



MoorMasterTM

Automated Mooring

State of the art technology

MoorMaster™ is a vacuum-based automated mooring technology that eliminates the need for conventional mooring lines. Remote controlled vacuum pads, recessed in, or mounted on the quayside and attached to hydraulic actuated arms, extend, attach and moor ships in a few seconds.

"Cavotec MoorMaster provided PHPA with a solution to a defined technical problem i.e. fitting a mini cape into a Panamax space. The system has proven to be a great success to date and allowed improved productivity, safety and risk management strategies. Innovative and the leading edge of changing maritime technological solutions"

John Finch

A/GM Operations - Harbour Master, Port Hedland Port Authority



TIME IS MONEY

Save between 20 to 90 minutes for mooring your vessel as MoorMaster™ requires only 25 to 40 seconds for mooring, and just 10 to 20 seconds to detach (Conventional mooring normally takes between 20 and 90 minutes and involves mooring gangs, ships' crews, pilots and tugs).

OPERATION PRODUCTIVITY & SAFETY

1 man operation with either a single port officer or the captain himself equipped with Cavotec remote control for your modern and safe mooring operation. Automatic adaptation to tidal and draft changes which enables the client to better use of personal which are not any more required in high-risk working zones.



INFRASTRUCTURE COST SAVINGS

MoorMaster™ units are designed to hold the vessel at a preset distance from uncompressed fenders. Furthermore, the units only attach to the parallel body of the ship, giving possibility of berth overhang. The need for berth extensions or mooring dolphins may therefore be eliminated in some cases.



"Cavotec MoorMaster represents a major asset for our port developments in fastening our operations and turnaround times which will help us improving the reliability and quality of our service for the benefit of our customers. This mooring system is a unique and innovative technology which has been adopted by our company in order to support our strategy in integrating more efficient and reliable systems for our ferry services."

Hans Henrik Simonsen
Fleet Manager, Danske Færger A/S

"Cavotec has demonstrated great versatility, creativity and adaptability in developing and delivering a product tailored to our unique marine environment."

Benoit Nolet
Manager, Transit of the Future St-Lawrence Seaway Management Corporation

A PROVEN REVENUE BOOSTER

MoorMaster™ improves operational efficiency and reduces environmental impact. Sophisticated electronic hydraulic controls minimise vessel movement (surge, sway and yaw) to maintain the vessels position with millimetre accuracy. MoorMaster™ units can also be used to warp the vessel position without the need for ships own steam or with the help of tugs.



CORE ELEMENT OF ENVIRONMENTAL STRATEGIC PLANS

Vessels using MoorMaster™ are "all secure" far more quickly than those using conventional means, enabling them to shut down their engines sooner and reduce the amount of time tugs are required. MoorMaster™ thus has a positive effect on air quality in ports.

PERMANENT ONLINE MONITORING & VISUALISATION

MoorMaster™ incorporates continuous load monitoring and sophisticated alarm functions relayed in real time to operations personnel onshore, onboard and/or in port control office. Alerts can be sent to pagers, mobile phones and other devices.



Advantages & Benefits

PORT

- Faster vessel-turnaround enables larger number of ship calls.
- Cargo and crew transfer can start earlier.
- Increased cargo throughput.
- Improved utilisation of tug fleet: tugs leave ships much earlier and return just prior to departure.
- Mooring gangs not required.
- Improved utilisation of terminal length if berthing distances reduced.
- Vessels longer than berths can be moored with overhang, enabling substantial savings on quay extensions or dolphin investments.
- Restricted waterways not disturbed.
- In some cases, MoorMaster™ may eliminate the need for breakwater construction.
- Personnel safety improved.
- Personal injuries during mooring reduced to a minimum.
- Potential reduction in insurance premiums.
- Mooring load status constantly monitored and event logs can be reviewed.
- Less wear and tear on fenders.
- Cargo operation less dependent on weather conditions.
- Vessel creep during port stay eliminated.
- Improved service for shippers.
- Reduced use of the vessels' propulsion system and of tugs and line boats diminishes fuel consumption and emissions.
- Faster connection to shore power, where available.
- Aid for development of STS Automation.

