Overview transshipment methods for inland waterways of:

Click on the subject to navigate directly to that page

- Bulk
- Palletized goods
- Project cargo
- Containers

Remark: The financial figures and operational characteristics included in this document are indicative, based on market research done in 2018-2019, and might be subject to change over time.

Disclaimer: When using content of this document, please make reference to POM Oost-Vlaanderen (2019), Overview transshipment methods.

List of abbreviations

Approx.	**approximately**
CAPEX	**Capital Expenditure**
cm	**Centimeter**
Excl.	**Exclusive**
FT	**Feet**
h	**Hour**
IWW	**Inland Waterways**
kWh	**Kilowatthour**
l	**Liter**
m	**Meter**
mio	**Million**
N/A	**Not Available**
OPEX	**Operational Expenditure (expressed in financial figures and operational characteristics)**
T	**ton**
TEU	**Twenty Foot Equivalent Unit**
y	**year**
@	**At**

Overview transshipment methods Bulk

Overview transshipment methods Bulk

Method B1: mobile loader/unloader

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: 350.000 euro OPEX: Energy: 28 l diesel/h Maintenance: 4 – 9,5 euro/h	0,75 – 2 euro/ton

Minimum required waterside infrastructure:

Bollards (with solid ground for installing crane)

Remarks:

- Suited for all bulk materials
- Capacity 400 up to 500 ton/h
- Works up to 18m aside the crane
- Internet search: 'material handler machine'

Overview transshipment methods Bulk

Method B2: mobile unloader

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: 150.000 – 350.000 euro OPEX: Energy: 0,2 – 0,6 euro/ton or 1,0 – 1,2 kWh/ton Maintenance: 0,04 euro/ton	N/A

Minimum required waterside infrastructure:

Bollards

Remarks:

- Suited for cereals, seeds, nuts, animal feeds and many other free-flowing materials
- Outreach / working span of up to 9m
- Capacity 80 up to 250 ton/h
- Diesel or electrical powered
- Internet search: ‘pneumatic ship unloader mobile’

Overview transshipment methods Bulk

Method B3: mobile unloader

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: < 200.000 euro OPEX: Energy: 0,18 euro/hour (@ 120kW) Maintenance: 4.000 euro/year (2%)	N/A

Minimum required waterside infrastructure:

Bollards

Remarks:

- Suited for rice
- Capacity up to 80 ton/h
- Part of the installation (blowers and electric control) are separately installed (in a nearby building)
- Internet search: 'pneumatic ship unloader mobile'

Overview transshipment methods Bulk

Method B4: mobile unloader

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: 195.000 - 210.000 euro OPEX: Energy: 0,35 euro/ton (@140 ton/h) Maintenance: approx. 45.000 euro/y based on 8h working/day	N/A

Minimum required waterside infrastructure:

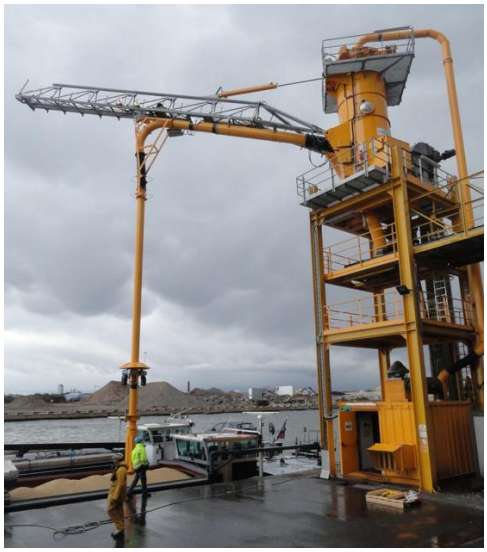
Bollards

Remarks:

- Suited for free flowing granular products
- Capacity up to 176 ton/hour (dry wheat)
- Internet search: 'agri vacuum ship unloader'

Overview transshipment methods Bulk

Method B5: stationary unloader



Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: 500.000 - 850.000 euro OPEX: Energy: 0,7 – 0,8 kWh/ton Maintenance: 0,04 euro/ton unloading	N/A

Minimum required waterside infrastructure:

Bollards

Remarks:

