# Improved Inland Rail Transport Through New Concepts for Intermodal Hubs

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**TOC Europe**
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GOTTWALD port technology

# Economic Drivers for Improved Inland Transport

**The key objectives to be achieved by innovative concepts are …**

- **Increased utilisation of rolling stock & barges, which means**
  - Less standstill of the trains through more productive moves for loading / unloading trains
  - Higher throughput of trains in the peak time of terminal operation
  - Similar objectives for barge terminals as for the rail terminals

- ***´…. The main objective of inland terminals should be to keep the trains rolling and not to be a bottleneck in the train schedules….´***

- **Increase of productivity of the interchange between rail, road and waterway transport**
  - Determine total duration of transport
  - Crucial for the economics of the street logistics

- ***´…. Intermodal terminals need to provide the infrastructure to support the interchange between the different transport modes as well as they can ….´***

- **Inland terminals need to be designed for an integrated approach to loading / unloading trains / barges, but also for storing and managing containers as well as handling empty containers**
  - Sufficient storage capacity is a pre-requisite for higher productivity

# Applications of Gottwald's Products

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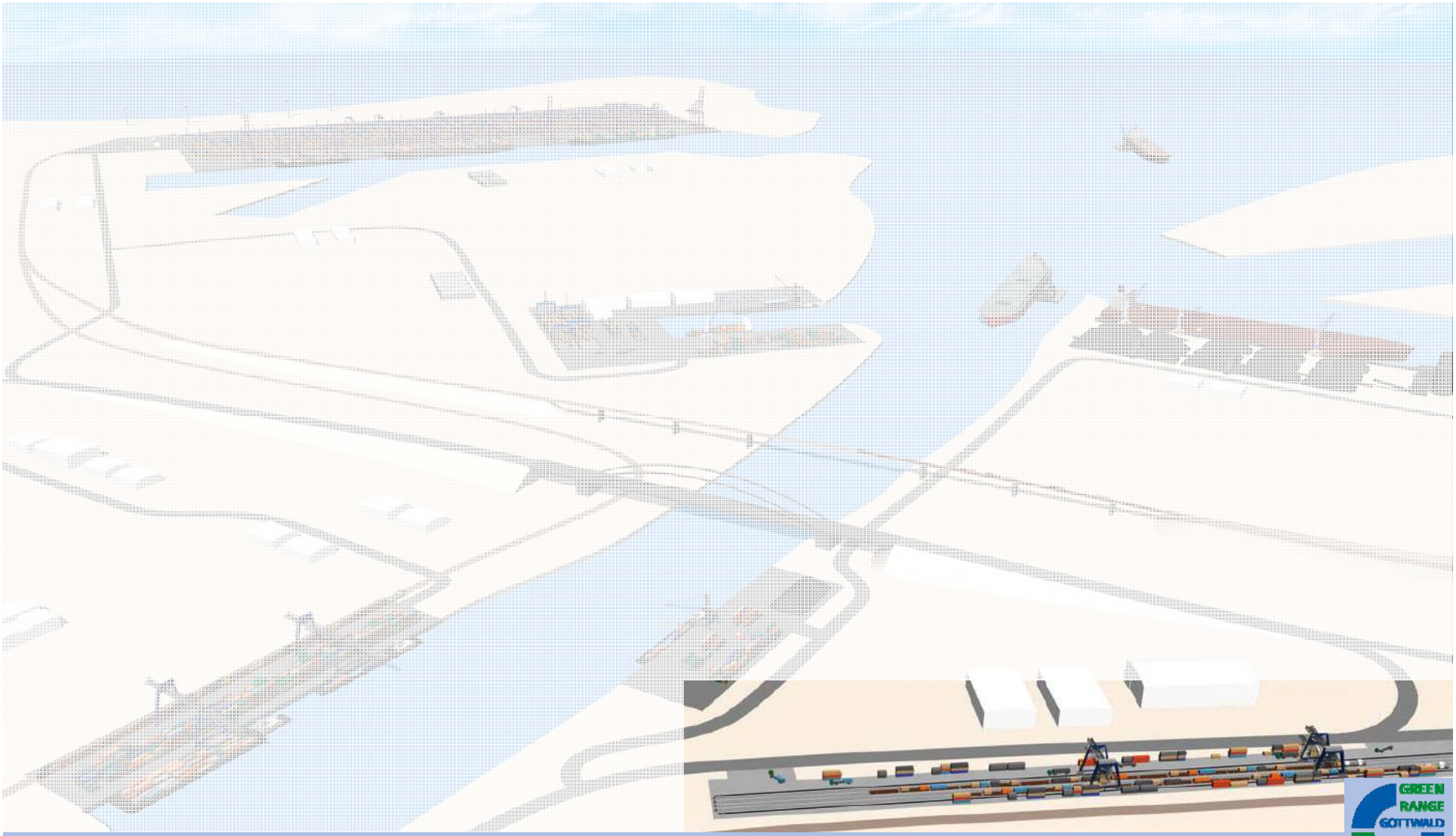


