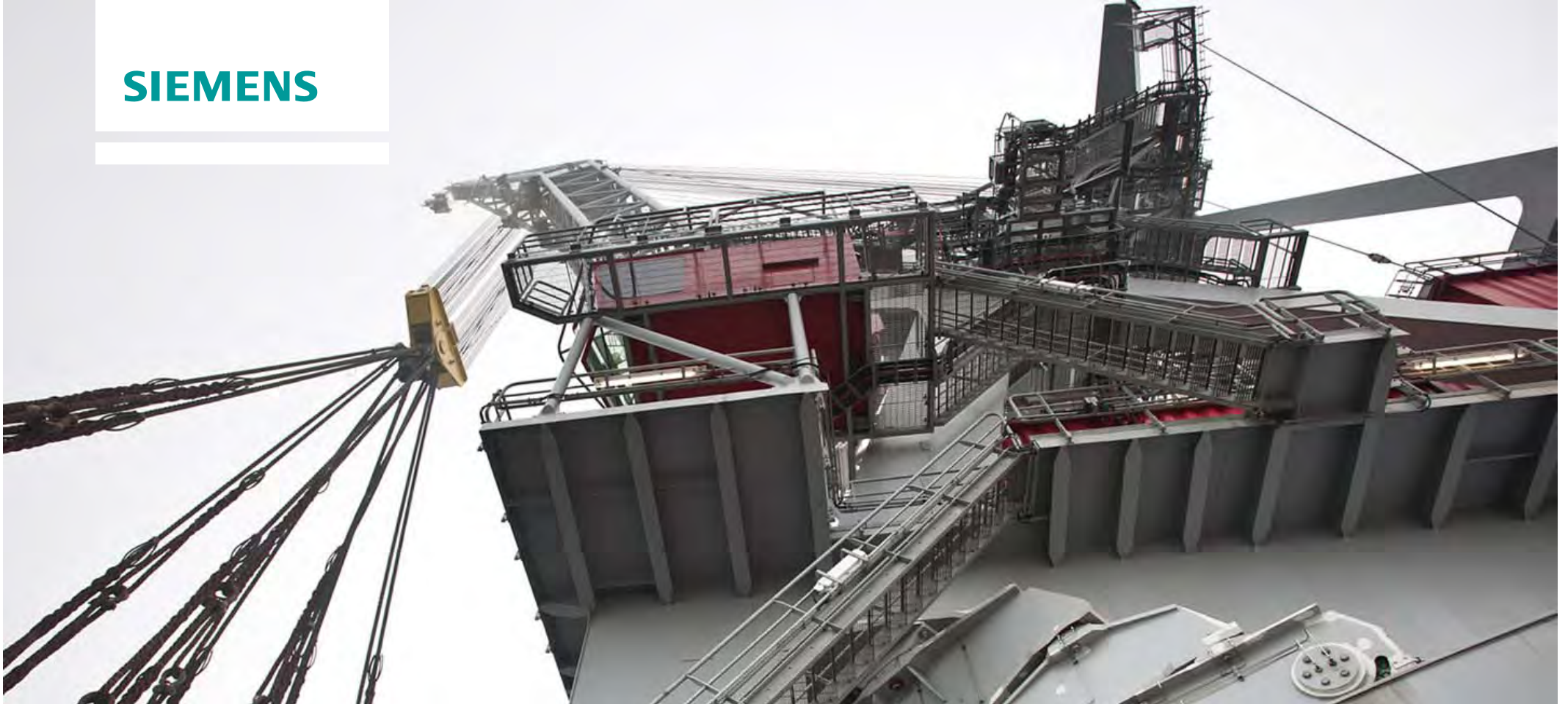


SIEMENS



Siemens Crane Technology for Modernization and Automation

Presenter: Falko Horsch

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Content

1. Crane Modernization

- Why Modernization
- Change-over from old AC- or DC-drives to new generation
- Installation of new PLC-system
- Introduction of new crane technology soft-and hardware
- Installation of modern Crane Management System (CMS)
- Installation of Crane-to-Crane/Crane-to-obstacle anti-collision system
- Installation of Load-collision prevention system

2. Automation

- Why Automation
- Truck positioning System
- Bay-scanning
- Spreader auto-landing
- Remote Control (RCOS)

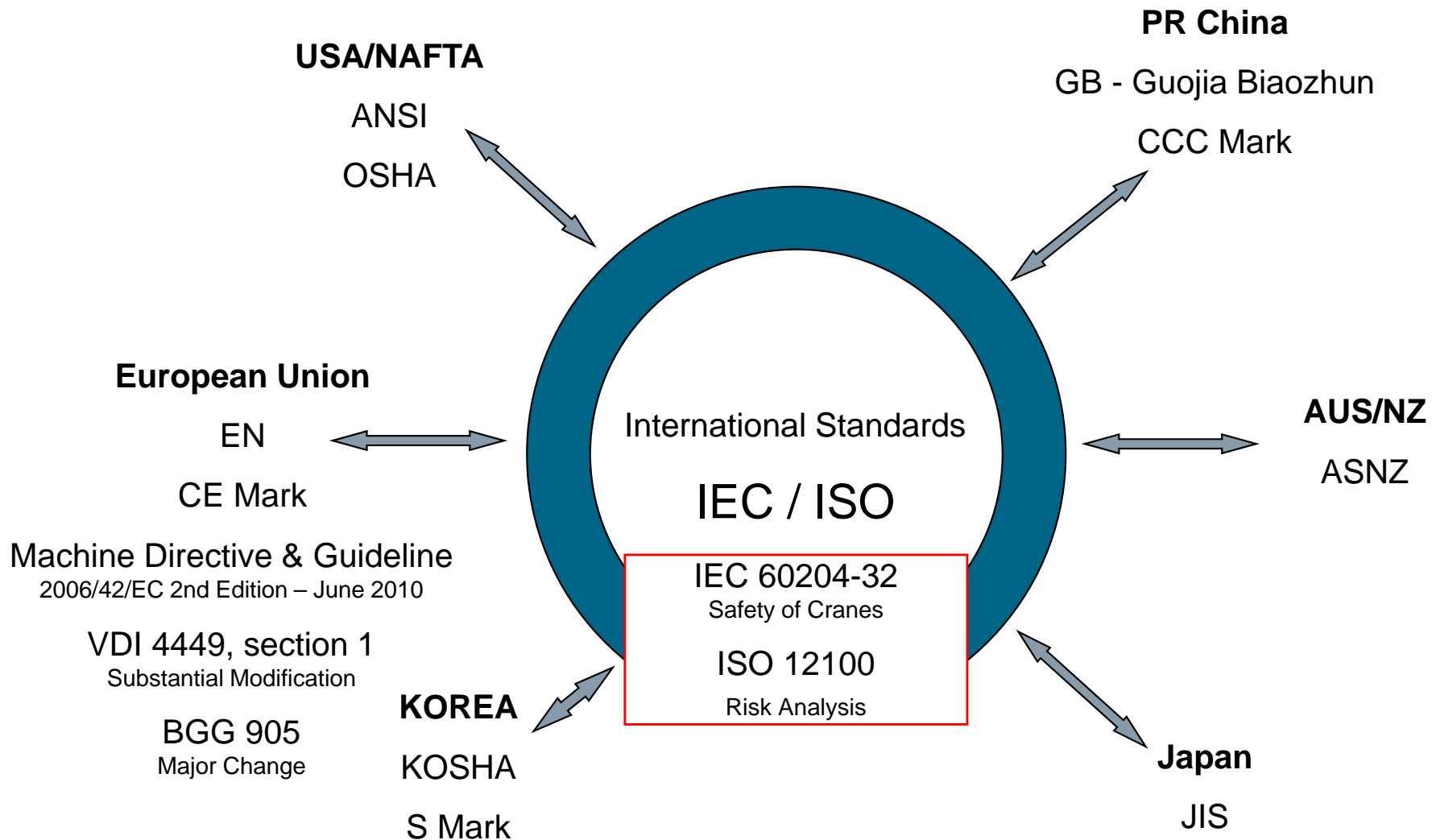
Why Modernization

- General mechanical conditions of crane: 👍
- Safety & Risk analysis 👍
- Drive spare parts: 👎
- maintenance and breakdowns: 👎
- support for older technology 👎
- energy costs 👎
- Budget for new crane investments 👎
- New technologies increase productivity 👍
- Reliability 👍



Modernization – Safety of Cranes

International Standards



Modernization Risk Analysis !



