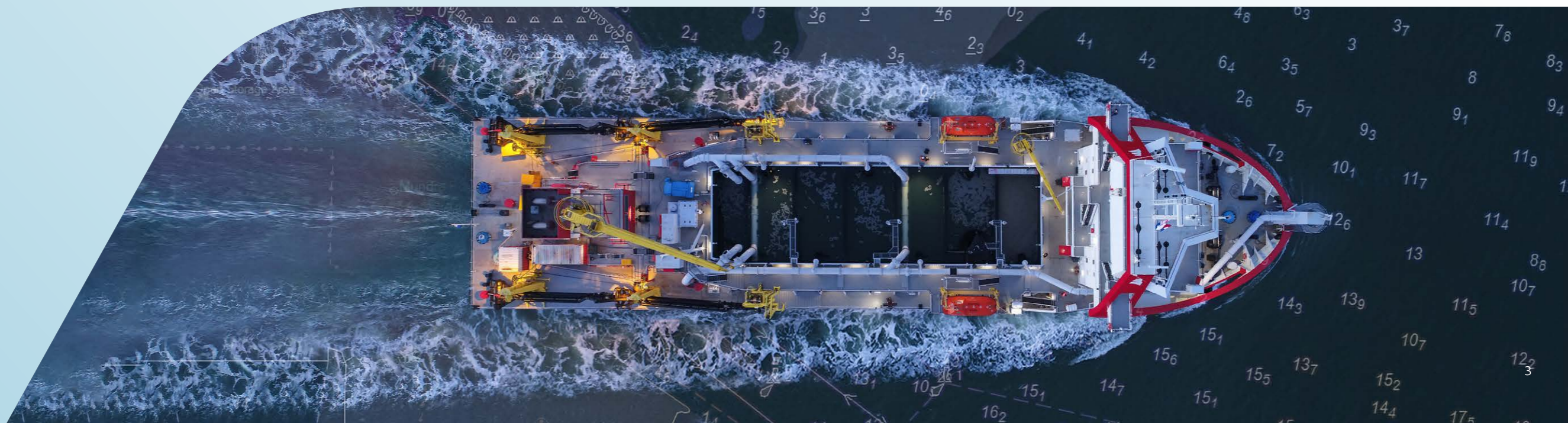
IHC Dredging Out there to outperform

Dredging is in our DNA. With over 300 years of experience, IHC Dredging is the market leader for the design, build and delivery of reliable, integrated vessels, equipment and services in the dredging sector.

With knowledge built over centuries and through our passionate colleagues, we provide a competitive edge to our customers in the dredging industry worldwide. Our people are deeply committed to technological innovation. By means of the state-of-the-art vessels and equipment that we design and build – and the services we deliver – our customers can improve their operational efficiency and make their activities more sustainable. This also prepares them for the challenges of tomorrow.

IHC Dredging's proven track record shows that global dredging operators, contractors and governmental authorities rely on our high-quality solutions and services. In order to serve all dredging needs, our products range from standard, modular stationary and mechanical dredgers, to the world's largest custom-built self-propelled dredgers and related equipment.

Our local, remote and digital services offer the necessary support required by our customers to keep assets in optimal condition and fit for the future. With our experts working on a global basis, we guarantee a local presence and industry leading support on every continent.



The future of dredging

Innovation and collaboration for more sustainable operations

In the dredging industry, there is a significant journey ahead in moving to more sustainable solutions and durable operations. To prevent further damage to the environment and even reverse the damage done, focus is being put on topics such as emission reduction, creating a circular economy, climate neutrality and building an infrastructure to accommodate the energy transition towards renewables.

In the quest for maximum sustainability and lower emissions, IHC Dredging is focussing on the development of sustainable and more

efficient solutions. IHC Dredging has already built several dredging vessels that are either running on LNG or are LNG-ready. In addition to looking towards alternative fuels with lower emissions, there is also a continuous pursuit for lowering the installed power through ever more efficient equipment.

To realise our vision of zero emissions operations and a more sustainable future, Royal IHC recognises that close cooperation with all stakeholders – including national governments, customers and suppliers – is required. By entering into industry-wide partnerships, barriers can be lowered, and the risks of investment reduced.

