

# The Floaterm Concept: Reducing Terminal Congestion with Waterside Cranes

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Barge cranes have been used to unload ships for decades. In Hong Kong harbor millions of containers have been transferred midstream from ships to barges using primitive methods.

The production was at the rate of ten or twelve per hour. This is no longer viable.

Yesterday, production was the issue. Today pollution and congestion are the issues.

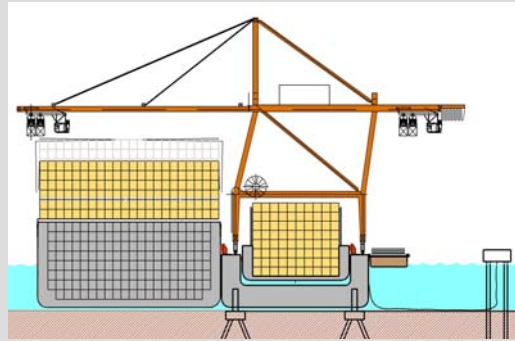
The Floaterm concept, which I am about to explain, will reduce pollution and congestion.

## A New Approach

Former Secretary of Transportation, Norman Mineta, called congestion one of the single largest threats to the economy:

“We need a new approach and we need it now.”

How can we reduce congestion and pollution?



Congestion is one of the largest threats to the US economy.

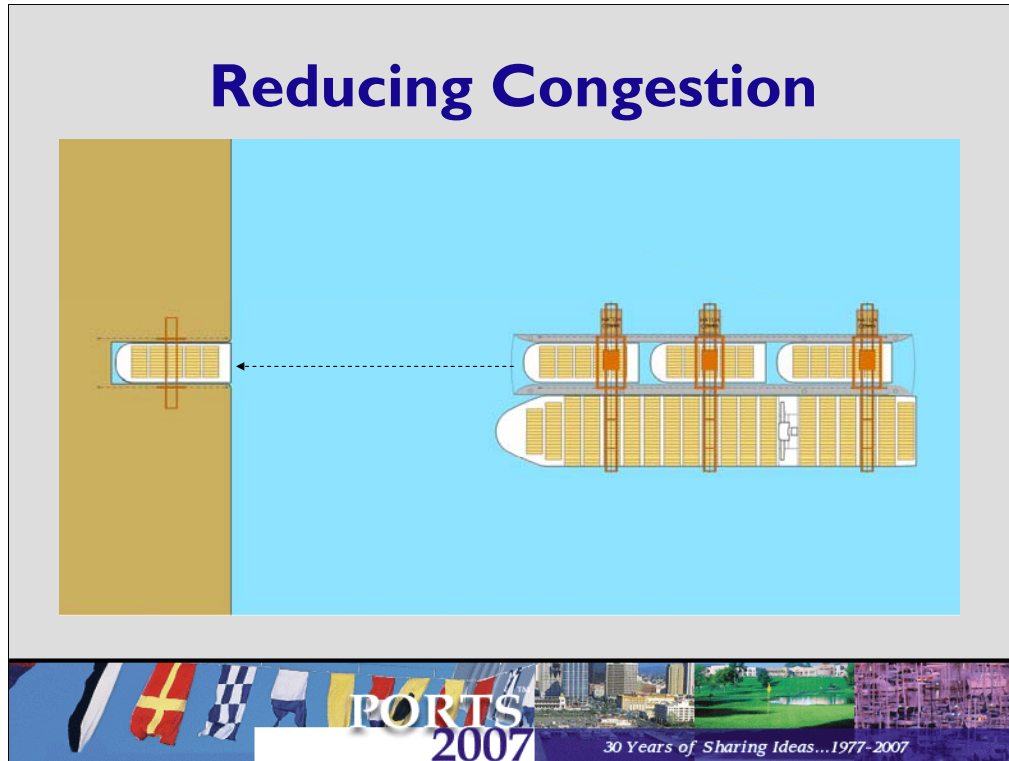
Secretary Mineta said, “We need a new approach and we need it now.”

Pollution from port operations is a rising concern as well.

Increased congestion and pollution create a growing need for new, more economical terminal operation methods.

Floaterm is a concept that will reduce congestion and pollution at ports and the arteries feeding them.

Floaterm is a transfer station where containers are exchanged from container ships to barges.