Health and Safety
Executive

HSE Update on Crane Safety in Ports

April 2011

Following a number of recent failures of lifting equipment at ports, HSE has produced a paper that deals specifically with recommendations on routine maintenance and thorough examination and testing of lifting equipment at ports.

This advice updates the information on crane safety provided to the ports sector through the Port Skills and Safety website, and to the wider industry, during 2010.

In the event of any queries, please contact **Chris Barringer** at HSE, Head of Transportation Section Christine.Barringer@hse.gsi.gov.uk

Background

Continuing HSE investigation into recent crane collapses has raised the following issues:

Following the collapse in July 2009 of the boom belonging to a Morris ship to shore container handling crane, evidence from the investigation strongly indicates the boom collapse was as a direct consequence of the failure of one of the crane's backstays due to the failure of a partial-penetration butt weld. Further details on the specific issues relating to this incident can be found in Annex 1.

The investigation of this incident, the investigation of the boom failure of a mobile crane used in harbour to load a supply vessel, and a number of other reported failures of lifting equipment such as reach stackers in ports gives rise to wider concerns about the suitability of the equipment, and the way in which it is used, examined and maintained.

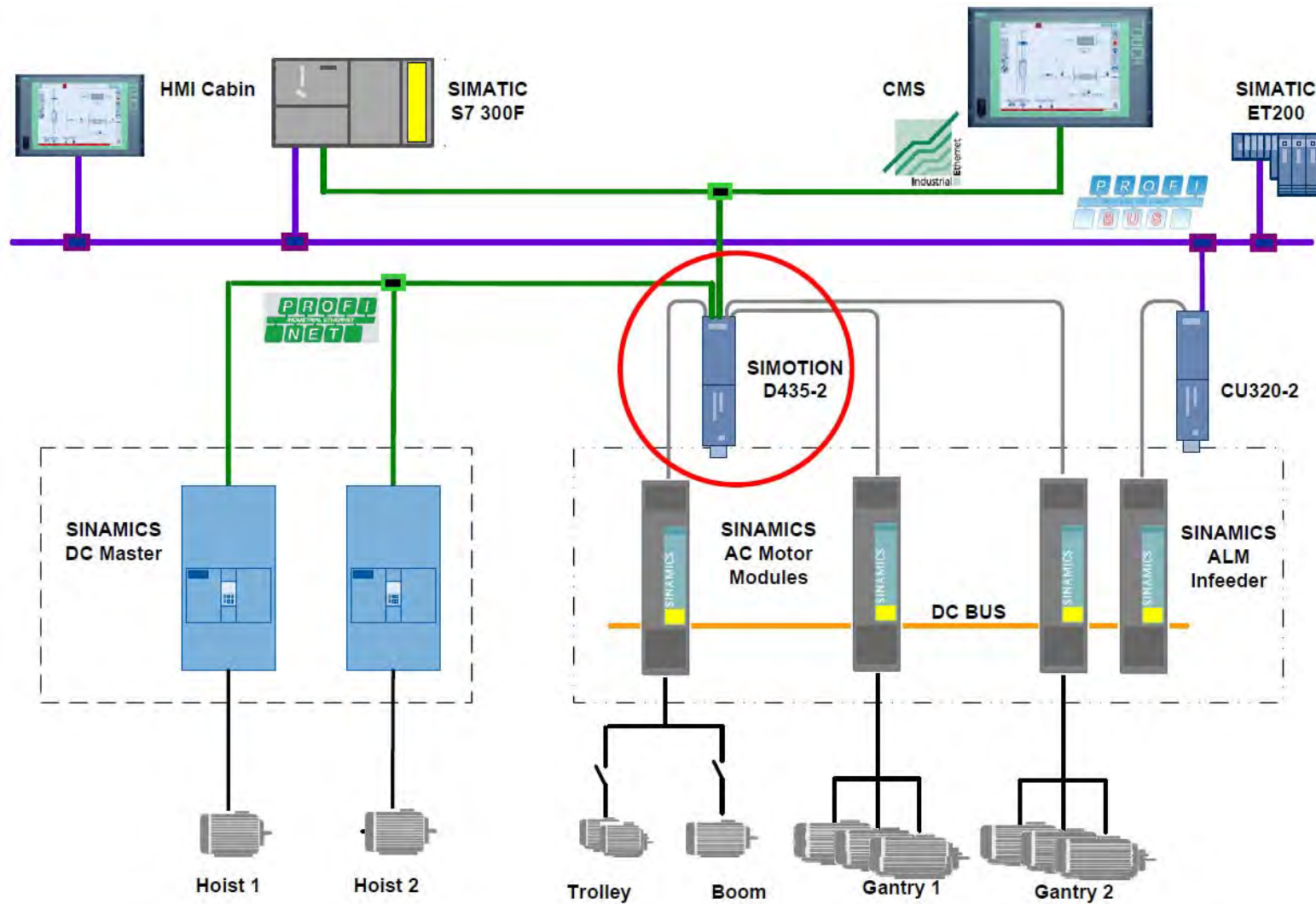
In another recent incident the boom of a mobile crane fractured and the load fell to the vessel deck. The design standard gave a design life of 25,000 lift cycles. Examination revealed extensive fatigue cracking and when the boom failed records showed that the crane had undertaken in excess of 117,000 similar lifts in the 3 years since the crane was purchased.

1. The legal framework

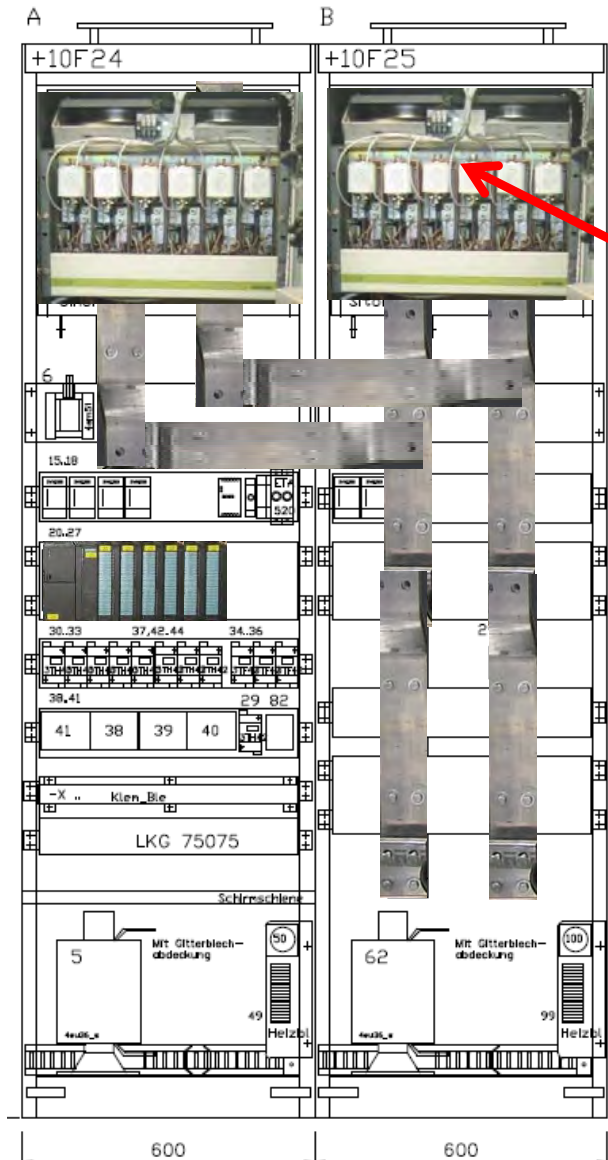
Manufacturers and suppliers of equipment have duties under the Supply of Machinery (Safety) Regulations 2008 to ensure that machinery is safe, and under the Health & Safety at Work Act Section 6 to ensure, so far as is reasonably practicable, that an article is designed and constructed to be safe and without risks to health at all times when it is being set, used, cleaned or maintained.



