

Automated Mooring Systems



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The Cavotec Group

Cavotec is the name of a group of companies specialized in power supply technology for cranes and other industrial equipment. It is formed by 6 manufacturing "Centres of Excellence" located in Canada, France, Germany, Italy and Sweden and by 5 local manufacturing units located in Australia, China, Germany, Sweden and USA.

For distribution of their products and support to customers Cavotec has 22 sales companies which, together with a network of distributors, serve more than 30 countries on five continents. Each manufacturing company, no matter where it is located, aims at being a market leader in its field by providing innovative and reliable products to Group customers.

Although they manufacture different products in different countries, they are globally supported and coordinated by the Cavotec Group in their product development and marketing activities.

Each sales company, and each distributor, has a policy aiming at better serving its local market with the full support of the Cavotec Group.

Our aim is to be local everywhere

Great emphasis is put in providing the highest quality not only in the selected products, but also in service and backing to their customers. Our philosophy in fact is to be local everywhere.

Our fields of activity are



Ports & Terminals



Mining & Tunnelling



Steel Mills & Aluminium plants



Airports



Energy & Offshore



Shipyards & Maritime Industry



General Industry & Automation

Mooring Systems Limited

Mooring Systems Limited (MSL) is a public listed company based in New Zealand. The company specialises in the design and production of revolutionary automated mooring systems for commercial and military vessels. The mooring systems have been adopted by important shipping and port companies, including well-known operators such as Patrick Shipping (Pty) Limited of Australia and the Port of Dover (UK). MSL installed its first ship based system called "IronSailor" on a rail passenger ferry in 1999. Since commissioning this system has safely performed over 10,000 automatic mooring operations without ropes and without the intervention of mooring teams. In March 2004, Mooring Systems Limited entered into an alliance with the Cavotec Group granting them the licence for the manufacture, the marketing and the service of their products.



DET NORSKE VERITAS

A breakthrough in maritime technology.

For thousands of years, the traditional practice of mooring with ropes has remained unchanged. Even in today's highly competitive transportation market with tens of thousands of ships, serving the massive international trade in consumer goods and bulk commodities, mooring methods have remained largely unchanged since the first sailors ventured out to sea.

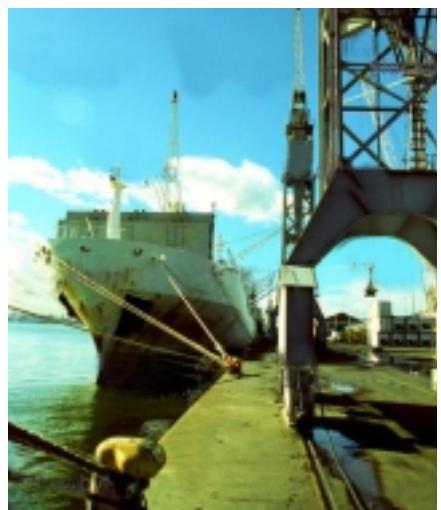
Changing an ancient and accepted tradition, such as mooring ships with ropes, was the challenge faced by MSL. Because of the dynamics and loads inherent with large bodies like ships moving in a fluid environment, any change to this practice required significant innovation besides being more cost effective and at least

equally as safe as its predecessor. The result of this departure from a very old practice is a range of shore-based (QuaySailor Series) and ship-based (IronSailor Series) automatic mooring systems.

Automating the mooring process represents an entirely new field of maritime technology. It is a highly complex and multi-disciplined area involving design of new products and in-depth analysis of environmental conditions and loads, hull forms, civil structural requirements and customer needs. The products are gaining great acknowledgement and interest worldwide.

The first installations demonstrate the safety and reliability of the

product range while further providing ship and port companies with important operational efficiencies and a cost advantage over their competitors.



Mooring ropes: an outdated concept for a modern industry.

Thanks to Mooring Systems innovative QuaySailor design the mooring of a ship can be done in a fraction of the time and cost compared to mooring with ropes.



Development of the system.

Based in Christchurch, New Zealand, the Mooring Systems Limited (MSL) technical team consists of experienced maritime personnel, naval architects and mechanical and electrical engineers who have over the years evaluated the performance and geometry of nearly a hundred in-house system designs.