# Drivers for Innovative Rail Terminal Operations

- **Improved service for connecting modes**
  - short train turn around times (≤ 2-3 hours) allow better scheduling of trains
  - Higher performance regarding interfacing road and rail
- **Returns on Investment**
  - Flexible terminal layout design including
  - Scalability for different terminal scenarios enable capability to expand in line with increased volume
  - High area utilisation
- **Reduction of Operating Costs**
  - Increased degree of automation allow to reduce labour costs
  - Less shunting Operation
- **Network Optimization across the various terminals (e.g. shuttle services and express trains) offer potentials for improvement of rail operations**

# Dedicated Functionalities in Maritime Terminals
# Focus on Service and Productivity

**Service and productivity increase from dedicated functionalities**

| Type 1 | Type 2 | Type 3 |
|---|---|---|
| waterside | waterside | waterside |
| | interchange | interchange |
| transport | interchange | interchange |
| | transport | transport |
| storage | | interchange |
| landside | storage | interchange |
| | landside | storage |
| | | landside |
| 1 system type | 2 systems type | 3 systems type |

# Intermodal Terminals – Status Quo

**Type 1**

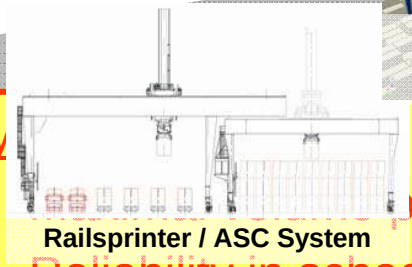


**Type 2**

**Type ?**

**Automated Solutions allow high productivity and low operating costs at higher volumes**

# Demands on Intermodal Terminals – Volume Growth and Cost Control Supports Automation


Degree of Automation

System Performance

Sy defined as
- possible &
- Reliability in scheduling the trains

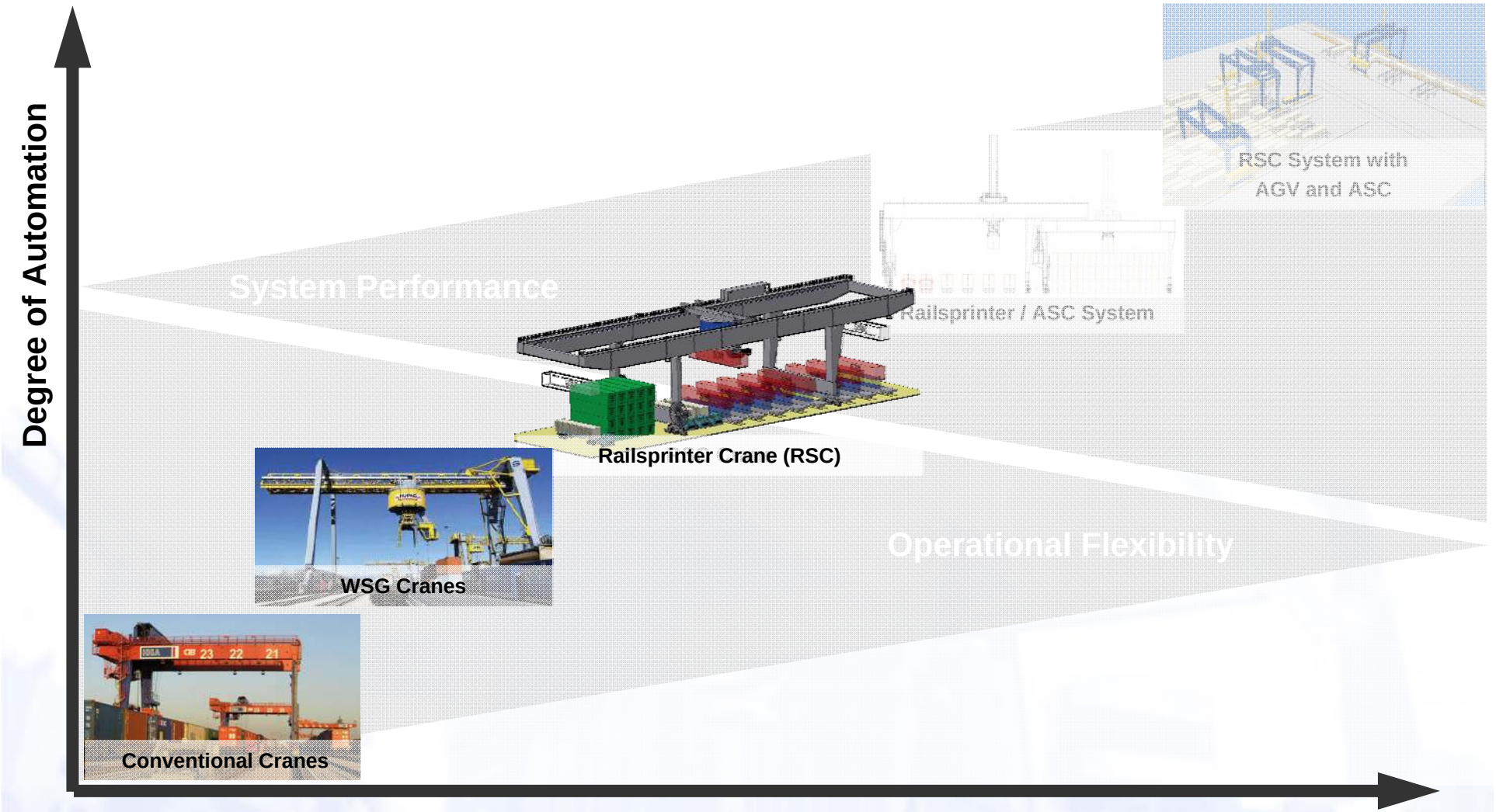
C)

Volume complexity requires
- Higher degree of planning efforts (respective IT solutions)
- Specialization regarding loading units