Change-over from old AC or DC-drive to new generation

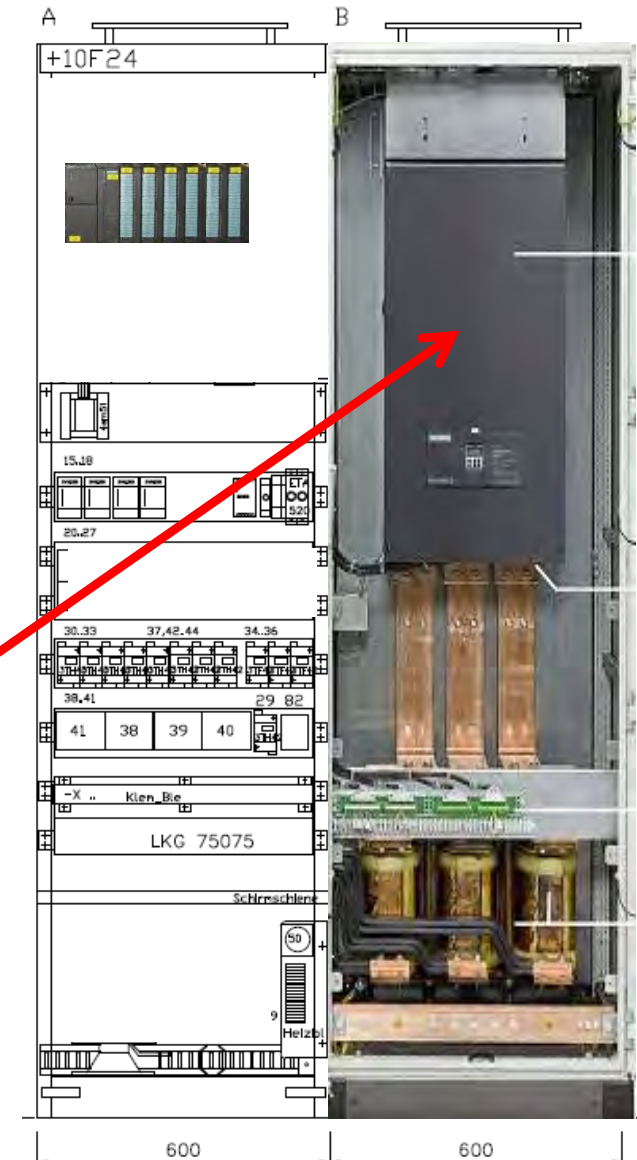


Change-over from old AC or DC-drive to new generation - example



DC-converter of old generation

DC-converter of new generation



Change-over from old AC or DC-drive to new generation - example

Former Fuji AC drive replaced by

- New SINAMICS S120
- AC-motors were retained



Customer benefits:

- Spare parts availability
- Scalable control system for future automation



Change-over from old AC or DC-drive to new generation - example

Former Fuji PLC system replaced by

- New PLC Simatic S7-300



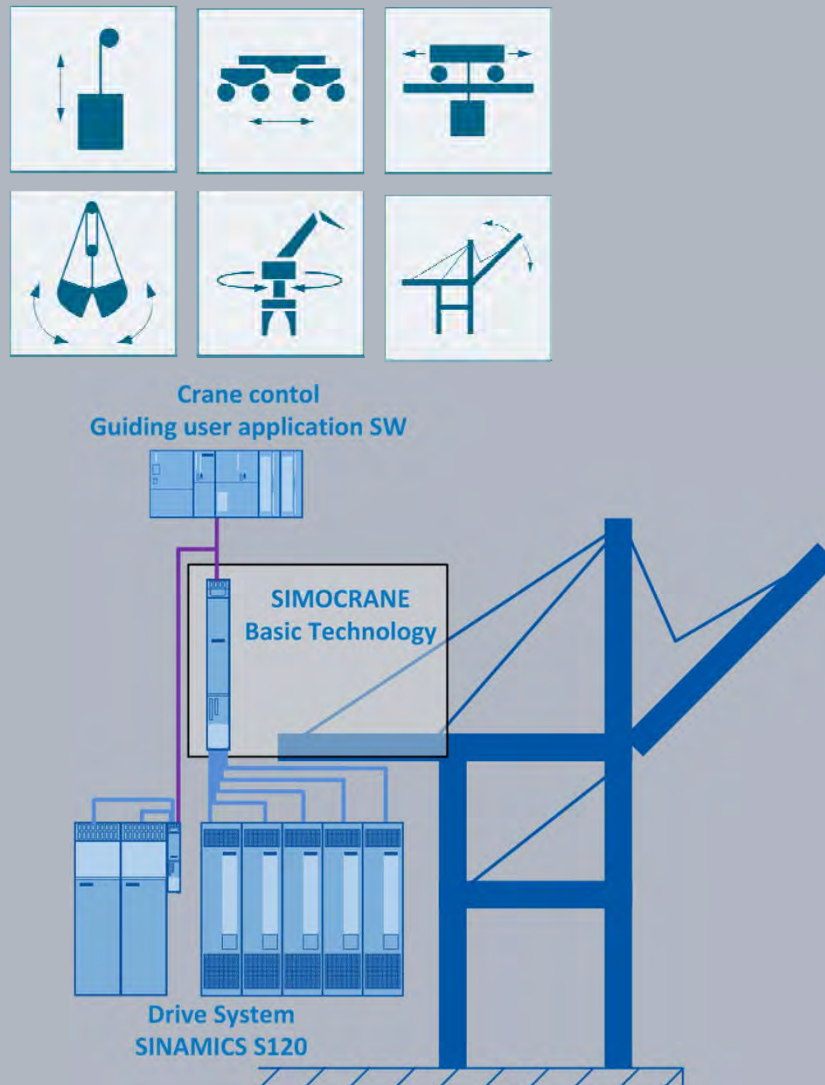
Customer benefits:

- Modular PLC system
- Spare parts availability
- Scalable control system for future automation



SIMOCRANE – Technology Software

Basic Technology

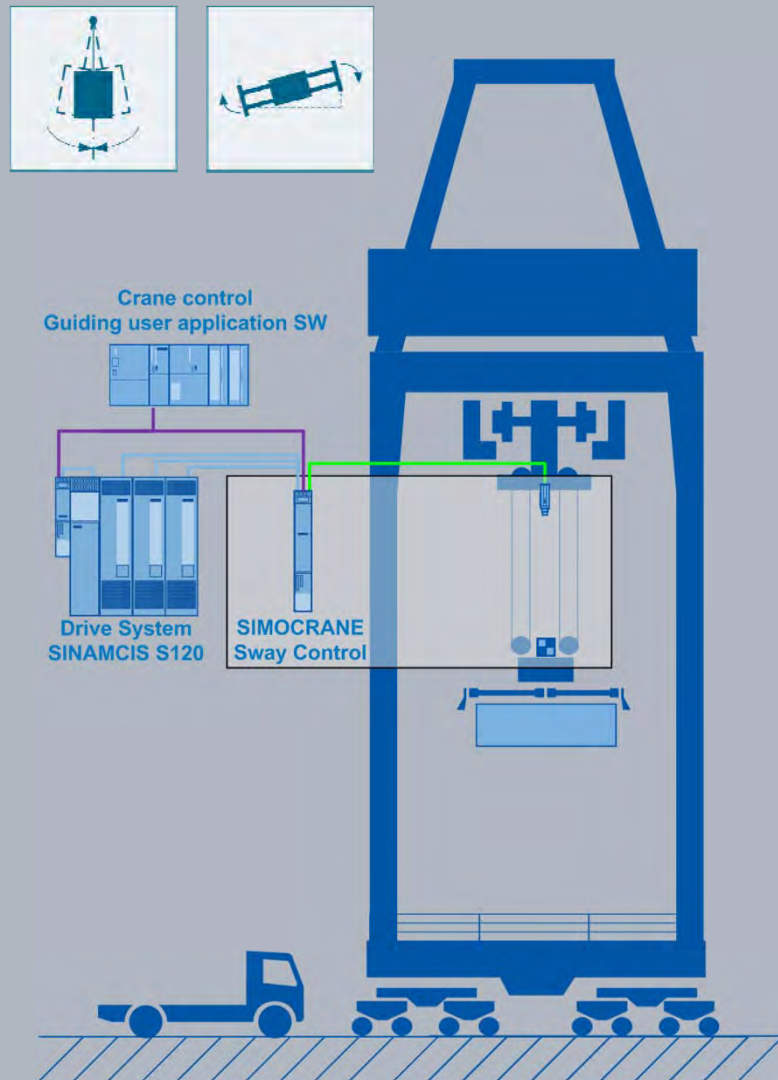


Functions with SIMOTION D435-2

- Load-depend field weakening
- Start pulse
- Slack rope control
- Tandem mode
- Monitoring functions
- Synchronous operation
- positioning