Efficiency improvement through continuous innovation

A company doesn't stay in business since the 17th century by standing still. By listening to customer feedback, IHC Dredging continues to innovate the design of our dredgers and dredging equipment.

Recent examples include:

- hull shape developments
- improved habitability, maintainability and ergonomics
- mission equipment developments for maximum durability and operational efficiency
- turbidity reduction via our Plumigator® anti-turbidity overflow system.

Increased automation options have been explored to improve dredging operational efficiency and provide a longer lifespan for mission equipment. Parallel to the drive for emission-free vessels, our agenda for the future also includes the development of highly automated dredgers with minimal or zero crew.

Digitisation

Another global trend with effects on the dredging industry is digitisation. Where the information age gave us a connected world, digitisation offers our customers connected equipment.

Some solutions currently being developed by IHC Dredging are:

- increased insight in the performance by means of an app to generate daily reports and sharing it to all involved automatically
- remote assistance and trouble shooting capabilities with artificial intelligence (AI)
- completely autonomous operations with first proof of concept designs of an autonomous unmanned dredger.





Redefining performance

Everything is impossible, until it is done. Handing over the Spartacus, the largest and most powerful cutter suction dredger in the world to DEME, we are proud to have

set a new standard in the dredging industry. Engineered to perform and built to last, our latest vessel is impressive down to the finest detail.

Packing more than 44,000kW of triple-fuel power and fitted with countless eco-friendly innovations and a heavy-duty cutter ladder that can reach dredging

depths up to 45 metres, the Spartacus leads the way with next-level efficiency and maximum sustainable performance.



Dredging vessels

As the market leader of supplying integrated dredging solutions, IHC Dredging designs and builds innovative vessels that enable our customers to be ahead of the competition and outperform in their industries. Our broad portfolio of vessels is applicable to a wide spectrum of dredging projects.

Trailing suction hopper dredgers

More than 100 years ago, Royal IHC's Kinderdijk shipyard built the first trailing suction hopper dredger (TSHD). Since then, the IHC Dredging has always performed in the forefront of dredging vessel design and innovation. IHC Dredging has built around 400 self-propelled standardised and custom-built TSHDs for its broad customer base. They are designed to work in extreme conditions, at challenging depths and to handle various types of soil.

Easydredge®

The Easydredge® is a product line of standardised TSHDs. The easy entrance design makes use of Royal IHC's decades of experience, focusing on standardisation and aiming at maximum cost-efficiency, straightforward design and affordability. While available from stock, the Easydredge® can also be adjusted to suit our customers' needs via pre-designed additions, now and in the future. This way, an easy-usable solution is offered without significant concessions in terms of delivery time and pricing. It allows to start and grow with the business and ensures that it remains the right tool for the right job.

Beagle®

Building on a century of dredging evolution and experience the Beagle® – a range of standardised TSHDs – has been developed with its aesthetic design and proven and advanced technology. The Beagle® is a modular platform, possible to tailor each vessel to fit the specific dredging job at hand, while retaining its standard features. The basic version provides all-round operational excellence with shore pumping and rainbowing facilities, ideal for general dredging projects such as waterway maintenance and capital work. A Beagle® is designed to perform in all dredging activities, such as dredging challenging soils in tough environmental conditions while complying to the most demanding ecological legislations.

Custom-built TSHDs

Custom built TSHDs can be designed for all possible dredging operations. When a standard design doesn't fit, specific requirements of the customer regarding execution and operational performance and technological know-how of Royal IHC are brought together to create an optimised fit-for-purpose design. Designs range from small, straightforward maintenance vessels to high-end mega TSHDs. The flexibility of a custom-built system creates optimum scope for technical innovations such as the use of alternative fuels, drive trains and new concepts to ultimately provide best return on investment.



Autonomous dredgers on the horizon

Where many initiatives in the industry are focused on exploring COLREG-compliant autonomous navigation, our autonomous hopper dredger project has a different approach. For such vessels, the most important aspects of the operation are the dredging and offloading process. While autonomous navigation is not ignored, the main focus of our developments is to first increase the autonomy during these phases.

