

Loading systems



MACGREGOR

Designed to perform with the sea



Passion for performance – united by the sea

MacGregor is a family of innovators. By engineering solutions that make the sea more accessible, safe and reliable, we support you whose livelihood depends on the changing conditions of the sea. To enable that we have a variety of strong product brands and committed experts with a passion for solving challenges – and the power of the sea is sure to provide those.

Our founders braved new frontiers in different times and places. Those origins merge at today's MacGregor, inspiring us to continue the stories, and create new ones. The spirit of our founders lives on in the pride we have for what we do, and our determination to find new solutions for the people we work with. Together with you we will write the next chapters.

We are a global team of professionals, who create value for you; the shipbuilders, owners and operators,

in the offshore and marine industries. Understanding your business and way of life is key to our work. It is the foundation to addressing your needs with tailored solutions for load handling, cargo handling, mooring or essential auxiliary equipment. Your productivity, sustainability, and equipment lifetime benefit from our combination of expertise and technology. As innovators, we work together with you to set benchmarks in innovative solutions and value creation. Our deep respect for and experience of the sea lays the foundation for adapting to its challenging conditions. Wherever we work around the world, we work together with a passion for performance and a love of challenges – united by the sea. Our shared values - integrity, quality and safety - propel us forward, and are an important factor in our ability to continue to deliver what our customers need to succeed; solutions that are *designed to perform with the sea*.



MACGREGOR

Designed to perform with the sea

The valuable connection

Since 1977 MacGregor has developed and supplied loading systems for both simple and sophisticated operations. The new range of products is based on innovative and proven technology and meets customers' and authorities' requirements for operational and environmental safety.

MacGregor believes that commitment to continued research and development is the key to maintaining a strong position in the market. Our experience, engineering competence and focus on people are just some of the reasons for choosing MacGregor to supply offshore loading systems.

Our loading systems ensure safe and efficient offshore transfer of crude and other products. The loading scenarios involve various types of offshore production and storage facilities such as FPSOs, FSOs, CALM buoys, loading towers and fixed platforms. The transfer of oil from these facilities to a shuttle tanker or tanker of opportunity is carried out via the offloading system and the bow loading system.

MacGregor has a strong history of innovation and execution excellence of loading systems. State-of-the-art concepts for challenging off-loading and bow loading projects have placed us at the forefront of the industry.

In-house technical expertise provides customers with safe, integrated and cost-effective solutions. The continued success of our loading systems depends on our commitment to deliver high quality products which are operationally safe and environmentally sound.

Our dedication to safety is verified by our long track record for the supply of systems with virtually no incidents leading to human injury. Various types of safety features are included in the equipment design and contribute to achieving the high level of safety, pollution avoidance, e.g.:

- Fail-safe brakes
- Control Interlocks
- CCTV surveillance of operations
- State-of-the-art alarms
- See through drum flanges
- Flushing systems
- Operational redundancy



Ragnhild Knutsen loading from the Varg FPSO.



Shipowner Tsakos' shuttle tanker *Rio 2016*.



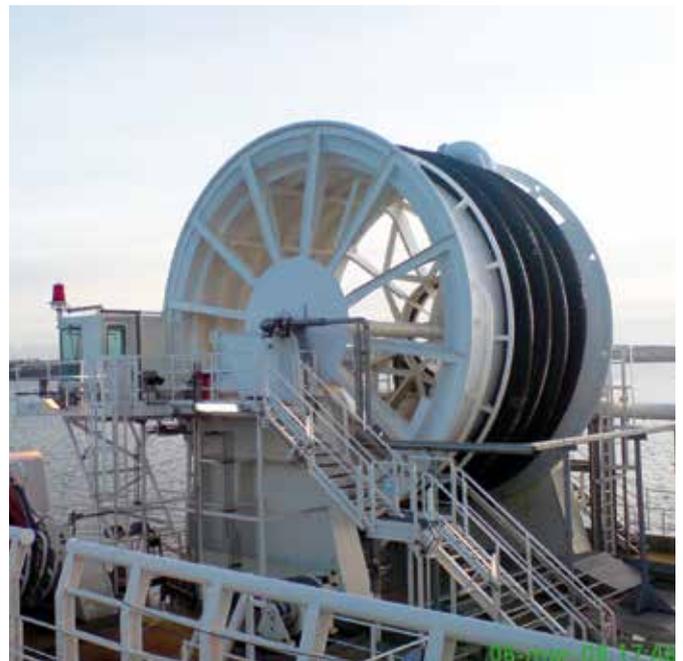
Bow loading, MacGregor cardang suspension with coupler.