To get a overview of the concept, let's look at the primary application – exchanging containers midstream

Components:

- Containership

- Crane barge with cranes and internal channel

- Feeder barge

- Remote terminal

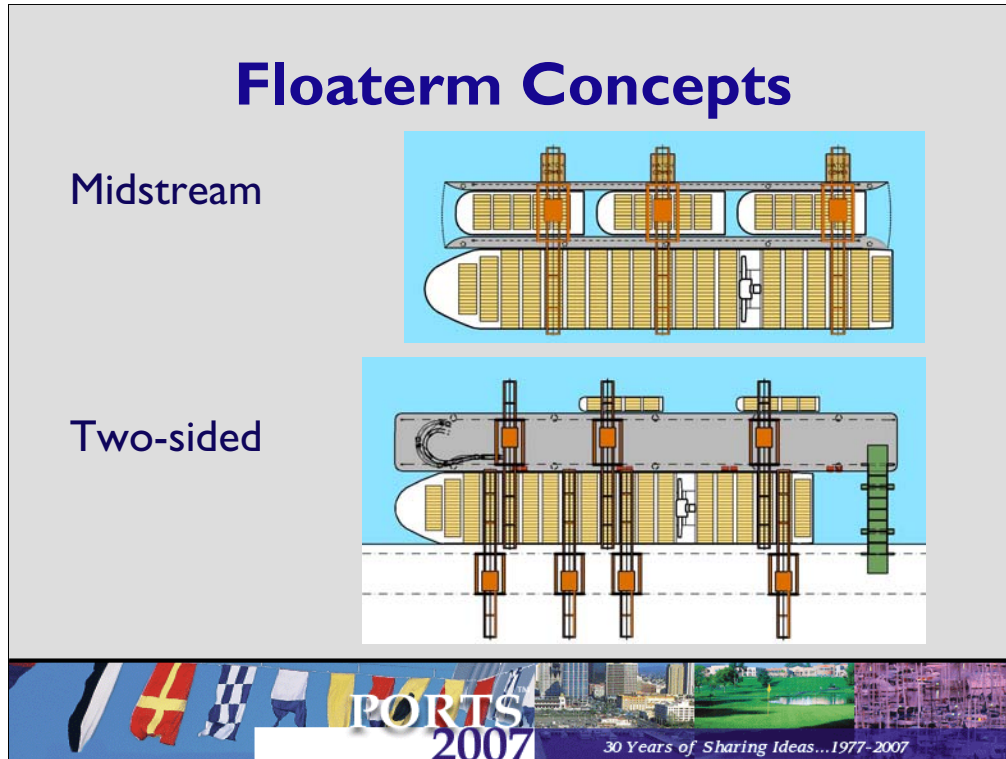
Containers will be transferred to feeder barges and moved upstream to regions with less congestion and pollution.

Each barge reduces the traffic on the highway by 400 trucks.

The cranes are electrically powered, as on-shore cranes are now.

The feeder barges are towed by diesel powered tug boats. The tug boat exhaust can be cleaned more effectively than terminal tractor and RTG exhaust.


We will look at this application in more detail later.



The midstream application is the primary Floaterm application.  
A secondary application is the two-sided operation.  
The two sided operation reduces ship time at the berth.  
Some details of both applications will be presented.  
Some inland terminal concepts will be briefly presented as well.  
Engineering calculations have been prepared to verify the technical feasibility of both concepts, but are not included in this presentation.

# Midstream Operation

The crane and the crane barge	Feeder barge
Operation	Size
Anchorage	Maneuvering
Stability	Remote loading/unloading
Propulsion	
Power Supply	



The two major components are the crane barge and the feeder barge.

Crane barge issues are:

How to transfer containers from the containership to the feeder barge

How keep the crane barge level during operations

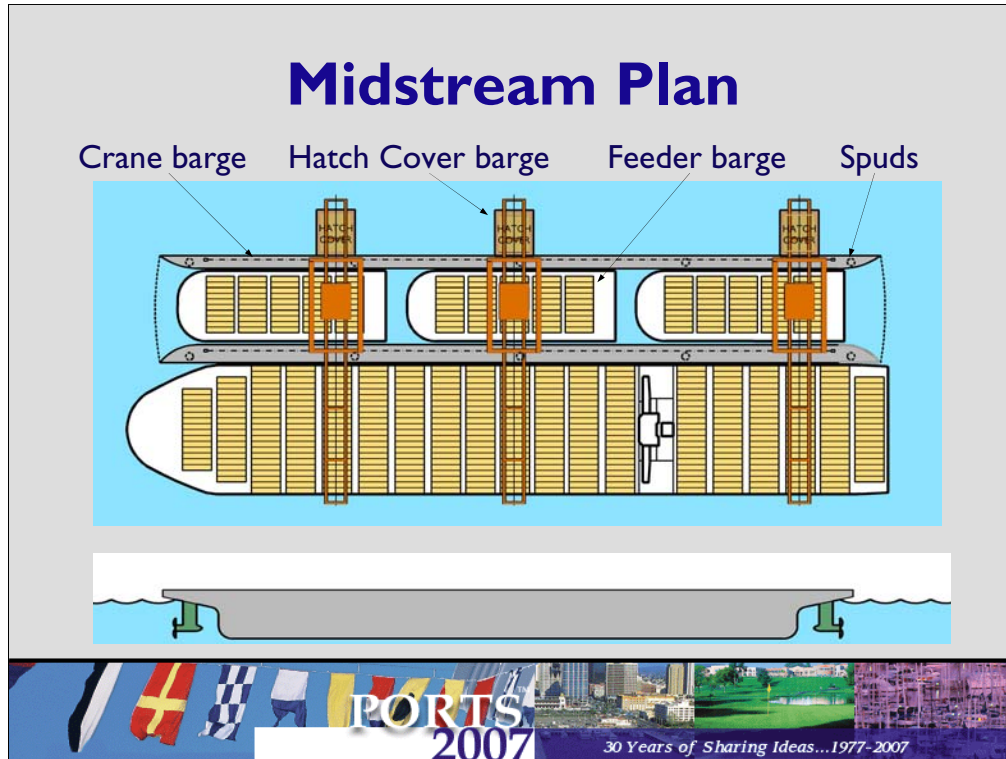
And how supply power to the crane barge

The feeder barge issues are:

The size and capacity of the barge

Maneuvering the feeder barge

Transferring containers at a remote terminal

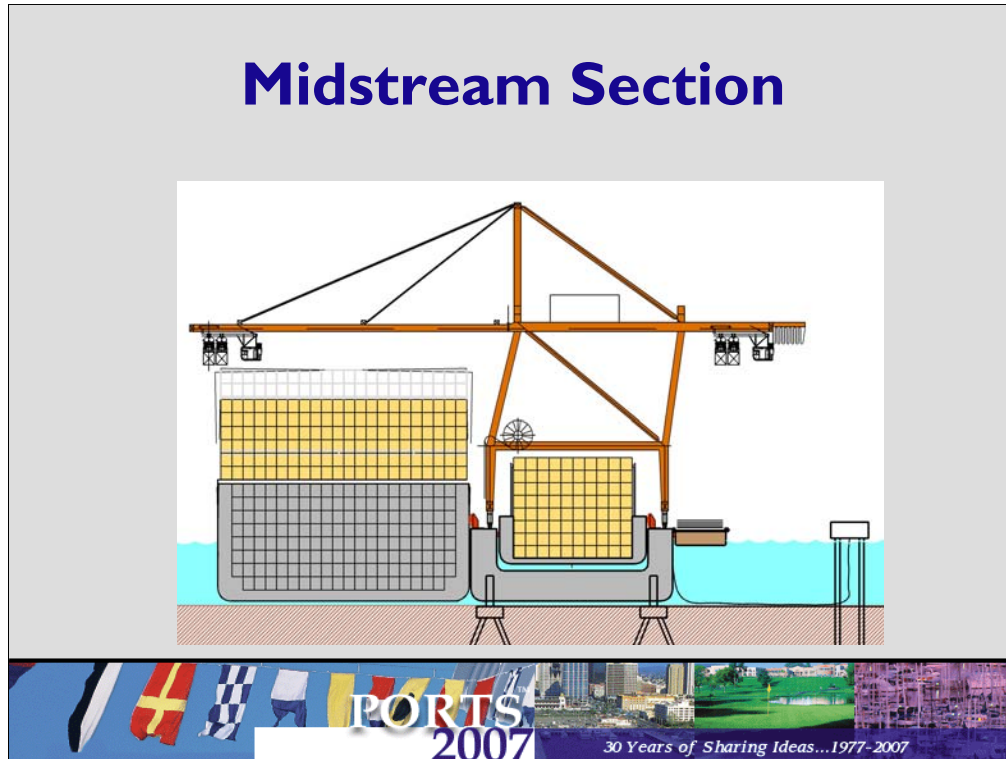


The crane barge components include:

- Three feeder barges within the crane barge at one time; each carries 400 FEUs. Notice the space between the barges to allow movement so the feeder barge cells and the containership cells can match.
- Hatch cover barges (three are shown.) They could be continuous or a cantilevered deck could be added.
- Spuds for holding position and stability. Spuds seat into permanent foundations on the bottom. They hold the crane barge level during operations. The spuds only need to take rolling moments. They carry a very small portion of the total weight. Even without the spuds the roll would be small, about 1 degree.
- The propulsion pods can maneuver the crane barge, or the crane barge could be towed.
- The power is supplied from a nearby dolphin.

Containers are transferred as they are arranged on the containership. No effort is made to sort the containers at the feeder barge.

Floater is transfer station. It simply allows containers to move from one vessel to another.



This slide shows:

- The power dolphin

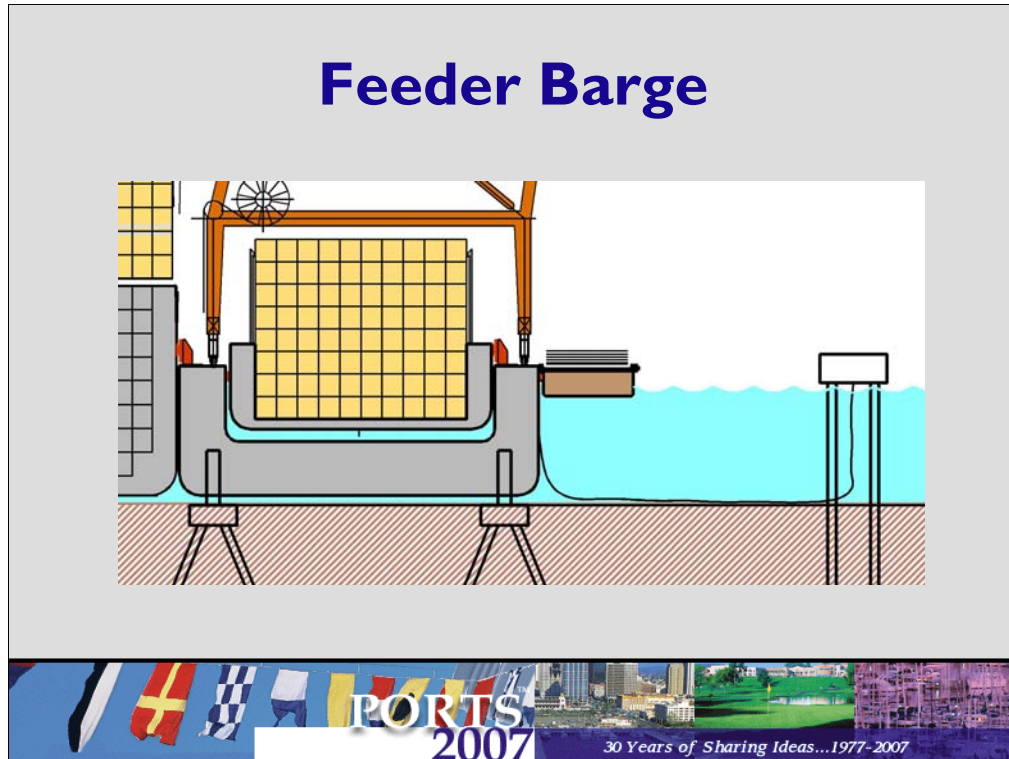
- The hatch cover barge, or a full length cantilevered deck.

- Foundations with sockets to receive spuds

  - The sockets are cleaned by jets from the base of the spuds

  - The spuds are held by cylinders which prevent roll and limit the vertical reaction to a fraction of the floating weight.

The crane barge may be parked at a fixed location and only needs to be moved for maintenance.



Recall the capacity of each feeder barge is 400 FEU. This means that for each barge traveling upstream, 400 fewer trucks are traveling on the road.

Note the full height cell guides

The feeder barges are moved into the crane barge channel by tugs. Once in the channel, pneumatic translating fenders move the barges, the red objects on the barge deck, developed by Cavotec.

IBCs will be handled on platforms on the shipside sill beams. IBCs are not used on the feeder barge.