MSL's new systems have captured all of the flexibility and characteristics of traditional mooring lines in a range of automated systems. Instead of a rope, the products use vacuum pads to provide the mooring attachment. Each pad has a measurable working load, providing a powerful physical attachment between ship and shore. MSL's vacuum pads have been tested and rated under the supervision of the international classification societies Det Norske Veritas (DNV) and Lloyds Register. When combined with the innovative, three dimensional

supporting apparatus, the mooring units emulate the range of movement, resilience and elasticity of a line mooring. Today, MSL's standard vacuum pads can cope with extensive surface irregularities and are able to slide under extreme loads without significant seal deformation or loss of attachment. Because the mooring units attach to the ship closer to the waterline and immediately counteract mooring forces, the system has a greater mooring efficiency than angled ropes. By using sophisticated internet based control software the system permits the user to monitor performance clearly communicating all essential mooring load information in real-time. Full control mechanisms and proper load measurement combined with robust communication systems are required to avoid unacceptable risks with the vacuum couple and the overall integrity of the mooring.

Mooring load information is produced from the measurement of vacuum efficiencies and from monitoring athwartships and fore and aft hydraulic cylinders.

With a full knowledge of the mooring conditions at all times, the operator has complete control and understanding of the moored state of the vessel. MSL is currently the only company in the world to have successfully designed, implemented and proven ship vacuum mooring in a commercial environment. In this process they have discovered key elements of intellectual property relating to their designs and processes. MSL has protected these features having a number of patents pending internationally.

The QuaySailor 40 in action in Melbourne for Patrick Shipping (Pty) Limited.





Shore-based mooring system.

QuaySailor Series

The 'QuaySailor' is the name given to the range of generic shore based mooring systems. It represents a major technical leap from the first ship-based system developed in 1999 as it does not require specific installations on the ship and can directly attach to the hull of most commercial and military vessels. The quay face model has the distinctive advantage of compact storage when not in use. This enables the system to rest behind the maximum fender impact line during berthing. When activated, the vacuum pad support frame is extended outwards and the vacuum mooring connection is established in a few seconds. The "QuaySailor" is designed to cater for most ship and shore configurations and has several significant features including:

- 3-dimensional actuation and dampening arrangement
- Ship Positioning
- Load and control measurement
- Real time internet based monitoring and data event logging

The first QuaySailor Series 40 was installed in Picton, New Zealand in 2002 and has since achieved hundreds of safe and reliable automatic moorings. The current range of shore-based units are shown below:

① QuaySailor 20

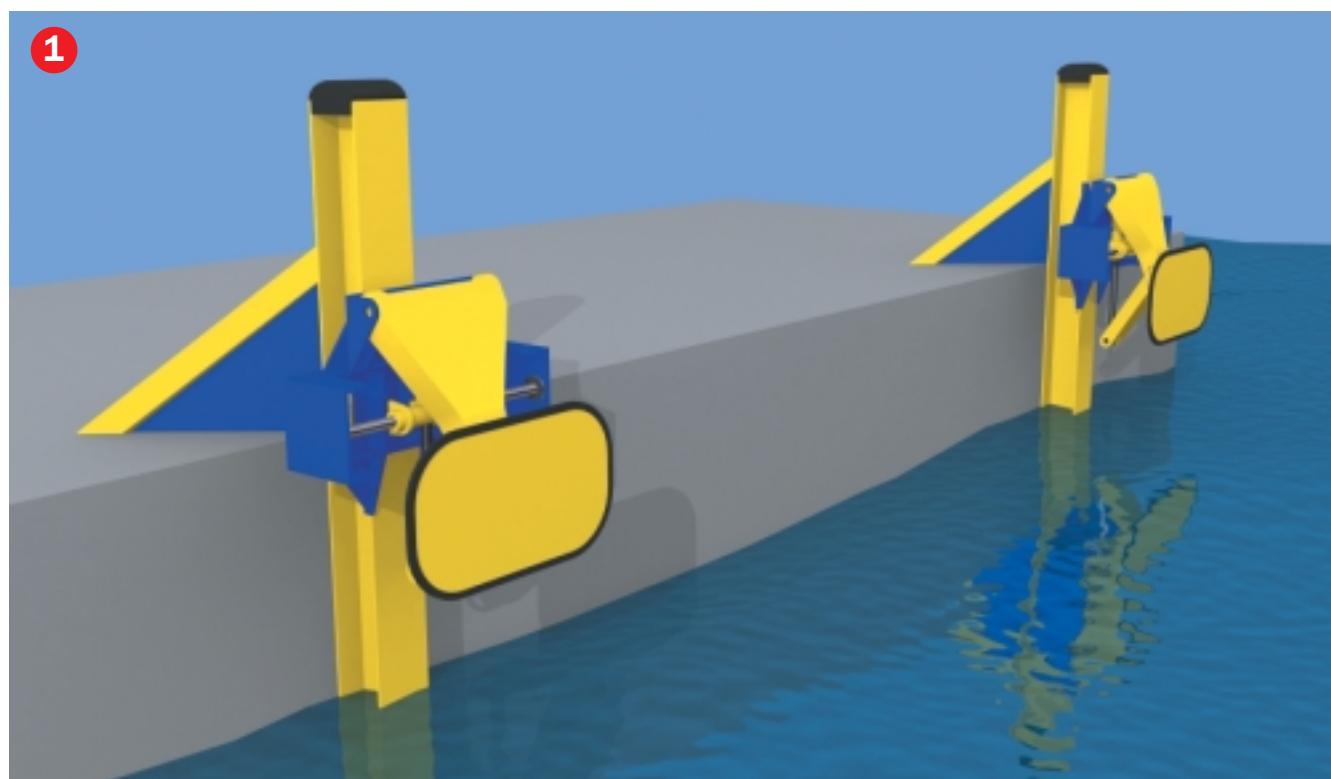
The QuaySailor 20 is designed to meet the needs of light high-speed single and double hulled craft that service short haul fast turnaround routes in harbours, inland waterways, canals and between islands. The system is designed for single operator control, actuating and mooring the vessel in less than 6 seconds with an unit design load of 20,000 kg and an outreach of 600mm.