- For dry bulk products up to 1,2 ton/m³
- Suited for cereals, flours, rice, malt, feed pellets, soy beans, wood pellets, fish meal, soy meal
- Capacity 100 up to 400 ton/hour
- Outreach / working span of up to 17,5m
- Electrical powered
- Internet search: 'pneumatic ship unloader'

Overview transshipment methods Bulk

Method B6: automotive unloader

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: 1,2 – 1,6 mio euro OPEX: Energy: 0,7 – 0,8 kWh/ton unloading Maintenance: 0,04 euro/ton unloading	N/A

Minimum required waterside infrastructure:

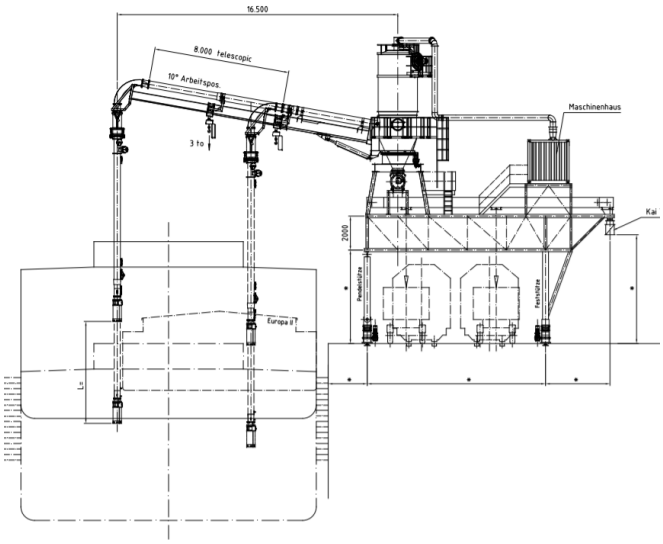
Standard quay wall

Remarks:

- Suited for dry bulk products up to 1,2 ton/m³
- Suited for cereals, flours, rice, malt, feed pellets, soy beans, wood pellets, fish meal, soy meal
- Capacity 100 up to 400 ton/hour
- Need of 2 – 3 operators
- Electrical powered
- Internet search: 'pneumatic ship unloader'

Overview transshipment methods Bulk

Method B7: automotive unloader



Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: 700.000 – 1.100.000 euro excl. transport & assembly OPEX: Energy: 0,9 kWh Maintenance: 1 - 2% of CAPEX/year	N/A

Minimum required waterside infrastructure:

N/A

Remarks:

- Suited for dry bulk products up to 1,2 ton/m³
- Suited for cereals, flours, rice, malt, feed pellets, soy beans, wood pellets, fish meal, soy meal
- Capacity up to 200 to 400 ton/hour unloading
- Internet search: 'pneumatic ship unloader'

Overview transshipment methods Bulk

Method B8: mobile unloader

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: 900.000 euro OPEX: Energy: 0,16 euro/ton Maintenance: 0,01 euro/ton	N/A

Minimum required waterside infrastructure:

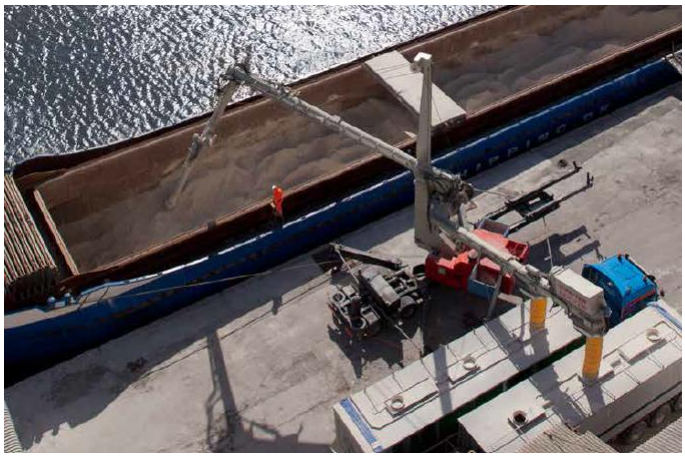
Bollards

Remarks:

- Mechanical screw type unloader
- Suited for all bulk products up to 1,2 ton/m³
- Suited for unloading of cement, grain, derivatives, alumina, fertilizers, chemical
- Capacity up to 220 ton/hour
- Internet search: 'pneumatic ship unloader mobile'

