Bremen June 18,2009

TOC 2009 Europe

“Trends in equipment automation and control”

Hans Cederqvist ABB Crane Systems

Content

1. Automation status

2.Project execution experience

3. Technology trends

4. Down-turn & vision

5. Summary & conclusions

Crane automation - status

- *ECT, Rotterdam (137 ASCs)*
- **PSA, Singapore (35 OHBCs)**
- **HHLA/CTA, Hamburg (52 ASCs)**
- **Evergreen, Kaohsiung (6 auto CRMGs)**
- APMT, Virginia (30 ASCs)
- **Euromax, Rotterdam (12 QC +58 ASCs)**
- Antwerp Gateway (14 ASCs)
- **Hanjin/Busan (12 QC + 42 auto CRMGs)**
- **PNC/Busan (7 QC + 31 auto CRMGs)**
- **TPCT/Taipei (20 auto CRMGs)**

In operation sofar this year

- Patricks/Brisbane (23 auto strads)

Together >500 automatic cranes

CTA, Hamburg - overview

EUROMAX, Rotterdam – Yard Area From Waterside

EUROMAX, Rotterdam – First commercial vessel

Hanjin, Busan – Overview quay and yard operations

Hanjin, Busan – stacking precision

TPCT – Taipei New Port

Automation – looking forward

- On-going projects
  - Hanjin/Algeciras (32 ASCs)
  - YML/Kaohsiung (22 auto RMGs)
- A large number of projects underway in all parts of the world – London, Barcelona, Busan…
- Gate automation using OCR
- RFID confirming vehicles
- QC automation supporting the operator

“All” green field projects today are implementing automation when checking/handling containers and vehicles

Content

1. Automation status

2.Project execution experience

3. Technology trends

4. Vision & Down -turn

5. Summary & conclusions

Delivery time for yard automation

Project	Suppliers	#	Months	Comment
Kaohsiung	ABB/Chin-Pan	6	14	Chassis
PNC,Busan	ABB/ZPMC	31	19	Chassis
CTA/Hamburg	ABB/Kunz	22	22	AGVs
Hanjin,Busan	ABB/ZPMC	42	23	Chassis
Taipei	ABB/ZPMC	40	26	Chassis
Virginia	other	30	30	ShCs
Rotterdam	ABB/ZPMC	58	35	AGVs,TOS

Automatic stacking can be introduced fast!
Number of cranes, number of systems to be integrated and new systems are influential factors.

