

Container Terminal Planning & Operations Current and Coming Trends

AAPA Marine Terminal Management Training Seminar

September 17-21, 2012

Baltimore, Maryland

Thomas Ward, PE/SE

Chief Engineer

Ports America

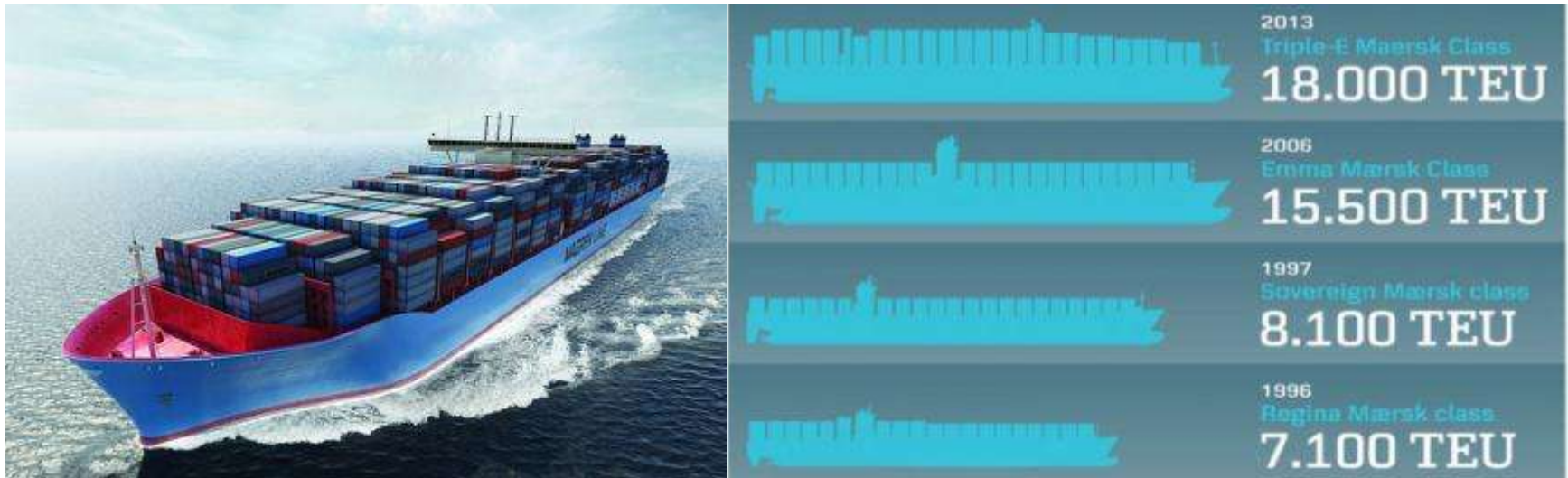


Trends

- Bigger Ships, Again
- Automation
 - Tactical
 - Strategic
- Privatization
Public-Private Partnerships