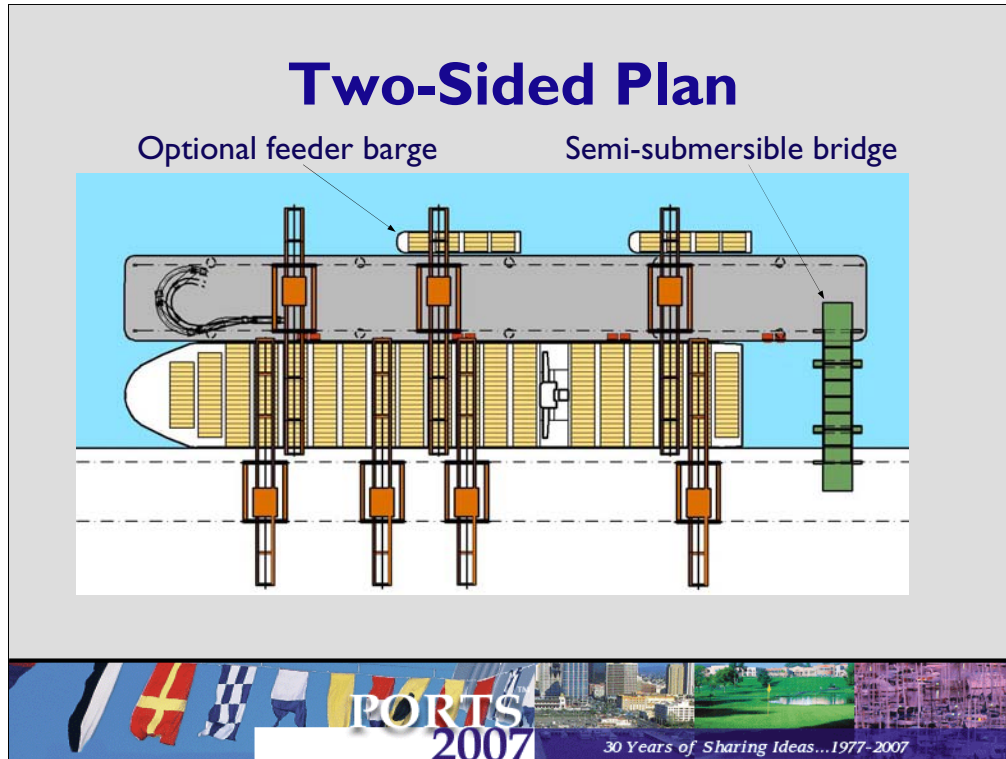
## Two-Sided Operation

Amsterdam  
ship-in-a-slip



Now we'll discuss the secondary application, the two-sided operation. In this operation, a ship berths in a slip with cranes on both sides.

The two-sided concept was originally applied at the Ceres Terminal in Amsterdam by Jordan Woodman Dobson. The Amsterdam terminal was completed in 2002 but has only recently begun full scale operations. For now, the increase in production is not known.



The ship is berthed between a marginal wharf and a movable offshore crane barge.

