Port Feeder Barge:

Floating infrastructure for congested (container) ports

Although tremendous efforts have been made in worldwide port development following issues are still on the agenda in many (container) ports:

- Limited water depth
- High berth utilisation
- Insufficient container capacity and facilities, especially in minor ports
- Poor hinterland connections
- Road congestion, especially within major ports

The urgently needed expansion of port infrastructure requires huge financial resources and takes a while to be realised. Hence it is worth to think about smart alternative solutions for container handling which could help to by-pass overloaded port facilities and could be realised very quickly.

Consequently a self propelled container barge with its own high performance cargo gear could serve as a very flexible combination of:

- 'Floating container truck' for the haulage within ports or to nearby locations (e.g. container freight stations)
- 'Floating terminal' for deep sea container vessels at anchorage
- 'Floating terminal' for coastal shipping at anchorage or within ports
- 'Floating terminal' for inland navigation within ports
- Floating crane for non containerised cargo

The Port Feeder Barge concept

The internationally patented **Port Feeder Barge** concept is a self-propelled container pontoon with a capacity of 168 TEU (completely stowed on the weather deck), equipped with its own state-of-the-art heavy-duty container crane mounted on a high column. The crane is equipped with an automatic spreader, retractable from 20ft to 45ft, including a turning device. A telescopic over height frame is carried along on board. The barge is of double-ended configuration, intended to make it extremely flexible in connection with the sideward mounted crane. Due to the wide beam of the vessel no operational (stability) restrictions for the crane shall occur. The crane has a capacity of 40 tons under the spreader, at an outreach of 27 metres (maximum outreach: 29 m). The unique vessel is equipped with 2 electrically driven rudder propellers at each end in order to achieve excellent manoeuvrability and the same speed in both directions. While half of the containers are secured by cell guides, the other half is not, enabling the vessel to carry containers in excess of 40ft as well as any over-dimensional boxes. The vessel shall fulfil the highest environmental standards. A diesel-electric engine plant with low exhaust emissions has been chosen to supply the power either for propulsion or crane operation. The vessel can be operated by a minimum crew of three.

The key element of the worldwide unique **Port Feeder Barge** concept is its own full scale container crane. While it looks like a standard shipboard crane, all its mechanical components have been especially designed for continuous operation – unlike standard shipboard cranes, which are designed for operation only every few weeks when a typical deep sea vessel is in port. Due to its nature, the **Port Feeder Barge** is continuously in port – seven days a week. Hence the load cycle requirements are even higher than for many quayside cranes, which have significant consequences on the layout of its mechanical components.

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Fig. 1: **Port Feeder Barge** © PORT FEEDER BARGE GmbH

Port Feeder Barge

Main Data

Type: ..... self propelled, self sustained, double-ended container barge

Length o.a.: ..... 63.90 m
Beam o.a.: ..... 21.20 m
Height to main deck: ..... 4.80 m
Max. draft (as harbour vessel): ..... 3.10 m
Deadweight (as harbour vessel): ..... 2,500 t
Gross tonnage: ..... approx. 2,000 BRZ

Power generation: ..... diesel-electric
Propulsion: ..... 2 x 2 electrical rudder propeller of 4 x 280 kW
Speed: ..... 7 knots at 3.1 m draft

Class: ... GL ✠ 100 A5 K20 Barge, equipped for the carriage of containers, Solas II-2, Rule 19 ✠ MC Aut

Capacity: ..... **168 TEU** (thereof 50% in cellguides), 14 reefer plugs
Crane: ..... LIEBHERR CBW 49(39)/27(29) Litronic (49 t at 27 m outreach)
Spreader: ..... automatic, telescopic, 6 flippers, turning device, overheight frame

Accommodation: ..... 6 persons (in single cabins)

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When berthed, the **Port Feeder Barge** is able, without being shifted along the quay, to put or pick 84 TEU in three layers between the rails of the quayside gantry cranes. This is more than sufficient, with a total loading capacity of 168 TEU. That is why the full outreach of the crane is not always needed. Berthing the vessel with the crane on the opposite side of the quay would speed up crane operation as the turning time of the outrigger is minimised. The height of the crane column is sufficient to serve even high quays in open tidewater at low tide ports while stacking the containers in several layers or to serve deep sea vessels directly.

