
KALMAR

The art of automation

Identifying & managing the critical items

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PORT&TERMINAL Technology

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Simulation

Environment

IT & Infrastructure

Optimization

Architectures

Safety

Business case

Terminal design

Operational concepts

Technologies

Cost savings

Project management

Automated equipment

Productivity

Labour

Risks

Emission

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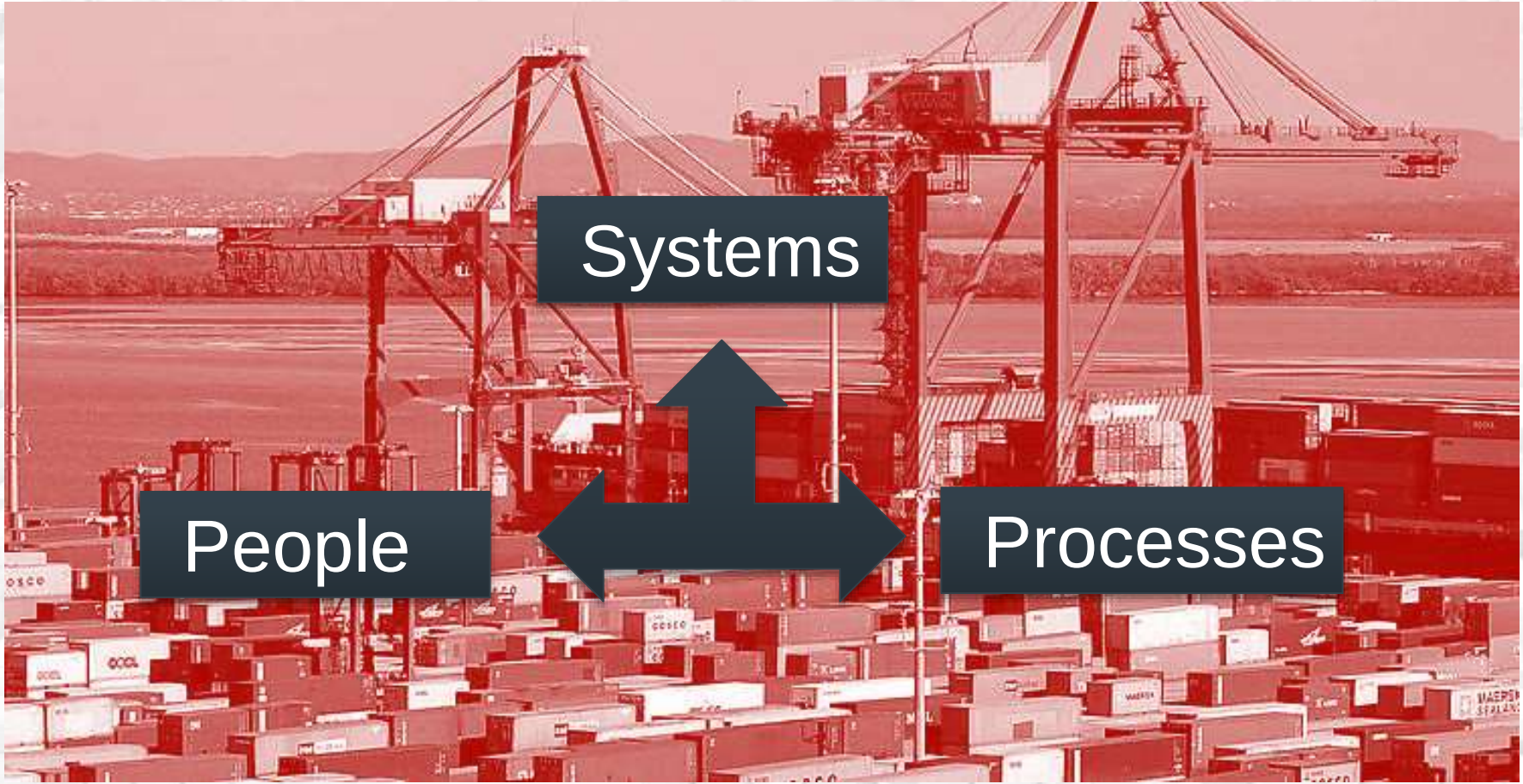
Contents



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People & Automation – What does it mean?

