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CHALLENGES WITH ECONOMIC DEMANDS**

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improving port  
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# HAMBURG PORT FEEDER BARGE CONCEPT

The promising Port Feeder Barge concept still has some obstacles to overcome to be finally introduced in the Port of Hamburg, writes **Dr Ulrich Malchow** from PFB

Hamburg has a serious problem with its air quality. The annual average NOx limit set by the EU in 2010 of 40 µg m<sup>3</sup> has been exceeded for some years now at several hot spots. Respective counter measures by the local government are overdue.

An analysis prepared by Hamburg's environmental authority for its Clean Air Scheme has come to the conclusion that approximately 50% of Hamburg's more than 20,000 tonnes of annual NOx emissions have their origin in the city's port business which includes the emissions from trucking which by nature, is to a substantial extent very much port related.

Another analysis made by Hamburg Port Authority has revealed that approximately two million teu, which is almost a quarter of the entire container throughput, is being annually shifted within the port. This is done 95% by truck and consequently contributes heavily to air pollution and also road congestion within the port.

As a meaningful and obvious consequence, the local coalition of the social democrats and the green party agreed in 2015 to support all efforts to shift more intra-port haulage of containers from road to waterway.

## BARGE CONCEPT

The Port Feeder Barge has been developed to considerably improve the internal container logistics in major and minor container ports and to reduce the corresponding ecological footprint.

A key element of the self-propelled pontoon type of vessel of 168 teu capacity is its own full scale heavy duty container crane mounted on a high column.

The barge is of double-ended configuration, intended to make it extremely flexible in connection with the sideward mounted crane. The vessel is equipped with two electrically driven rudder propellers at each end in order to achieve excellent manoeuvrability and the same speed in both directions. Hence the vessel can e.g. easily turn on the spot and navigate sideward.

While half of the containers are secured by cell guides, the



Photo: PFB

■ Port Feeder Barge (computer rendering)

other half is not, enabling the vessel to also carry containers in excess of 40ft length as well as any over-dimensional boxes or even break-bulk cargo. 14 reefer plugs allow for the carriage of electrically driven temperature controlled containers.

Unusually for a shipboard crane, it is equipped with an automatic spreader, extendable from 20 to 45ft, including a turning device. A telescopic over height frame to handle flats with over height cargo is also carried on board. With a skilled driver the crane performance is estimated to be 20 moves/hour. The crane is key to providing independence from the availability and most importantly from the high cost rates of the big gantry cranes which are tailor made for 20,000 teu vessels, but not for small barges.

## INCREASED EFFICIENCY

Bundling containers for waterborne transport is already much more energy efficient per teu than the road haulage of single containers and causes less emissions per teu. Also, the standard shipboard crane is less energy consuming than the operation of the huge gantry cranes. Furthermore, the efficiency of the big quayside cranes is rather low when serving the small vessels.

To further reduce the ecological footprint of intra-port container logistics, the Port Feeder Barge is fuelled by LNG. A gas-electric engine plant supplies the power either for propulsion or crane operation which results into an extremely 'green' harbour vessel.

As the vessel is of pontoon type, there is plenty of void space below the weather deck to accommodate the voluminous LNG tanks so there is no loss of cargo space.

In Hamburg, the Port Feeder Barge is intended to serve as a 'floating truck' in the course of a daily round voyage throughout the port shuttling containers between the various container

■ A Port Feeder Barge working independently from quayside equipment at a deep sea terminal (computer rendering)



Photo: PFB

facilities which have water access. This will substantially reduce container trucking in the port.

As the barge will be operated as a liner ('bus') service it can be booked even for single containers composing the majority of intra-port container haulage.

According to an analysis of Hamburg Port Authority approx. 400,000 teu out of the two million teu which are trucked within the port are well suited to be carried on the water as their place of origin as well as their destination have water access.

The Port Feeder Barge could also act as a dedicated 'floating terminal' for inland navigation. During its daily round voyage throughout the port the barge could also collect and distribute the containers also for inland navigation.

“ The Port Feeder Barge has been developed to improve the internal container logistics in major and minor container port and to reduce the corresponding ecological footprint

Once a day, the Port Feeder Barge could call at a dedicated berth to meet with the inland barges where the containers are being exchanged ship-to-ship independently from any terminal equipment (virtual terminal call). No quay is required but the transhipment operation can take place somewhere midstream at the dolphins.