Overview transshipment methods Bulk

Method B9: mobile unloader



Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: 880.000 – 1.565.000 euro OPEX: Energy: 0,24 euro/ton Maintenance: N/A	N/A

Minimum required waterside infrastructure:

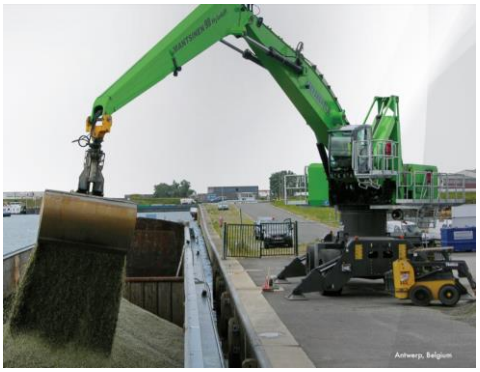
Bollards

Remarks:

- Suited for cement, alumina, sulphur, grain, feedstuff, biomass, fertilizers and quick lime
- Capacity up to 500 ton/hour
- Internet search: ‘dry bulk handling’

Overview transshipment methods Bulk

Method B10: hydraulic material handling crane



Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: small: 600.000 euro large: 2.000.000 - 3.000.000 euro OPEX: Energy: 20-25 l/h (small) - 30-40 l/h (large) Maintenance: 20 €/h (small) - 35 €/h (large)	0,65 – 1,40 euro/ton depending on specific weight of the product + 0,25-0,30 eurocent/ton fee for use quay wall (Belgium)

Minimum required waterside infrastructure:

Standard quay wall

Remarks:

- Clamshell grab : fully automatic, 80-90 cycles/hour (+1.000 ton per hour possible), 1 up to 20m³/grab
- Scrap Orange peel grab or magnet: fully automatic, 60-80 cycles/hour, 1 up to 10m³/grab
- Quick-changeable tools allow various types of cargo handling with the same machine at very high speeds
- Different undercarriages: rubber tires, crawlers, rail wheels, fixed
- Different drivelines: diesel, electric or hybrid
- Internet search: 'hydraulic harbour crane'

Overview transshipment methods Bulk

Method B11: Mobile Harbour Crane

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: 2.100.000 – 2.300.000 euro OPEX: Energy: 0,08 euro/ton (@500 ton/h) Maintenance: every 500h (2.500-3.500 euro parts excl. labour and oil)	0,65 – 1,40 euro/ton depending on specific weight of the product + 0,25-0,30 eurocent/ton fee for use quay wall (Belgium)

Minimum required waterside infrastructure:

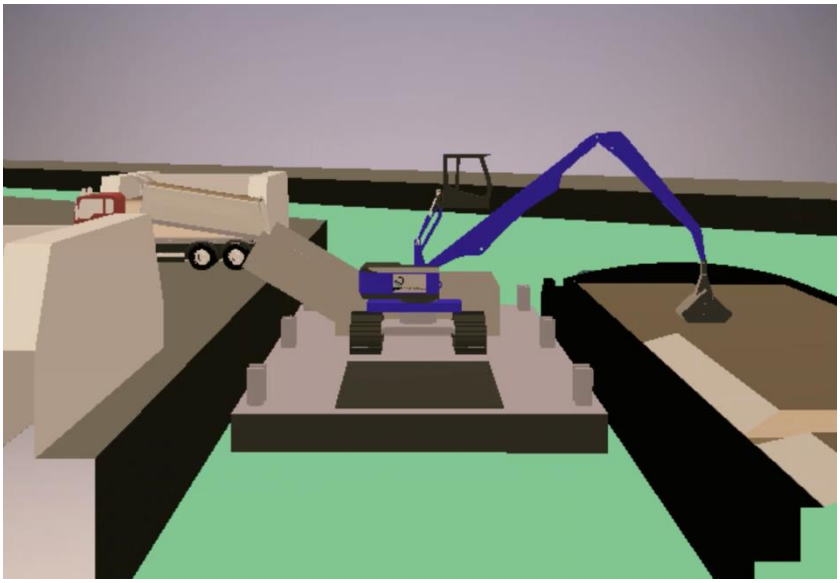
Standard quay wall (UDL 1,4t/m² - Area Pressure approx. 10t/m² – 25t/m²; depending on the configuration)