SHIP

- Potential slower cruise speeds for vessels.
- Cargo and crew transfer can start earlier.
- Improved utilisation of pilots' time: pilots are able to disembark immediately after the fast mooring and return just prior to departure.
- Ships' crew can use their time for more productive jobs and keep uninterrupted rest hours.
- Reduction of ships' crews, especially for vessels on dedicated and high frequency routes.
- No need for crew to modify rope arrangements due to tidal and draft changes.
- Improved personnel safety.
- Mooring loads and status known at all times.
- Less wear and tear on ropes, winches and ships' hulls and plating.
- Automatic repositioning facility results in fuel savings for vessels.
- Reduced use of the vessels' propulsion system and of tugs during berthing diminishes fuel consumption and emissions.

MoorMaster™ references

MoorMaster™ first entered service in 1999 at a ferry application in New Zealand. At this point, MoorMaster™ was a bold challenge to thousands of years of conventional mooring methods.

Today, MoorMaster™ is a widely accepted technology that has performed some 40,000 mooring operations, with a 100 per cent safety record, at ferry, bulk handling, Ro-Ro, container and lock applications all around the world.

Cavotec engineers continue to develop MoorMaster™ and are perfecting new ways the technology can be used to improve safety, operational efficiency and realise infrastructure savings.



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Salalah, Oman

Product:	MoorMaster™ 400 (trial)
Vessel names:	Various
Type:	Shore-based
LOA:	Up to 362m
Capacity:	Two x 400kN = 80 tonnes
Route:	Global
In operation:	Tried 2005
Operator:	Maersk A.O.
Moorings:	Several per day
Owner:	Cavotec



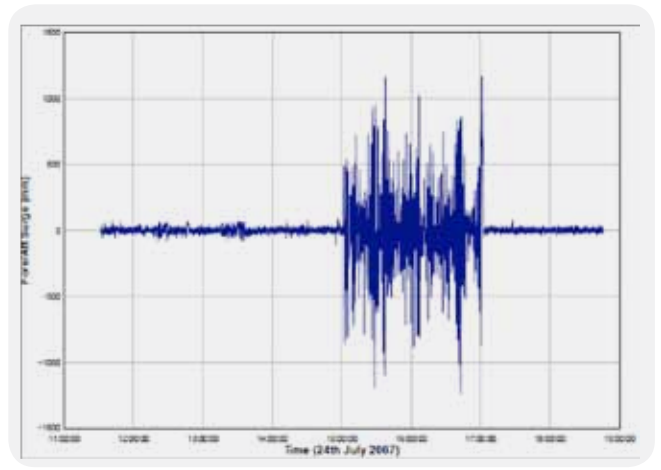
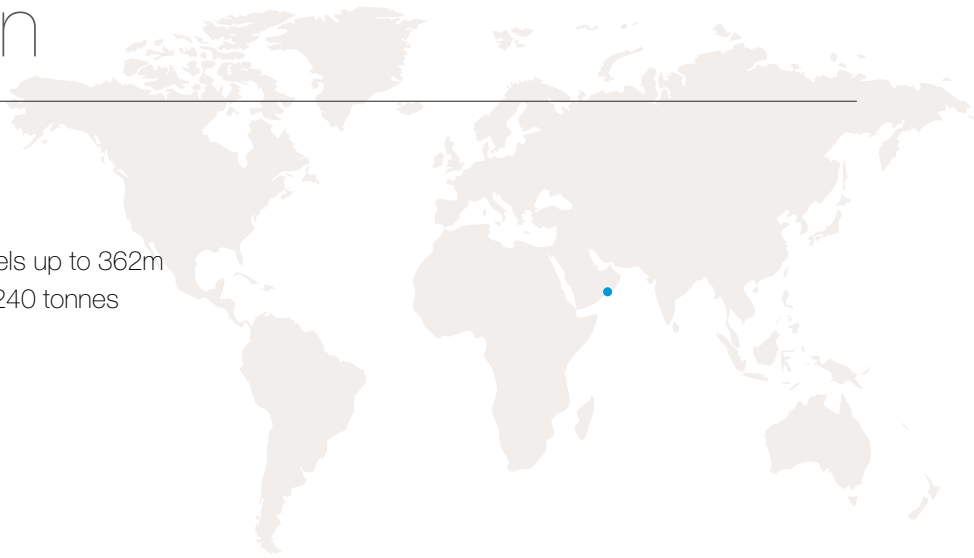
Oman's Port of Salalah installed two MoorMaster™ 400 units at a container berth on a trial basis in September 2005. The six-week trial was designed to measure the MoorMaster™ system's ability to reduce the surge motion caused by 'long waves' on container