SIMOCRANE – Technology Software

Advanced Technology – Sway Control

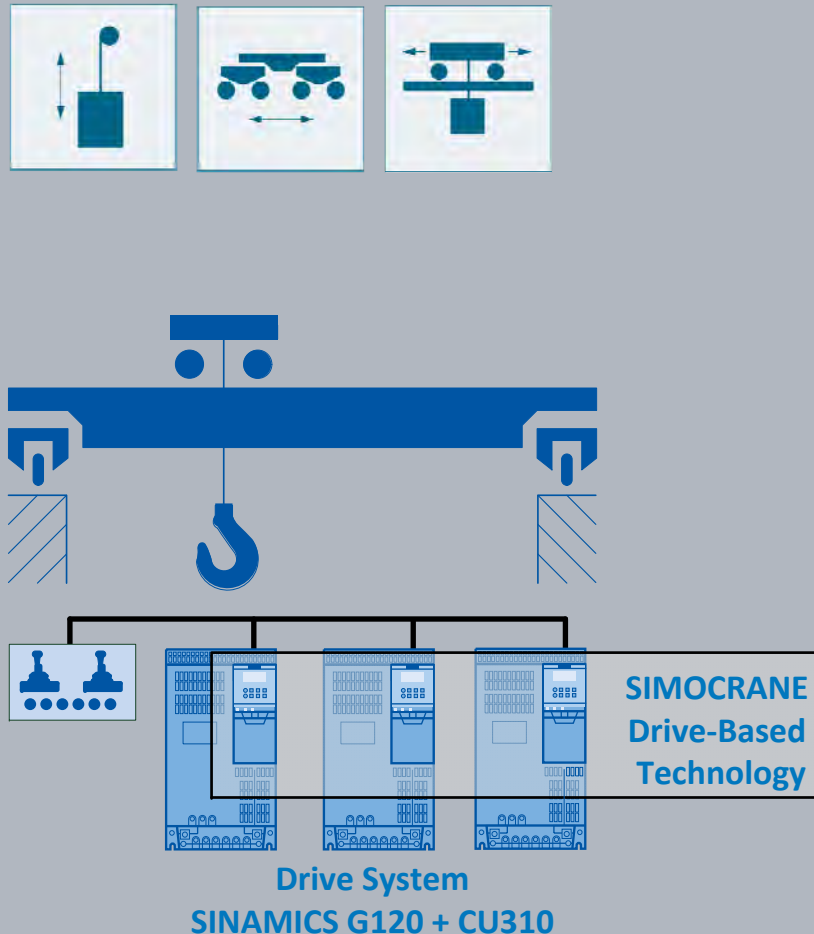


Functions:

- Control of the load swaying
- Positioning of the load
- Automatic crane operation
- Trim, list and skew control
- Skew damping

SIMOCRANE – Technology Software

Drive-based



Functions:

- Load-dependent field weakening
- Pre-limit switch
- Start pulse
- Time-optimized positioning
- Master-slave closed-loop torque control
- Monitoring for over-speed and current distribution
- Master switch
- Brake control
- Safety Integrated

Benefits: Functions are integrated in drive controller

SIMOCRANE CMS Basic package

Crane Management System - STS



- Crane located multi-terminal CMS station
- Industrial SIEMENS Rack- PC & Touch-Panel PC
- Crane driver information & operation (cabin)
- Service and maintenance assistance (E-House)

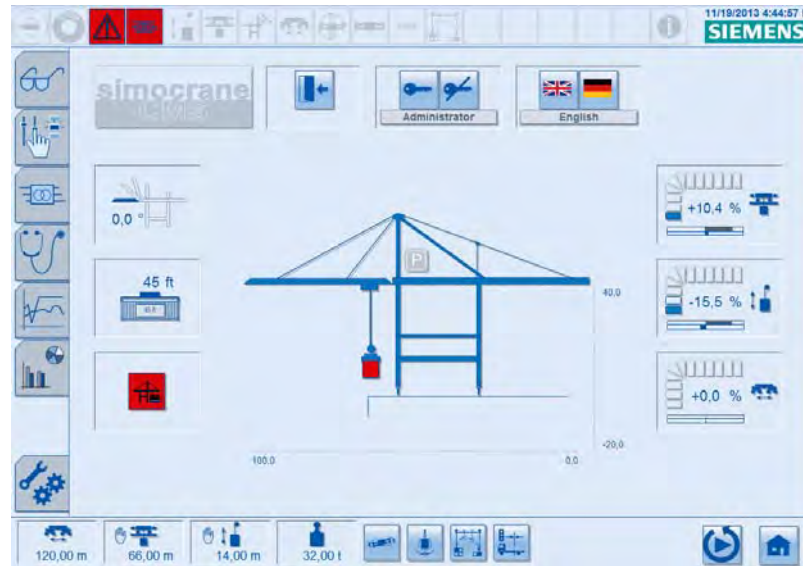
SIMOCRANE CMS Lean package

Crane Management System – RTG/RMG

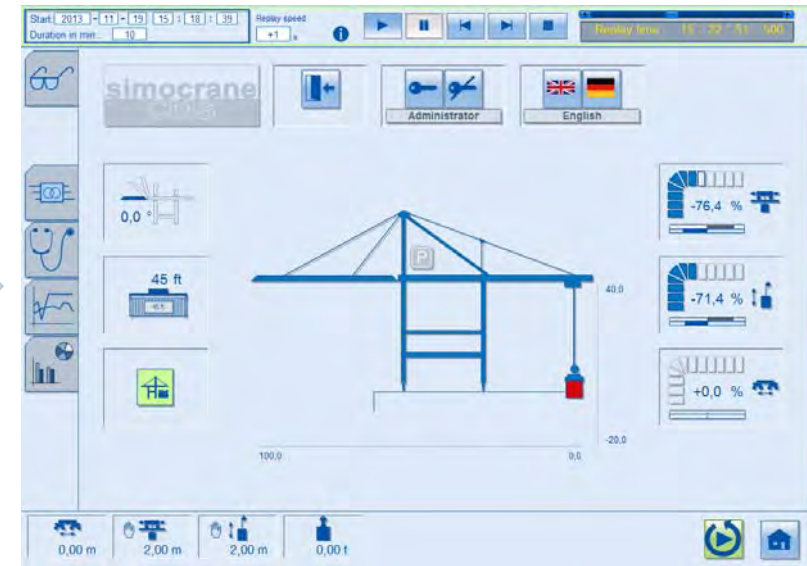
- Industrial SIEMENS Rack-PC
- Service and maintenance assistance (E-House)
- Crane located CMS station with MultiWebClient for remote access and remote control

SIMOCRANE CMS Replay Function (Playback)

Normal mode (normal operation)



