The modern port automate the mooring handling

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Content

• Automated vacuum mooring
  ➢ References
  ➢ Automated vs. conventional
  ➢ How it works
  ➢ Operational features & benefits
  ➢ What it takes
Ports & Maritime

Automation in the industry

Gating
Ports & Maritime

Automation in the industry

AGVs
Ports & Maritime

Automation in the industry
The modern port automate the mooring handling

Automation in the industry

Mooring

LARGE FERRIES

BULK

CONTAINER

SMALL FERRIES

MEDIUM FERRIES

LOCKS

Port Hedland, Australia
May 24, 2011
11.00 (WST)
MoorMaster™ automated mooring

References

More than 300 MoorMaster™ units in service at some 100 unique sites worldwide by 2020.

MoorMaster™ systems have successfully completed more than 500,000 automated mooring operations to Q4 2018. By 2020, approximately 500,000 such operations will be made each year.

No personnel injuries

- 4 ferry terminals for Sør Trøndelag Kommune, Norway – Expected operation Q1-19
- 6 ferry terminals for Fjord1, Norway – Expected operation Q1-19
- 3 ferry terminals for Aéroé Ferries, Denmark – Expected operation Q2-19
- 6 ferry terminals for Boreal Sjø, Norway – Expected operation Q4-19
- 24 ferry terminals for Fjord1, Norway – Expected operation Q1-20
- 5 ferry terminals for Ontario Transport – Expected operation Q2-20
Automated vs conventional
Conventional mooring

An old “tradition” that still need to be improved...

A lot of people with hands on...

Unpredictable - dangerous
High Load points  Labour intensive  Limited effectiveness
Manual operation  “Old” / Obsolete  Time consuming
Hands off the mooring ...

- One remote operator
MoorMaster™

How it works
Automated vacuum mooring

The time it takes...

**Moor** 25-30 sec

**Detach** 10-15 sec

20t holding power

1400 x 1900 mm
MoorMaster™ automated mooring

Large vacuum pads instead of mooring lines

20t holding power

1400 x 1900 mm
Automated vacuum mooring

MoorMaster™

- Steel construction
- Neoprene rubber seal
- Effective sealing area = 2.55m²
- Suction force = 20 tonnes
- 26mm lip to seal around obstructions
- Tested by DNV

- Surface must be relatively flat
- Seal will **adapt to minor obstructions**
- Vacuum accumulator
- 10-20 minutes of attachment on poor surface in case of power failure
Automated vacuum mooring

MoorMaster™ - Range of motion & Forces

- **In-Out motion ("X" axle - perpendicular to berth)**
  - Mechanically limited / range dependent on linkage geometry
  - Movement beyond mechanical limit will result in decoupling
  - Max strength at 80% vacuum: 20 tons per pad

- **Left-Right motion ("Y" axle - parallel to berth)**
  - Range dependent on linkage geometry
  - Movement beyond mechanical limit will result in decoupling
  - Max strength at 80% vacuum: 10 tons per pad

- **Up-Down motion ("Z" axle - vertical to berth)**
  - Unlimited with ‘stepping’
  - Vertical rails length depending on various factors
Automated vacuum mooring

MoorMaster™ - a typical TOP-mounted unit

Pivot ±4°

±700mm Free movement

±200mm

Outreach 1.2m Coupling 200kN

2x2m Footprint

Self contained unit with vacuum & hydraulic pumps, Oil tank, electrical panel a.o.
Automated vacuum mooring

MoorMaster™ - a typical TOP-mounted unit

Outreach 1.5m
Coupling 200-400kN

Pivot ±4°
Free movement

±400mm
Move/Dampen with 100kN per pad

±1000mm
1 or 2 vacuum pads on a telescopic boom

2x2m
Footprint

Self contained unit with vacuum & hydraulic pumps, Oil tank, electrical panel a.o.
Automated vacuum mooring

MoorMaster™ - a typical FRONT-mounted unit
Automated mooring example

small ferries

- Extended time for battery charge or fuel saving
- Unmanned ferry berth
- Short pier
Fast ferries

- Fuel saving
- Possibility for short pier
- Unmanned ferry berth
Automated mooring example

Large RoPax
Automated mooring example

Container & Bulk
MoorMaster™

Automated mooring example

LNG & Oil
MoorMaster™
Operational features & benefits
Operational features and benefits

**Automation**
- DETECTION & RTM
- SHIP OFF FENDER LINE
- TIDAL/DRAFT ADITION
- MOTION DAMPENING
  - Surge, Sway & Yaw
- PARKING

**Control**
- REMOTE
- STATUS, TRENDS & LOGS
- CRITICAL ALARMS

**Time**
- MOORING
  - ~ 30 seconds
- REPOSITIONING
  - ~ 10-15 seconds
- DETACH
  - ~ 10 seconds

**Staff**
- 1 Operator
MoorMaster™

Time benefits - Ferry example

Conventional mooring
- Mooring: 5 min
- Loading/offloading pax & vehicles: 23 min
- Unmooring: 2 min
- Turnaround: 30 min

Automated mooring
- Mooring: 30 s
- Loading/offloading pax & vehicles: 29 min (+20%)
- Unmooring: 15 s
- Turnaround: 30 min

Automated mooring
- Mooring: 30 s
- Loading/offloading pax & vehicles: 23 min
- Unmooring: 15 s (-20%)
- Turnaround: 30 min

6
MoorMaster™

Time benefits - Container terminals

Conventional mooring:
- Mooring: 20 min
- Loading/offloading cargo: 15.5 hrs
- Unmooring: 10 min
- Turnaround: ~16 hrs