Content

1. Automation status

2.Project execution experience

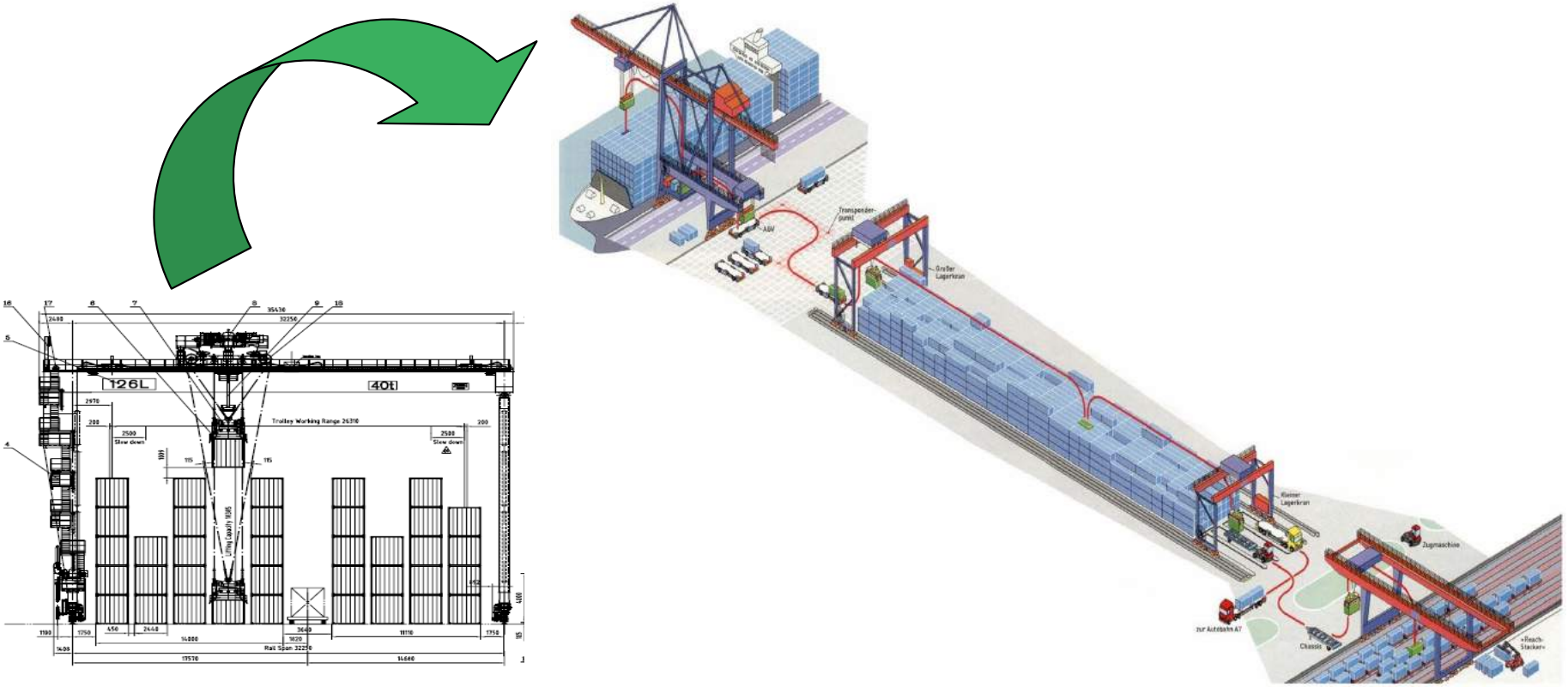
3. Technology trends

4. Vision & down-turn

5. Summary & conclusions

Technology trends - ASCs

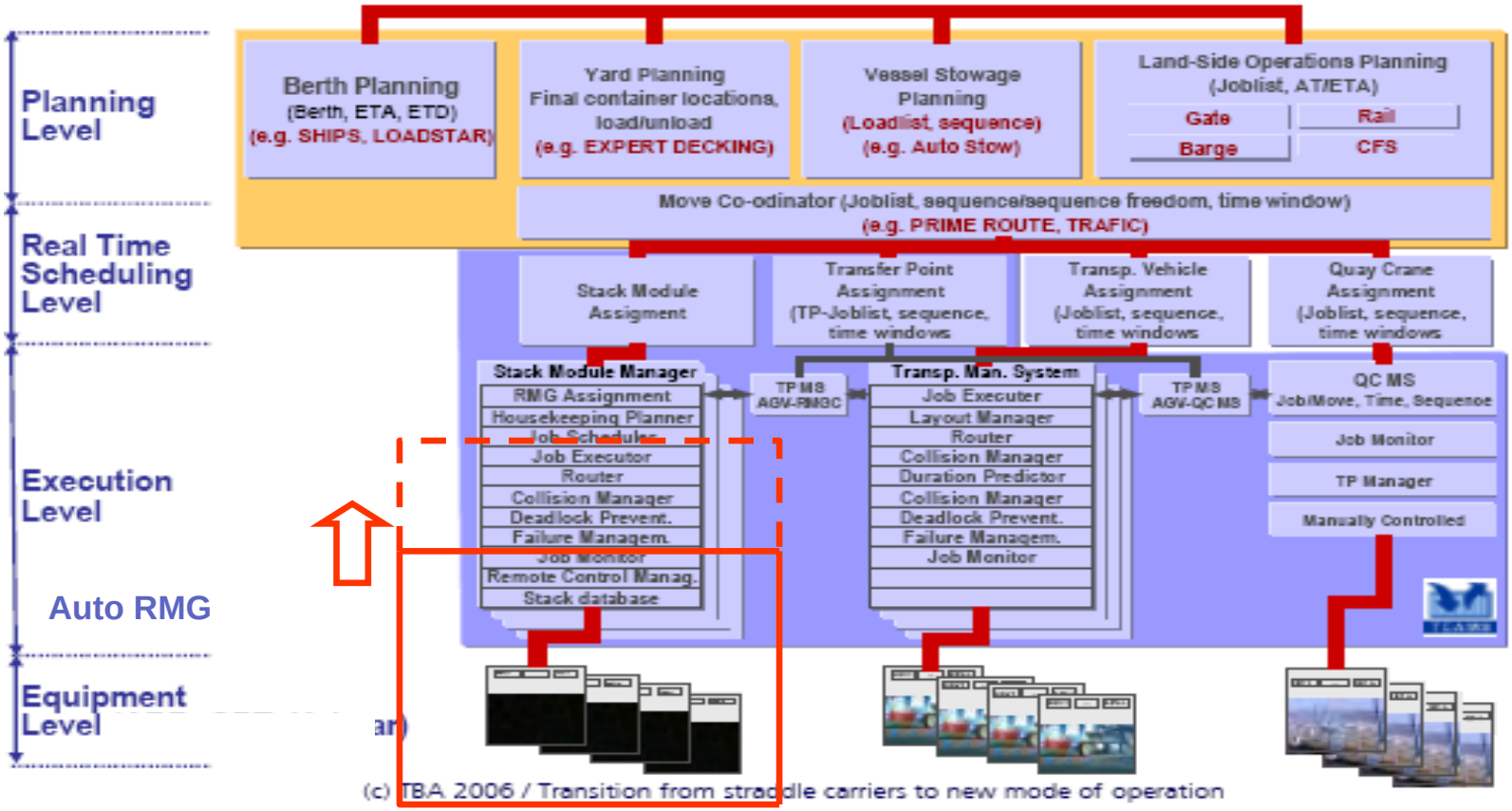
- From crane to the provision of a functioning block with interfaces