- Fever people involved
- Less people checking
- Automated cranes and vehicles do not complain
- Depending more on fewer people
- More difficult to trace the reason for lower performance

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Focus on change & human resource management

- Most employees will become ‘computer workers’
- Workforce needs different competences
- Create a matrix of competences needed
- Perform a competence gap analysis
- Create a extensive training program
- Start the change management program early
- Cultural change: “it is ok not to know and to ask”.

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Processes - consideration during project preparation

- Automation is now widely accepted as the way to high productivity, efficiency and competitiveness in today's container terminals.
- However, it is still often seen as a challenging proposition requiring terminal operators to integrate multiple complex systems from various equipment and software providers.

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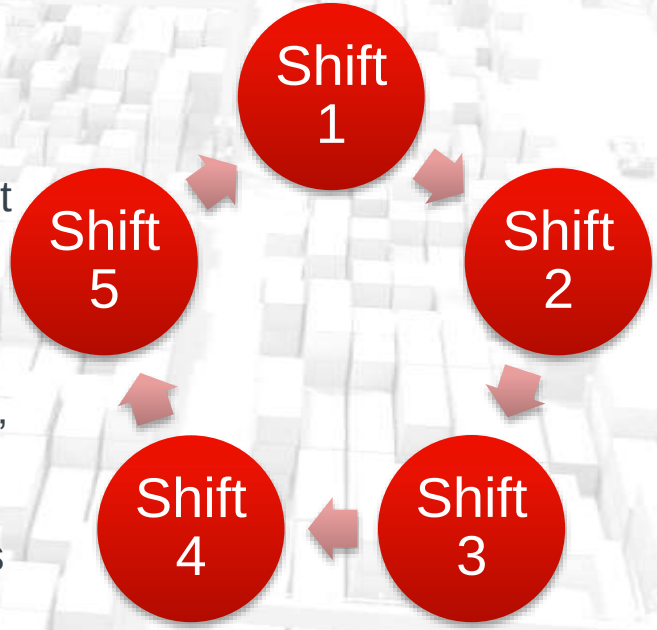
Processes - After Go Live challenges

- Operators use the system in multiple ways
- The logic of software schedulers is not always transparent
- The challenge is exception handling
- Consequence: every shift creates its own ‘way of working’
- Problem: strict control of processes and way of working is needed to optimize and improve performance



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How to ensure common processes?

- The key is to have a strong dayshift:
  - To align processes between various shifts
  - Document processes
  - Communicate with the IT department
  - Secure the continuous improvement circle
- Strong dayshift challenges:
  - The acceptance and the authority (from the other shifts)
  - The best qualified people
  - Renumeration

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Project Preparation – critical steps

How to ensure enough focus on People & Processes?:

1. Create a solid project governance
2. Establish project management team with competences in all areas:
   - Civil
   - Equipment
   - Automation
   - Software & IT
   - **Operations**
   - **HR / Change management**
   - **Sales**
   - **Communication**

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Project Preparation – critical steps

3. Make sure the project team delivers:
   - Change management program
   - Detailed process descriptions
   - Detailed ‘ways of working’
4. Front load the project
5. Start the project preparation early!

Total project preparation:

15 months to three years+

Kalmar’s response to these industry challenges

- A way to make Kalmar and Navis experience and expertise available for terminal operators to help realize its highest potential
- 5 component comprehensive end to end offering
- Products are pre-integrated which reduces uncertainty and risks
- Stable foundation for defined processes and way of working

Kalmar OneTerminal

Project services

Automated equipment

navis N4

Kalmar TLS

Kalmar Care

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3 pre-integrated terminal concepts