Offshore loading at the *Varandey* field in the Barents Sea.



MacGregor bow loading, hose valve on board shuttle tanker *Vasily Dinkov*.



Offloading: MacGregor offloading hose reel on board *Alveim* FPSO.

Bow loading system

The MacGregor bow loading system enables a shuttle tanker to safely and efficiently load oil from an offshore production or storage facility. The bow loading system consists of two integrated systems.

The hose handling system

A 20" bow loading coupler is located forward at the centreline of the ship. The coupler receives the hose end from the offloading vessel/platform (FPSO, FSO). A vital part of the system is the MacGregor moment free bow loading coupler which allows the coupler to follow the movement of the hose. The system includes a hose winch for pulling in and handling the hose during the connection and disconnection phases.

The hawser handling system

A roller fairlead and a chain stopper located on the platform deck are operated together with a twin drum traction winch for mooring purposes during tandem loading. The chain stopper is a hydraulically operated, self-locking type, and can be released under full design load. Aft of the chain stopper is a guide roller with a built-in load cell which operates together with a traction winch. The system also includes a storage reel or bin for storing the messenger line during loading.



MacGregor bow loading system, coupler.



Knutsen shuttle tankers *Jasmine* and *Rose*.



Our offshore loading systems ensure safe and efficient offshore transfer of crude and other products.

Offloading system

An offloading system enables an offshore unit to offload oil to a shuttle tanker or tanker of opportunity. The system consists of two integrated systems.

The hose handling system

The hose handling system comprises of various components that handle the hose during offloading and store the hose between loadings. The hose can be stored on a reel on deck, or on a chute along the deck. Simple systems have the hose floating in the sea between loadings.

The hawser handling system

The hawser handling system is a mooring system with the purpose of maintaining the tandem-moored vessel

at a safe distance during loading operations. The hawser is attached to a releasable hawser-handling winch which combines mooring, handling, storage and emergency release functions into a single unit. After the offloading operation has been completed, the releasable hawser handling winch is used for storing the hawser complete with thimbles, chafing chain, messenger line and forerunner line.

All operations are handled without any manual handling of shackles and hawsers.



Offloading: MacGregor offloading system on board FPSO Cidade De Vitória.



Offloading: MacGregor offloading system on board Petrojarl Cidade De Rio Das Ostras.



Offloading: MacGregor offloading system on board Alvheim.

Exploring the Arctic and subarctic regions

MacGregor successfully provides functional and reliable MacGregor systems for rough and extreme weather conditions. As development of the arctic continues, the need for specialised equipment for these harsh and environmentally vulnerable areas becomes significant.

The majority of today's shuttle tankers operate in the extreme weather conditions of the North Sea or in the arctic north of Russia, where reliable systems are a must. Customers continue to depend on us to develop and deliver equipment that meets these demands.

With over 100 years of experience supplying MacGregor deck machinery designed for extreme conditions, we have acquired extensive expertise and skill, which is reflected in other innovative products such as our MacGregor arctic crane offloading system.

Arctic and subarctic deliveries include mooring and loading systems to the northern territories of Canada and Russia.

The MacGregor arctic crane offloading system was developed for offloading oil to dedicated shuttle tankers operating in arctic conditions. The system is designed for the following loading scenarios:

- Icy conditions in pack ice with hose above ice and minimal changes in position
- Open water in summer season with dynamic loads and frequent vessel movements

The crane is designed for long-term operation and stowing in harsh arctic and corrosive offshore/marine environments.

Some of the first references for the supply of MacGregor deck winches are for the polar vessels Fram and Maud, used by Roald Amundsen during his polar expeditions in the early 1900s (including his historic expedition to the South Pole in 1910-1912).



Varandey field, Russia: First offloading with MacGregor bow loading system and MacGregor offloading system in June 2008.



Loading at *Priazlomnoye* field, Russia.



Arctic: *Varanday* field.



Arctic: MacGregor arctic loading cranes for *Priazlomnoye* field, Russia.



Reference: MacGregor anchor winch on board the wreck of *MAUD*, Northern Canada.

