

Best Practices in Supply Chain Optimization

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Mark Sisson, PE
AECOM

Supply Chain Optimization Issues

Terminal location

Terminal size

Hinterland connections

Terminal operating mode

What defines “ideal” behavior

Terminal Location

West Coast is still closer to Asia

More options than ever for North America with expanded Panama Canal, but biggest container ships today cannot fit

US Port utilization is low by global standards (i.e. most existing ports are nowhere near capacity)

Oakland and Seattle have empty terminals

Container lines have abandoned Portland, OR

Ports and terminals cost a lot of money to develop, so must be confident of long term customer commitments before investing

Terminal Size

Big ships like big terminals

Less physical constraints

Better able to handle surges of cargo

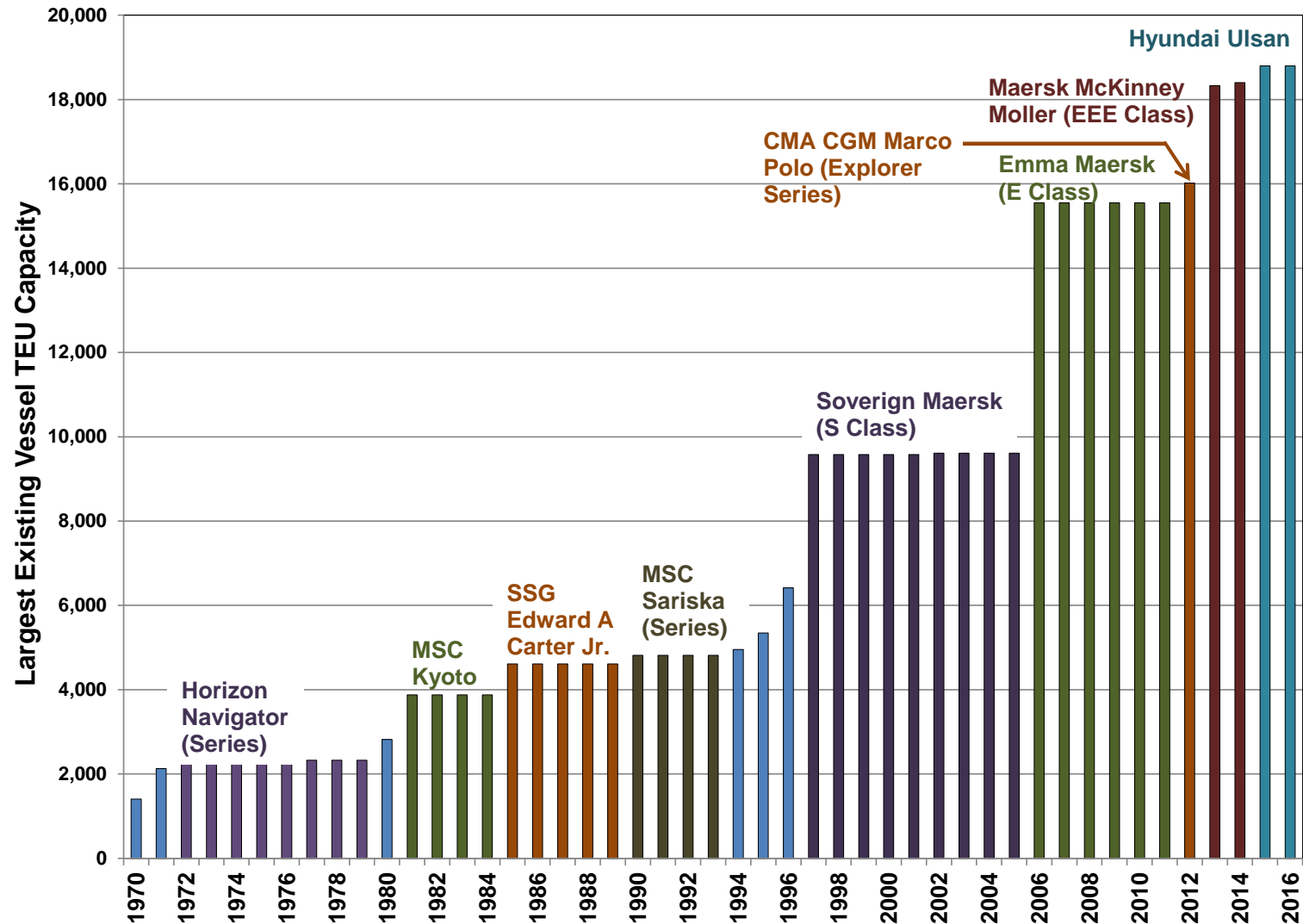
Economies of scale for equipment

Easier to manage chassis

Consolidation of shipping lines and terminals is ongoing.
Oakland has gone from 6+ terminals to 3 recently

The whole Port of Savannah is one terminal!