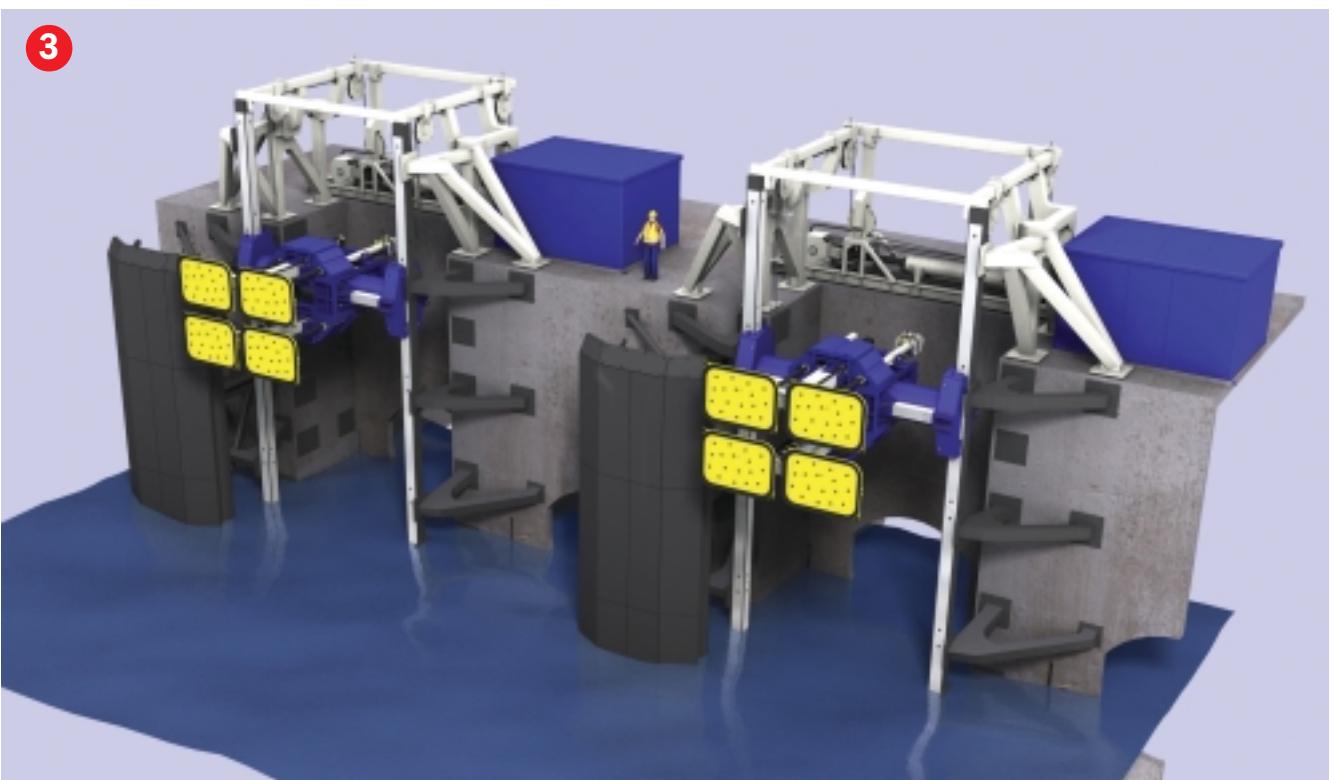
② QuaySailor 40

The QuaySailor 40 is ideally suited to ships from 70 up to 250 metres in length. The number of units required to safely moor a ship will be dependent on the hull windage area and environmental weather patterns. In most instances between 2 and 6 units will be required for a single berth. The unit has a design load capacity of 40,000 kg and an outreach of 1100mm.