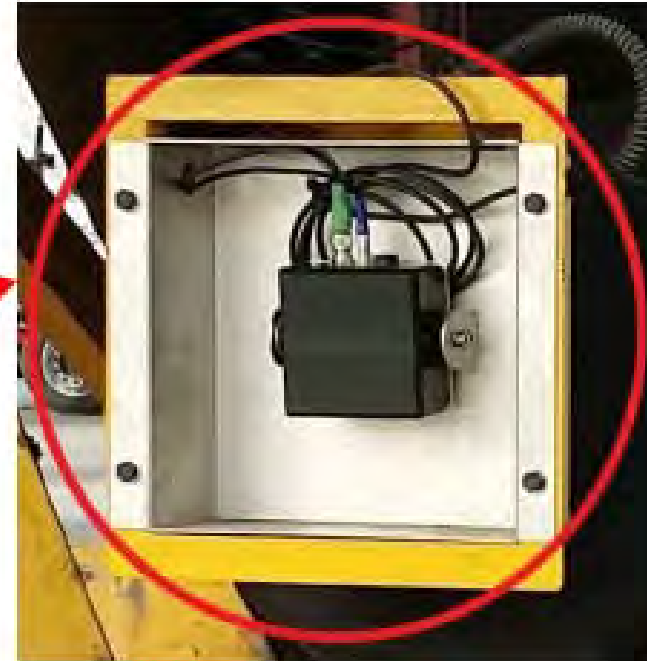
Replay mode



Replay Controller



Anti-collision Crane to obstacle



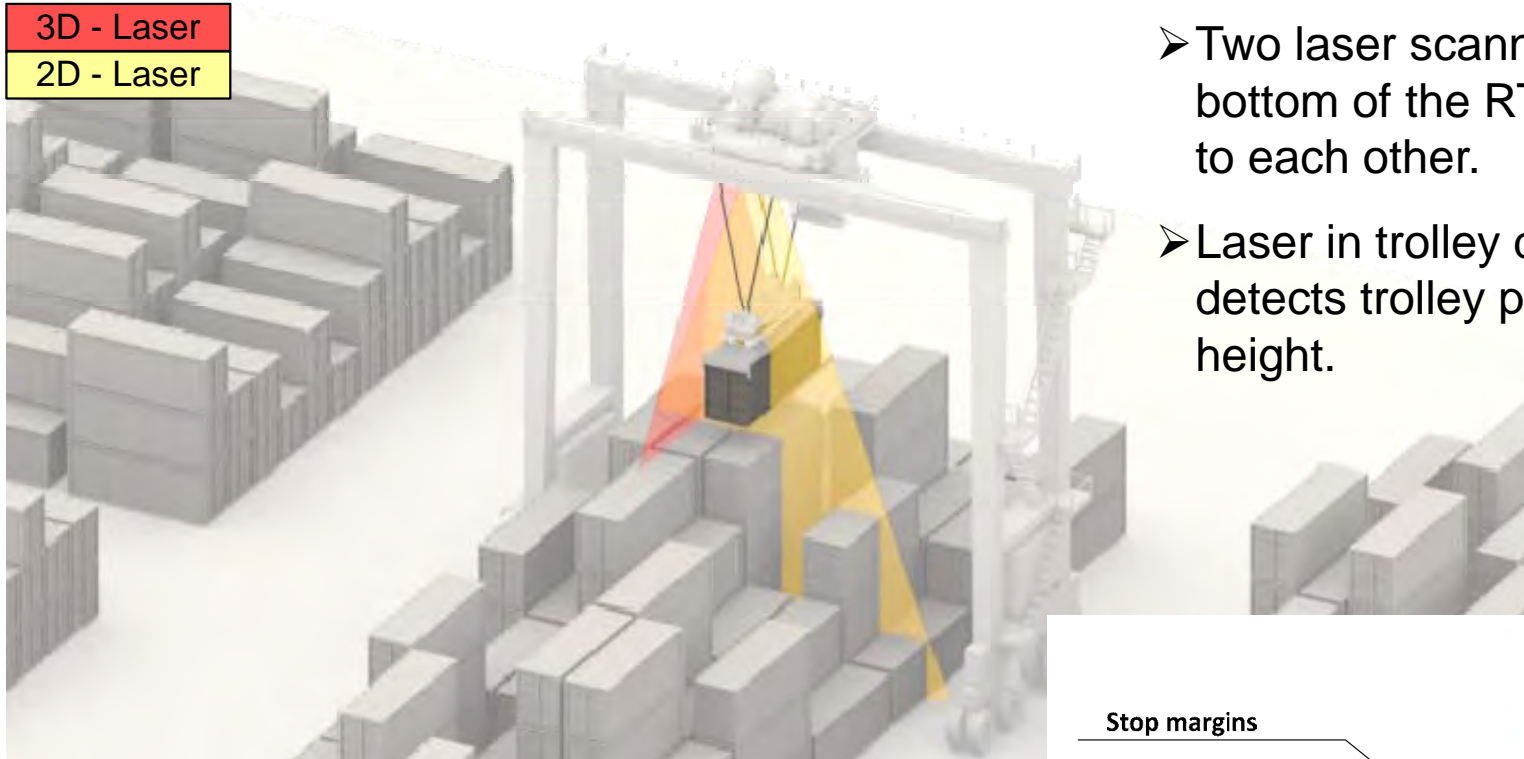
- Radar based system
- Robust and immune against dust and dirt
- Sensitivity adjustable

Anti-collision Crane to Crane



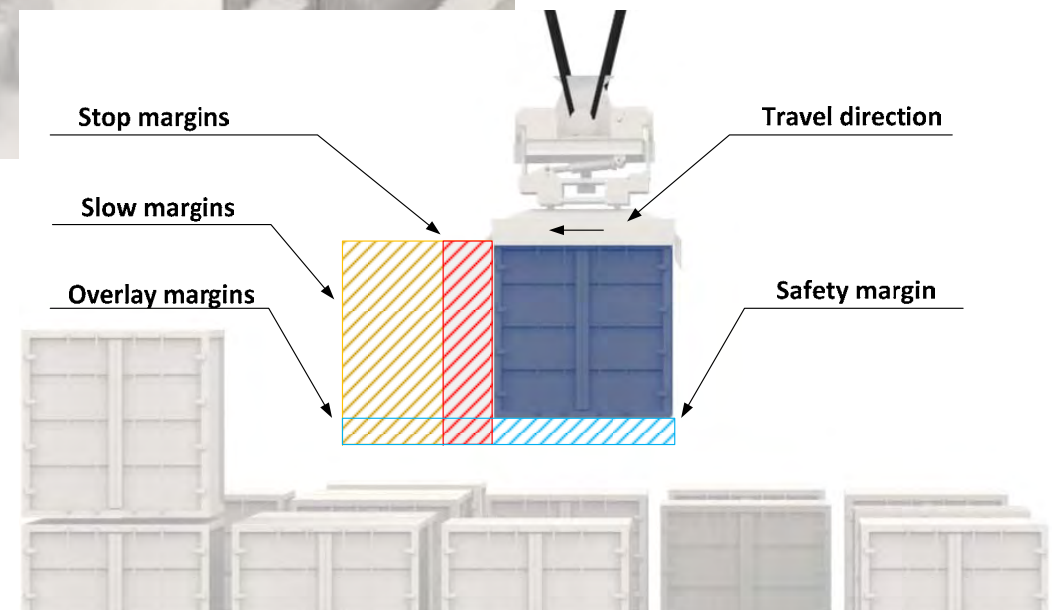
- Radar based system
- Robust and immune against dust and dirt
- Sensitivity adjustable

Load Collision Prevention System (LCPS)



- Two laser scanners are installed on the bottom of the RTG trolley with 90° offset to each other.
- Laser in trolley direction (yellow beam) detects trolley position and spreader height.