Largest Container Vessel Size over Time



Busiest Dozen North American Container Terminals

from AAPA website

| 2016 Rank | Port | Country | 2016 |
|-----------|-------------------------|---------------|-----------|
| 1 | Los Angeles | United States | 8,856,783 |
| 2 | Long Beach | United States | 6,775,170 |
| 3 | New York/New Jersey | United States | 6,251,953 |
| 4 | Savannah | United States | 3,644,521 |
| 5 | Seattle/Tacoma Alliance | United States | 3,615,752 |
| 6 | Vancouver (BC) | Canada | 2,929,585 |
| 7 | Hampton Roads | United States | 2,655,707 |
| 8 | Manzanillo | Mexico | 2,580,660 |
| 9 | Oakland | United States | 2,369,641 |
| 10 | Houston | United States | 2,182,720 |
| 11 | Charleston | United States | 1,996,276 |
| 12 | Montreal | Canada | 1,447,566 |

Hinterland Connections

Cost per ton-mile is much cheaper via ship than trucks, so proximity to end market on water is key.

Big local population = big port (NY and LA)

Distribution centers matter (Savannah)

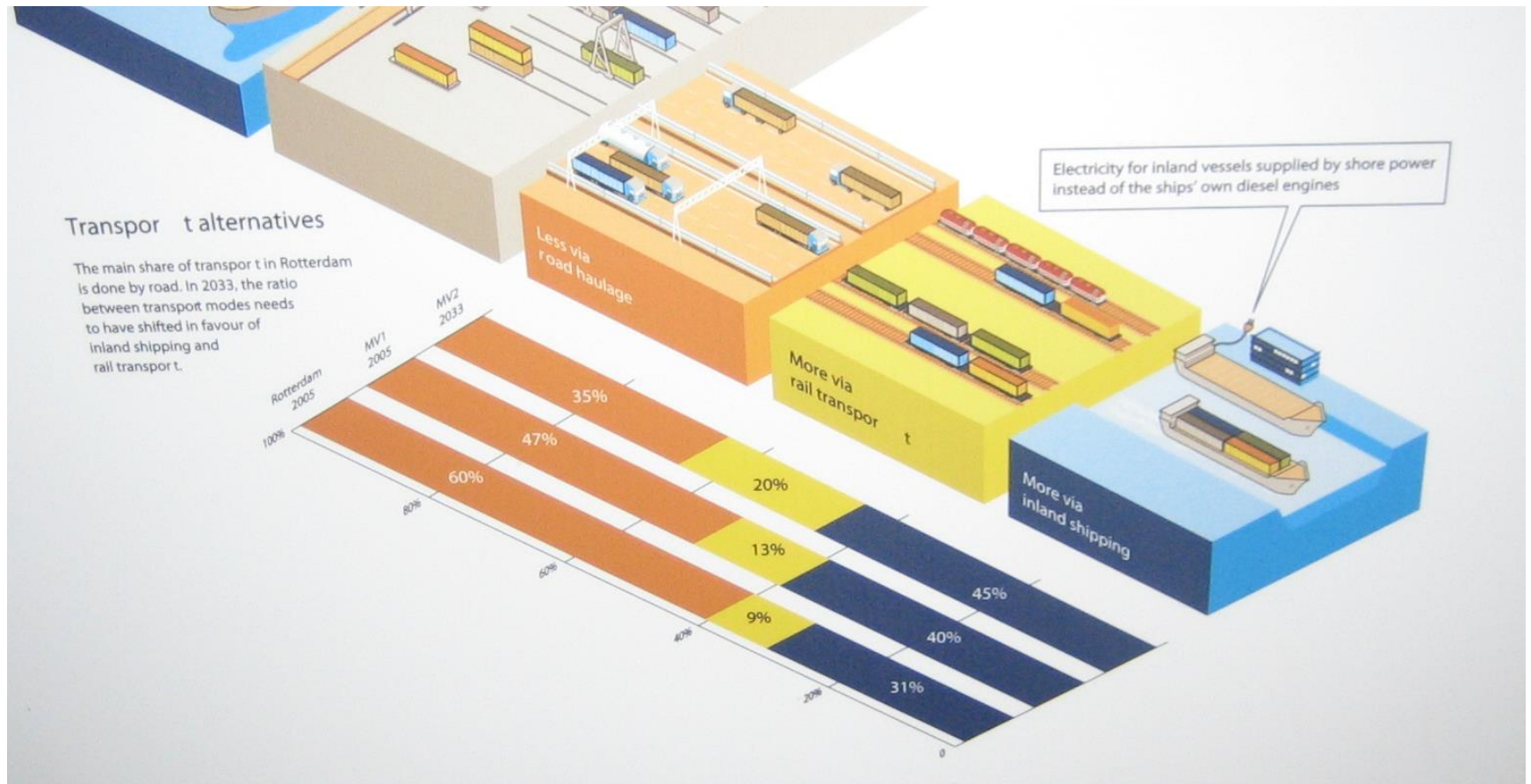
Rail gives many options for interior connections, but big ships prefer to go where big populations live