With this in mind, we have designed the so-called 'Mission Master' which connects different systems on board including the

dredging control and the dynamic positioning (DP) systems. Together, these are capable of controlling the propulsion and the dredge equipment. The philosophy behind this approach is that 'the whole is greater than the sum of its parts', thus creating added value by combining and making systems work together that are already on the vessel.

Tests with our inhouse simulator have shown that we are able to take aspects of the dredging process to a high level of autonomy in a controlled environment.

Innovation



Cutter suction dredgers

IHC Dredging designs and builds a variety of standardised and custom-built CSDs. These are capable of dredging compacted soil types and materials, such as clay and rock. High accuracy and a continuous rate of production ensure that our CSDs are ideal for many dredging jobs, such as land reclamation and the construction of new harbour basins and canals. Royal IHC designs, engineers and manufactures all of the major equipment on CSDs. This is hugely beneficial to the customer, who receives a unique package of integrated dredging solutions.

Beaver®

Beaver® dredgers are the latest generation of preconfigured cutter suction dredgers. They can be matched to customer requirements for many applications and feature a wide range of optional extras, including increased dredging depths, anchor booms, spud carriage installations, swivel

bends, and automation. This standardised series is available with a dredging depth ranging from 6-18 metres and a suction pipe diameter ranging from 260-650mm. The standardised design means that they can be delivered from stock – with shorter delivery times than custom-built vessels – and are competitively priced.

Custom-built CSDs

A solution for every challenge our CSDs are renowned for their efficiency, reliability, high production rates and complex, state-of-the-art technological features. The custom-built vessels are designed to meet individual customer requirements according to the philosophy that for every challenge, there is a solution. In addition, all products benefit from an outstanding level of

service, as well as high performance levels. Custom-built dredgers range in size, from smaller rock dredgers and environmentally friendly models, designed for reservoirs and lakes, to the largest LNG-powered vessel in the world.

Auxiliary vessels and other dredgers

IHC Dredging can supply a wide range of auxiliary vessels and equipment, which are required to transport dredged material to the final placement site, assist the dredger or increase its overall production rate.

Work boats

The Delta Multi Craft (DMC) work boat series is designed to optimise the operation of Beaver® CSDs. This means they are guaranteed to be able to tow the dredger and lift the pump casing and cutter. They can team up with all types of dredgers and improve operational efficiency. This cleverly engineered work platform can pick up and put a load on its own deck – something that a tug or crew vessel cannot do.

Grab hopper dredgers

Our grab hopper dredgers are designed for port maintenance, especially in confined areas such as docks and berths. These compact dredgers are easy to operate with reduced maintenance costs and high levels of autonomy.

Split hull vessels

IHC Dredging's split-hull vessels are designed for seagoing and inland use. The ease and speed of disposal makes them highly attractive for use in combination with backhoe dredgers, CSDs and grab hopper dredgers. They can also be converted to a TSHD with a trailing suction pipe system, or to a grab hopper dredger by installing a crane.

Backhoe dredgers

Our backhoe dredgers operate with extreme accuracy when trenching and working close to solid structures in sand, compact clay and rock. They are equipped with high-end control and automation systems for dredging operations.





Imagine the performance

Intrinsically strong and durable, our single-cast Curve Tooth cutter head is designed to handle the toughest of soils. With patented, self-sharpening teeth and an integrated

locking system that allows for quick and easy tooth replacement, we set the standard in the market of dredging operations.