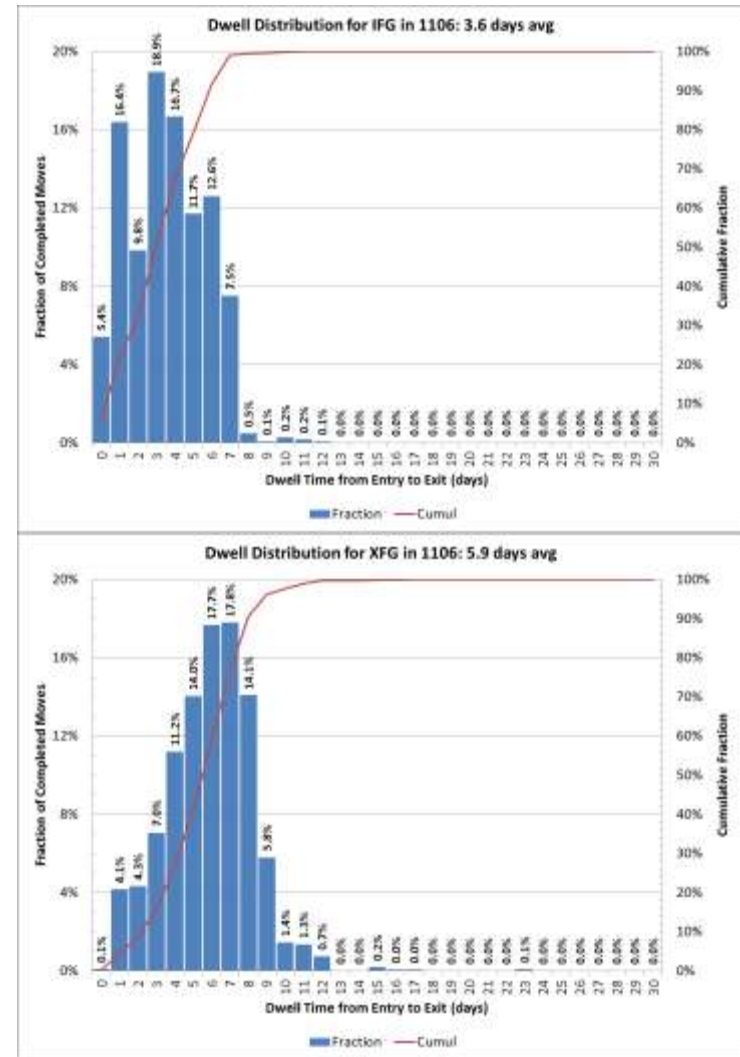
The Big Ship Challenge

- Big Ships. Really Big Ships.
- Again
- The “Maersk Challenge”
- Again
- 6,000 vessel lifts in 24 hours? Sure! No Problem!



6,000 Lifts in 24 Hours: Vessel Flow

- 250 boxes / hour across the apron
- In a “typical” U.S. Import/Export facility:
 - 5,400 import load TEUs with 3.6 days dwell
 - 3,600 export load TEUs with 6.0 days dwell
 - 1,800 export empty TEUs with 5.6 days dwell



6,000 Lifts in 24 Hours: Yard Space

- Peak storage demand, for one call/week:
 - 5,200 import load TEUs
 - 4,500 export load TEUs
 - 2,200 export empty TEUs
 - 1,000 depot empty TEUs
- 37 acres / 15 hectares **net** CY at maximum credible density
- 47 acres / 19 hectares gross terminal area
- For just one ship/week

6,000 Lifts in 24 Hours: Yard Flow

- Waterside on the day of the call:
 - 3,000 import loads discharged
 - 2,000 export loads loaded
 - 1,000 export empties loaded
- Landside (for two successive calls):
 - 900 import loads delivered
 - 700 export loads received
 - 600 empties received
- Yard Volume: 8,200 lifts in 24 hours:
 - 340 lifts/hour with uniform 24-hour gate operation
 - 560 lifts/hour with SoCal 16-hour gate operation

6,000 Lifts in 24 Hours: Machines

- Import RTGs:
 - 20 lifts/hour vsl, 10 net lifts/hr gate
 - 22 machines
- Export Top-picks:
 - 20 lifts/hour gate or vessel
 - 18 machines
- About one machine every 300 ft (100 m) of storage row, about seven 40' bays apart
- About 400 circulating waterside and landside vehicles at any one time

But then, there are...

- ...more than one ship per week
- ...variable ship schedules
- ...unreliable export bookings
- ...10% to 12% loaded reefers
- ...“hot” intermodal rail traffic
- ...“hot” key-customer traffic
- ...special security scans (VACIS, etc.)
- ...customs holds, productivity variations, weather, and other random factors
- All making the situation much tougher

Impact of Call Duration on Peak Storage

Type	Duration	VF	Storage	Impact
Import	1 days	0.96	5,180	
<i>5,400 TEUs</i>	2 days	0.87	4,700	91%
	3 days	0.81	4,370	84%
Export	1 days	1.24	4,460	
<i>3,600 TEUs</i>	2 days	1.15	4,140	93%
	3 days	1.08	3,890	87%
Fulls	1 days		9,640	
<i>9,000 TEUs</i>	2 days		8,840	92%
	3 days		8,260	86%