ASC & AutoShutlle™

AutoStrad™

AutoRTG

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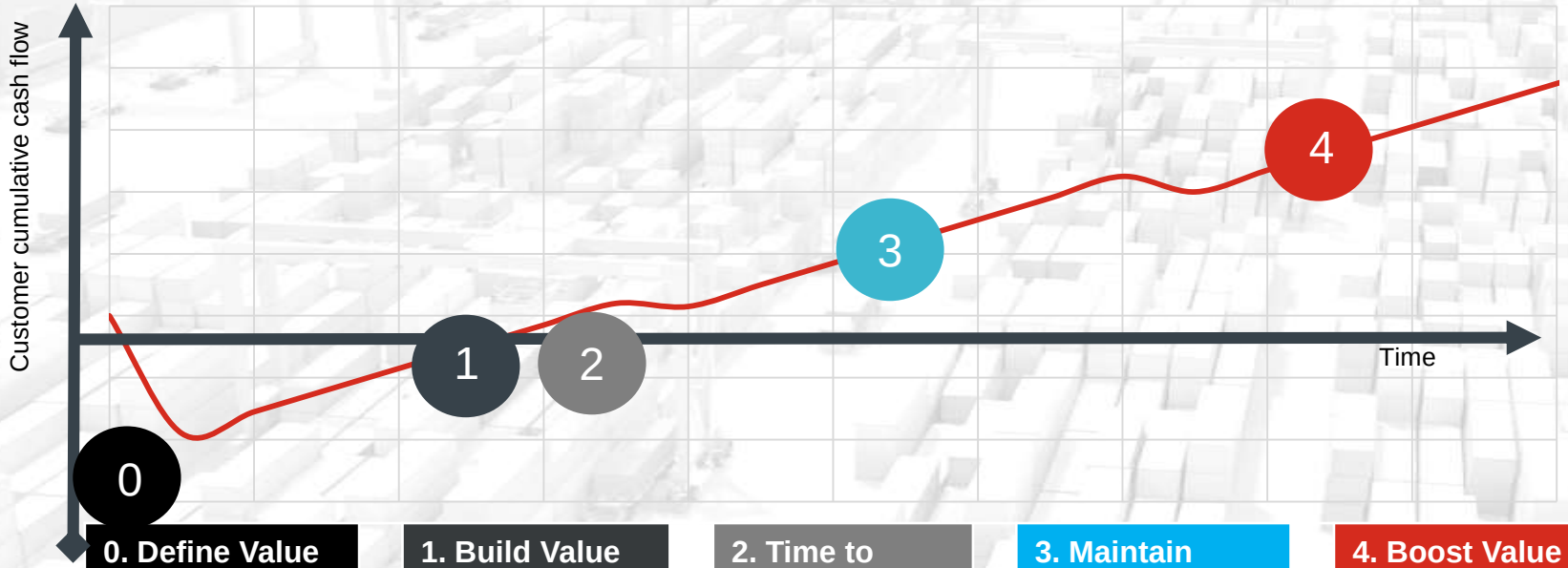
Focused on improving your business



0. Define Value	1. Build Value	2. Time to Value	3. Maintain Value	4. Boost Value
- Terminal development services - Terminal concepts - Assist development business case	- Pre-Integration - Fast-track delivery	- Fast track start-up - Saving in ramp-up costs - Operations support - Knowledge transfer	- Flexible maintenance - Operations support - Upgradable platforms	- Efficiency care - Efficiency acceleration

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Questions and answers

Kalmar automation references

Kalmar Automated Terminal References

DP World London Gateway, UK

Terminal setup:

- Greenfield, mega size terminal
- ASCs and shuttle carriers
- 1.6MTEU

Equipment & software

- 40 Kalmar ASCs for Berths 1 & 2
- 20 Kalmar ASCs for Berth 3
- 28 Kalmar Electric Shuttle Carriers (ready for automation)
- 12 Kalmar Hybrid Shuttle Carriers (ready for automation) in delivery for Berth 3
- Kalmar TLS
- Kalmar Automated Truck Handling
- Navis N4 TOS

Comment

The challenge has been to develop a brand new port and logistics park with a focus on automation and how it can deliver maximum productivity, reduce operational cost

1

"It is of utmost importance for us to have equipment and TOS that are fully integrated and make our operations as efficient as possible."

Andrew Bowen
Engineering director, DP World London Gateway

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DP World
Brisbane, Australia

Terminal setup:

- Brownfield - conversion from a reachstacker operation
- ASCs and manual shuttle carriers
- 2 cranes per block
- 900.000 TEU