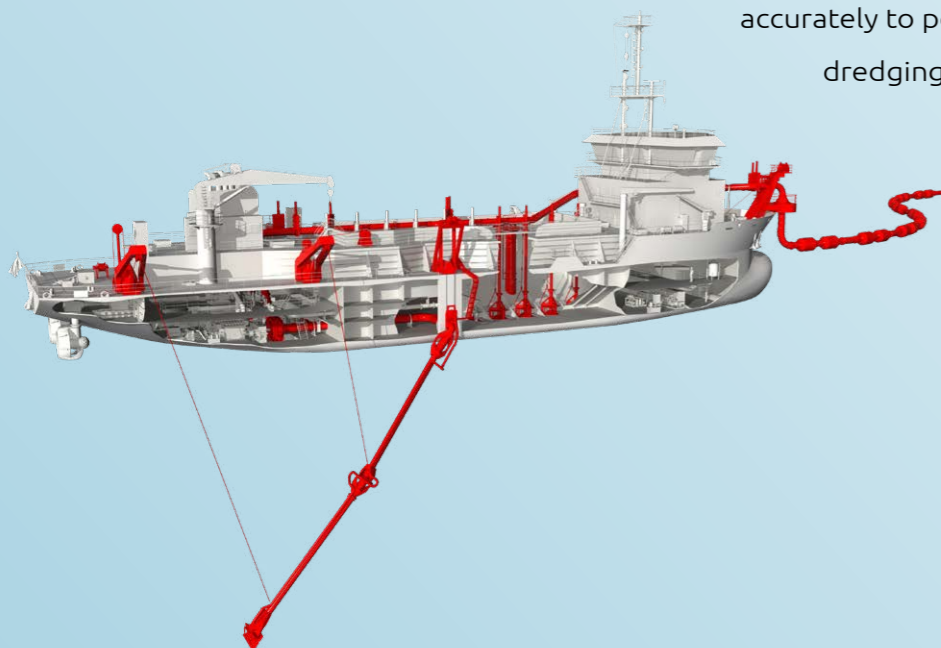


Dredging equipment

IHC Dredging builds, modifies and upgrades hydraulic dredgers all over the world. The specialised dredging equipment onboard of these dredgers delivers a range of benefits to our customers worldwide, including higher productivity, reduced operating costs, optimum efficiency and minimal downtime. As such, it contributes to the profitability of various international dredging projects.

Hopper equipment

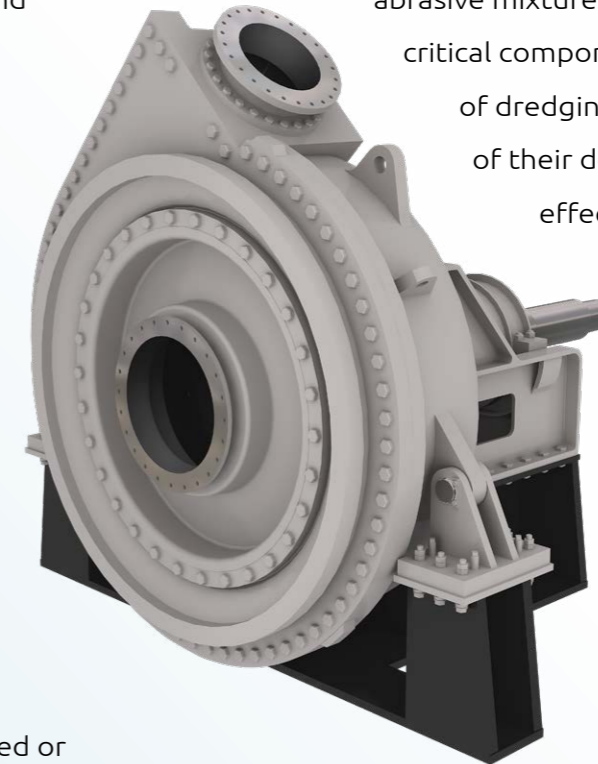
The primary equipment that ensures an efficient excavation and loading process on board a TSHD are the draghead, suction pipe, swell compensators, gantries, degassing system and overflow. The productivity of the vessel is influenced greatly by the effectiveness of this equipment. The suction pipe and draghead can be positioned accurately to perform the intended dredging operation and transport the soil to the hopper.



Furthermore IHC Dredging offers several types of discharge systems for quick and efficient soil discharge. These include bow couplings and bottom doors.

Dredge pumps

The cost-effectiveness of dredging depends to a great extent on the performance of pumps. IHC Dredging has a long track record in delivering modern dredge pumps in any configuration (single or double-walled, submerged or onboard) and jet pumps. They are developed,



designed and produced with high efficiency in mind. Targeting the efficient transport of either abrasive mixtures, dredge pumps are critical components in almost all types of dredging systems. The optimality of their design, which reduces the effects of wear, and the ease of maintenance are the main parameters in defining the productivity of our dredge pumps. IHC's latest technology is utilised in jet pumps to ensure a quick loading and discharge process.