Technology trends – interfacing vehicles

- Decoupling horizontal transports

Technology trends - TOS



- more suppliers
- more flexible interface TOS/crane

Content

1. Automation status

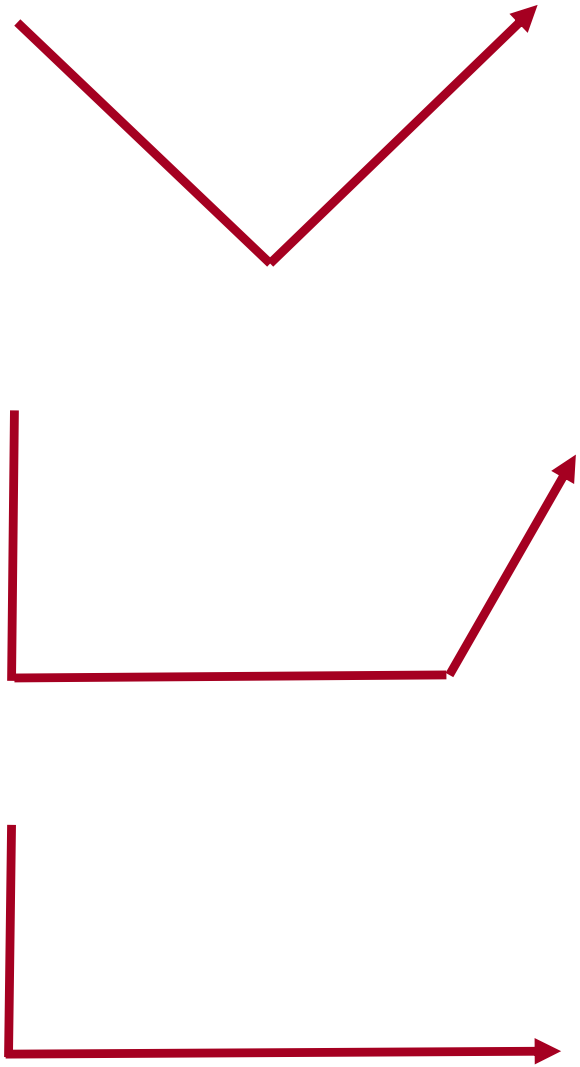
2.Project execution experience

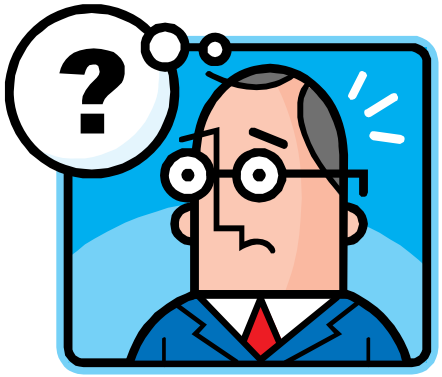
3. Technology trends

4. Vision & down - turn

5. Summary & conclusions

Down – turn ….