Remarks:

- Grabs up to 20m³ attachable
- Capacity up to 500 ton/hour (coal) – 800 ton/hour (other)
- Adjustable to fit every pier
- Internet search: 'Mobile harbour crane'

Overview transshipment methods Bulk

Method B12: mobile loader/unloader on pontoon



Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: 420.000 euro OPEX: 0,35 euro/ton when transshipping 1 Mio ton/year	N/A

Minimum required waterside infrastructure:

Bollards

Remarks:

- Transshipment pontoon with hydraulic cistern
- Capacity up to 500 ton/hour
- No footprint on the quay
- Internet search: no information supplied

Overview transshipment methods Bulk

Method B13: mobile loader on pontoon

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: N/A OPEX: N/A	N/A

Minimum required waterside infrastructure:

Bollards

Remarks:

- Rental of pontoon and mobile loader

Overview transshipment methods Bulk

Method B14: loader for trucks based on ramp

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: N/A OPEX: annual inspection	± 3.000 euro/week exclusive transport & build-up (estimated at 10.000 euro)

Minimum required waterside infrastructure:

Bollards or none (created by the pontoon)

Remarks:

- Capacity up to 350-400 ton/hour
- Internet search: 'scheepsbelader ponton'

Overview transshipment methods Bulk

Method B15: mobile hopper loader with conveyor belt

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: 150.000-175.000 euro	350 – 500 euro/day
OPEX: Energy: 10- 15l diesel/h Maintenance: 5.000 euro/y	exclusive transport

Minimum required waterside infrastructure:

Bollards

Remarks:

- Transshipment belt solution
- Length transport belt: 14 - 20m
- Suited for coal, grains, fertilizers, biomass, ores, aggregates, woodchips, mulch, wood pellets, sulphur, cement, …
- Capacity up to 500 ton/hour
- Diesel or electric powered
- Internet search: 'mobile feeders'

Overview transshipment methods Bulk

Method B16: gantry crane

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: 1.500.000 – 2.000.000 euro OPEX: Energy: N/A Maintenance: average estimation 35.000 – 40.000 euro/y	N/A

Minimum required waterside infrastructure:

Bollards

Remarks:

- Transshipment speed of 150 – 200 ton/hour
- Can lift up to 7-8 ton/grab
- Internet search: 'gantry crane inland waterways'

Overview transshipment methods Bulk

Method B17: craneship

Financial and operational characteristics:

Purchase equipment	Purchase service
N/A	380 euro/hour for transshipment all included Remark: sailing cost not included (= as normal IWW sailing cost and depending on the trajectory)

Minimum required waterside infrastructure:

Bollards

Remarks:

- Transshipment speed: 200 up to 650 ton/hour (depending on specific weight)
- Can lift 12 ton at 17m alongside ship
- Cargo: up to 1.263 ton (936m³)
- Internet search: 'kraanschip'

Overview transshipment methods Palletized goods

Overview transshipment methods palletized goods

Method P1: crane ship

Financial and operational characteristics:

Purchase equipment	Purchase service
N/A	0,75 – 1,25 euro/ton/move for transshipment Remark: sailing cost not included (= as normal IWW sailing cost and depending on the trajectory)

Minimum required waterside infrastructure:

Bollards

Remarks:

- No infrastructure needed on quay
- Pick-up of pallets up to 10m aside the ship (max 2,5 ton)
- Pick-up of pallets up to 4 ton
- Transshipment speed of 100 to 125 pallets/hour
- Internet search: ‘multimodal logistics’

Overview transshipment methods palletized goods

Method P2: crane ship 2



Financial and operational characteristics:

Purchase equipment	Purchase service
N/A	1,00 – 2,50 euro/move for transshipment Remark: sailing cost not included (= as normal IWW sailing cost and depending on the trajectory)

Minimum required waterside infrastructure:

Bollards

Remarks:

- No infrastructure needed on quay
- Pick-up of pallets up to 9m aside the ship (@1ton)
- Pick-up of pallets up to 4 ton and up to 5m above ship
- 198 euro pallets/layer, 400 euro pallets max/ship
- Transshipment speed of 90 to 120 pallets/hour
- Internet search: 'multimodal logistics'

Overview transshipment methods palletized goods

Method P3: hydraulic material handling crane

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: 10.000 - 35.000 euro OPEX: N/A	N/A

Minimum required waterside infrastructure:

Standard quay wall

Remarks:

- Pallet forks fully automatic
- 40 cycles per hour
- 1 up to 4 pallets per lift
- Quick-changeable tools allow various types of cargo handling with the same machine at very high speeds
- Different undercarriages: rubber tires, crawlers, rail wheels, fixed
- Different drivelines: diesel, electric or hybrid
- Internet search: 'hydraulic harbour crane'

Overview transshipment methods palletized goods

Method P4: platform + forklift truck

Financial and operational characteristics:

Purchase equipment	Purchase service
N/A	2 euro/move

Minimum required waterside infrastructure:

Standard quay wall

Remarks:

- Up to 250 ton/h depending on weight material (example = 3 to 5 ton per move)
- 60 to 80 moves per hour
- Transshipment cost can go down to 0,7 euro/ton (case dependent)
- Internet search: not applicable (custom made solution)

Overview transshipment methods Project cargo

Overview transshipment methods Project cargo

Method PC1: paper roll

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: 35.000 euro OPEX: Maintenance: 250 euro/year	N/A

Minimum required waterside infrastructure:

Depending on crane

Remarks:

- Vacuum system
- Fully automatic
- 90-100 cycles per hour
- Lifts two paper rolls (usually between 3 to 5 tons per roll)
- Internet search: N/A

Overview transshipment methods Project cargo

Method PC2: steel coils

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: 40.000 euro OPEX: Maintenance: 250 euro / year	N/A

Minimum required waterside infrastructure:

Depending on crane

Remarks:

- Fully automatic coil clamp
- 60 cycles/hour
- Allows damage free transshipment
- 1 unit per lift
- Distance between 2 rows (for access clamp): 30 cm
- Internet search: 'harbour crane coil clamp'

Overview transshipment methods Project cargo

Method PC3: roundwood

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: 40.000 euro OPEX: Maintenance: 250 euro / year	N/A

Minimum required waterside infrastructure:

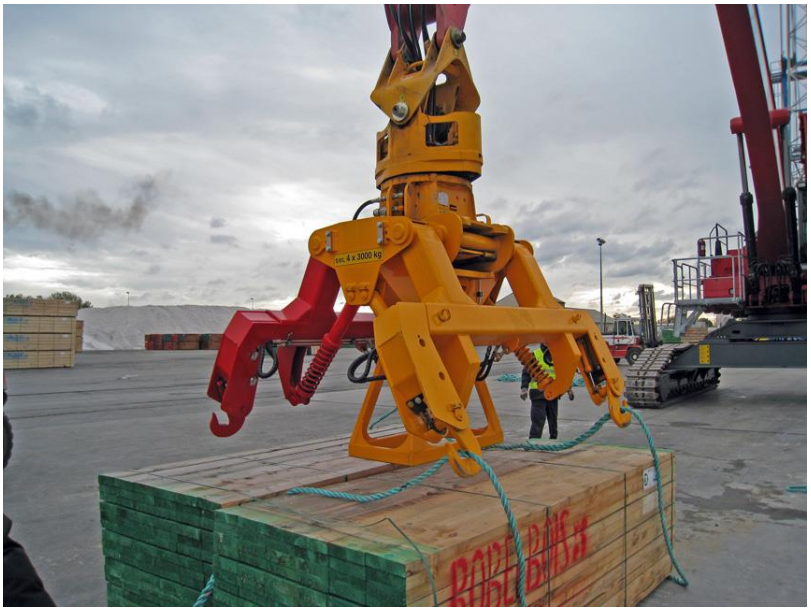
Depending on crane

Remarks:

- Fully automatic wood grapples
- 60 cycles per hour
- Up to a whole truck per lift
- Internet search: 'roundwood grapple'

Overview transshipment methods Project cargo

Method PC4: sawn timber



Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: 40.000 – 50.000 euro OPEX: Maintenance: 250 euro / year	N/A