Rail and barge are preferable to truck

Emissions

Infrastructure cost

Port of Rotterdam Mode Shift Graphic



Marine Terminal Operations Today

Nearly 24/7 operations for ship or rail work

Gates 40-80hr/week (i.e. closed up to 75% of the time!)

Appointments are the exception, and terminals don't use appointment data for much

Information transfer at terminal gates is highly automated (OCR, RFID etc.)

Union resistance to customer pre-booking transactions (this is viewed as clerk's work)

Only a handful of robotic terminals in North America – but these are increasingly popular globally

TraPac's Robotic Terminal in Los Angeles



Random Access vs Homogeneous Blocks aka “Peel off”

Overhead gantry cranes (typically RTGs) used for random access

Very expensive with 4 staff per machine

Low productivity <10 net moves/hr

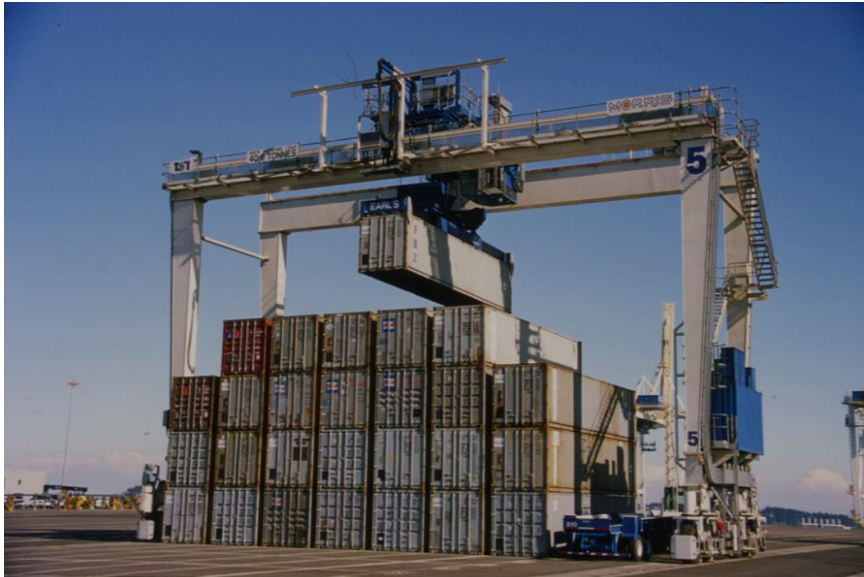
Top-picks used for homogeneous piles (exports and big block imports)

