Automation status, challenges and lessons learned

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Presentation Overview

- ‘Why’ Terminal Automation?
- Next Generation Automated Terminals
- Areas of focus with Automation
- Automation lessons learned
Conclusions

- Automation is here to persist
- Automation is challenging and complex
- Automation needs a different Approach
- Automation needs a Holistic and Engineering Methodology
- TOS Role for Automation is critical
- Optimization, Automation Interface, 3rd Party Integration and UI are driver factors
Automation ‘Promised Land’

- Equipment, Systems and People performing as a whole
- Predictable operations and well-organized Terminals
- Logic behind Systems addressing efficiency and flexibility
- Safe and sustainable operations, people out of the yard
- Simple user interfaces allowing proactive behaviors, and performance oriented mindsets

…and this is not anymore just simulation, a reality!!

(Source: https://www.kiviniria.net/CM/images/portrait/kn_act_4619_36764071.png)
Why Terminal Automation?
Why Terminal Automation?

- Financial
- Operations:
  - OPS performance
  - OPS capacity
  - OPS control
  - OPS consistency
- Environment
- Safety

Container Terminal as a Factory
Automation will reduce overall longshore jobs at the facility by 40 to 50 percent. The use of auto‐strads will reduce the number of workers needed per crane by 53 percent. Automating the container backland reduces the number of workers per transtainer by 85 percent.

Source: Internal research on Labor cost, June 2010

Automation is being demanded in China because container terminals don’t find qualified stevedores to work at terminals.
OPS capacity

To utilize Triple E to its potential, a minimum of 6–8 cranes should be made available.

To achieve an acceptable port stay, cranes will need to reach mid to upper 30 moves per hour.

MAERSK Line, Delivering expectations – Tackling challenges together, IAPH conference April 2014

Source: Maersk presentation IAPH, April 2014
The industry is stuck in a range and can’t break out. The industry is stuck at 25 to 30 moves per crane, per hour. We haven’t had any breakthrough development that can get that to 40 to 50 moves per hour,”

“There has been little progress in carriers’ and terminals’ ability to get these ships quickly worked and sent back out to sea, resulting in delays to cargo and added costs for carriers.”

MAERSK CEO, JOC Feb 2015

Source: Port Authority Algeciras Bay, January 2015
Larger vessels are maybe the right way to go for the lines, but they are not for the terminals. Lines and terminals have to come to terms, only then can the savings on the liner side be turned into productivity improvements at terminals. Yvo Saanen (TBA) at Port Technology International June 2013

- Higher capital deployed:
  - Vessel utilization focus
  - Overall cost reduction
  - Pressure on Terminals:
    - Min port stay
    - Max berth productivity

- Terminal upgrade
- Berth occupancy release potential
- But operational cost increase

- Capacity increase
- Productivity increase
- Use released berth utilization for additional income

Source: Port Technology International Yvo Saanen, June 2013
OPS control and consistency

Source: Forbes Magazine High-tech Ports, May 2012
Key highlights

Investment on Automation continues
Pressure on financial and performance at terminals is increasing. Requirements for safety and environment are also fundamental.

Automation behind its operational potential
Targets on capacity and productivity will establish new boundaries: and Automation stays as a credible option to achieve those goals.

Focus on operational performance and capacity
We’re aiming for performance numbers well beyond the current. It will take not only evolution, but also revolution, in container port handling technology.
Next Generation Automated Terminals
Vessel and Quay

- STS remote operations
- Better control and automated functions on STS
- Real time and mobile information to Crane Team
- STS multi-lift and dual cycling strategies

“More controlled quayside environments”
Horizontal Transportation

- De-coupled transfer with cranes, reduced fleet
- Electric vehicles and automatic recharging
- Smart pooling logic optimizing AHT fleet
- Congestion management for parking and transfer
- AHT multi-lift and dual cycling strategies

“Reliable, cost-effective and environmentally friendly”
Container Yard

- Container inventory control
- Dynamic and flexible yard planning strategies
- ASC dual cycling strategies
- Automated truck handling
- Reefer monitoring

Yard capacity and equipment availability
Decision Logic and Optimization

Quay

Horizontal Transportation

Yard

OPTIMIZATION
Decision Logic and Optimization

- Decision support for operational decisions
- Dynamic planning & execution strategies
- Inventory control and ‘rich’ operational data
- User ‘engagement’ on automated decisions
- User ‘proactivity’ on operations monitoring

System ‘logic’ addressing flexibility and resiliency
APMT Maasvlakte II

Kim Fejfer, CEO APM Terminals: "APMT Maasvlakte II is clearly a game-changer in the shipping industry."

Frank Tazelaar, MD APM Terminals Maasvlakte II: "We have a clear focus to deliver the perfect terminal, although the ultimate potential will not be realised on day one."
Rotterdam World Gateway
Long Beach Container Terminal

Phase 1:
- 6 Quay Cranes
- 30 AGVs
- 32 ASCs
- 3 RGCs

Anthony Otto, LBCT President, Reuters March 2012
Key highlights

Technology is progressing and will not stop
The progresses from equipment and system perspectives are really promising but Terminal Design & Planning (including integration) is fundamental.