- Stretching duration:
 - To two days saves 8%
 - To three days saves 14%

Impact of Call Two-Call Interval on Storage

Type	Interval	VF	Storage	Impact
Import <i>5,400 TEUs</i>	1 days	1.74	9,400	120%
	2 days	1.64	8,860	113%
	3 days	1.45	7,830	
Export <i>3,600 TEUs</i>	1 days	2.30	8,280	109%
	2 days	2.19	7,880	104%
	3 days	2.11	7,600	
Fulls <i>9,000 TEUs</i>	1 days		17,680	115%
	2 days		16,740	108%
	3 days		15,430	

- Decreasing vessel interval from three days:
 - To two days increases demand 8%
 - To one day increases demand 15%

Thruput, Density, Velocity, and Safety

- 6000 lifts/day = 560 lifts/hour = 15 lifts/hour/acre
- “Keep it simple, stupid” (KISS), is no longer viable
- Every utilization of every storage and production slot will need to be:
 - Planned in advance
 - Dynamically managed
 - Automatically allotted in real time
 - Optimized for productivity
 - Constrained by safety
- Whether the terminal is manned or automated, its management will have to look automated...

Automation

- To date, automation in the U.S. has been “tactical”:
 - Optical character recognition
 - Inventory control
 - Equipment tracking and coordination
 - Equipment assignment
- In Europe, automation has also been “strategic”:
 - Automation of equipment operations
 - Automated rail-mounted stacking cranes
 - Automated guided vehicles
 - Automated strads and shuttles
 - Semi-automated dock and yard gantries

Tactical Automation

- Substantial penetration of USWC
- Potential spread to USEC, depending on ILA pact
- Substantial reduction or elimination of “clerk”-type activities and manning
- Next steps:
 - Installation of “driver assist” technologies on RTGs
 - Emulation to optimize operational strategies
 - Intelligent yard equipment assignment