③ QuaySailor 80

The QuaySailor 80 is designed to meet the needs of larger ships in exposed seaway conditions where high windage is common. The unit ranges up and down the quay face and can cope with tidal variations of up to 10 metres and surge conditions causing vertical, fore and aft movement, of up to 1 metre per second. Typically, three or four units will be required for large Ro/Ro vessels. The unit has a design load capacity of 80,000 kg and an outreach of 2500mm.





Ship-based mooring system. IronSailor Series

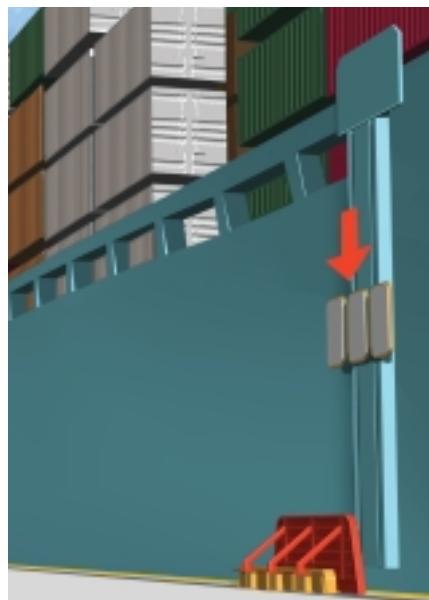
The "IronSailor" is the name given to the range of generic ship based mooring systems developed by Mooring Systems Limited since 1998. This was the year that MSL's first product, the "IronSailor Series I" was installed on the "Aratere" a 150m, 12,000 g.r.t. rail passenger ferry built by H.J. Barreras SA in Vigo, Spain. This system is a specific ship based automated mooring system that comprises of 4 units rated at 20 tonnes each. The units are positioned in pairs with two units forward on the ship and two units aft. They are activated from the bridge wing of the ship's wheelhouse, extending out through hull doors to attach to a steel plate on the berth. Since its installations the "IronSailor" has performed over 10,000 automatic moorings, proving the system and technology beyond doubt.

The complete range of ship based systems consists of three different models to be able to better meet specific requests from customers. The current range of ship-based units are shown below:

① IronSailor Series E

The Series E is an externally mounted unit that is designed to be retrofitted to existing ships. The unit is stowed at sheerstrake level when not in use.

When activated, the units travel down the hull of the ship and couple with a plate mounted on the shore.



② IronSailor Series I

The Series I was installed on the "Aratere", a 150m, 12,000 g.r.t. rail passenger ferry, in 1998. The 4 units, each rated at 20 tonnes, are positioned in pairs with two units forward on the ship and two units aft and are activated from the bridge wing of the ship's wheelhouse.

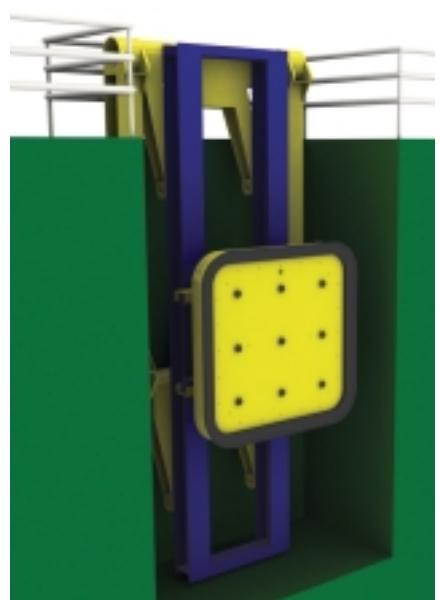
The units extend out through hull doors to attach to a steel plate on the berth. Since installation the system has made over 10,000 automatic moorings.



③ IronSailor Series T

The Series T system is designed to meet the needs of barge and inland waterway operators.

The unit is similar to the QuaySailor Series in respect of geometry allowing smaller service craft to automatically secure to larger vessels for transhipment operations.



Monitoring & Control Interfaces.

One of the most important elements of MSL's systems is the control interface. The systems utilise state of the art control components to provide a user friendly operating environment for both ship and shore personnel.

Using secure encrypted radio links between ship and shore and internet compatible software, MSL is able to provide all users with system status information. This means that, for example, harbour authorities can monitor (and control where appropriate) the mooring system performance electronically and remotely. In fact a single operator can control the mooring for an entire port.