Plumigator overflow

Tackling the most well-known problems of turbidity, plume, and air beneath a vessel, IHC Dredging has developed an innovation called the Plumigator overflow. Since its early development, we have been working on the continuous improvement of this innovation aiming at creating a solution that is both sustainable as well as beneficial to our customers' operational efficiency.

While already successful in limiting air release and turbidity during dredging, offering environmental as well as economic benefits it is now optimised in its design to create a larger passage for debris and further

reduced the need for grating. The moveable insert ensures the release of yet collected debris and ease of accessibility for maintenance and inspection. Both ultimately improve uptime.

The patented design of the inlet openings also reduces the velocity of excess water in the hopper. This is beneficial as it allows the soil particles extra time to settle. Combine this with the decreased weight of the construction, it creates a boost in production by reduced loading time and increased payload.

Innovation



Cutter equipment

IHC's cutter technology is driven by fundamental knowledge of excavation, slurry creation and wear resistance. The first point of physical contact between the soil and the vessel is the dredging wheel or the cutterhead, which are the key components for high-density slurry creation. The productivity of a cutter suction dredger is influenced greatly by the effectiveness of these components.

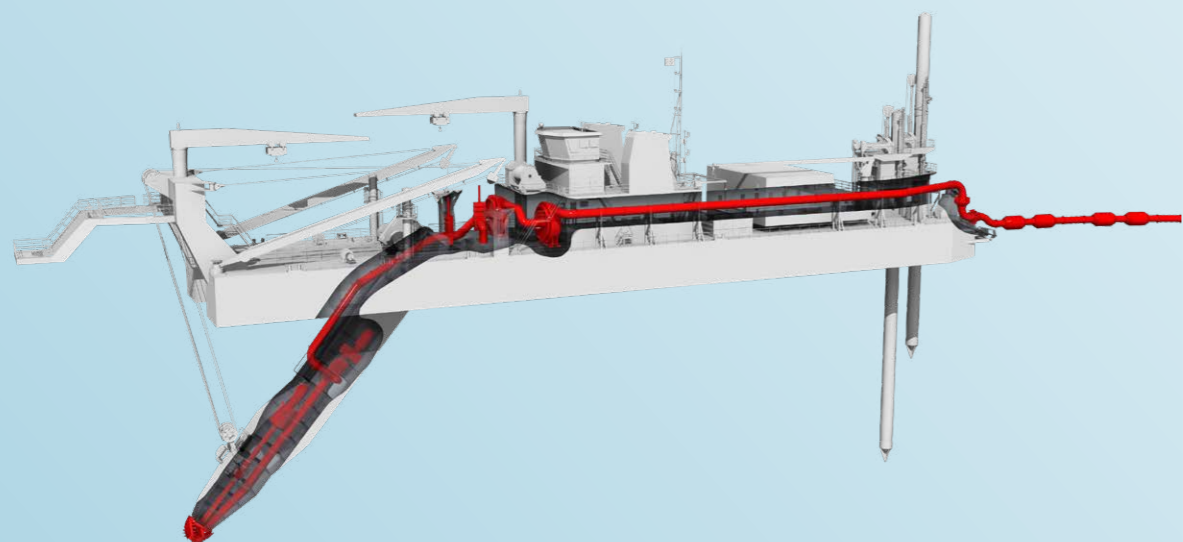
Dredge line components

An important part of the dredging process is the transportation of soil through the pipeline, the regulation of the mixture by valves, and the discharge to – and in – the floating discharge lines. Our product range contains rubber hoses, dredge lines, turning glands, jet water systems, gate valves, de-aeration valves and ball joints. The choice of the right component, at the right location and for a specific type of soil minimises wear and energy loss.

Automation

Optimally utilising a dredger requires finding a delicate balance between the platform and all installed dredging equipment on a large-scale built and highly powered instrument. This balance is controlled by automation. The evolution of onshore and offshore communications has facilitated a greater understanding of data. This has resulted in an enhanced ability to predict operational behaviour.