...but optimization and decision support logic
...equipment, systems and people performing as a whole: addressing flexibility and resiliency but systems can’t be black boxes for users.

Next Generation Automated Container Terminals
New terminals coming are one step forward for Terminal Automation industry: Go-lives are important milestones but the journey will continue.
Areas of Focus with Automation
Pushing ‘automation’ boundaries out

- Technical Integration
- Operational Readiness
- TOS-ECS solution
- User engagement
Technical Integration

- Functional design to be well defined upfront, but flexibility for tuning and improvements across the project
- Aiming for standard and generic but still a high grade of customization and configuration for each project
- Modern and agile technologies for iterative development
- Cooperation between customers and providers

Technical integration is complex and impacts equipment, systems and people
Technical Integration

Automation tends to require time, designs are never final, and concepts are not worked out to 100%. Everything must be integral: that requires a different and proactive approach.

William Rengelink (APMT MV II), Lloyd's Automation Seminar Nov 2013
TOS – ECS as ONE solution

- Clear interfaces on what / when / how information needs to be shared and used
- Flexible, open and modular architecture to facilitate design, implementation, testing and tuning phases
- Solution approach and mutual dependency on solution ‘growing’ and tuning to operational readiness

TOS and ECS are the ‘spinal cord’ for automation
TOS-ECS as ONE solution

TOS
- Workflow
- Scheduling
- Dispatch Validation

ECS
- Execution
- Routing Move Control
- Dispatch Process

Events → Orders → Events

PLC Communication

Orders → Events → Orders
Go-Live readiness and testing

- Testing outcome determines Go-Live date
- Fundamental project driver and TOS-ECS integration catalyst
- Realization of operational readiness:
  - Systems usability
  - OPS procedures for regular and exceptional flows
  - OPS strategies configuration driven by productivity

Testing needs to be meaningful to operations to impact go-live readiness
Go-Live readiness and testing

Go-Live readiness and testing is as much a commercial decision as it is an operational decision. "With the benefit of hindsight, we would probably allocate more time to testing, both the automated equipment and all the software integration. This is something software suppliers have been stressing for some time. Going live is a much commercial as an operational decision." - DP World Brisbane, World Cargo News, September 2014

"We have to move from what we think is the best way to work based on the computer simulations to testing what is the best way to work based on the operational data we're collecting and analyzing," - Patrick Brehmer (APMT MV II), PEX Operations Expert, February 2015

Diagram:
- Functional Testing
- Operability Testing
- Exception Handling
- User Qualification
- System Resiliency

Image: A person working on a laptop with a diagram in the background.
User engagement

- Performance driven culture must involve processes, tools and workflow between users
- Systems user interfaces must facilitate user proactive behaviors through a ‘deviation monitoring’ focus
- Qualified users and performance driven organizations at control centers will maximize Automation benefits
- Stevedores union must be integral part of Automation planning

Automation is challenging for operational mindsets
User engagement

"The more a Terminal is automated, the more reliant it will be on the human brain."
Robin Audenart, Ports and Harbours, December 2011

"People management and sourcing in automated terminals can be a 'very underestimated task'. Typically people have difficulty in adopting processes to work in an automated system. It's something you cannot underestimate when you switch to automated processes: to get the most out of an automated system, a terminal may need to bring in new people."
Yvo Saanen, Port Strategy, July 2013
Operational mindsets ‘evolution’

When we heard about the new terminal three years ago, and that the cranes would be operated with joysticks and screens from the office, none of us believed it. We thought ‘No way,’ because you won’t feel or hear the crane and the boxes. But we’re doing it, and for the most part, it’s better. It is a cultural but exciting shift.

STS operator and instructor, APMT MVII
Feb 2015
Key highlights

**Technical Integration**
Integration is our fundamental constraint so far: must be driven as a core function addressing cross-functional collaboration.

**Testing is determining go-live readiness**
Testing needs to be meaningful to impact integration and operational readiness effectively.

**Focus and perseverance**
Equipment, system and people must be manage as a whole: there are critical dependencies to make project progress firmly forward.
Lessons learned

Peter Miedema – VP Professional Services EMEA
Lessons learned: high level areas

Terminal Automation Implementation Project

- EQUIPMENT
- SYSTEMS
- PEOPLE

Project Approach
10 Lessons learned

1. Apply ALL Project Management related best practices
2. Realize that the devil is in the detail
3. Take Integration management very seriously
4. Understand that successful automation comes from great team work
5. Ensure that Operations understand systems better then ever before
6. Invest heavily in testing and training
7. Respect Murphy’s Law : Exceptions and problems will happen!
8. Implement a world class IT Infrastructure and professional IT processes
9. Manage the expectations : Crawl, Walk and than Run
10. Expect some “Blood, Sweat and Tears” during your automation journey
Key Navis learnings

1. Reliable planning and high quality execution of large software development projects for automated terminals is critical

2. The Navis QA department will constantly have to add use cases for new automated sites to increase test quality

3. Product training must be developed parallel to the new software development and new methods of training must be applied

4. These type of automation projects do require more on-site staff to complete the product

5. The ideas and initiatives from and the partnerships with our customers are crucial for automation project success
Thanks to the team making this happen
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