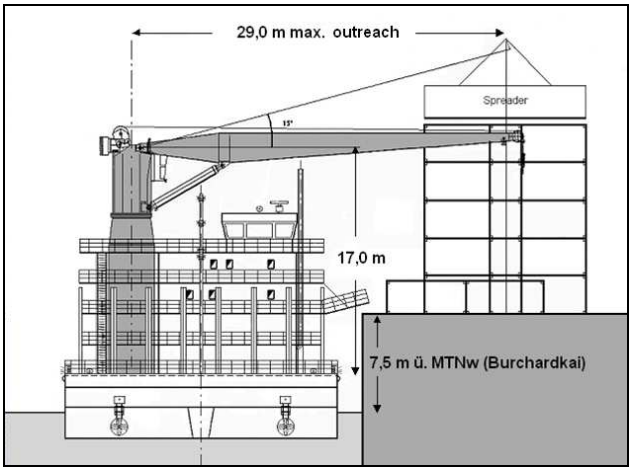

Fig. 2: Outreach of crane

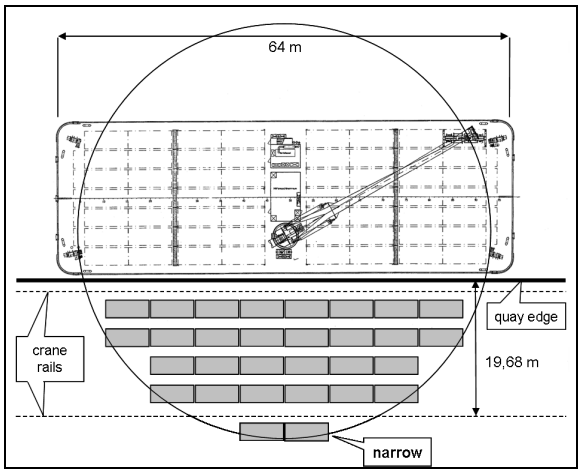

Fig. 3: Turning circle of crane

Employment

<u>From road to waterway ('floating container truck')</u>

As more and more terminals are operating on their capacity limits separate container freight stations are being built in the neighbourhood of the ports to remove the stuffing and stripping activities to off-dock facilities which often have their own (shallow) water access, but no cranes, resulting in additional road haulage. These transports cause an increase of box movements more than proportionally to the general growth of container traffic.

A self sustained **Port Feeder Barge** being independent from quayside equipment could shift these containers from road to waterway. Compared to trucking, the **Port Feeder Barge** does not cause any additional work for the deep sea terminal. Instead of carrying a container to the pick up area for the trucks a terminal vehicle carries it to any quayside zone in terminal's option. If the terminal has the possibility to grant the **Port Feeder Barge** a permanent berth – for example where the water depth is not sufficient for any seagoing vessel – there is even the possibility to reduce the terminal's expenses, as the boxes could be brought directly to the berth without being put into intermediate container stack, hence avoiding double handling. This should be the case with many terminals of jetty-type deep water berths.

Connected to container trucking in multi-terminal ports is assisting the feeder operations. The common feeder vessels either have to call at all the various deep sea terminals where their customers are berthing or feeder operators have to contract road hauliers for intra-terminal transports (see above). If the **Port Feeder Barge** would collect and distribute containers for the feeder vessels, the feeders could concentrate on the major terminal(s) only, thus reducing the number of vessel shiftings, reducing their time in port and related costs, improving safety and increasing terminal and berth efficiency.

From the terminal's point of view, all vessels with just a few boxes to handle by quay crane are critical with respect to profitability anyhow. In general crane productivity with feeder vessels is 30-35% less compared to main line vessels.

Fig. 4: **Port Feeder Barge** working independently from quayside equipment at a deep sea terminal requiring only a small gap between two deep sea vessels

'Floating terminal' for deep sea vessels

Many minor ports are cut off from containerisation as their water depth and/or their quayside facilities are not sufficient to be called directly by even mid-sized container vessels.

Without huge investments in infrastructure deep sea container vessels could be served at anchor by the **Port Feeder Barge** which also would shuttle the boxes on its own between the anchorage and ashore requiring only simple and small facilities with only shallow water in port to handle the boxes.