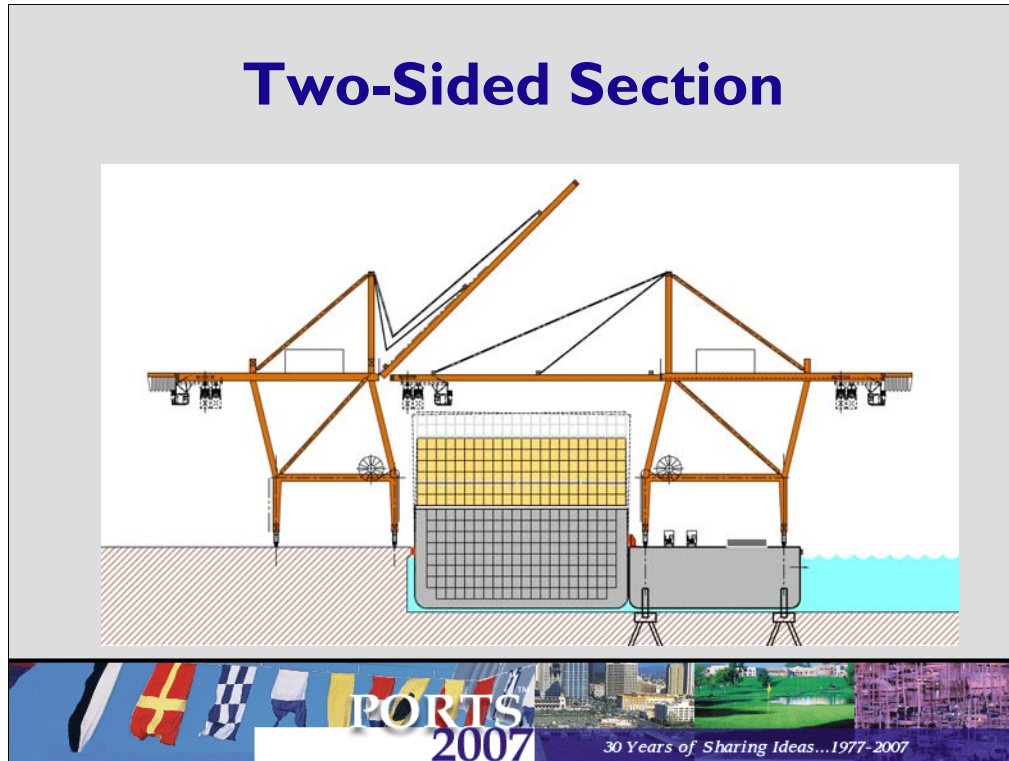
The ships may be berthed the normal way, since the barge can move out of the way under its own power.

The primary advantage of the Floaterm offshore crane barge is the availability of more lanes underneath the cranes, which reduces congestion on the wharf.

The traffic in the terminal itself will increase, however.

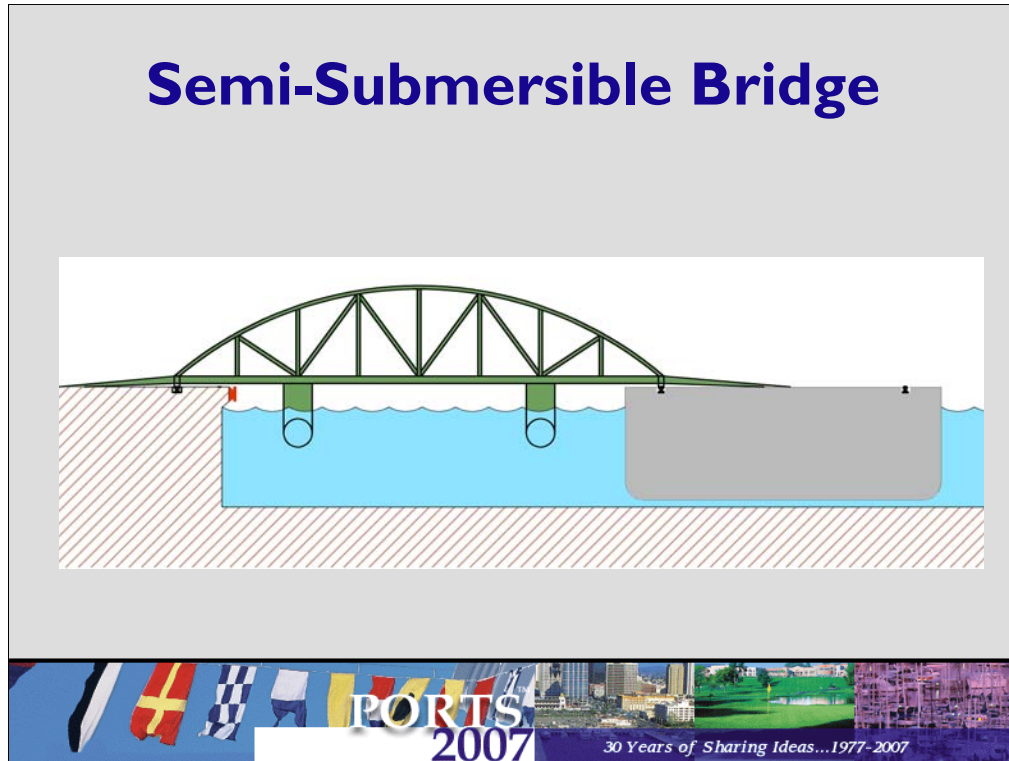
With dual hoist tandem 40 cranes on both the wharf and the barge, production would be expected to more than double that of a conventional terminal system.

Based on reports from Asian ports, seven cranes servicing one ship can produce over 350 moves per hour.