Automated mooring:
- Mooring: 40 s
- Loading/offloading cargo: ~16 hrs
- Unmooring: 15 s
- Turnaround: +3.2%
Other benefits

Environment
Other benefits

Infrastructure

Virtual quay

Breakwater
Other benefits

Maintenance
MoorMaster™

What it takes...
MoorMaster™ automated mooring

What it takes to get automated

- Self-contained units
- Secure the quay is strong enough to handle MoorMaster™ forces
  - A foundation might be needed
- Drilling of holes for chemical anchors. Grouting of feet.
- Lifting & mounting of units
- Supply of
  - Power cables to each unit (20-32kW)
  - Fiber optic cables between units
  - Internet cable to 1 unit
- Control equipment
  - Ferries: Mount onboard
  - Other: SCADA, Tough pad
- Optional equipment
  - Weather station, Cameras, Back-up generators etc.
MoorMaster™ automated mooring

What it takes to get automated

- Dynamic unit separated from Services unit
- Secure the quay is strong enough to handle MoorMaster™ forces
- Mounting of vertical rails. Drilling of holes for chemical anchors. Grouting of feet. Mounting of services units
- Lifting & mounting of dynamic units
- Supply of
  - Power cables to each unit (30-50kW)
  - Fiber optic cables between units
  - Internet cable to 1 unit
- Control equipment
  - Ferries: Mount onboard
  - Other: SCADA, Tough pad
- Optional equipment
  - Weather station, Control room, Cameras, Back-up generators etc.
MoorMaster™ sites - North Europe

60 sites
91 MoorMaster™ machines in total

+50 sites
Potentially with positive ROI

Denmark - Sweden/Norway
Germany - Scandinavia/Baltics
Sweden - Baltics
Poland - Sweden
UK - France
MoorMaster™ automated mooring

Why automate the mooring

The good reason could be:

• Congestion
• Turnaround issues
• New infrastructure plans
• Safety issues
• Environmental targets
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Ready for a change ?!
Thank you for your attention

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HANDLING IRON ORE CARRIERS
Australia & Norway

- LARGER VESSELS at short Jetty
- Elimination vessel motion caused by PASSING SHIPS
- Automated WHARPING
- Improved personnel SAFETY
- Increased CARGO THROUGHPUT
MOORING CONTAINER VESSELS

in Oman, Lebanon & South Africa

- VESSEL SURGE reduced
- Improved container handling EFFICIENCY
- Only ONE OPERATOR for mooring handling
- Less PILOT & TUG time needed
- BREAKWATER construction avoided

MOORING CONTAINER VESSELS since 1999
HANDLING DREDGING VESSELS

in Brisbane (Australia)

- Saved valuable PROJECT TIME
- Improved PERSONNEL SAFETY
- Reduced VESSEL MOTIONS

Part of an airport project
MOORING & CHARGING ELECTRIC FERRY

in Lavik & Oppedal (Norway)

- More CHARGING TIME
- ACCURACY of ferry position
- Faster TURNAROUND TIME
- No need of SHORE CREW
MOORING SMALLER FERRIES in Denmark

- INFRASTRUCTURE COST savings from short berths
- NO SHORE CREW needed
- Reduction of SHIP CREW
- Faster TURNAROUND TIME
- Less rope & winch MAINTENANCE
MOORING LARGE FERRIES
in Helsinki (Finland)

- Better UTILIZATION of shore CREW
- Excellent SERVICE for their clients, the ferry lines
- Improved personnel SAFETY
- EU FUNDING (Automation)

MoorMaster™
Since 1999
MOORING GENERAL CARGO VESSELS

in 15 locks (Canada & USA)

- ONE MOORING OPERATOR instead of 3
- FLEXIBILITY improvement
- Faster TURNAROUND TIME
- Improved personnel SAFETY
MoorMaster™ automated mooring

SHIP TO SHIP - CLNG, Norway
Automated vacuum mooring

What you get
MoorMaster™ automated mooring

What you get

IMPROVED COMPETITIVENESS

- Improved efficiency
- Highest Safety standard
- Reduced Engine time
- Improved berth flexibility
MoorMaster™ automated mooring

What you get

MORE TIME for

- Loading/unloading cargo
- Recovering delays
- Utilization of shore & ship crew
- Throughput capacity
What you get

REDUCED RISKS for

• Personnel Safety & port Security
• Ground personnel dependence
• Time table delays
• Infrastructure damages
• Environment
Extra for questions…
What if there is a power cut?

• The typical duration of the vacuum pads still to hold on to the vessel is between 15 minutes and 15 hours dependent on the vacuum seal against the hull.

• The control system continues to monitor system and sound alarms as it has UPS back power on the control system.

• System hydraulics and vacuum systems do not operate.

• Where the power grid is considered a significant risk, a back-up generator should be employed.
Are the vacuum pads leaking?

- The efficiency of the seal is related to surface condition and the efficiency of the couple.

- A poor seal will mean that vacuum pumps may run continuously or start up frequently to maintain pre-set vacuum levels.
Do you still need fenders?

- Yes

- Conventional fenders are required for absorbing berthing loads
MoorMaster™ automated mooring

Does the ship needs strengthening?

• Few ships need any reinforcement

• However, steel structures with a thickness below 10mm should be examined more closely

• Note that the force exerted on the hull by MoorMaster™ is never more than 1 atmosphere and therefore less than that from fenders
MoorMaster™ automated mooring

What is the back-up?

• Same as with conventional mooring methods:
  ➢ Switch on thrusters or
  ➢ Call on tug assistance or
  ➢ Leave the berth