The improvements in control, monitoring and automation systems reflects this, and they are now able to continuously adapt and efficiently execute a specific operation. Automation further enhances the benefits of an already efficient IHC-built dredger. As such integrated automation, governed by an experienced operator improves the efficiency, accuracy and predictability of the operation and can enhance production by up to 30%.





Foresight is the essence of efficiency

To achieve optimal performance and increase operational efficiency, IHC Dredging provide its customers with indispensable intelligence. With 24/7 asset and performance monitoring, and remote

support and consultancy on demand, we help you to make better-informed, data-driven decisions and improve your results on the go.



Dredging services

By offering high-quality services and global support, we help our customers operate in a highly-skilled and efficient manner. In turn, this propels them towards achieving optimum levels of productivity by improving the performance of their vessels and equipment. This increases their uptime and reduces the total cost of ownership.

Services during manufacturing and commissioning

During the early vessel manufacturing stage, we advise our customers of the most efficient maintenance program, planned or condition based, with a recommendation on spare parts and maintenance tasks. In the commissioning phase, we ensure that our customer as well as their vessel are ready for operations. This includes offering various start-up and digital services, consultancy, and training.

Services during operations

Maintenance management, repairs and spare parts

Efficient and effective maintenance is essential in keeping a vessel performing at its best. Combining IHC Dredging's design and building knowledge with our operations and maintenance experience, we ensure our customers can reduce OPEX and unplanned downtime.

Vessel and component repairs are carried out by our highly skilled experts with extensive OEM knowledge and logistic process expertise. Equipment is overhauled at one of our global OEM workshops with the aim to become operational again as fast as possible. We also help customers manage complex repairs (prepare for, supervise and execute) while reducing costs and keeping short

lead times. Via our global stock locations, IHC Dredging supplies spare parts whenever needed to perform maintenance on systems in an efficient and economical way.

Condition monitoring services

A Condition Based Maintenance program includes monitoring of all critical assets. For dredgers this could include online vibration and wall thickness measurements on pumps and piping, or inline oil analysis of gearboxes and hydraulic installations. Our specialist can assist with making not only the right choice of a condition monitoring system but more important, how to take monitoring data and create useful operational information.

Performance services & consultancy

With over 70 years of extensive knowledge and operational experience, our team is skilled in providing a broad range of advisory services during the operation of the equipment.

This combined with access to performance data of the vessel, enables us to provide support in the preparation, operational use and optimisation of the dredging equipment and projects.

Training

An optimum operation requires a well-educated crew. IHC Dredging provides a full range of high quality training courses in the field of dredging for operators, technicians, project engineers and managers. Tailored to the dredging equipment and requirements of our customers, we provide worldwide, local and on-the-job training. Our portfolio ranges from introduction courses to highly specialised masterclasses. Training is also provided at our facility in The Netherlands, which is equipped with state-of-the-art dredge simulators.



A holistic approach to our projects

At IHC Dredging we aim at delivering a totally integrated solution and we believe that designing, constructing and putting into operation the most efficient dredger is only possible in **close collaboration** with our customers.

With more than a century of experience of building vessels – and hundreds of these still operating all over the world – our track record of **listening to and understanding** our customers' operational needs speaks for itself. Key to our longstanding success is knowing the circumstances in which a vessel

will operate. From there, together with our customers we **build a specific business use case** that will ensure a vessel is designed to deliver optimal performance efficiency for its required task, while resulting in the lowest operational costs.

We offer a service that includes **in-house design, engineering and building** of vessels, mission equipment and tools, thus allowing for expert guidance through every critical step of the shipbuilding process, conform to the strictest safety regulations and environmental standards.

We aim to increase the ease of doing business by offering **financial solutions** for all of our products, regardless of their size. In current markets, it can be significantly challenging for our customers to arrange financing themselves. For this reason, IHC provides a helping hand and is involved in around nine out of ten of our orders in one way or another.

To help starting up operations, IHC Dredging provides **commissioning services, training and advice** throughout the complete life cycle of projects. This can range from

detailed feasibility studies and consultancy to optimise operations to the development of a detailed dredging plan in order to **maximise production levels, efficiency, and profit**.

Want to explore how IHC Dredging can help with your dredging challenge? Reach out to us. Together, we create the maritime future.



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