vessels of up to 347 metres LOA, 8,000 TEUs, and 110,000 tonne displacement. During the annual Khareef season, productivity at Salalah is reduced by long period wave motion, as vessels are forced to reposition during loading and discharging operations.

The tests showed MoorMaster™ reduces vessel motion from some three metres to less than 10 centimetres, representing substantial productivity gains in comparison to traditional mooring techniques.

Salalah, Oman

Product:	MM200C
Vessel names:	Various
Type:	Front mounted
LOA:	Container vessels up to 362m
Capacity:	12 x 200kN = 240 tonnes
Route:	Global
In operation:	Since 2009
Operator:	AMP Terminals
Moorings:	3-4 per week
Owner:	Port of Salalah



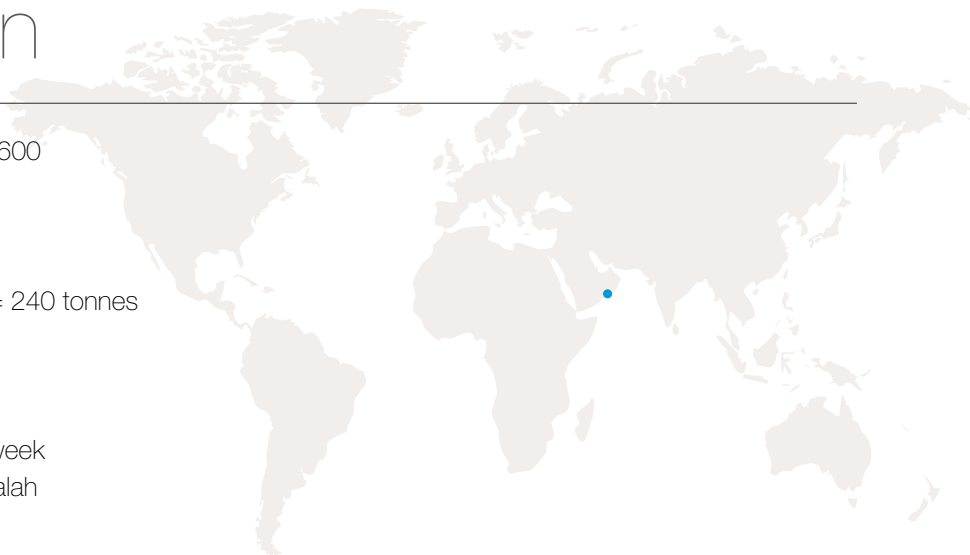
MoorMaster™ automated mooring systems are in use at the Port of Salalah at two of the port's six container berths, where they moor vessels of up to 362m LOA. The most recent installation has a holding force of 2,400 kN, provided by 12 x MM200 units. The primary reason for the Port of Salalah to use vacuum mooring is to dampen

vessel surge motion that occurs during the Khareef season, when surges up to +/- 2.5m occur with rope mooring. Cargo handling efficiency tends to drop dramatically, by between 30 and 40 per cent, during this period. MoorMaster™ holds vessels in a stable position (± 50 -100mm) and also eliminates vessel creep, thus

maintaining operational efficiency. Due to the speed of operation of the MoorMaster™ units - attaching in 25 seconds and detaching in ten - the port is able to optimise the use of pilots and tugs, as both are able to leave vessels earlier and return later. Major shipping lines such as MSC and Maersk use these berths.