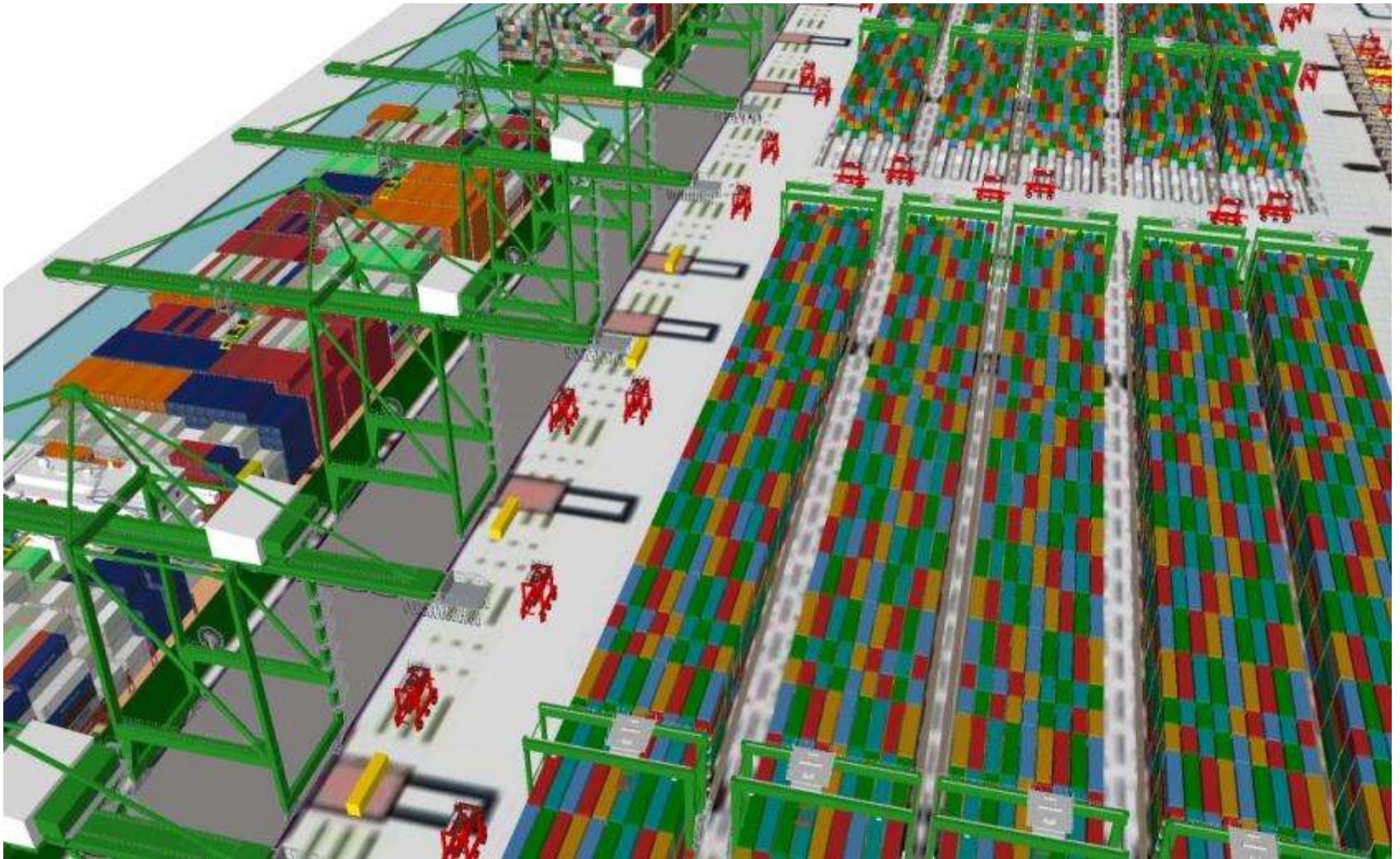
Strategic Automation

- Currently only one terminal with strategic automation in the U.S.: Portsmouth, Virginia
 - Using Automated Stacking Cranes (ASCs) + manned straddle carriers
- Coming soon:
 - TRAPAC, Los Angeles: ASCs + automated shuttles
 - Middle Harbor, Long Beach: ASCs + auto guided vehicles
 - Global Terminals, New York: Jim Devine
- Other Potentials:
 - Pier S, Long Beach: ASCs + automated shuttles
 - Berth 305, Los Angeles: ASCs + AGVs
 - Deltaport 2, Vancouver, BC

Pier S Plan



Pier S Plan



Traditional Economics

- Terminal infrastructure is expensive and fixed
- Infrastructure bought by Port and leased to Tenant/Operator
- Infrastructure cost recovery thru lease, wharfage, and dockage
- Equipment is relatively cheap and portable
- Equipment bought and maintained by Tenant/Operator
- Labor is expensive, tactical, variable, and complex
- Labor is hired and managed by Operator

Automated Economics

- Infrastructure still expensive, but now tied to Tenant-specific automation scheme
- Equipment and automation control is much more expensive, and no longer portable
- Regular labor is reduced, and has a very different assignment pattern
- Management labor is increased, requiring more skills, training, and sophistication
- The economic model is very different

Economic Models

- Traditional:
 - Port is doing a “CapEx Recovery” via the lease
 - Operator is doing “OpEx Recovery” through operating contract with the liner, marking up labor costs
- Automated:
 - Port is still doing a CapEx Recovery, but more so
 - Tenant/Operator must also do CapEx Recovery on the automation suite
 - Trying to do CapEx Recovery by marking up the costs of a shrinking labor pool is tough
 - Tenant /Operator must have some sort of MAG from the liner(s) – a very different economic model

