

Terminal Automation

Lifting the Industry to the Next Level



moffatt & nichol

Creative People, Practical Solutions.®

Bart Vermeer
Sr. Manager Terminal Automation

moffattnichol.com

MOFFATT & NICHOL AT-A-GLANCE

INTERNATIONAL COMPANY

Headquartered in Long Beach

1945

FOUNDED IN
SOUTHERN
CALIFORNIA

29

OFFICES
WORLDWIDE

SERVES BOTH PUBLIC
& PRIVATE SECTORS

600+

EMPLOYEES

450

IN MARITIME &
PORT-RELATED
WORK

8,000+

PROJECTS

85%

ARE MARITIME/
PORT WORK

90%

REPEAT
BUSINESS

MARINE & PORT FACILITIES

RANKED NO. 2

ENR TOP 500

Container Logistics

The customer



CMA CGM to deploy six 18,000-TEU ships from Asia to West Coast

CMA CGM plans to upgrade a trans-Pacific service to the West Coast by deploying six ships with capacities of 18,000 twenty-foot-equivalent units, starting late May, a bet that container terminals can handle the largest mega-ships to call the U.S. and that volume will steadily grow.



The customer



“Since 2007 the ship size in the Asia-Europe trade has effectively doubled. We used to have 6,500TEU being the workhorse, now it’s the 13,000TEU and larger ships which are the workhorses. Our point is simply that port productivity has not doubled since then. While there has been improvement in productivity, we are spending more time in port because of bigger ships.”

Søren Skou, CEO, Maersk Line

State of containerization



**Rising cost
infrastructure
development**

Bigger ships

**Growing
container
volume**

**Volatility of
fuel prices**

Globalization

**Larger call
sizes**

**Alliances and
service
consolidations**

**More focus on
safety**

**Pressure for
higher vessel
productivity**

**Increased
levels of
security**

**Environment,
emissions
(CO2)**

**Volatility in
investment
climate**

Bigger vessels, what is the limit?

Possibly this is about maximum achievable berth productivities...

And not about the technical vessel design challenging or nautical restrictions

Ultra Large Container Vessels are not the largest ships ever built.

Ultra Large Crude Carriers built in the 1970s were larger...

All those were scrapped years ago, some after less than a decade of service.



Terminal Design

Lift the industry to the next level

To address

- The voice of the Customer
 - Berth productivity of 250 moves/hr.
- Safety
 - Reduce LTIF by separating man and machine.
- Sustainability
 - Meet requirements to win concessions.
Electrification and densed operation.

Automated terminals designs can address those items very well,

But how to turn design into reality?



Integration by design

Process

- Design is based on an **optimized** process.
- Each main process is described and it drives the design.

Blocks

- Breakdown to manageable entities – “building blocks”
- Defining functionality of each block.

Elements

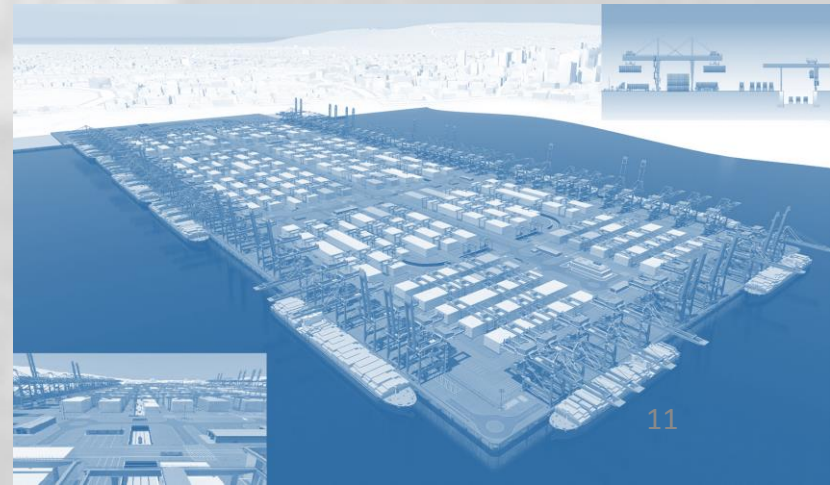
- Define and specify the elements and interfaces.
- Who communicate to who about what data.

Integration

- The logical result of building up the elements into process building blocks and by putting these together into a working process.

Design of automated terminal

- If you don't design for high productivity you will not reach high productivity.
- **How much innovation are you willing to take in the project.**
 - **Proven technology vs innovation**
 - **Track record of the vendor**
 - **Track record with integration between vendors**
- Phase promising innovations.