Salalah, Oman

Product:	MoorMaster™ 600
Vessel names:	Various
Type:	Shore-based
LOA:	Up to 350m
Capacity:	Four x 600kN = 240 tonnes
Route:	Global
In operation:	Since 2006
Operator:	APM Terminals
Moorings:	3-4 times per week
Owner:	The Port of Salalah



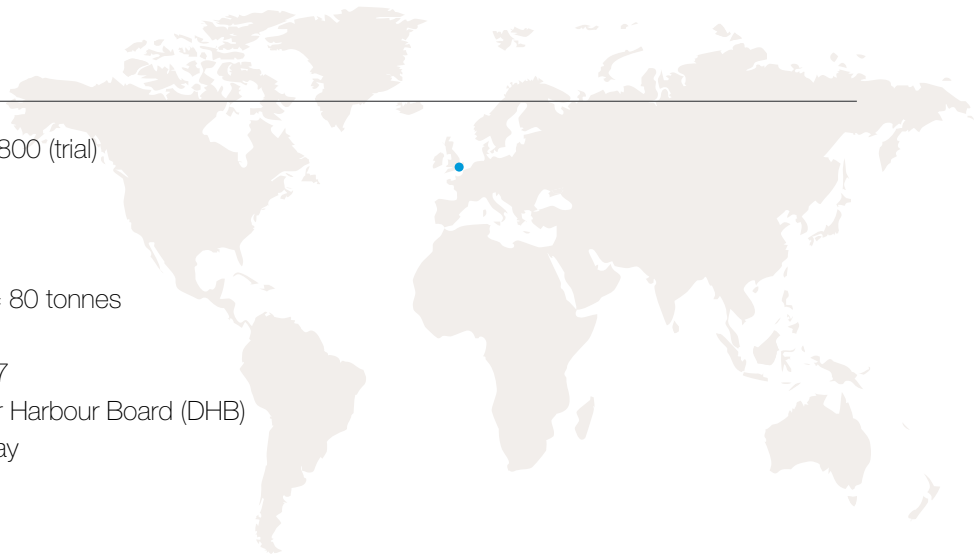
Following the success of trials carried out in 2005, the Port of Salalah installed four MoorMaster™ 600s at a berth servicing container

vessels of up to 350 metres LOA and 130,000 tonnes displacement. MoorMaster™ has proven to be an extremely efficient tool for the control and reduction of vessel

motion, dramatically improving productivity through time savings during berthing, loading and departure.

Dover, UK

Product:	MoorMaster™ 800 (trial)
Vessel names:	Various
Type:	Shore-based
LOA:	Up to 185m
Capacity:	One x 800kN = 80 tonnes
Route:	Dover – Calais
In operation:	Tried 2005-07
Operator:	P&O, the Dover Harbour Board (DHB)
Moorings:	Up to 12 per day
Owner:	DHB



In June 2005 Cavotec ran trials of the world's most powerful automated mooring unit, the MoorMaster™ 800, at a newly constructed berth at the Port of Dover in the United Kingdom. The busiest ferry port in Northern Europe, the Port of Dover's Berth 8 is used by Ro-Pax ferries of

up to 185 metres length overall. Conditions at the port are frequently severe; with winds reaching 60 knots and one metre swell heights at berth. During the trial the MoorMaster™ 800 successfully performed some 750 mooring operations, illustrating the effectiveness of MoorMaster™ automated mooring in the face of

large tidal variations and extreme environmental conditions. In 2007, after 750 successful moorings the trial was terminated and the unit was decommissioned. It is expected that implementation of MM200 based systems will be part of the future port development plans."