Public and Private

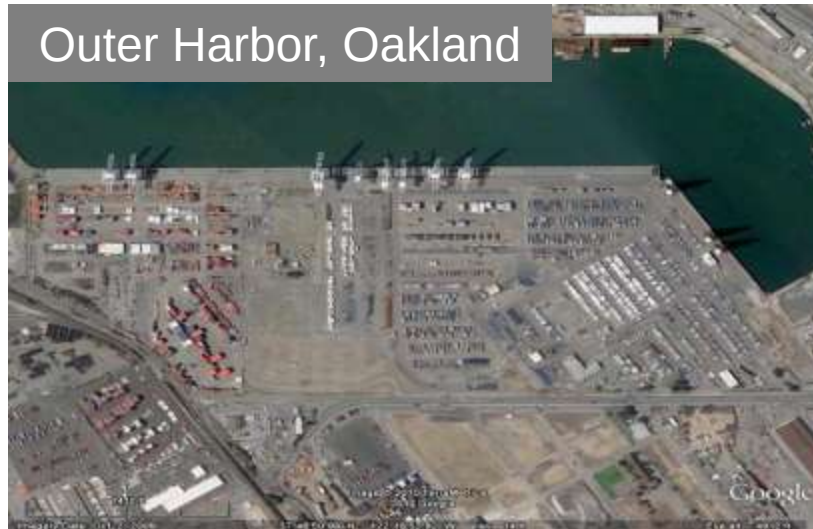
- Rather than a clean division:
Public Port and Private Operator,
Public CapEx and Private OpEx
- We have more of a mixing of public and private investment
- Public-Private Partnerships are becoming more common...

Public Private Partnerships

- Are becoming more common as port authorities encounter more financial limitations
- Result in the terminal operating company getting involved with port facility development
- Result in the terminal manager getting involved with oversight of design and construction
- Result in the need for new skills, expertise, and discipline in the terminal staff

Ports America's current PPPs

- Oakland: 50 years
Densification & Automation
- Newark: 30 years
50 Acre Expansion
- Baltimore: 50 years
4th Berth



Oakland, Outer Harbor PPP

- Focused on creation of “Mega Terminal” for bigger ships, and rehabilitation of Port’s oldest infrastructure
- All infrastructure and rehab to be paid for by Tenant, in exchange for lighter lease terms
- A shift of the Port’s traditional capital role to the Tenant
- The Tenant’s “CapEx Recovery” to be achieved with lower lease operating costs on a very long lease

Ports America Investments in Oakland

- New entry complex, exit complex
- New data center and conduit trunks
- Major pavement reconstruction and re-grading
- Demolition of old marine building, gate building, administration building, storage buildings
- Construction of new automobile parking area
- Installation of new backup power
- Construction of shore power capacity for ships
- Installation of new terminal lighting system
- More to come, including planned automation

New Entry Gate



New Exit Gate



Traffic Optimization



Seagirt, Baltimore PPP

- Focused on “New Panamax” capability by 2014 to coincide with Panama Canal widening
 - New Berth IV with 50 foot dredge depth
 - New Super Post-Panamax cranes
- To be purchased by the Tenant, in exchange for lighter lease terms
- A shift of the Port’s traditional capital role to the Tenant
- The Tenant’s “CapEx Recovery” to be achieved with lower lease operating costs on a very long lease

Ports America Investments in Baltimore

- New 1200' deep-water berth and mooring dolphin
- Rehabilitation of the terminal containment dike
- Installation of new drainage control structures
- Dredging of the berth area to 50 foot depth
- Purchase and installation of four new dock gantry cranes
- Construction of a satellite chassis operating yard
- Augmentation of the terminal power grid
- More to come, including new buildings

New Wharf



Four New Cranes



PPP Benefits

- Development is accelerated, and made cheaper, by Tenant's profit motive
- Development is better tuned to the Tenant's specific needs
- Development is less politicized
- Development and operating costs can be better balanced
- Development can better reflect Tenant's investment in new operating technologies

PPP Challenges

- Tenant inherits “archaeology”
- Tenant’s staff may not be as adept at the ins and outs of development
- Port retains authority in permitting, but not responsibility for costs incurred
- Continued influence of Port’s “social engineering” efforts
- Perceived inequities between different Tenants
- Development more site-local than regional-strategic

To Conclude...

- Pressure for augmented capabilities and capacities continues
- New technologies will require reconsideration of traditional roles and funding methods
- Funding is tight
- Creativity in funding and development is needed
- The role of the terminal manager is expanding from operations to development
- Privatization is causing many paradigm shifts
- Flexibility is needed on all fronts