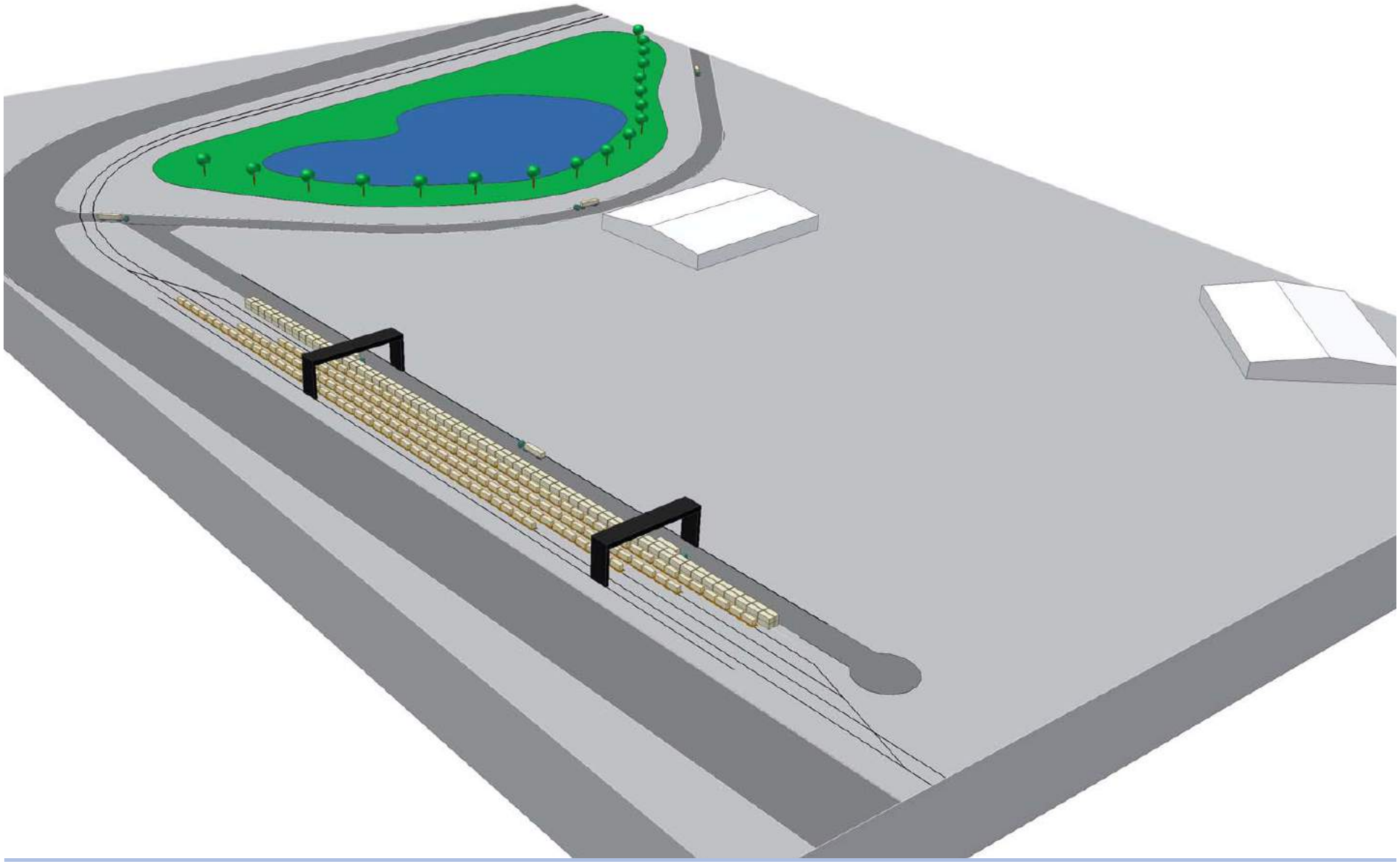
Operational Flexibility


Volume Growth

# Type 1 Terminals
# Equipped with Cranes by Gottwald

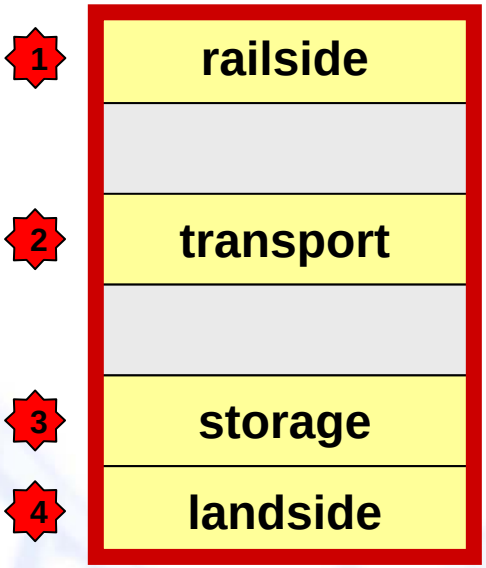