C-HOW

Explore the possibilities

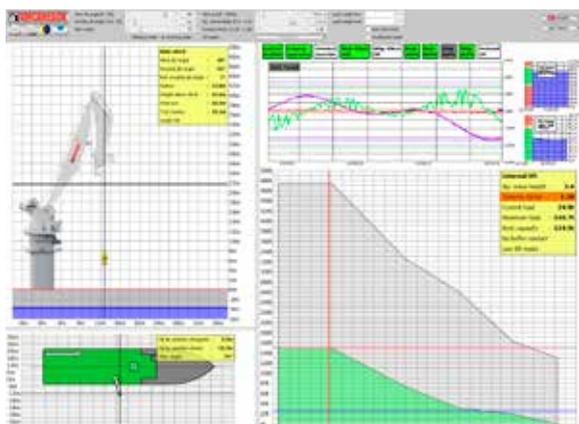
Simulation technologies are becoming standard in the offshore industry. At MacGregor, we rewrite the standards to take into account your needs and to offer a range of simulation packages that can optimise your equipment, while enhancing safety and operational efficiency.

C-HOW is a simulation platform that allows users to run their equipment through various simulated conditions and operations. The tool provides relevant data for a wide range of conditions or design setups when physical systems cannot, giving you better information earlier in a project, along with the ability to explore numerous possibilities from any location and without risk.

Benefits at every stage in a project

The software is extremely flexible and simulation detail can be varied and upgraded depending on the level of functionality required.

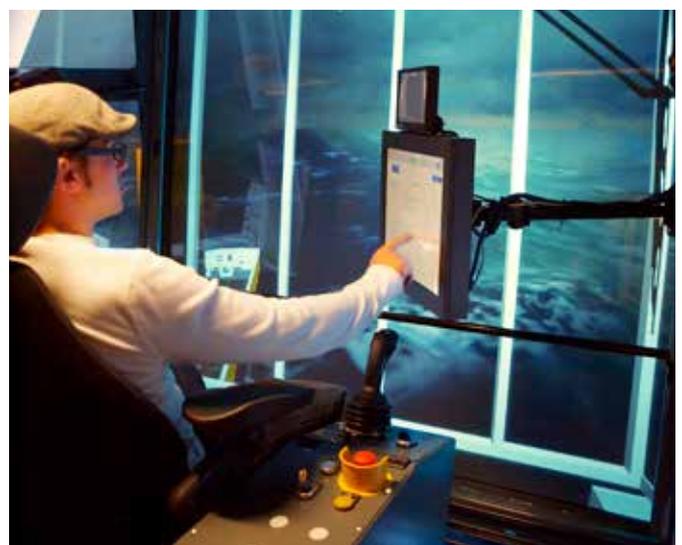
Its multi-purpose applications offer numerous benefits; from concept studies, design and operational planning to crew training, and for modifications and upgrades. C-How can be your presentation tool that will allow you to demonstrate operational functionality and capabilities.



Scale your C-How simulator package to suit your needs

C-How can be tailored to specific customer requirements. This tool is modular and scalable, and all packages are configured for further vessel layout, additional equipment and new operational scenario development. It is not limited for use with MacGregor equipment and can be tailored for use with products/systems from other manufacturers.

C-How can be installed to run on different hardware setups and is designed for easy upgrade packages that offer the user possibilities ranging from a basic planning and testing tool to a full-scale operational training experience.



Worldwide presence and local service

Our customer-driven engineering and service solutions support customers in their onboard, port and offshore operations worldwide. Today, half of the world's oceangoing ships are fitted with MacGregor equipment. Turn to us when you want a reliable partner to keep that equipment up and running throughout your ship's lifetime.

Genuine marine spare parts - solution for reliable performance

We are able to source genuine spare parts and components (hydraulic, electronic and mechanical), even when it comes to obtaining original spare parts that are no longer stocked. Our logistic centres arrange original MacGregor spare parts to any destination worldwide.

MacGregor offers you lifecycle support for ships, ports and terminals, offshore vessels and rigs. We complement our products with original spare parts and support services.

Maintenance and damage repairs

For any minor or major repair work, conversion or modernisation of your cargo handling equipment, contact us. Our work starts with consultancy where we undertake a thorough inspection of your equipment. Through our lifetime analysis, we can determine whether the equipment is to be repaired, converted or modified, thus extending its productivity.

We supply repair services on a planned schedule, on demand or on an emergency basis.

Product experts

Tight and continuous collaboration between our field services network, product competence centres and new sales units ensure precise, quick and efficient support to our customers.

We operate in approximately 50 countries and we are constantly strengthening our local presence to meet changing market needs. MacGregor's service network consists of more than 60 service centres in major ports around the globe, staffed by specialists.