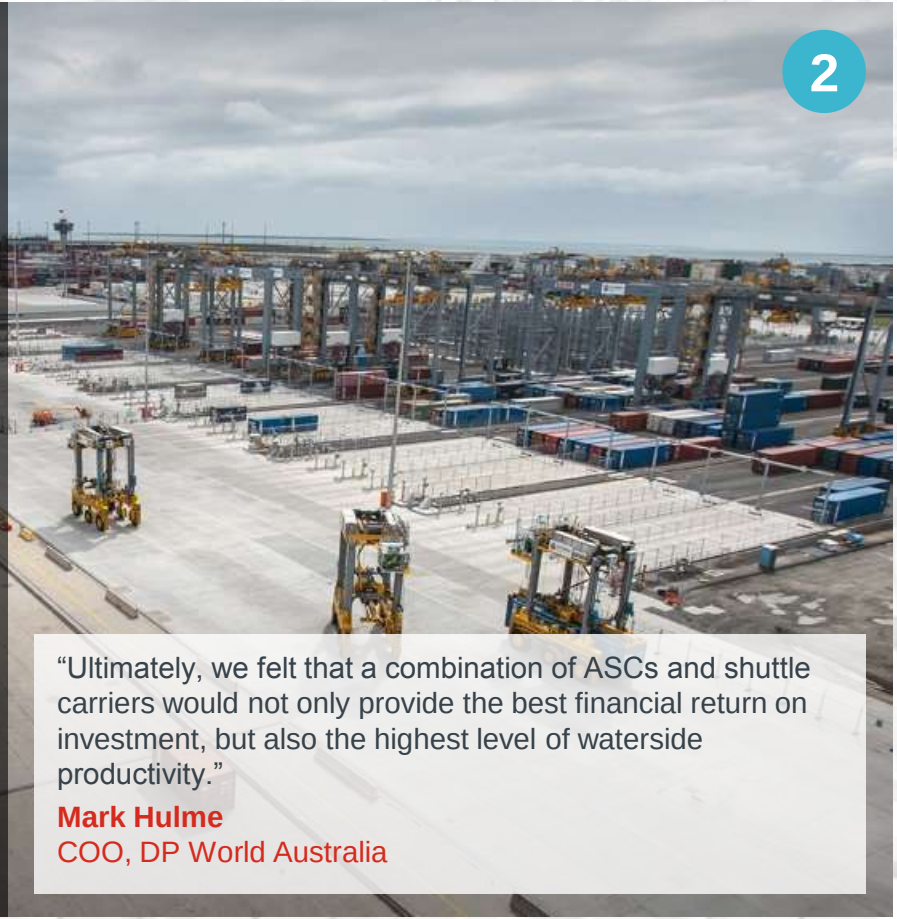
Equipment & software

- 16 Kalmar ASCs
- 14 manned Kalmar Electric Shuttle Carriers
- Kalmar TLS
- Kalmar Automated Truck Handling
- Navis N4 TOS

Comment

The competitive environment at the Port of Brisbane became tougher with the arrival of a third stevedore in 2012.

DP World Brisbane realised that it would have to make more effective and efficient use of terminal space while maintaining the highest standards of safety and comply with [illegible] customer service.



2

"Ultimately, we felt that a combination of ASCs and shuttle carriers would not only provide the best financial return on investment, but also the highest level of waterside productivity."