'Floating terminal' for coastal shipping

Coastal shipping has a bigger role to play if coastlines have to be exploited and regional container hubs have to be developed. However development of coastal container shipping suffers from the fact that it has to compete for space with international forces. Major ports and container terminals continue to be congested and berthing for coastal vessels is a real nightmare according to coastal operators. Lack of container handling facilities at minor ports, and restrictions, are additional major obstacles. As well as with deep sea vessels from abroad **Port Feeder Barges** could serve also coastal vessel directly as a 'floating terminal' in minor ports.

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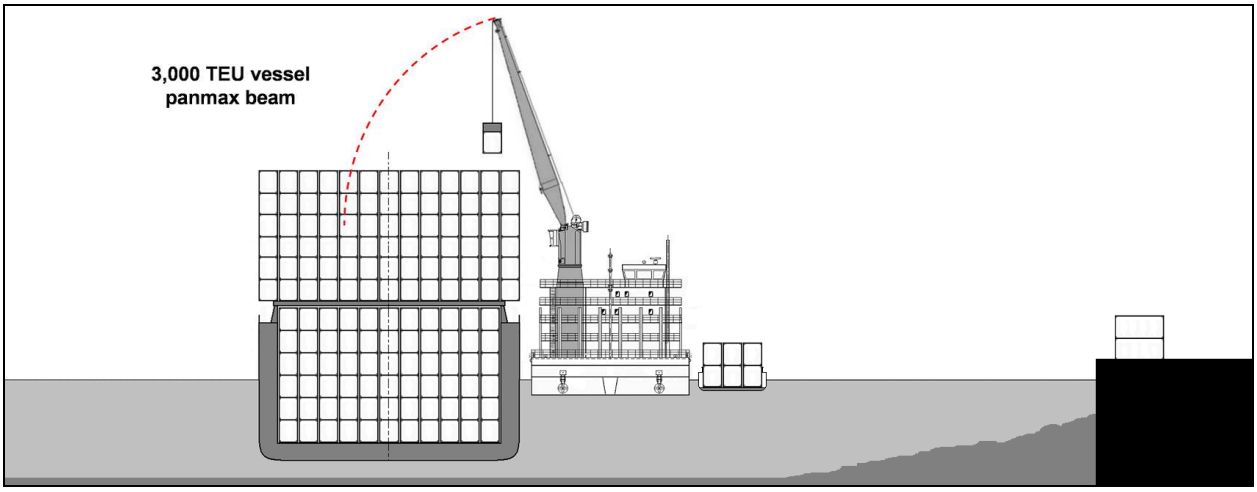

Fig. 5: **Port Feeder Barge** employed as a floating terminal for deep sea / feeder vessels or inland navigation

'Floating terminal' for inland navigation

Inland waterway shipping is destined to take a bigger portion of hinterland traffic even in container transport. To avoid berthing of the small inland waterway vessels at all the deep sea container berths, which would be a waste of valuable terminal capacity, and not to be forced to build dedicated inland barge terminals the **Port Feeder Barge** could act as a floating and movable terminal for inland navigation. The containers would be exchanged ship-to-ship, independently from any shore side facility. Not even a quay is needed but transhipment operation can take place somewhere midstream at the dolphins. Such operation would strengthen the competitiveness of inland navigation resulting in an increased share in hinterland transport.

Operating **Port Feeder Barges** is also affecting urban issues. With respect to investment, availability of land, building approval, flexibility and not to forget environmental and townscape issues a 'floating terminal' is much cheaper, smarter and easier to realise than any land based facility. In addition it could be financed privately.

Floating crane for non containerised cargo

With a capacity of 49 t under the hook (40 t under the spreader) the **Port Feeder Barge** can also be employed as a floating crane for any kind of cargo other than containers or for stand-by purposes in case of emergency. Unlike some other heavy floating equipment, the barge can navigate in very shallow waters due to its light ship draught of only 1.2 meters. Despite its small size the **Port Feeder Barge** can also lighter grounded container vessels even with more than panmax beam by working from both sides.

Conclusion

The **Port Feeder Barge** concept can be considered as a **'green'** logistic innovation for sea ports that could help to ease congestion and to reduce the environmental impact of heavy container trucking in many container ports. In minor/intermediate ports which suffer from a lack of sufficient shore based container facilities and/or very limited water depth such vessels could in the first place facilitate container handling. This would strengthen the potential of coastal shipping substantially. Employing **Port Feeder Barges** is less costly and quicker to realise than the erection of comparable shore based facilities not to mention that less parties have to be involved for approval.

Hamburg, March 2009

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