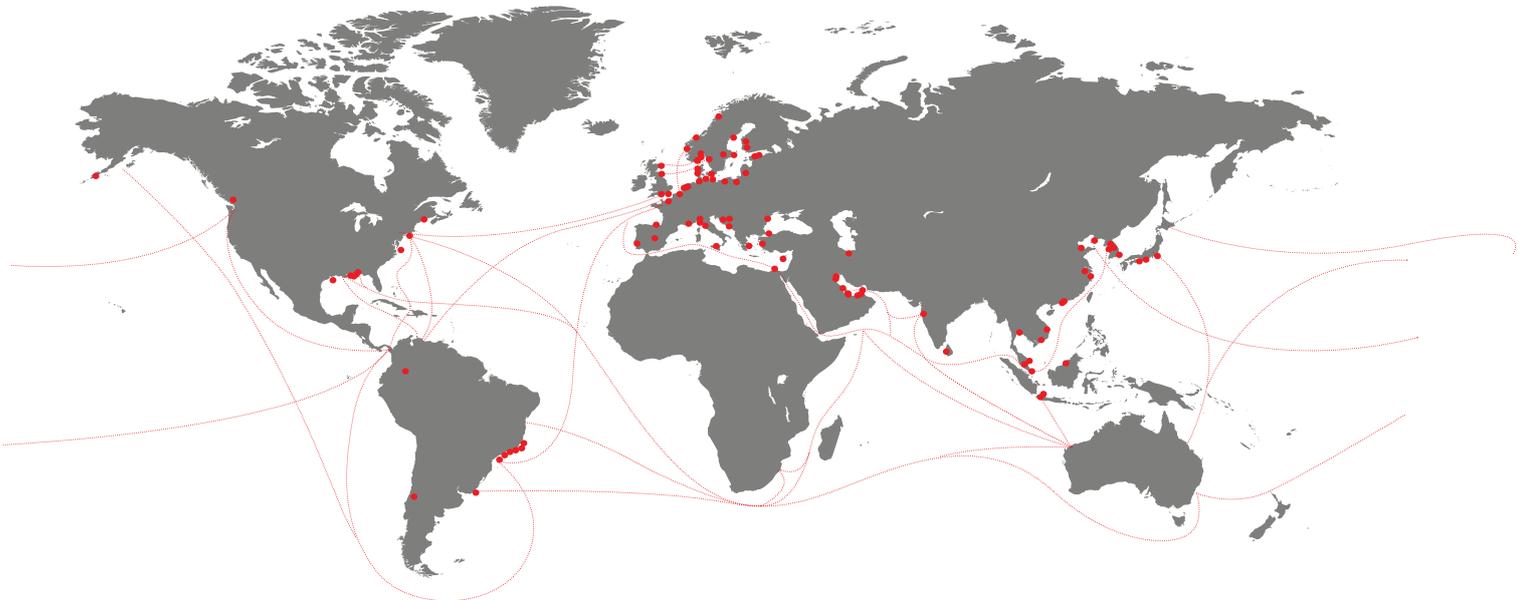
Global presence, 24/7

Armed with our world class expertise in cargo and load handling, we can provide service to our customers all over the world. Our global service network with its trained engineers, spare part coordinators and service personnel is at your service 24 hours a day, throughout the year and across the globe.



Wherever needed, you can rely on our support.
We serve our brands globally:

- Ankerlökken Marine
- Allset
- ASCA
- Becker
- BMH
- Conver-OSR
- Grampian Hydraulics
- Flintstone
- Greer Marine
- Hamworthy
- Hatlapa
- Hydramarine
- Hägglunds
- Interschalt
- KGW
- KYB - ASCA
- KYB - Kayaba Industries / Navire Cargo Gear
- Luezhoe
- MacGregor
- MacGregor-Conver
- MacGregor-Hägglunds
- MacGregor-Kayaba
- MacGregor-Navire
- Navire Cargo Gear
- NMF
- Nordströms
- Ozean Service & Reparatur
- Platform Crane Services (PCS)
- Plimsoll
- Pusnes
- Porsgrunn
- Rapp
- Triplex
- TTS
- Vestnorsk Hydraulikkservice (VNH)



MacGregor is a leader in sustainable maritime cargo and load handling with a strong portfolio of products, services and solutions, all *designed to perform with the sea*.

Shipbuilders, shipowners and operators are able to optimise the lifetime profitability, safety, reliability and environmental sustainability of their operations by working in close cooperation with MacGregor.

MacGregor is part of Cargotec (Nasdaq Helsinki: CGCBV).

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