Hov/Sælvig, Denmark

Product:	MoorMaster™400
Vessel names:	Kanhave
Type:	Shore-based
LOA:	91m
Capacity:	Two x 400kN = 80 tonnes
Route:	Hov – Sælvig (Samsø)
In operation:	Since 2009
Operator:	Samsøtrafikken
Moorings:	14 per day
Owner:	Nordic Ferry Services (NFS)



With short turnaround times and limited crew numbers, NFS sought to automate as many procedures as possible following the introduction of a new-build, 91 metre long passenger ferry running between Hov on the Danish mainland and Sælvig on

the island of Samsø. The two MoorMaster™400s installed in each modified port now make mooring safe, even in severe weather, within 25 seconds, via a remote control system housed in the ship's bridge. MoorMaster's™ repositioning capabilities

automatically adjust to tidal conditions and infrastructure, ensuring the vessel is constantly in optimal position. The ship's hull is also better protected because MoorMaster™ continuously holds the vessel at a preset distance from the fender line.

Melbourne & Devonport, Australia

Product:	MoorMaster™400
Vessel names:	Searoad Tamar, Searoad Mersey
Type:	Shore-based
LOA:	118m, 149m
Capacity:	Four x 400kN = 160 tonnes
Route:	Melbourne – Devonport
In operation:	Since 2003
Operator:	Searoad Holdings Pty Ltd
Moorings:	One per day
Owner:	Searoad Holdings Pty Ltd



MoorMaster™ automated mooring technology first saw service in Australia at the port of Melbourne, on a dedicated berth used by two Ro-Ro vessels; the Searoad Tamar, (149 metres, 13,697 tonnes displacement), and the Searoad Mersey, (118 metres, 7,928 tonnes displacement). This shore-based MoorMaster™ variant consists

of four MoorMaster™ 400 units, each rated at 40 tonnes. The units are positioned in pairs, forward and aft of the amidships line. Similar to the MoorMaster™ systems employed at Picton, New Zealand, these MoorMaster™400s are activated from the bridge wing, extending to attach to the ship's hull. To accommodate

displacement caused by local tide variations and draft change, this system employs the patented 'stepping' method. The application also offers the considerable advantage of being able to shift vessels along the berth. The system has been in daily operation since 2003.

Picton, New Zealand

Product:	MoorMaster™ I-400
Vessel name:	Aratere
Type:	Ship-based
LOA:	150m
Capacity:	Four x 200kN = 80 tonnes
Route:	Picton – Wellington
In operation:	1998-2009
Operator:	Interisland Line Ltd
Moorings:	Three per day
Owner:	Toll NZ Ltd



The very first MoorMaster™ automated mooring system, the MoorMaster™ I-400, was installed on the rail passenger ferry Aratere in 1997. The Aratere has an LOA of 150 metres, and 12,000 tonnes displacement. Four MoorMaster™ units are positioned on the vessel,

with two units forward and two aft. Each unit is rated at 20 tonnes. The units are activated from the bridge wing; and extend through hull doors to attach to movable steel plates on the pier face. The I-MoorMaster™ has performed over 17,000 automated moorings

to date, delivering a safer port environment, time savings, reduced expenditure on fuel, and the elimination of wear on ropes and winches.

Picton, New Zealand

Product:	MoorMaster™ 400
Vessel name:	Aratere
Type:	Shore-based
LOA:	150m
Capacity:	One x 400kN = 40 tonnes
Route:	Picton – Wellington
In operation:	2002-05
Operator:	Toll Shipping Pty Ltd
Moorings:	Three per day
Owner:	Cavotec



Introduced in 2002, the MoorMaster™ 400 automated mooring system is Cavotec's first shore based MoorMaster™, and exerts a holding capacity of 40

tonnes, the equivalent to a large harbour tug. Controlled from the bridge wing, the unit extends from the quayside and attaches to the hull. Safe, fast,

and reliable, the MoorMaster™ 400 quickly secures and releases the Aratere, three times a day, every day.