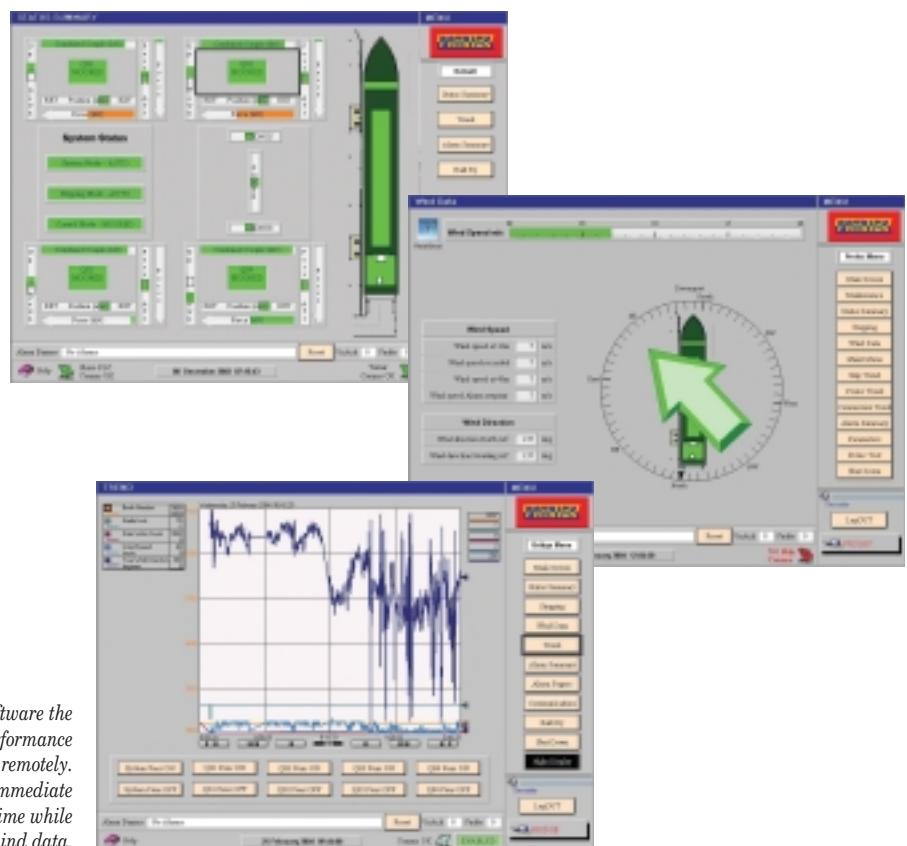
Where control systems are resident on the vessel the ship Master can control the mooring of his ship with just two buttons: "Moor" and "Detach".



The system can be monitored and controlled in realtime directly from the bridge.



Complete control with just two buttons.



With state of the art internet compatible software the ship master or port control can monitor performance and control the mooring systems remotely.

Various trend display options provide immediate information of the moored condition over time while accurately measuring wind data.

Advantages of the mooring system.

For thousands of years the maritime industry has relied on the use of ropes to secure vessels.

It has been a reliable system that has worked well but is now somehow out of sync with the maritime industry's focus on continuous improvements in productivity and efficiency.

As we have illustrated in this catalogue there now is a reliable and generally applicable alternative to mooring lines. This system firmly places the cost inefficiencies associated with labour intensive mooring lines in the past.

Safety

- Risk of injury to shore and ship personnel by mooring ropes eliminated.
- Continuous load monitoring and sophisticated alarm functions, relayed in real time to operations personnel.
- Multiple redundancy of vacuum pads and inherent fail safe features ensure secure mooring even during power cuts or loss of control signals.
- Robust mechanical design using only top-rated components, ensuring reliable operations.

Economy

- Fast attachment (typically > 12 sec) and instant release.
- No more delays while waiting for mooring crews to become available.
- Only one operator required, based ashore or onboard, to activate and remotely monitor the mooring system.
- No more disruption of other duties or mandatory rest hours of ship crews.
- Reduction of crew numbers on ships and pier on fixed-route operations.
- Shorter port stay means less speed is required at sea and offers better ship and berth utilisation.

Environment

- Fast mooring means less operation of the ship's propulsion, of tugs and lines' boats etc, and consequently diminishes emissions into the port environment.
- The mooring systems have low electric power demand and virtually have no consumption once attachment has occurred.
- Lower speed requirement for sea voyage translates into fuel savings.
- Elimination of rope, paint and fender wear, vastly extending the life cycle of these products.



The QuaySailor 40 at Picton was installed in 2002 and has since performed thousands of mooring operations.





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