Mark Hulme
COO, DP World Australia

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VICTL
Melbourne, Australia

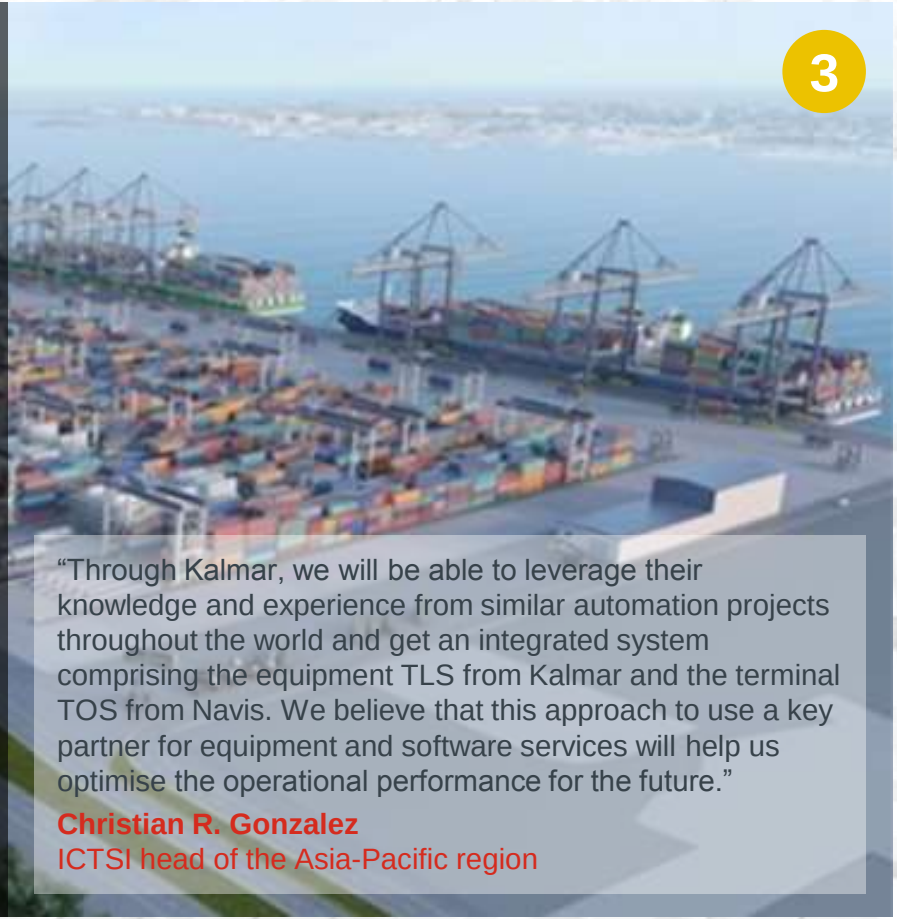
Terminal setup:

- Greenfield, fully automated
- ASCs and AutoShuttles™
- Phase 1 - 600.000TEU

Equipment & software

- 12 Kalmar ASCs
- In Phase 2, 8 ASCs more in delivery
- 11 Kalmar AutoShuttles™
- Kalmar TLS
- Kalmar Automated Truck Handling
- Navis N4 TOS
- System Integration Services

Comment
The ability to integrate and link several components into a one seamless process brings true value to the customer. As a system integrator, Kalmar provides a solution, all the way from the TOS, TLS automation, software, equipment, [illegible] that bring an



3

"Through Kalmar, we will be able to leverage their knowledge and experience from similar automation projects throughout the world and get an integrated system comprising the equipment TLS from Kalmar and the terminal TOS from Navis. We believe that this approach to use a key partner for equipment and software services will help us optimise the operational performance for the future."

Christian R. Gonzalez
ICTSI head of the Asia-Pacific region

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Trapac
Los Angeles, USA

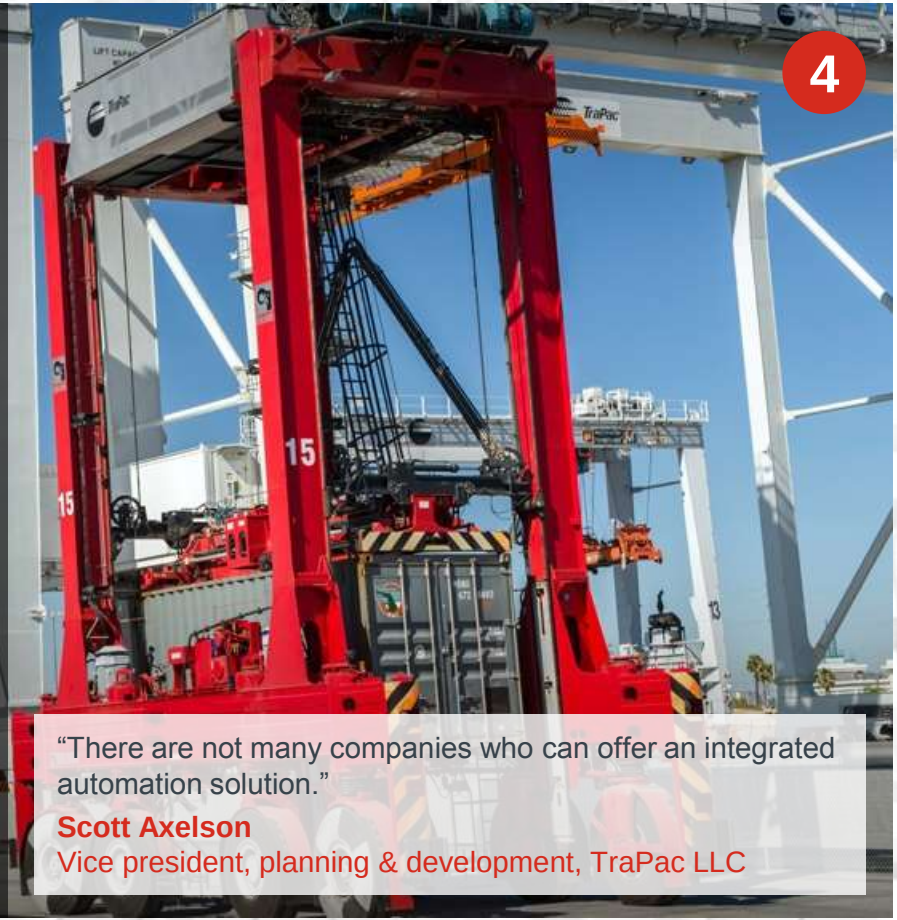
Terminal setup:

- Brownfield – conversion from RTG and reach stacker operation
- ASC stacks including mini blocks for truck handling
- Automated straddle carrier stacks

Equipment & software

- 27 Kalmar ASCs for Phases 1-3
- 2 Kalmar 5th generation ASCs for Phase 3/5
- 28 Kalmar Electric Automated Straddle Carriers
- Kalmar Automated Truck Handling
- Kalmar TLS
- In-house TOS

Comment
Due to the shape of the terminal at Trapac the decision has been made to have both ASC and automated straddles carrier stacks as straddle carrier stacks. This ensures an optimal use of the space and ensures the highest capacity



4

"There are not many companies who can offer an integrated automation solution."

Scott Axelson
Vice president, planning & development, TraPac LLC

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HHLA Container Terminal Hamburg, Germany

Terminal setup:

- Brownfield - conversion from straddle carrier operation
- ASCs and straddle carriers
- 3 cranes per block
- 5.2 MTEU

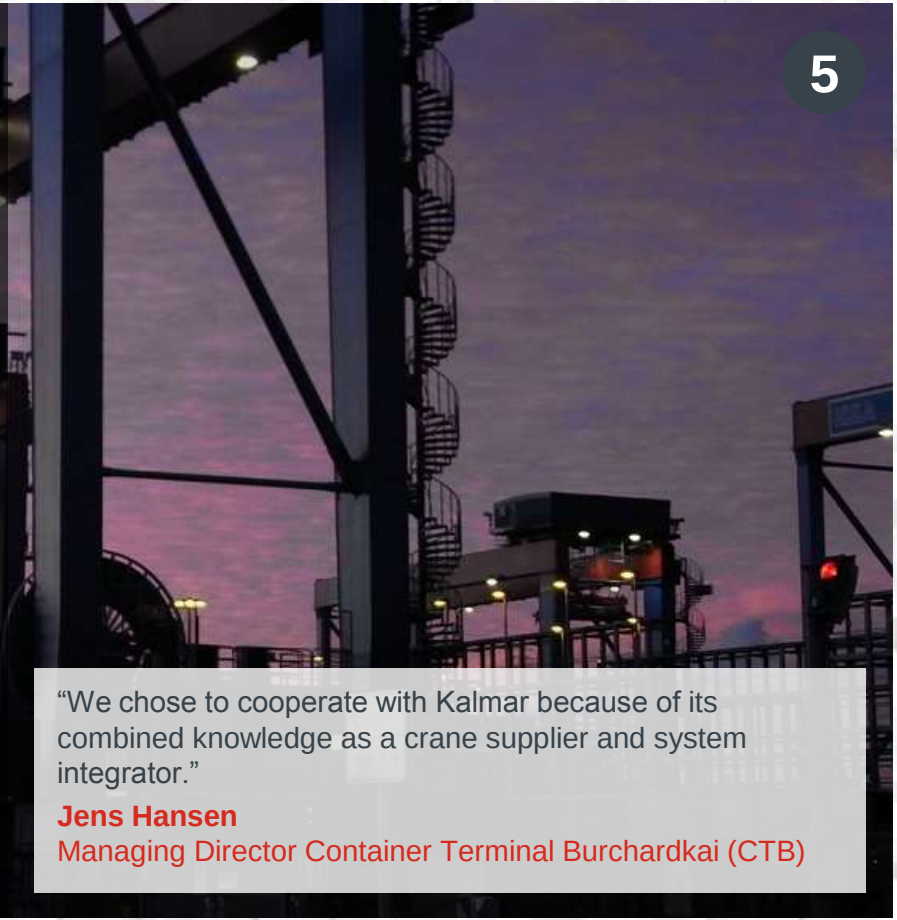
Equipment & software

- 24 Kalmar ASCs
- Kalmar Straddle Carriers
- Navis Sparcs for vessel planning
- HPC/Inform for scheduling and execution

Comment

CTB was faced with the challenge of increasing capacity from 2.6m TEU to more than 5.2m TEU. With the terminal footprint restricted, the growth could only be realised by increasing stacking density.