The Port Feeder Barge could also serve as a stand-by emergency response vessel for the quick lightering of grounded container vessels. It has to be conceded that virtually no port is really prepared for such incidents. The bigger the vessel the less salvage equipment is available. To lighter a 20,000 teu vessel a floating crane with a hook height of around 60 m is needed. To be prepared to serve mega vessels the Port Feeder Barge will have to be slightly enlarged by extending the crane beam and heightening the crane column.

The acute lack of such equipment has been proven in 2016 when the 19,000 teu vessel 'CSCL Indian Ocean' ran aground on the Elbe River and was stranded for five days. It was only due to very lucky circumstances the vessel did not need to be lightered.

A 'green' port has to make provisions also for such a scenario as a stranded container vessel can easily suffer from structural damage which could cause a serious oil spill. Grounded container vessels are a worldwide underestimated risk.

OVERCOMING CHALLENGES

Despite all these obvious advantages and the barge's economic viability, its introduction within the Port of Hamburg has not been as easy as expected. Introducing such a concept requires a lot of coordination with all the local stakeholders: Local government, port authority, terminal operators, industry associations, unions, customs, liner agencies, container depots, stuffing & stripping companies, rail operators and truckers.

Smooth Port Feeder Barge operation depends decisively on the consent of all terminals allowing the self-sustained operation at their facilities.

But while Hamburg's trucker association is supporting the concept, one local government controlled terminal operator which operates three terminals in Hamburg, has refused its full support for seven years (by claiming additional service charges from the PFB).

On a positive note, the company has itself fully committed to

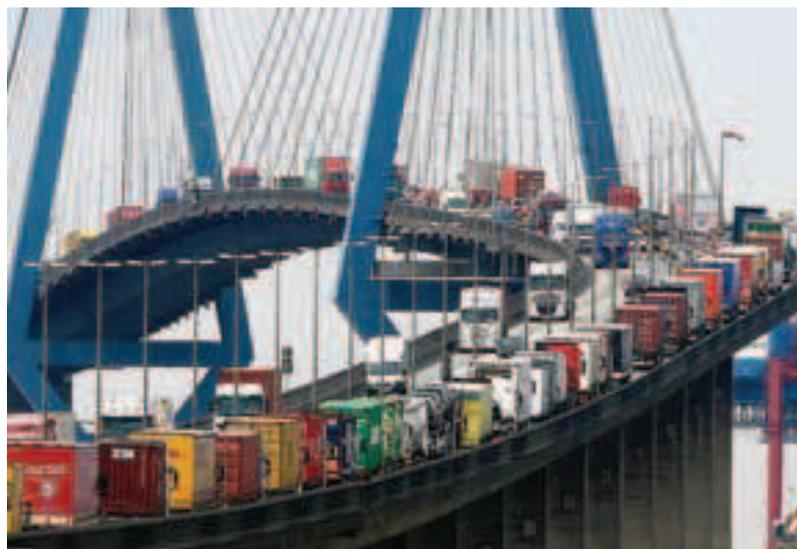


Photo: PFB

protect the environment and to create sustainable intermodal transport chains, while the local government as the major shareholder has expressively committed itself to shift more containers to the waterway. So, there is hope that the situation can be worked through soon.

If all stakeholders can agree on a common way forward, the PFB could be operational in 2020/21.

Despite the political challenges, thankfully the barge's innovative character, (which is worldwide unique and is protected by patents) is not marred by technical challenges. All components represent proven shipbuilding technology. Hence construction and operation can be done anywhere in the world.

However, the Port Feeder Barge concept requires a new kind of cooperation among all the relevant stakeholders within the respective port in order to get the full ecological and logistical return out of the concept. And that is where the main challenge lies into the future.

Typical view on Hamburg's Koehlbrand Bridge linking the eastern and western part of the port

PRINCIPAL PARTICULARS: Port Feeder Barge

Type:	Self-propelled, self-sustained, double-ended container barge
Length o.a.:	63.90m
Beam o.a.:	21.20m
Height to main deck:	4.80m
Max. draft (as harbour vessel):	3.10m
Deadweight (as harbour vessel):	2,500t
Tonnage:	Approx. 2,000 GT
Power generation:	Gas-electric
Propulsion:	2 x 2 electrical rudder propeller of 4 x 280 kW
Speed:	7 knots at 3.1 m draft
Class:	GL X 100 A5 K20 Barge equipped for the carriage of containers, Solas II-2, Rule 19 X MC Aut
Capacity:	168 TEU (thereof 50% in cell guides), 14 reefer plugs
Crane:	LIEBHERR CBW 49(39)/27(29) Litronic (49t at 27m outreach)
Spreader:	Automatic, telescopic, 6 flippers, turning device, overheight frame
Accommodation:	6 persons (in single cabins)