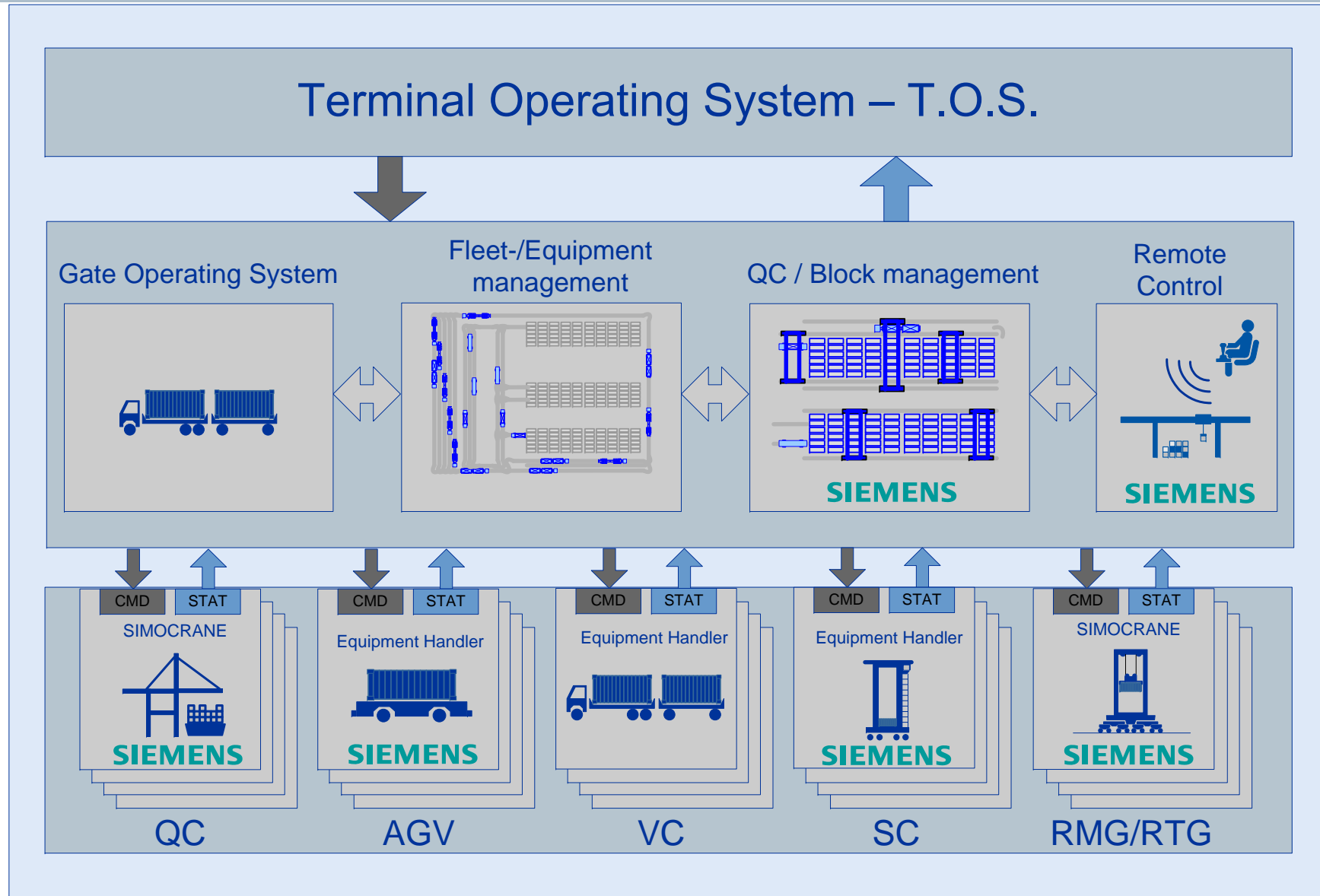
- A speed depending safety box will detect timely slowdown and stop.
- Sway and terminal pavement slope is considered in detection and control.



Why automation ?

- Relief of operator from monotonous tasks
- Increase of health and safety
- Increase of availability of STS/ARMG
- High transparency of all operations
- Reduction in energy costs
- Predictive maintenance through “Big Data” analytics
- High productivity and efficiency of whole terminal

Terminal automation



Terminal automation System definition

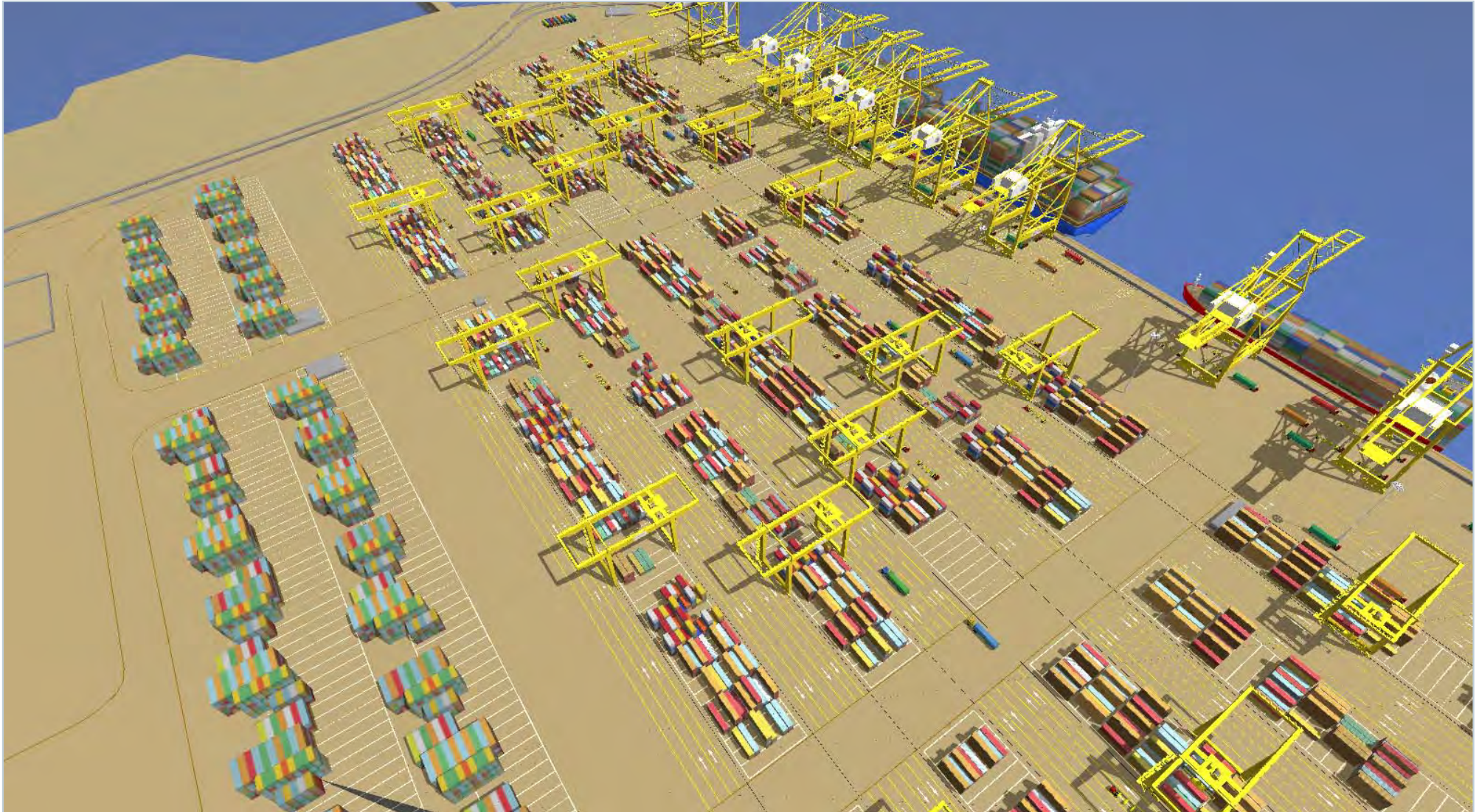
Siemens Scope

- BMS – Block Management System
- QC-MS – Quay Crane Management System
- BCS – Block Control System
- RCOS – Remote Control Operation System
- (Semi) Automated Cranes