The integration puzzle





Automated Yard



CTA, Hamburg – Mother Child Concept



Euromax, Rotterdam – Two Per Block

Flavors



AWG, Antwerp – Auto Truck Handling



RWG, Rotterdam – Side & End loading

Automated Horizontal Transport



- AGV –
 - Coupled operation
- L-AGV –
 - Semi-Coupled operation
- Automated Shuttle Carries
 - uncoupled operations

Conventional AGV (Toyota)



Autoshuttle by Kalmar

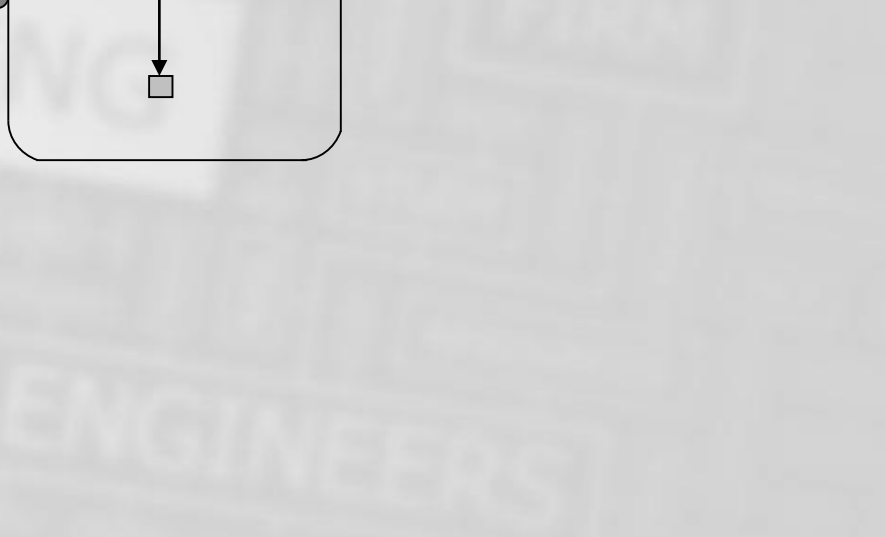
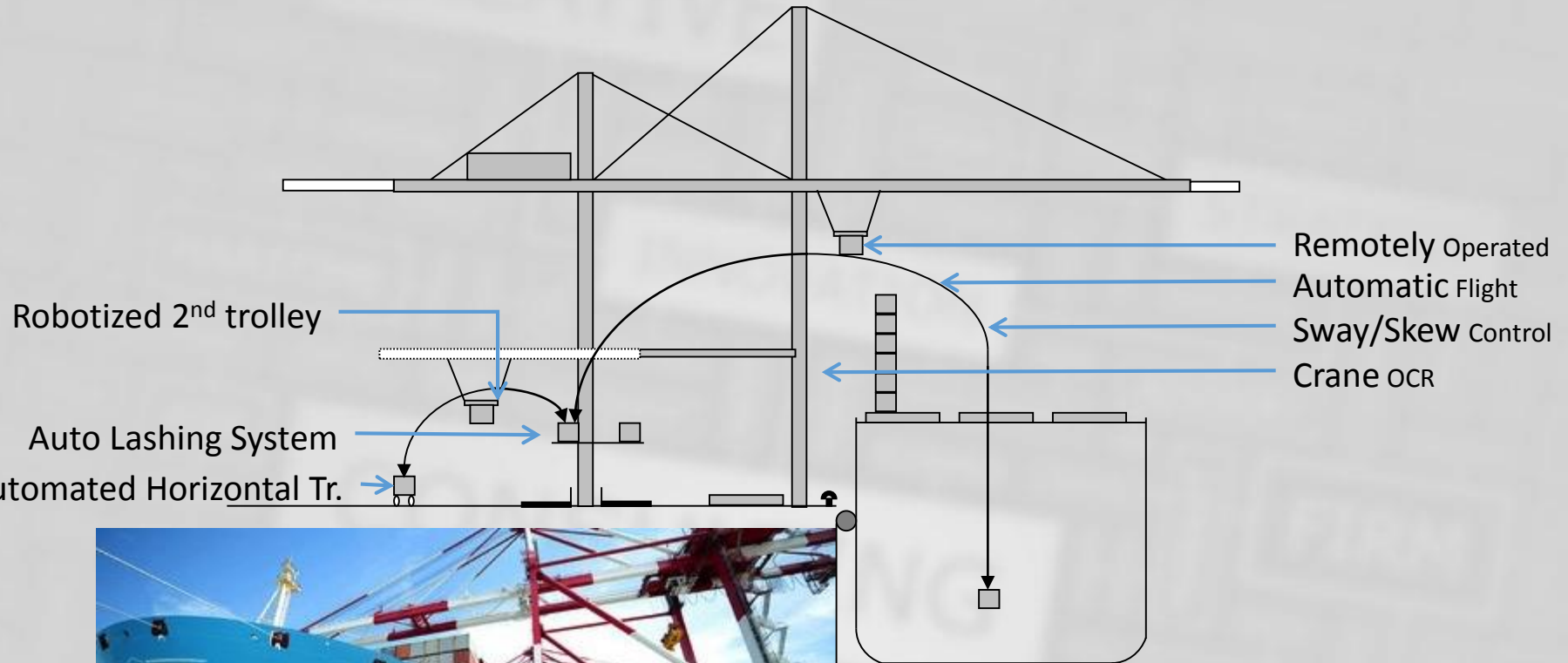