Much cheaper to buy and staff

Productivity approaching 20/hr or more

Some operators using supplemental wheeled yards off-site to facilitate peel-off operations

RTG vs Top Pick Operations



RTG



Top Pick

Top Picks Can achieve Much Higher CY Density than RTGs



Ideal Behavior Depends on Your Perspective

Ideal BCO/Trucker Behavior from Terminal Operator Perspective

Pre-advisement

Arrives during “off-peak” terminal demand

Picks up import cargo soon after arrival

Imports cargo in big homogeneous blocks that can be delivered at operator’s convenience (Top Picks, not RTGs)

Has own chassis in good order (this is the global standard, but not in the US)

Ideal Terminal Operator Behavior from BCO/Trucker Perspective

Open 24/7 and allows for pickup anytime without restriction or pre-advisement

Proactively advises when cargo will be available

Proactively advises of any cargo holds or other problems

Sufficient equipment and staff on duty to give quick turn times regardless of truck arrival

Has adequate supply of good order chassis on site

Facilitates two moves per truck visit (minimal deadheading)

Has on-terminal rail

Ideal Freight Terminal/Port Behavior from Neighbor Community's Perspective

Minimal truck traffic (rail or barge preferred)

Low emissions

Low noise (especially at night)

Low light pollution

Grade separated road/rail interfaces

Waterfront recreation opportunities

POLA's Wilmington Waterfront Park



Middle Harbor Shoreline Park, Oakland



Several Companies now Make Electric Terminal Tractors

Meet The Orange EV Electric Terminal Truck

2 years ago by Mark Kane 10



Teamwork and Compromise Required for Continuous Supply Chain Improvement

As much info provided as early as possible

Use of technology to provide better info automatically (DrayQ app example)

Clever terminal software to make use of info (pre-sorting, logical appointment limits, etc.)

Movement toward 24/7 operations to maximize asset utilization

Well managed chassis pools, and information about availability

Motivated terminal labor and/or robotic operations

Adequate physical infrastructure

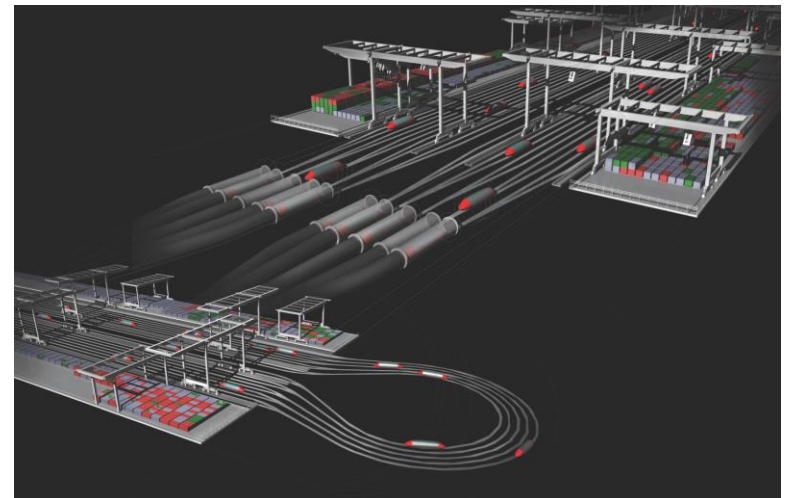
Some Disruptive Technologies to Watch

Electric or fuel cell long haul trucks

Automated cars & trucks operating on public roadways

Automated ships (could make transshipment to smaller ports much more appealing)

Hyperloop (very fast and reliable freight movement separated from road traffic)



Thank You

Mark.sisson@aecom.com

510-874-1798