# Type 1 Terminal

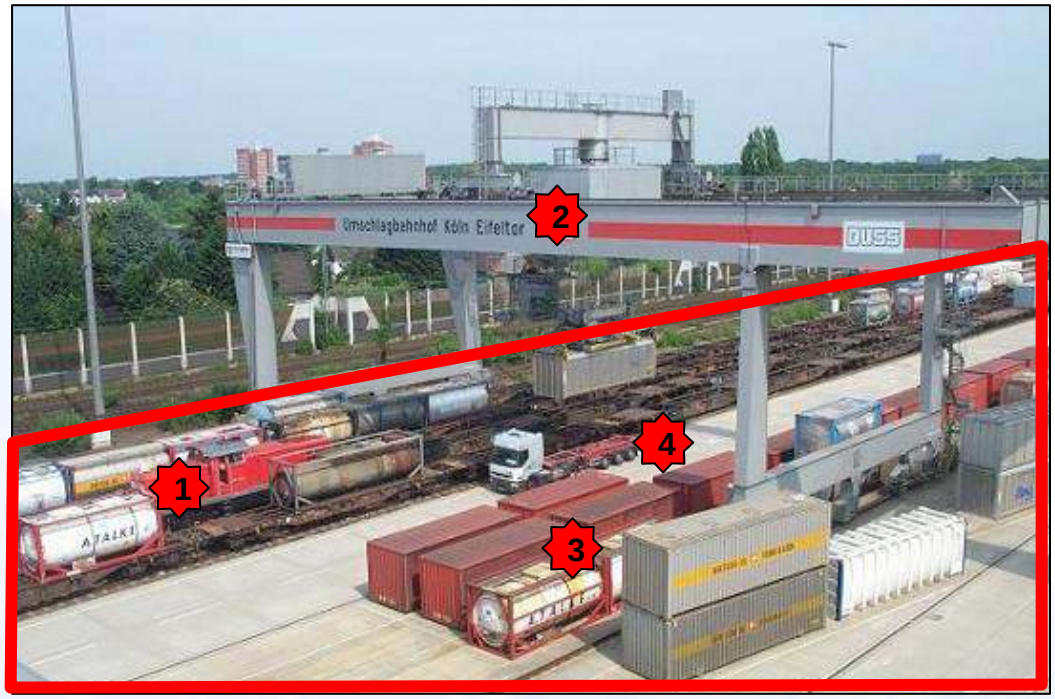


# Existing Railway Terminals Compared with Type 1 Maritime Terminals

**Type 1**



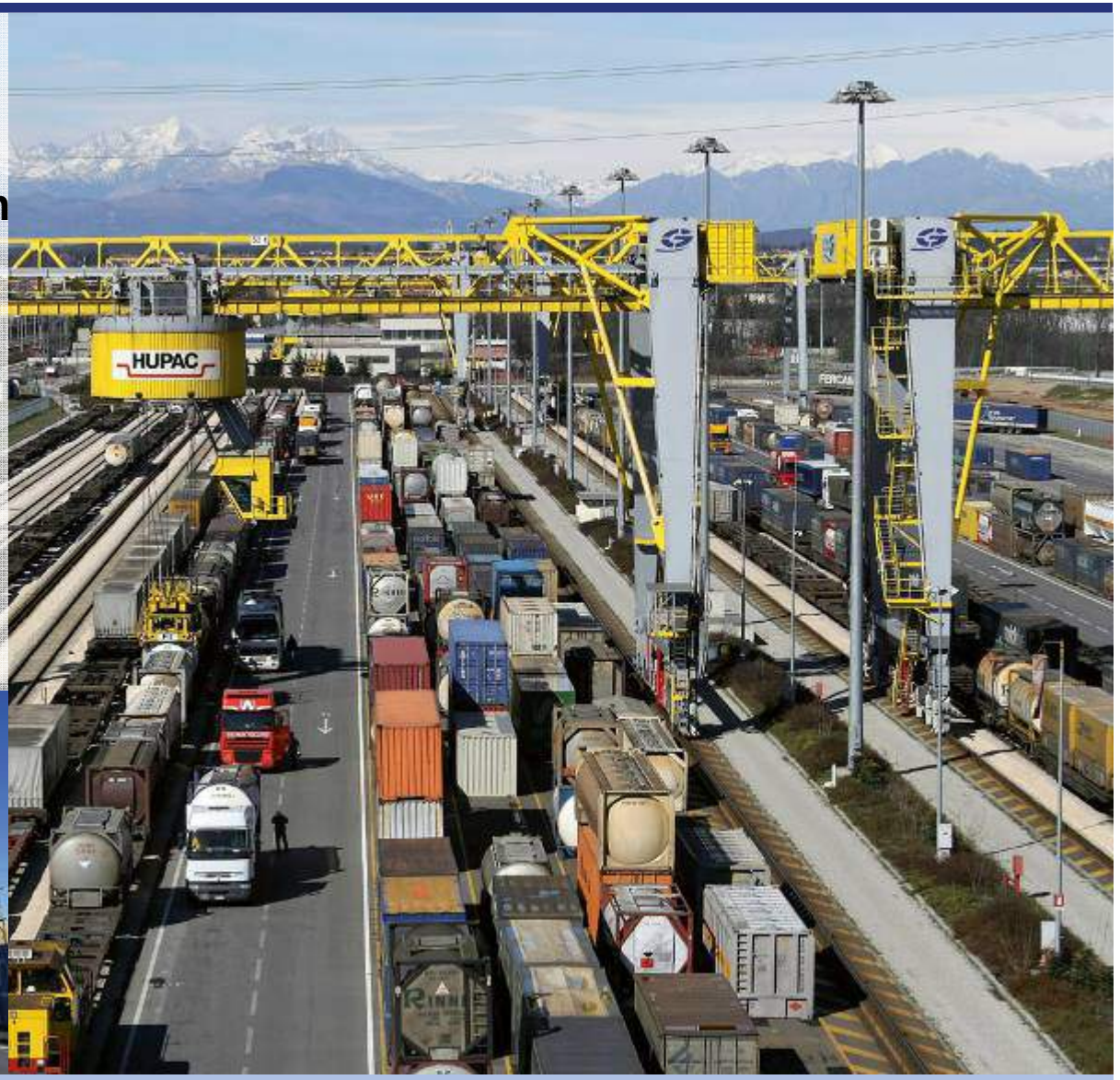