Full Electric Lift AGV (GPT)





Automated Vessel Handling





Automated Gate

- **The most mature automated process at terminals today**
- **Bring it to the next level**
 - No people in the gate, increasing safety
 - Guide truckers over the terminal using their smart phones
 - Integration with Truck Appointment system
 - Integration with Auto Truck Handling (ATH)





Automated Rail Handling

- Automated rail cranes are out there
- Technically very similar to ARMG in the yard

Challenge:

- How to avoid RGC running over people working between the rail tracks

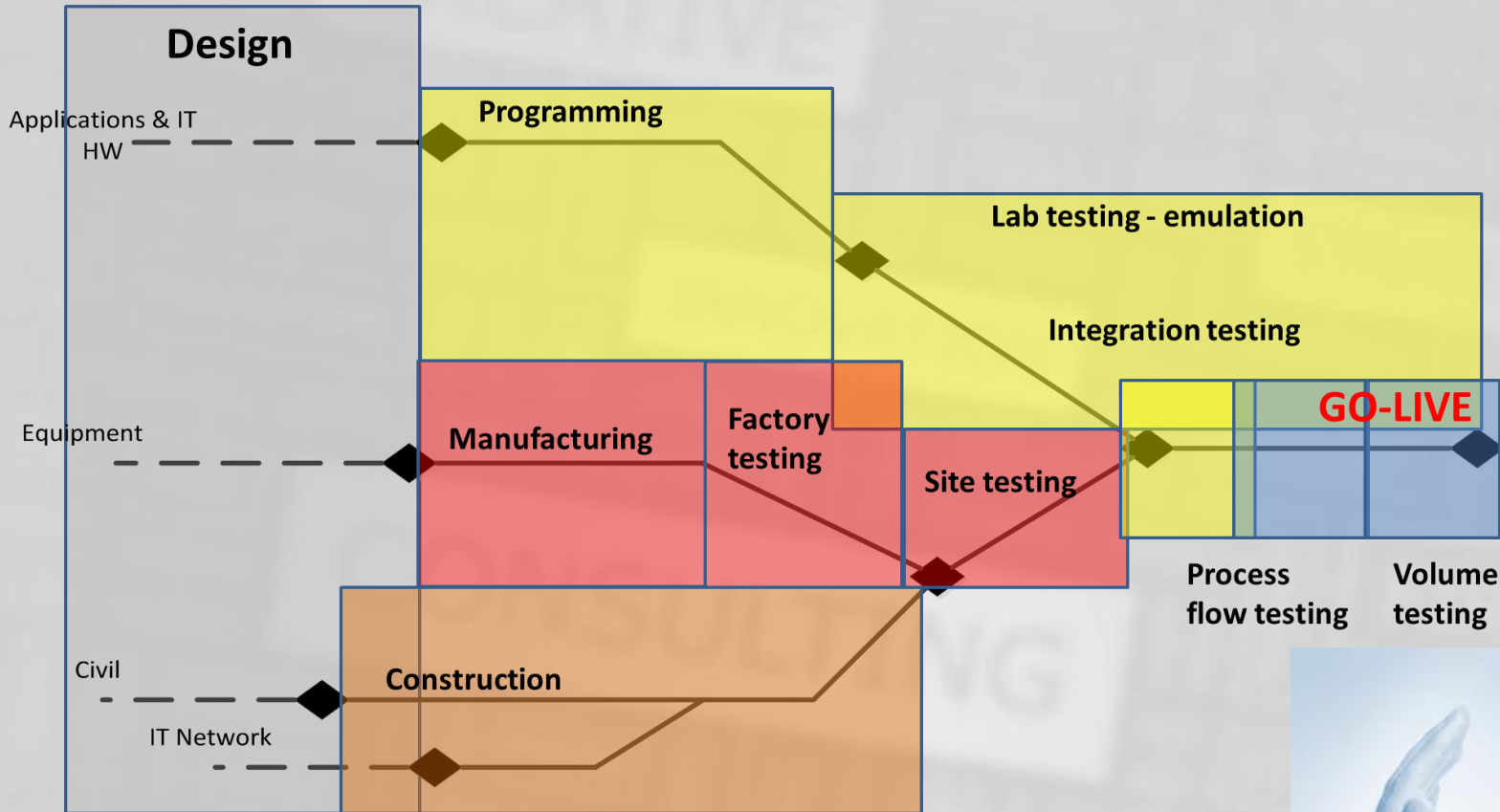
Automated RGC at APMT MVII, Rotterdam



Automated RGC at Warsteiner, Germany



Simulation and Emulation



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THANK YOU!

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