Think long term…!

Vision

Some time in the (near) future ships will be unloaded/loaded with handling speeds approaching the technical capacity of the quay cranes – supported by electrically driven vehicles and ASCs!

But how to get there?

1. **Automate the quay crane**
2. **Introduce automatic twist-locks**
3. **Remove lashing operations**
4. **Move in steps..**
5. **Verify progress**

STS Automation building blocks (ACLAS)

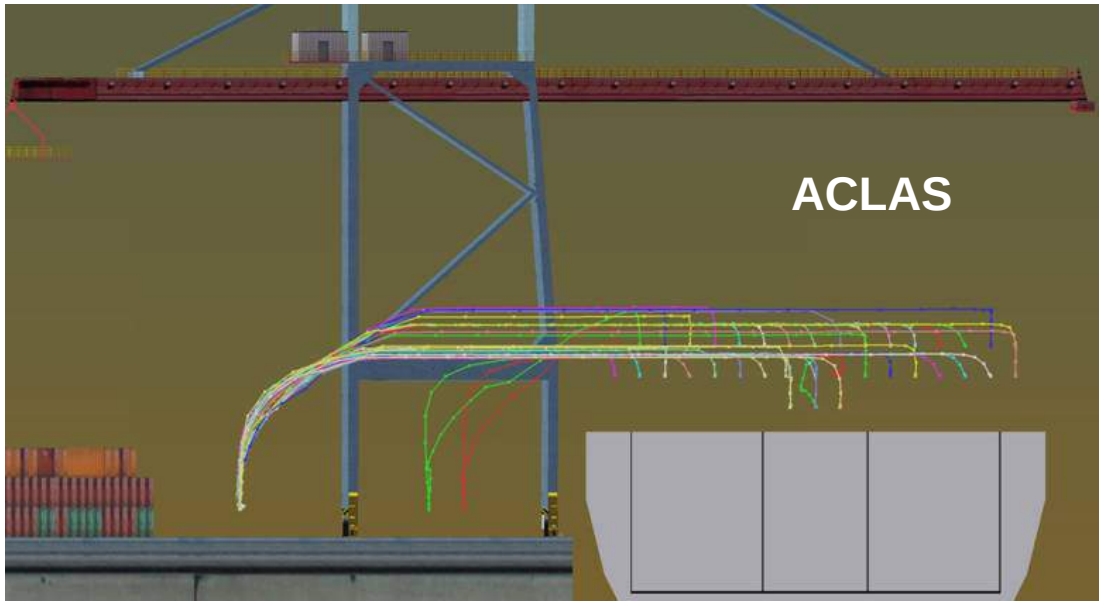
- Ship Profiling System (SPS)
  - Generates a height profile of a vessel.
  - Provides the optimum safe path for the ELC.
- Electronic Load Control (ELC)
  - Sway and position control
  - Automated travel cycles between any selected positions on vessel and quay following an optimal safe path and accurate positioning
- Chassis/Straddle Carrier Alignment System (CAS/SCAS)
  - Guides the vehicle driver to stop in position aligned with crane
- Skew Control
  - Controls the skew pendulum during the whole cycle.
  - If used with a CAS, the skew angle of the container will be adjusted to align with the skew of the chassis.
- Automatic landing system
- Automated twist-locks and removal of same