Delivery third parties

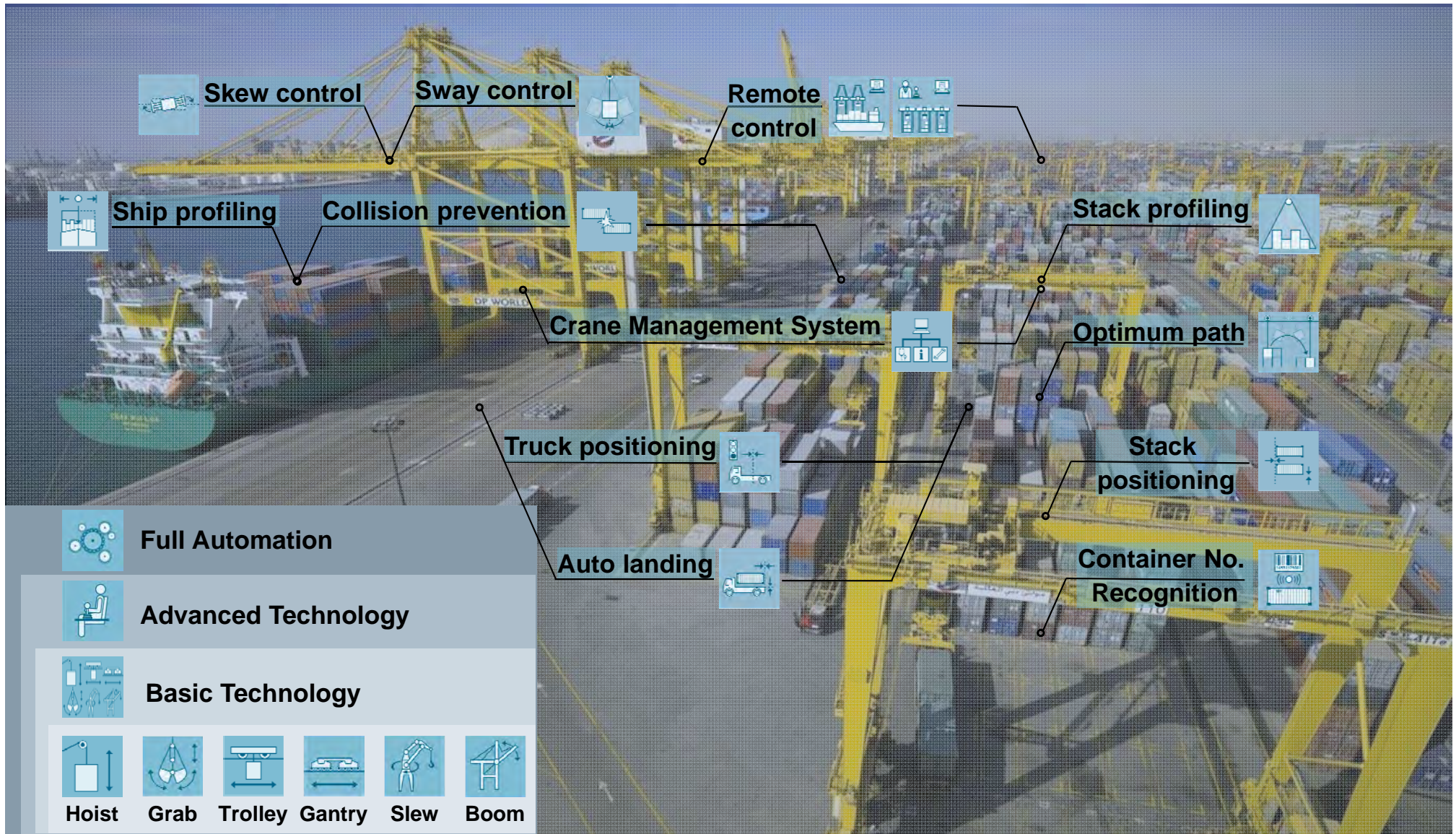
- TOS – Terminal Operation System
- GOS – Gate operation System
- Driver Kiosk
- ECS - Equipment Control System
(TEMS – Terminal Equipment management System)

Terminal automation PortView



SIMOCRANE

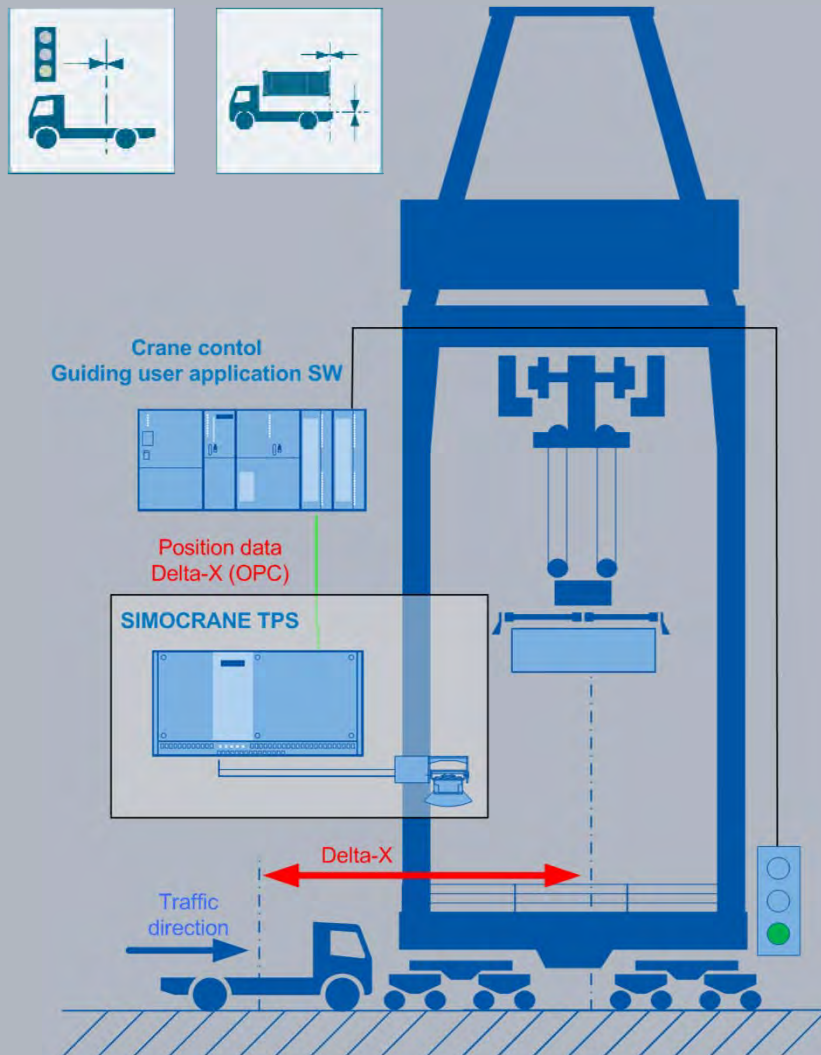
Fully modular automation solution for terminals