Minimum required waterside infrastructure:

Depending on crane

Remarks:

- Auto-release hooks
- 40 up to 50 cycles per hour
- 1 up to 8 packages per lift
- Lifts up to 12 tons per package
- Internet search: 'sawn timber spreader'

Overview transshipment methods Project cargo

Method PC5: big bags

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: 30.000 – 40.000 euro OPEX: Maintenance: 250 euro / year	N/A

Minimum required waterside infrastructure:

Depending on crane

Remarks:

- Auto-release hooks
- 50 cycles per hour
- 1 up to 20 big bags per lift
- Lifts up to 4 ton per big bag (if not exceeding total capacity)
- Internet search: 'big bag spreader'

Overview transshipment methods Project cargo

Method PC6: pulp bale

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: 50.000 – 75.000 euro OPEX: Maintenance: 500 euro / year	N/A

Minimum required waterside infrastructure:

Depending on crane

Remarks:

- Fully automatic pulp bale spreader
- 70 cycles/hour
- 2 up to 8 bales per lift (standard bales +/- 2 ton)
- Internet search: 'pulp bale spreader'

Overview transshipment methods Project cargo

Method PC7: vacuum suited objects up to 6 ton

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: Lifter portion : 23.000 to 27.000 euro Vacuum Pad portion sizes: 3.000 to 6.000 euro OPEX: Maintenance cost: +/- 805 euro/month (based on one lifter and one pad used for a 40-hour work week)	N/A

Minimum required waterside infrastructure:

Bollards

Remarks:

- Lifts up to 6 ton
- Max 90 moves per hour
- Suited for steel, poly or concrete pipe, as well as flat plate and concrete slabs (pipe from 101 to 457 mm outer diameter)
- Options for Diesel, Hydraulic or Electric powered models
- Will not damage delicate materials and bonded coatings
- Vacuum lifter can be fitted to mobile loader/port crane, or other host machines
- 360° rotation provides precise placement of materials
- No extra workers needed to assist
- Minimum 30 minutes of continuous vacuum in the event of power failure
- Internet search: 'why vacuum lifting'

Overview transshipment methods Project cargo

Method PC8: single pipe lifting

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: Lifter portion: 59.000 to 90.000 euro Vacuum Pad portion size from 4" to 56": 6.800 to 16.000 euro, larger sizes available on special order OPEX: Maintenance cost: +/- 870 euro/month (based on one lifter and one pad used for a 40-hour work week)	N/A

Minimum required waterside infrastructure:

Bollards

Remarks:

- Lifts from 10 ton max up to 25 ton max; higher capacities available by special order
- Max 120 moves/hour
- Options for Diesel, Hydraulic or Electric powered models
- Vacuum pads can be easily adapted to handle different shapes of products (pipes from 101 mm to unlimited outer diameter)
- Will not damage delicate materials and bonded coatings
- Vacuum lifter can be fitted to mobile loader/port crane, or other host machines
- 360° rotation provides precise placement of materials
- No extra workers needed to assist
- Minimum 30 minutes of continuous vacuum in the event of power failure
- Internet search: 'why vacuum lifting'

Overview transshipment methods Project cargo

Method PC9: concrete elements

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: Lifter portion 59.000 to 90.000 euro Vacuum Pad portion size from 4” to 56”: 4.000 to 20.000 euro, larger sizes available on special order OPEX: Maintenance cost: +/- 870 euro/month (based on one lifter and one pad used for a 40-hour work week)	N/A

Minimum required waterside infrastructure:

Bollards

Remarks:

- Lifts from 10 ton max up to 25 ton max; higher capacities available by special order
- Max 80 moves/hour
- Options for Diesel, Hydraulic or Electric powered models
- Will not damage delicate materials and bonded coatings
- Vacuum lifter can be fitted to mobile loader/port crane, or other host machines
- 360° rotation provides precise placement of materials
- No extra workers needed to assist
- Minimum 30 minutes of continuous vacuum in the event of power failure
- Internet search: ‘why vacuum lifting’

Overview transshipment methods Project cargo

Method PC10: concrete road barriers

Financial and operational characteristics:

Purchase equipment		Purchase service
CAPEX:	11.270 euro for one clamp design 21.200 euro for two clamps design	N/A
OPEX:		
Energy: Hydraulic power used from host machine Maintenance: 305 euro/month		

Minimum required waterside infrastructure:

Bollards

Remarks:

- Designed to lift concrete road barriers up to 9m long and up to 10,5 ton
- 360° rotation provides precise placement of materials
- Rotation and clamping operates using the hydraulic system of the host machine so host machine must have two sets of hydraulic lines available
- Remote operation is safer than using hooks, slings or chains
- Elastomer grips provide superior performance and full surface contact without damaging materials
- Hydraulic lock for safety will not drop barrier if hydraulic pressure is lost
- Eliminates workers from being in unsafe lifting areas
- Internet search: 'why vacuum lifting'

Overview transshipment methods Project cargo

Method PC11: multiple pipe handling

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: Lifter portion: 59.000 to 270.000 euro Vacuum Pad portion size from 4" to 56": 8.500 to 16.000 euro, larger sizes available on special order OPEX: Maintenance cost: +/- 870 euro/month (based on one lifter and one pad used for a 40-hour work week)	N/A

Minimum required waterside infrastructure:

Bollards

Remarks:

- Lifts up to 40 ton; higher capacities available by special order
- Max 120 pipes/hour
- Options for Diesel, Hydraulic or Electric powered models
- Vacuum pads can be easily adapted to handle different shapes of products
- Lifts any materials with a surface where vacuum can be created
- Will not damage delicate materials and bonded coatings
- Vacuum lifter can be fitted to mobile loader/port crane, or other host machines
- No extra workers needed to assist
- Minimum 30 minutes of continuous vacuum in the event of power failure
- Connects quickly to a Reach Stacker
- Internet search: 'why vacuum lifting'

Overview transshipment methods Project cargo

Method PC12: Flexible material handling

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: Lifter portion from 39.500 euro Vacuum Pad portion sizes from 4” to 56”: 350 to 16.000 euro OPEX: Maintenance cost: +/- 400 euro/month for one lifter & one pad	N/A

Minimum required waterside infrastructure: Bollards

Remarks:

- Lifts up to 6 ton
- Max 20 moves/hour
- Vacuum pads can be easily adapted to handle different shapes of products
- Width between center pads: min 0,7m, max 3m50
- Hydraulic powered from host machine
- Lifts any materials with a surface where vacuum can be created
- Will not damage delicate materials and bonded coatings
- Vacuum lifter can be fitted to mobile loader/port crane, or other host machines
- No extra workers needed to assist
- Internet search: ‘flexible lifter’

Overview transshipment methods Project cargo

Method PC13: project cargo general

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: 2.400.000 – 2.600.000 euro OPEX: Energy: 18 euro/h Maintenance: every 500h (2.500-3.500 euro parts excl. labour and oil)	N/A

Minimum required waterside infrastructure:

Standard quay wall (UDL 1,4t/m² - Area Pressure approx. 10t/m² – 25t/m² (depending on the configuration)

Remarks:

- Single lifts up to 80 ton
- Twin lift operation up to 160 ton
- Adjustable to fit every pier
- Internet search: 'Mobile harbour crane'

Overview transshipment methods Project cargo

Method PC14: craneship

Financial and operational characteristics:

Purchase equipment	Purchase service
N/A	50 – 60 euro/move for transshipment Remark: sailing cost not included (= as normal IWW sailing cost and depending on the trajectory)

Minimum required waterside infrastructure:

Bollards + quay with asphalt or suited access for trucks

Remarks:

- Transshipment speed: 15 - 25 moves/hour (depending on circumstances)
- Grab/drop cargo up to 45 ton at 24m alongside ship
- Ships up to 2.000 ton
- Internet search: 'container kraanschip'

Overview transshipment methods Project cargo

Method PC15: craneship

Financial and operational characteristics:

Purchase equipment	Purchase service
N/A	380 euro/hour for transshipment all included Remark: sailing cost not included (= as normal IWW sailing cost and depending on the trajectory)

Minimum required waterside infrastructure:

Bollards

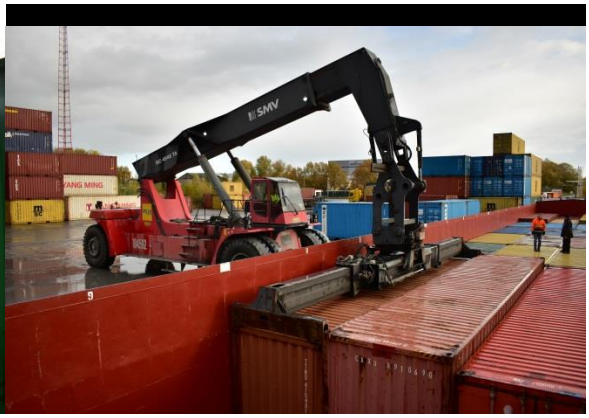
Remarks:

- Transshipment speed: 15 - 30 moves/hour (depending on circumstances)
- Can lift 12 ton at 17m alongside ship
- Ships up to 1.263 ton (936m³)
- Internet search: 'kraanschip'

Overview transshipment methods Containers

Overview transshipment methods containers

Method C1: reach stacker



Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: 520.000 – 650.000 euro OPEX: Energy: approx. 11- 12 euro/running hour Maintenance: approx. 25 euro/running hour (maintenance mechanics + tires)	20 – 50 euro/move on inland terminals

Minimum required waterside infrastructure:

Heavy duty quay wall

Remarks:

- Transshipment speed on average: 20 container moves/hour
- Pick-up of up to 30 ton for 4th row in ship
- Reach inside ship: up to 4 containers wide
- Can stack up to 4 or 5 containers high (on quay)
- Negative lift up to 2.400mm below quay
- Wheel base 7,5m to 9,2m (depending on application)
- Internet search: 'reach stacker'

Overview transshipment methods containers

Method C2: hydraulic material handling crane

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: small: 600.000 euro large: 2.000.000 - 3.000.000 euro OPEX: Energy: 20-25 l/h (small) or 30-40 l/h (large) Maintenance crane: 20 €/h (small) or 35 €/h (large) Maintenance spreader depends on use : 500 to 2000 €/y	N/A

Minimum required waterside infrastructure:

Standard quay wall

Remarks:

- 40-60 container moves/hour
- Single or twin lift, telescopic or non telescopic (20-30-40ft containers)
- Container spreader fully automatic
- Quick-changeable tools allow various types of cargo handling with the same machine at very high speeds
- Different undercarriages: rubber tires, crawlers, rail wheels, fixed
- Different drivelines: diesel, electric or hybrid
- Internet search: 'hydraulic harbour crane'

Overview transshipment methods Containers

Method C3: Mobile Harbour Crane

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: 2.400.000 – 2.600.000 euro OPEX: Energy: 1,08 euro/container Maintenance: every 500h (2.500-3.500 euro parts excl. labour and oil)	N/A

Minimum required waterside infrastructure:

Standard quay wall (UDL 1,4t/m² - Area Pressure approx. 10t/m² – 25t/m² (depending on the configuration)

Remarks:

- Up to 30 cycles/hour
- Container handling up to Handy Size Vessels
- Adjustable to fit every pier
- Internet search: 'Mobile harbour crane'

Overview transshipment methods containers

Method C4: gantry crane

Financial and operational characteristics:

Purchase equipment	Purchase service
CAPEX: 7.000.000 euro OPEX: Energy : 3.3 kWh / move Maintenance: 10.000 – 20.000 euro/y excluding ropes	N/A

Minimum required waterside infrastructure:

Standard quay wall

Remarks:

- transshipment speed of average 45 containers/hour
- Can lift up to 40 ton
- Internet search: 'gantry crane inland waterways'

Overview transshipment methods containers

Method C5: craneship

Financial and operational characteristics:

Purchase equipment	Purchase service
N/A	50 – 60 euro/move for transshipment Remark: sailing cost not included (= as normal IWW sailing cost and depending on the trajectory)

Minimum required waterside infrastructure:

Bollards + quay with asphalt or suited access for trucks

Remarks:

- Transshipment speed: 15 - 25 moves/hour (depending on circumstances)
- Can lift 20 - 40 - 45ft containers
- Grab/drop containers up to 45 ton at 24m alongside ship
- Ships up to 100 TEU with reefer connections
- Internet search: 'container kraanschip'