Remote operations - Key Benefits

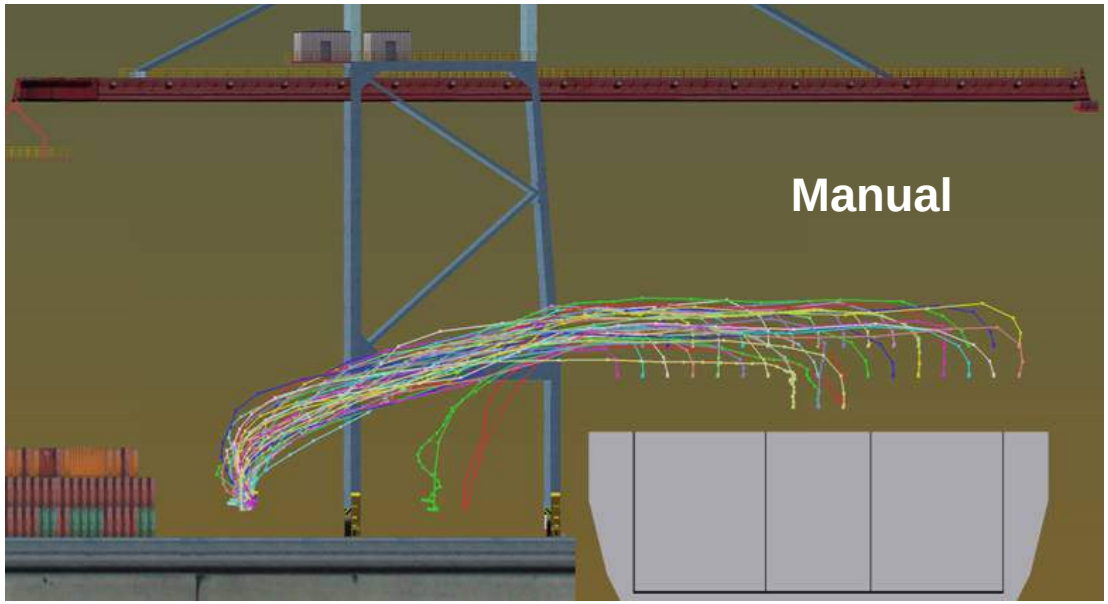
- Faster – shorter ramps, higher speeds
- Better ergonomics
- Less noise for the driver
- Improved visibility
- Faster change of drivers

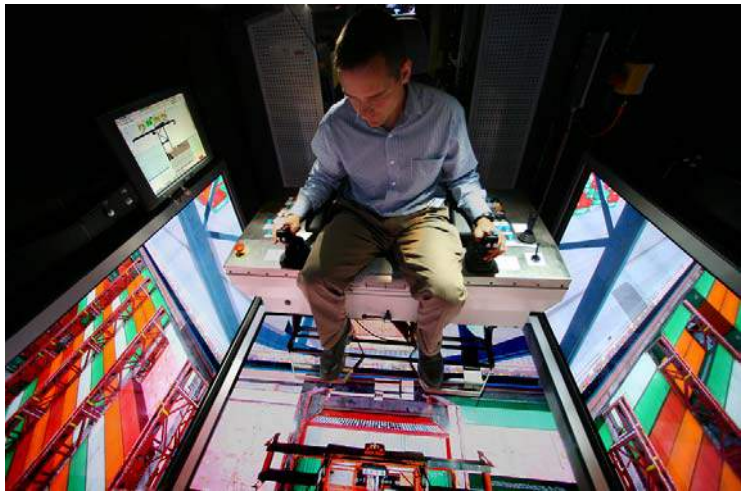
Higher productivity and safer operations

Productivity test – one ship bay



- Skilled operator versus ACLAS





Optimizing the benefits of crane automation

Your robot cells!

Optimizing the benefits of crane automation

Each crane robot cell shall include:

- Access control and safety functions
- Vehicle detection
- Vehicle positioning
- Vehicle identification
- Remote control
- Centralized maintenance/operations control and analysis
- Optimum sequencing of cranes in same block
- Logistic interface

Summary & Conclusion

- Think long-term!
  - 10 000+ TEU ships the standard
  - Ability to handle these with high productivity and low operational cost will be crucial
- Yard automation is today a proven technology – quay crane will soon be there
- The investment in automation will in many cases be only marginally higher compared to manually operated alternatives due to savings in civil works and reduced number of cranes - > short RoI
- Optimize the design – build upon the automation experience!

Power and productivity
for a better world™