The setup is unique in featuring three cranes. The solution was favored by HHLA to allow the capacity and throughput of the ASC blocks to be optimised within the given space restrictions.



"We chose to cooperate with Kalmar because of its combined knowledge as a crane supplier and system integrator."

Jens Hansen
Managing Director Container Terminal Burchardkai (CTB)

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Patrick Terminal
Brisbane, Australia

Terminal setup:

- Capacity 800 000 TEU
- AutoStrad terminal

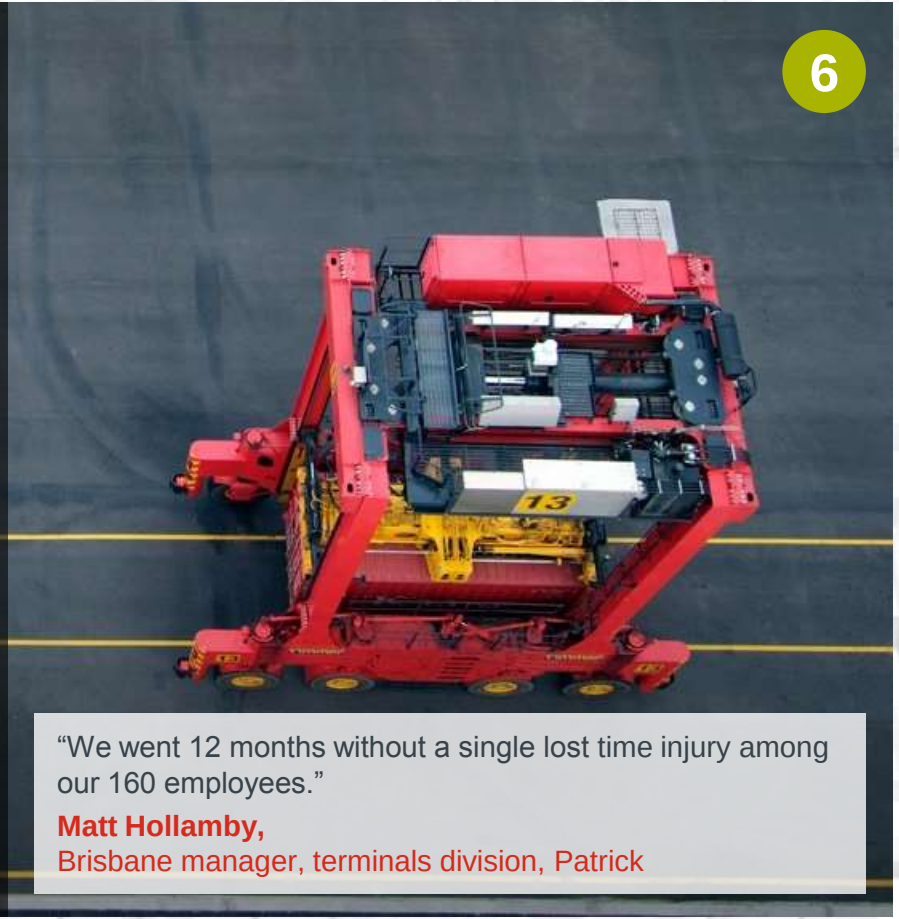
Equipment & software

- 27 Kalmar AutoStrads™ – 3-high
- In-house TOS
- Kalmar RTCS (Real Time Control System)

Comment
The unmanned Kalmar AutoStrads™ can operate 24/7 in almost any weather conditions, ensuring smooth flow of cargo and significant cost savings.

Patrick's work force has decreased drastically, as today a crane gang of only four people is needed to operate a ship-to-shore crane and the yard and stacking area.

The transition to automation can be done quickly and at low cost.



