



Advanced Optimization

in Container Terminals

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Port & Terminal Technology 2016



INFORM Business Divisions

Logistics



- Truck Fleet Dispatch
- Distribution & Parcel Centers
- Container Terminals
- Mobile Asset Management

Manufacturing Logistics



- In-plant Materials Handling
- Supply / Inbound Scheduling
- Automotive Logistics
- Healthcare Logistic

Aviation Logistics



- Airport Ground Handling
- Airline Hub Operations

Inventory & Supply Chain



- Inventory Optimization
- Advanced Demand Planning
- Sample Inventory Counting

Production Scheduling



- Production Scheduling (APS)
- Intelligent Capacity Planning

Risk & Fraud



Fraud Prevention

- Banking Sector
- Insurance Sector
- Telecoms

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Facts and Figures



- Established in 1969
- Organically growing, no external investors
- Since 1985 always profitable
- Internal ownership (directors, staff)
- Today more than 500 employees
- Principal corporate objective: long-term sustainability



Global Activities



Challenges

Globally

 Individualization: More & more tasks have to be coordinated at high speed

• Big Data:

huge amount of data vs. huge # of possible actions

Immediateness:

Wise decisions needed despite permanent & unplannable market changes

• The Unexpected:

Taking complex decisions in a quick, flexible & situation responsive way

Maritime Terminal

- Mega-ships, mega headaches
- More cargo on a single ship, higher peak loads
- Adaptations to infrastructure & equipment
- Efficient waterside processes in sync with high performing hinterland systems

Inland Terminals

- Higher peak loads across the entire SC due to mega ships
- Insufficient terminal & intermodal infrastructure capacity to efficiently handle cargo volumes
- Increased network constraints affect service & performance



Algorithms: A Powerful Weapon





Agile Optimization

What's That?

Management concept responding to the massive challenges of today's rapidly transforming business world.

The Management Concept

- **Rapid:** flexible & quick response at any time
- **Smart:** with optimized decision quality
- Interactive: (Human + Computer)²





- Best-of-Breed IT (Add-on)
- Algorithms
- Operations Research



Standard vs. Agile Solutions



Inland Terminals

Standard Solutions	• TOS	 New handling equipment
	 (Semi-) Automation 	 More rails, more space
	 New handling equipment 	Additional labor
Agile Solutions	 TOS + Optimization software as add-on 	 TOS with built-in Optimization software



Operations Research (OR)

Powered by algorithms, there are many techniques for greatly speeding up the search for good solutions

Yard

- Slot suitability
- Slot restrictions
- Retrieval distance
- Operational areas

Equipment

- Last/current position
- Job suitability
- Availability/time windows
- Driving times/distances

Load Unit

- Size, type, content, restrictions
- Departure time & destination





Operations Research (OR) – Example



Daily Challenges





Optimization Modules





Truck / Gate Benefits

Reduced Turnaround Times

- Optimized selection of transfer points
- Optimized sequence of transfer points
- Standardized gate processes provide yard managers with the necessary information in real-time
- The integration of gate automation technology is also possible





Yard Management Benefits

Tap the Full Potential

- Efficient utilization of resources and storage areas
- Best possible space utilization
- Higher stacking possible
- Minimized rehandlers
- Scattered stacking terminal wide or within target areas



Benefits Achieved from Staging Areas

Smoother Handling

- Transport chains will be generated by creating smart links between staging, waiting and storage areas
- Minimization of waiting times
- The suitability of different equipment types is considered
- Improved ability to meet deadlines





Benefits to Handling Equipment

Minimized Driving Distances and Times

- Equipment productivity will be increased thanks to real-time optimization of container moves
- Reduced time for empty travel and idle equipment
- Combining jobs where possible
- Vehicle Pooling/dynamic crane split
- The integration of positioning systems & (semi-) automation possible





Benefits to Train Load Planning

Improved On-Schedule Performance

- Optimization tools support the train dispatcher in preparing the load plan
- Maximized wagon/slot utilization
- Minimized loading distance and configuration (pin) changes
- Double stacking
- Handling orders for loading/unloading trains are updated in realtime & intelligently assigned to handling resources





Container Terminal Logistics





Container Terminal Altenwerden (CTA) – Hamburg



Hinterland Steering & Optimization

> 3 M TEU/a

- 500,000 boxes (813,000 TEU) by rail in 2013
- 7 rail tracks of 700 m with 4 RMG (30 trains/d)
- 12 tractors, 200 chassis
- 2,500 trucks/d (gate)



Container Terminal Burchardkai (CTB) – Hamburg



Intelligent Control of all Transport Orders

- Ongoing terminal capacity expansion from 2.6 to 5.2 M TEU/a
- Conversion from straddle carrier to fully automated yard cranes
- 8 automated yard blocks (>25 after completion)
- 133 straddle carrier
- 30 gantry cranes
- Megaship ready



Container Terminal Burchardkai (CTB) – Hamburg



SyncroTESS at CTB

- Intelligent control of all transport orders (waterside to yard & yard to rail buffer)
- Comprehensive optimization of transport chains
- Supports tandem/quad crane operations (megaship size)
- Straddle carrier pooling
- Intelligent yard utilization
- Terminal expansion without additional space



APM Terminals: Maasvlakte II (Rotterdam)

Hinterland Optimization

- Optimization Software as add-on to existing TOS
- 4 rail tracks of 750m with 2 RMGs (8 rail tracks with 6 RMGs in the final phase)
- 37 battery powered lift-AGV
- 3 dedicated rail-ASC-blocks (6 in the final phase)



Characteristics

- Identification of Transport Chain ASC + AGV + RMG as source of optimization potential for rail handling
- Train Load Planning: Assignment of containers to railcar slots (yard location as input)
- Scheduling Rail Operations:
 - Meeting time points for containers at the rail buffer
 - Managing transfer points at the rail buffer
 - Sequence work orders for each RMG



TraPac LLC (Port of Los Angeles)



Rail Crane Optimization & Crane Control System (Semi-automation)

- Optimization as add-on to existing TOS
- 8 rail tracks with 3 new double cantilever RMG
- ASC and Auto-Strads
- Automatic RMG pick/ground (containers from rail buffer area) and gantry moves
- Remote railcar un-/loading

Project Timeline

- Contract signature: July 2015
- First on-site testing: Sept. 2015
- Delivery: January 2016
- Go-live: Summer 2016





TraPac LLC (Port of Los Angeles)

Characteristics

- Crane Control Software to direct crane for pick/ground moves at the rail buffer & railcar
- Rail buffer: rendezvous between automatic Straddle Carriers & RMGs in auto-mode
- Rail car: limit remote operator works to trolleying loaded (empty) spreader for drop-off (pick-up) of container at a rail car
- Interaction of Crane Control System with TOS and Crane System. Safety System (cone cars, cone men) also in place.
- Optimization on top of automation





GCT Deltaport (Canada)



Rail Crane Optimization

- Intermodal rail yard expansion increasing capacity 1.9m TEU/a within existing footprint
- 8 rail tracks with 8 cranes and more than 150 TPs
- Semi-automatic cantilevered RMGs
- Optimizes yard transfer via truck/trailer to rail crane
- Supports double-stacking
- Add-on to TOS (Navis N4)
- Delivery: Oct. 2016
- Go-live: Spring 2017

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Selected Customer References



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Benefits – Do More with and for Less





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