Panel III: Terminal Technology – Not Just for Containers anymore

Technology in Container Handling – but more to come!

Dr. -Ing. Felix Kasiske, Partner, Head of Terminal Development & Design
Technology in Container Handling – but more to come!

Agenda

Introduction

History & State-of-the-Art in Container Handling Technology

Scope of Technology Application – Big Bang vs. incremental Path

Outlook
HPC Hamburg Port Consulting GmbH

- Founded in 1976 as subsidiary of HHLA Hamburger Hafen und Logistik AG
- Around 100 experts (incl. subsidiaries, w/o HPC Ukraina), annual turnover in 2012: approx. € 15.0 million
- Reputation as one of the world's leading consultants in the port sector
- Since 1976 port and transport-related projects in more than 100 countries, both in the private and public sector
- Approx. 1100 projects world-wide with extensive experience in container terminal planning
- Subsidiaries for port training & management (HPTI) and transport solutions (Uniconsult), HPC Ukraina as terminal operator in Odessa (Ukraine)
HHLA Container Terminals in Hamburg

- CTT Container Terminal Tollerort
- Unikai Empty Container Storage (LZU)
- CTB Container Terminal Burchardkai
- CTA Container Terminal Altenwerder
HPC Services
Container Terminal Automation Planning

Introduction

Full Service Provider

Preparation

Assessment

Design & Planning

Realization

Commissioning & Operations

Improvement

HPC

Conceptual planning
- System selection
- System calibration

Concept validation
- Static assessments
- Dynamic simulations

Equipment definition
- Specification
- Tender Support
- Construction supervision

IT + TOS selection
- Business Process Definition (BPM)
- Specification
- Tender support

Integration / Commissioning
- IT + equipment integration support
- Commissioning support
- Operations Optimization
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- Introduction
- History & State-of-the-Art in Container Handling Technology
- Scope of Technology Application – Big Bang vs. incremental Path
- Outlook
History of Technology Development
In Container Terminal Handling

- **50s/60s:** Malcom McLean’s idea and the twist-lock system
- **60s:** typical container handling equipment
- **70s:**
- **80s:** Terminal Operating Systems
- **90s:** DGPS Tracking
- **1993:** ECT Rotterdam – first automated container terminal
- **2001:** HHLA Container Terminal Altenwerder
- **2005:** Patrick AutoStrad Terminal, Brisbane
- **2014:** APMT Maasvlakte II
State-of-the-Art in Quayside Equipment

- **Ship-to-Shore Container Cranes**
  - Single Trolley
  - Double Trolley

- **Spreader**
  - Single (Twin)
  - Tandem 40'

- **Automated Twistlock Handling**

→ Quaside Technology has Potential to be improved
End of the 1980s Introduction at ECT Delta Terminal Rotterdam
2005 Adoption of Diesel-Electric Drives
2007 Lift-AGV Concept (Decoupling)
Since 2009 Battery AGV Test-Trial at CT Altenwerder Hamburg

Battery-Driven AGV
- Diesel-Electric AGV: 8-12 hours of operation
- Automated rapid battery changing & charging station

Lift AGV
- Source: Gottwald/Terex

Terminal Tractor
- Source: Cargotec

Cassette AGV
- Source: TTS

Shuttle Carrier
- Source: Cargotec

To achieve higher Degree of Efficiency & Low Fuel Consumption in the Terminal
State-of-the-Art in Storage Yard Equipment

- ASC – Automated Stacking Crane
  - High Performance, electrically Drives

- Hybrid RTG with Ultracapacitor
  - Store & Re-use braking Energy

- E-RTG
  - Cable Reel System
  - Conductor Bar System
  - Electrification avoids On-Site Pollution

→ Terminal “Electrification” requires Public Grid Capabilities!
CTA Hamburg – the last Milestone (2001)

- STS with double trolley and twin spreaders (manned main trolley and automated secondary trolley)
- Manual twist-lock handling
- Automated horizontal transport by means of regular AGVs (battery-driven AGVs were developed and tested to become industry-proven)
- Automated stacking yard system with Double-ASCs
- Remote-controlled truck handover
- Manual horizontal transport to rail ramp
- Manual/semi-automated rail crane operation
- Proprietary TOS

→ CTA had set the state for more than a decade of terminal development
APMT Maasvlakte II – the next Step (2014)

- STS with double 40/twin 20 spreaders (remote-controlled main trolley and automated secondary trolley)
- Twist-lock handling?
- Automated horizontal transport by means of battery-driven Lift-AGVs
- Automated stacking yard system with Twin-ASCs
- Truck handover?
- Automated horizontal transport to rail ramp
- Manual/semi-automated rail crane operation
- TOS yet to be developed

⇒ APMT Maasvlakte II is expected to set the new state by end of 2014
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Technology Application Criteria

Meeting Point

External Drivers

Environmental Requirements
Labour availability & reliability
Performance and Reliability Requirements
Increasing traffic vs. limited area sizes
Equipment evolution & technology

Operator Internal Goals

Improve safety and labor conditions
Lowering life cycle costs
Reduce equipment damage
Increase the level of service
Increase stacking density

Customer Satisfaction

Scope of Technology Application – Big Bang vs. incremental Path
Technology changes Paradigms

Automated Terminal Planning Process

From manually handling and decision making

To robotics and automated decisions

From freely adaptable

To fixed configurations

Automated Terminals are long term running Machines with inherent Processes!
Trade-offs in Technology Application

- **Benefits**
  - Productivity and operating cost gains
  - Quality improvement
  - Process stabilisation and reliability
  - Electrification and emission reduction
  - Safety improvement
  - Image gains

- **Cost**
  - Investment cost
  - Training cost
  - M&R cost
  - Cost of operations breakdown
  - Opportunity cost for reduced flexibility

- **Ability**
  - TOS capabilities
    - Ability to integrate
    - Complexity management
    - Usability
    - Safety and regulatory frameworks

→ System Decisions Trade-Offs determine long term Capacity, Performance and Cost
Complexity of Technology Implementation

- Cost behavior resulting from increased complexity
- Sum of individual component implementation cost

→ Complexity is THE automation cost driver
→ Bing Bang solution require very professional management!
General Approach

Aspects to be considered

- All System Component Capacities must be balanced
- All System Decisions determine a long term, difficult-to-change Investment
Big Bang vs. Incremental Approach

**Greenfield Project**
- Political framework conditions and set timelines
- Commercial performance expectations
- Cost structures of competing players
- Volume and complexity challenges

→ Application of State-of-the-Art Technology is Survival Decision

**Conversion Project**
- Scope of technology application and resulting process changes
- Adequate sequencing of conversion steps
- Proper phasing of conversion of capacities
- Acceptance within existing labour organisation

→ Application of State-of-the-Art Technology incrementally or evolutionally

→ Initial Situation determines Degree of Freedom in Design
Required Resources

Technology Application requires experienced Professionals
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Off-the-Shelf “Integrated Solutions”? vs.

**Off-the-Shelf/Integrated**
- Reduced complexity
- Faster implementation
- Responsibility/liability can be passed over to suppliers
- Integration MAY BE less costly and faster

**Taylor Made/Customer-driven**
- If done right, terminal remains adaptable to market changes
- Due to higher involvement of operator, resources for continuous optimization are available inhouse
- Options remain with terminal operator to create a competitive advantage

→ Every Terminal is a unique Terminal and requires a specific Solution!
→ Integrated Offers are not necessarily creating synergies at the customer but for sure at the supplier site
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