This section is similar to the Amsterdam section except a barge replaces the far-side wharf.

The Floaterm barge is similar to the midstream barge, except, there is no channel, and the barge is connected to the land by a floating bridge.



Pontoons lift the semi-submersible bridge so it can be easily moved to and from the operating position.

Once in place, the pontoons are partially voided, and the bridge rests on the crane rails. One end allows for small differential movement between the wharf and the barge.

This pony truss is light and practical. Some time ago we designed similar RoRo pony truss bridges for Matson.

## Remote Terminal

Feeder barge load/unload

Marginal wharf and shore crane

Slip and overhead gantry

Self-load/unload



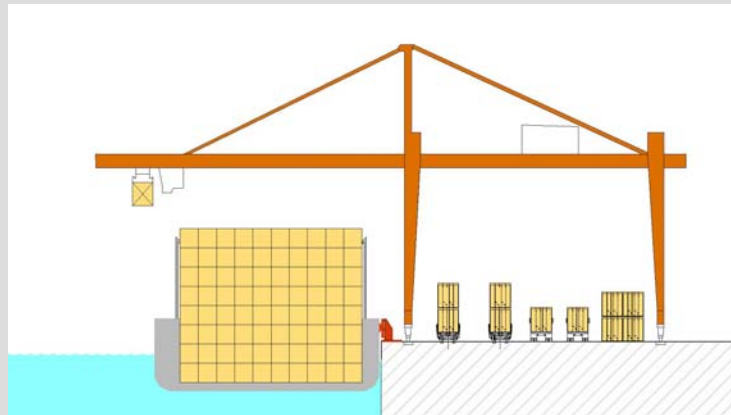
The remote terminal is in the hinterland beyond the congestion at the port.

The feeder barge draft is less than 30 feet. The barges may reach inland terminals not accessible to large container ships.

Containers will be transferred to shore at a marginal wharf, in a slip, or the barge could be self-unloading. A self-unloading barge allows service to inland terminals that do not have cranes.