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SIMOCRANE

Truck Positioning System

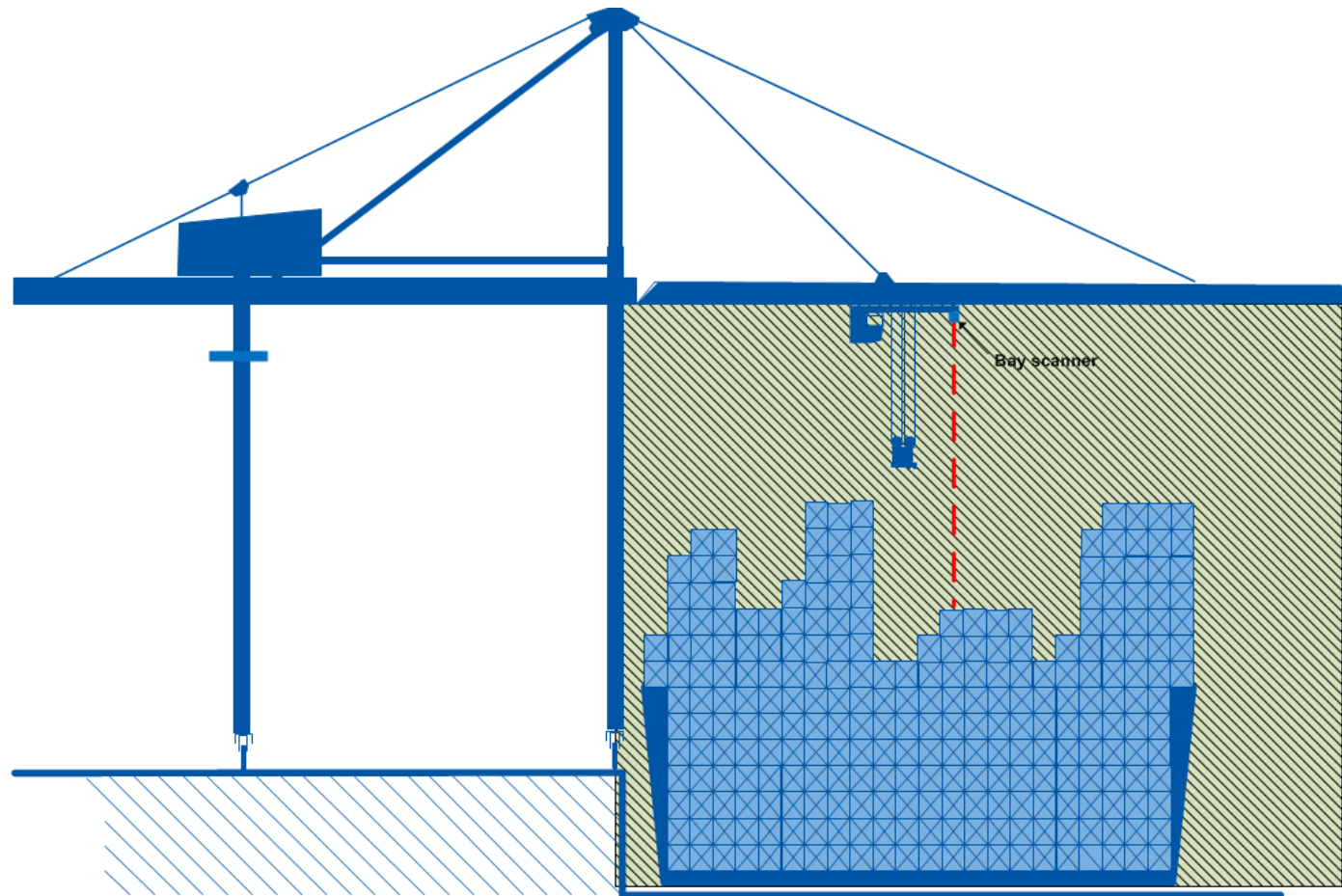


Functions:

- Scanning working lanes (max. 2)
- Recognize parameterized objects
- Provide high precision position data of parameterized objects in 2D and 3D.
- Automatic system calibration

SIMOCRANE

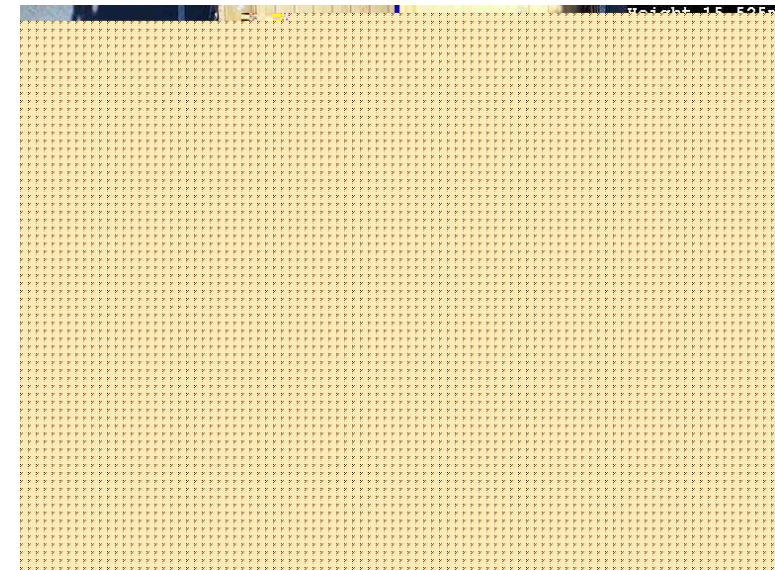
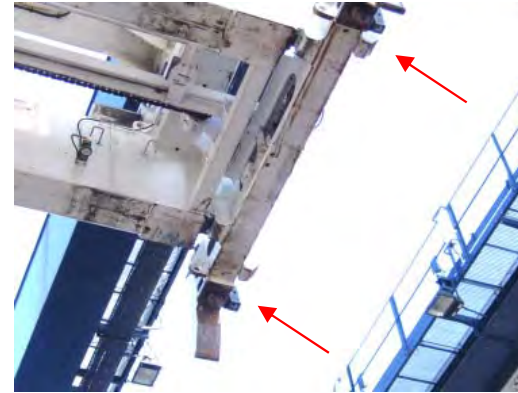
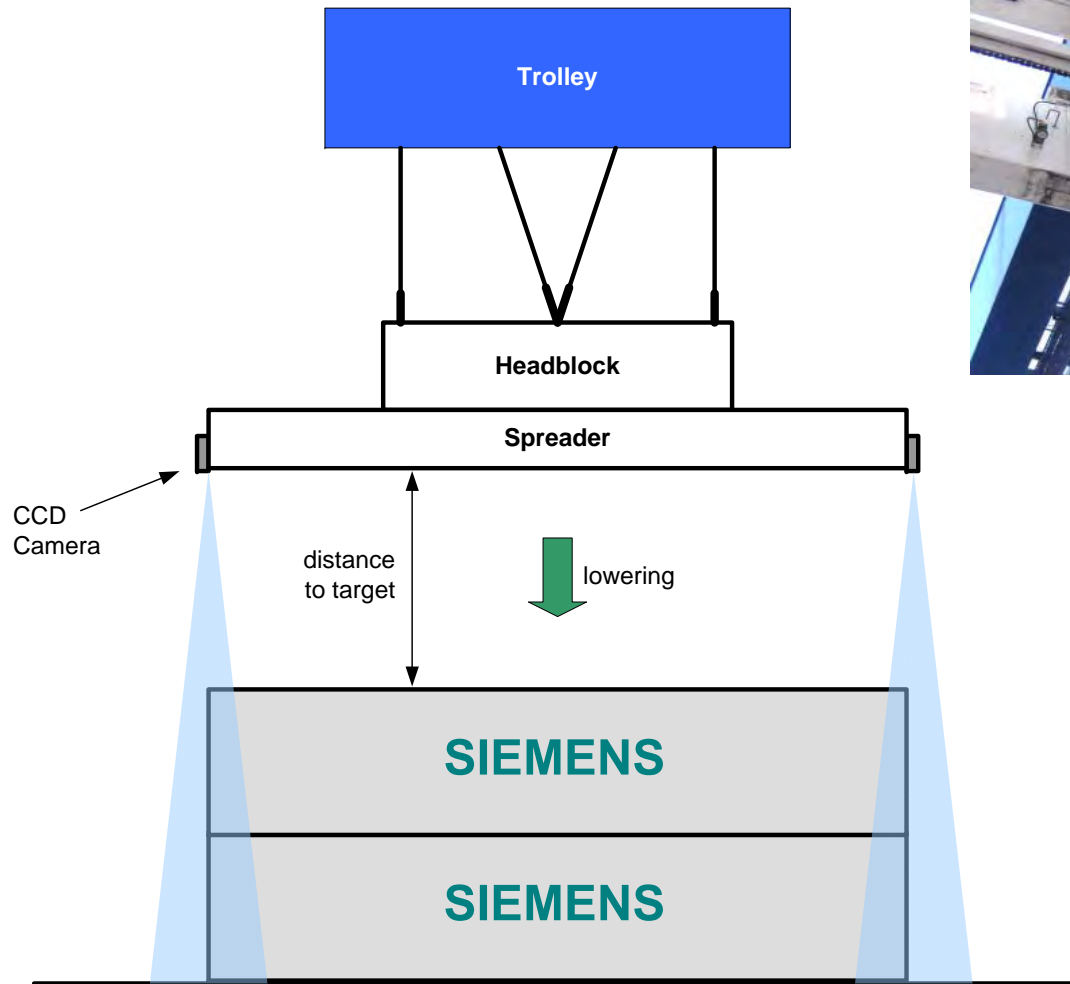
Bay scanner function



Functions:

Based on the scanned hoist height, this function is used to define permanently the container stack on the water side

Yard Crane Automation Intelligent Spreader



Spreader auto landing function

Remote Control of STS



Siemens' main focus is on safety:

- ✓ Camera positions according customer's processes
- ✓ Automated tracking of spreader
- ✓ Automated zoom into vessel
- ✓ Improved vision on stacker platform
- ✓ **Siemens' RCOS matches productivity of local control !**

Thank you for your attention!



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