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"We went 12 months without a single lost time injury among our 160 employees."

Matt Hollamby,
Brisbane manager, terminals division, Patrick

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Patrick Terminal Sydney, Australia

Terminal setup:

- AutoStrad terminal

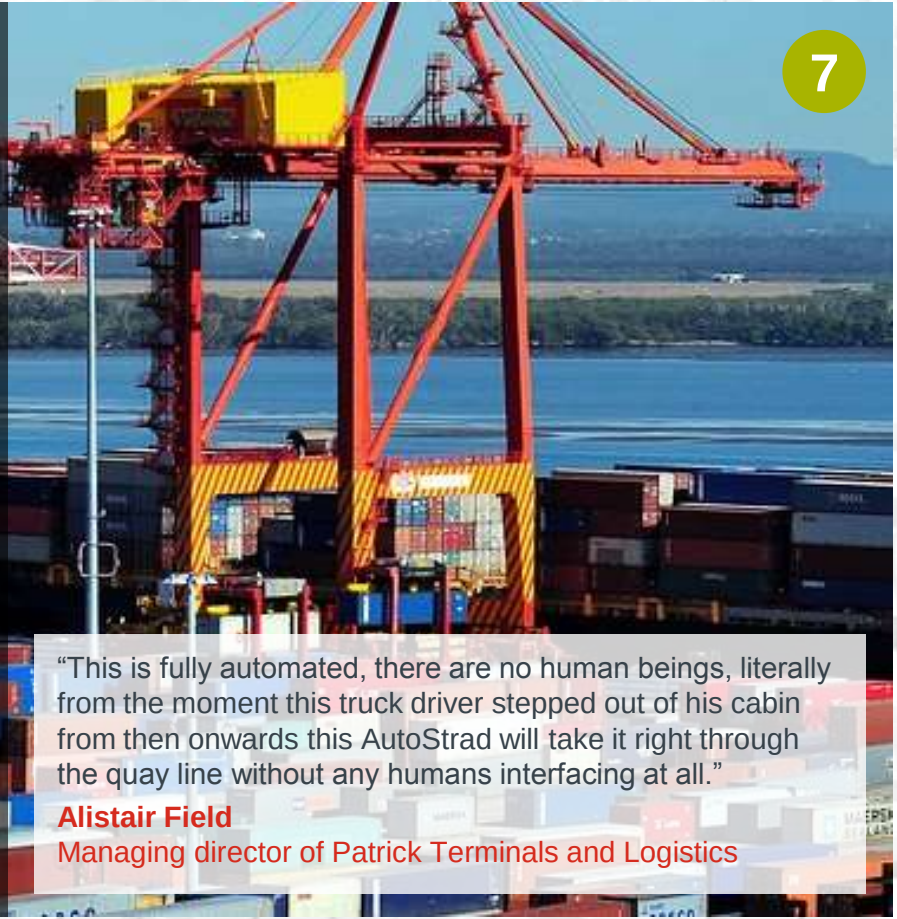
Equipment & software

- 44 Kalmar AutoStrads™ – 3-high
- Radar-based navigation system
- In-house TOS
- Kalmar RTCS (Real Time Control System)
- Kalmar Care service contract

Comment

The whole process can occur overnight and without the need for expensive overhead lighting – AutoStrads do not need to see to navigate. They use 20 per cent less fuel and incur lower maintenance costs.

And when there's a rush on – for instance, when a bunch of truck drivers arrive to take containers away – the algorithm that controls the AutoStrads will redirect them from other tasks to focus on the most pressing job.



"This is fully automated, there are no human beings, literally from the moment this truck driver stepped out of his cabin from then onwards this AutoStrad will take it right through the quay line without any humans interfacing at all."

Alistair Field

Managing director of Patrick Terminals and Logistics

ECT Delta Terminal Rotterdam, the Netherlands

Terminal setup:

- First and largest fully automated terminal in the World
- ASC, AGVs and straddle carriers for truck loading

Equipment & software

- 105 Kalmar ASCs including 11 replacements in 1 over 5 design in 2015 to increase the yard's capacity
- 265 AGVs (4 AGVs per STS crane)*
- In-house process control software (PCS)
- Navis Sparcs TOS

Comment
Kalmar's solution is engineered to be able to use the existing rail and infrastructure

*Not supplied by Kalmar