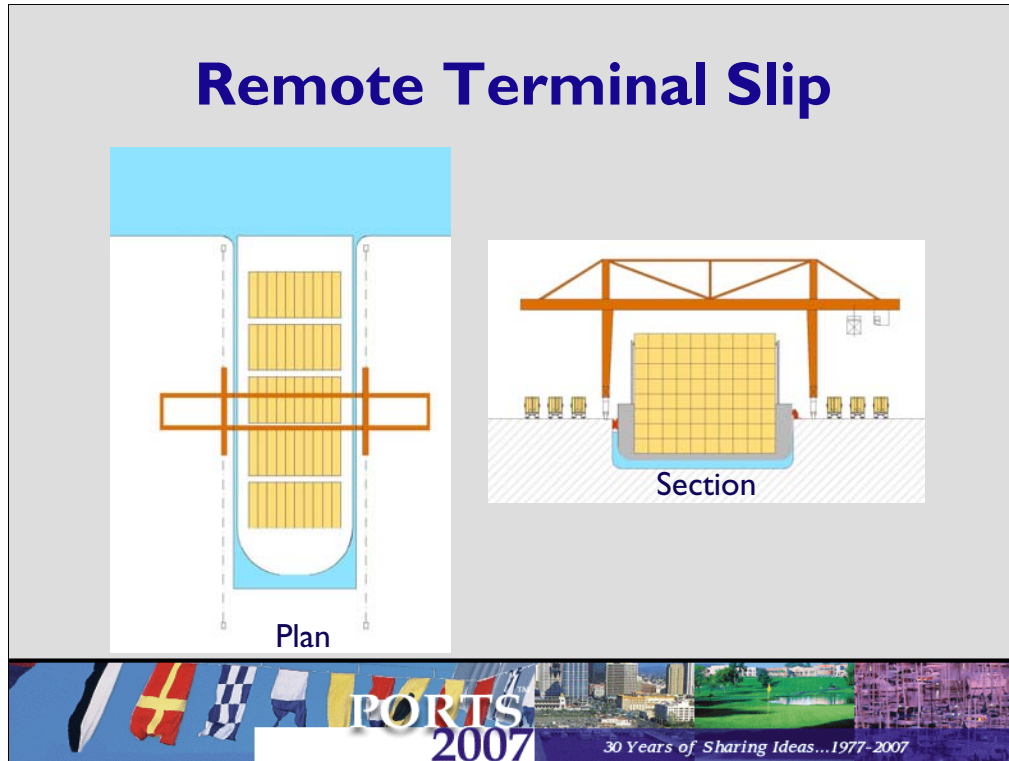
## Remote Terminal Wharf

Gantry crane or mobile harbor crane

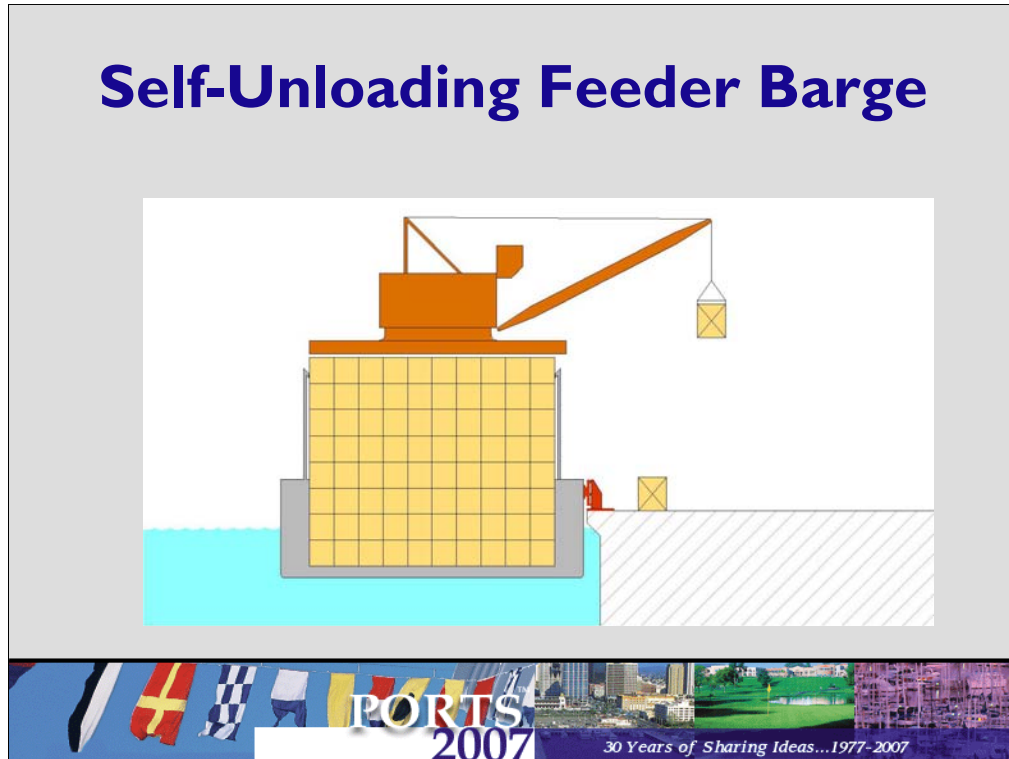


Containers can be loaded directly to rail if properly sorted, or the containers could be set on the inland wharf and the sorted using the gantry crane. A conventional Panamax crane or a harbor crane, such as a Gottwald, could handle containers.

Containers may be loaded to bomb carts, chassis, or rail or stowed on the wharf.



If more production is needed inland, a bridge crane could handle the containers.



Here, a crane is placed on a feeder barge.

At first this may seem unrealistic, but Matson and Liftech designed a self-loading Hawaiian Island barge crane similar to the one shown.

This crane and barge has been successfully operated between islands for over a decade.

## Floaterm

“We need a new approach and we need it now.”

Conventional waterfront terminal operations congest and pollute; we need a new approach.

Once the cost to all stakeholders – shippers, owners, operators, and public at large – are combined, Floaterm will be viable.



The primary application, the midstream application, will reduce congestion and pollution by using waterways instead of highways and railways.

The secondary application, the two-sided application, increases production at the wharf thereby reducing the containership's time at the berth.

Floaterm will be a viable solution, once the cost to all stakeholders – shippers, owners, operators, and public at large – are combined.

## Thank you

**Acknowledgements:**

The concept was originally developed by Liftech in 2000 at the suggestion of the Port of Oakland Executive Director Charles Foster. Simultaneously, Dr. Asaf Ashar of Louisiana State University developed a parallel concept.

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See the paper for references and more information.