Picton, New Zealand

Product:	MoorMaster™ 400
Vessel name:	Kaitaki
Type:	Shore-based
LOA:	181m
Capacity:	Two x 400kN = 80 tonnes
Route:	Picton – Wellington
In operation:	Since 2005
Operator:	Toll Shipping Pty Ltd
Moorings:	Three per day
Owner:	Toll Shipping Pty Ltd



The introduction of a new, longer vessel for the Picton to Wellington route in 2005 required the extension of the Picton pier – if conventional mooring ropes were used.

Avoiding the cost of extending the pier by at least 60 meters or driving piles for mooring platforms, Toll Shipping opted to install two MoorMaster™ 400 units at the end of the pier. Picton now

enjoys the benefits of safe, swift and efficient operations, while having also made considerable capital expenditure savings.

Port Hedland, Australia

Product:	MM200
Vessels:	Large bulk carriers up to LOA 295m
Type:	Front mounted
Capacity:	14 x 200kN = 280 tonnes
Route:	Global
In operation:	Since October 2010
Operator:	Port Hedland Port Authority
Moorings:	1 every second day
Owner:	PHPA



Fourteen MoorMaster™ MM200 units, with a total capacity of 2,800kN, spaced at 14m intervals, are installed at Port Hedland in Western Australia. The MoorMaster™ units moor dry bulk carriers of up to 135 kdw, 295m LOA. The units and vessels at the 270m long berth, located at the harbour mouth, are exposed to strong tidal

currents and hydrodynamic effects created by passing ships. The maximum size of vessels (LOA 295m) is longer than the berth itself that was originally designed for LOA 200m bulk carriers. MoorMaster™ has thus enabled the PPHA to accept larger vessels and thereby increase capacity without the need for costly infrastructure investment.

Furthermore, MoorMaster™ comprehensively addresses critical personnel and vessel safety concerns of the PPHA. These MoorMaster™ units are built to withstand the harsh environmental conditions at the port: up to 2 kn current, 7m tidal variations, vast amounts of fine iron ore dust and extreme heat (+45°C).

St. Lawrence Seaway, The Great Lakes, Canada

Product:	MoorMaster™ 200LS
Vessel names:	Various lakers
Type:	Shore-based
LOA:	Up to 200m
Capacity:	Four x 200kN = 80 tonnes
Route:	Global
In operation:	Since 2007
Operator:	The St. Lawrence Seaway Management Corporation (SLSMC)
Moorings:	Several per day
Owner:	SLSMC



The St. Lawrence Seaway, a vital trade link between Canada's Great Lakes and the Atlantic Ocean, has become the world's first inland waterway to replace mooring ropes and cables with the MoorMaster™, cutting vessel transit time and creating a safer

environment for those working on ships and shore-side. In a ground breaking application for MoorMaster™ automated mooring technology, Cavotec designed a prototype MoorMaster™ system consisting of two MM200LS units for use in the St. Lawrence

Seaway lock system in 2007. Successful trials led to the installation of an additional two MoorMaster™ units for use in this deep lock, with a water level variation of 14 metres.



We are present in

Australia	Ireland	Sweden
Bahrain	Italy	Switzerland
Belgium	Lebanon	U.A.E.
Brazil	Luxemburg	U.K.
Canada	The Netherlands	U.S.A.
Chile	New Zealand	
China	Norway	
Denmark	Peru	
Finland	Qatar	
France	Russia	
Germany	Singapore	
Greece	South Africa	
Hong Kong	South Korea	
India	Spain	



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