**1 system type (1 crane)**



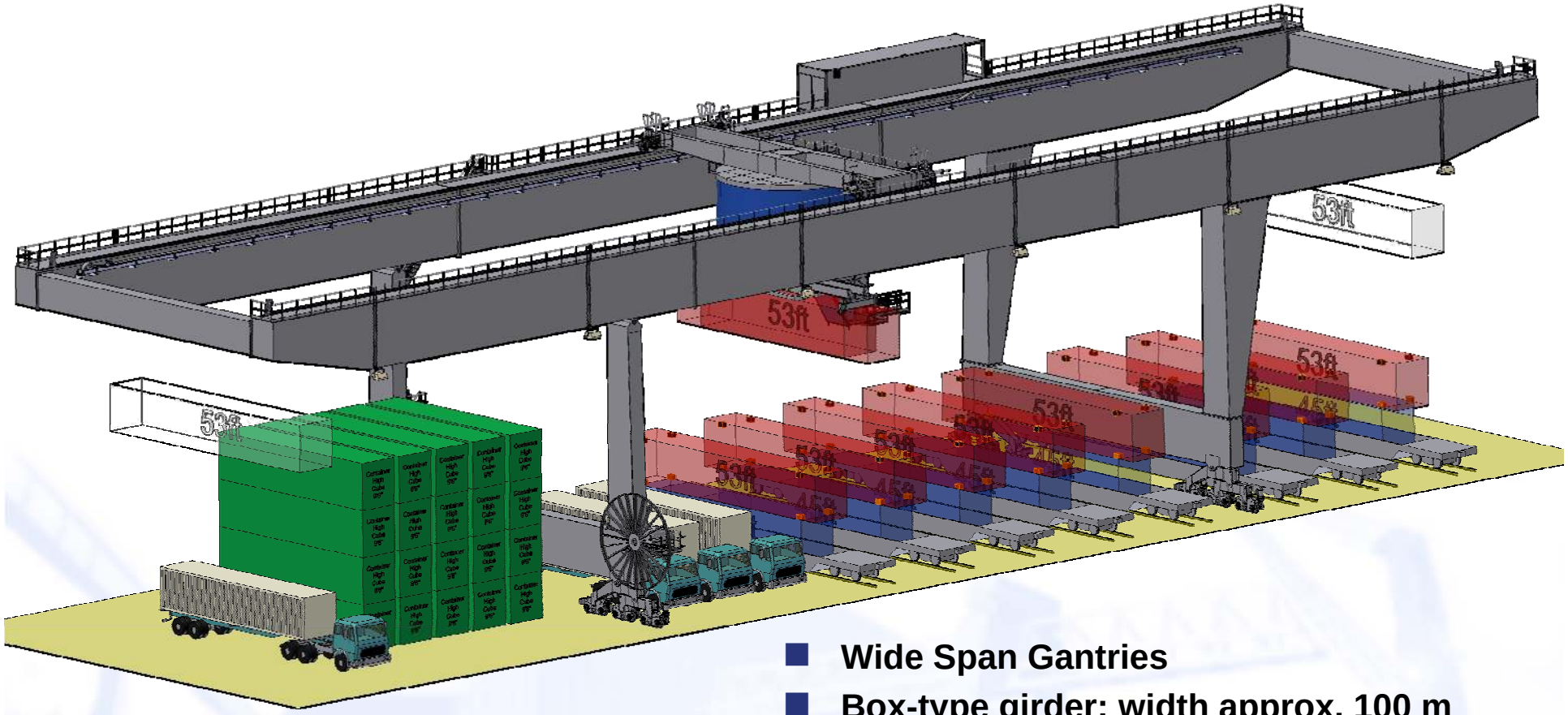

- 4 Wide Span Gantries at CTB, Hamburg
- Built by KSR (Demag Cranes)
- Manual cranes
- Very low degree of automation

# Rail Terminals for Combined Traffic
# Gottwald Cranes at HUPAC

- 6 Wide Span Gantries
- HUPAC, Gallarate, Italy
- Semi-automated operation
- Transhipment of containers from road to rail and vice versa



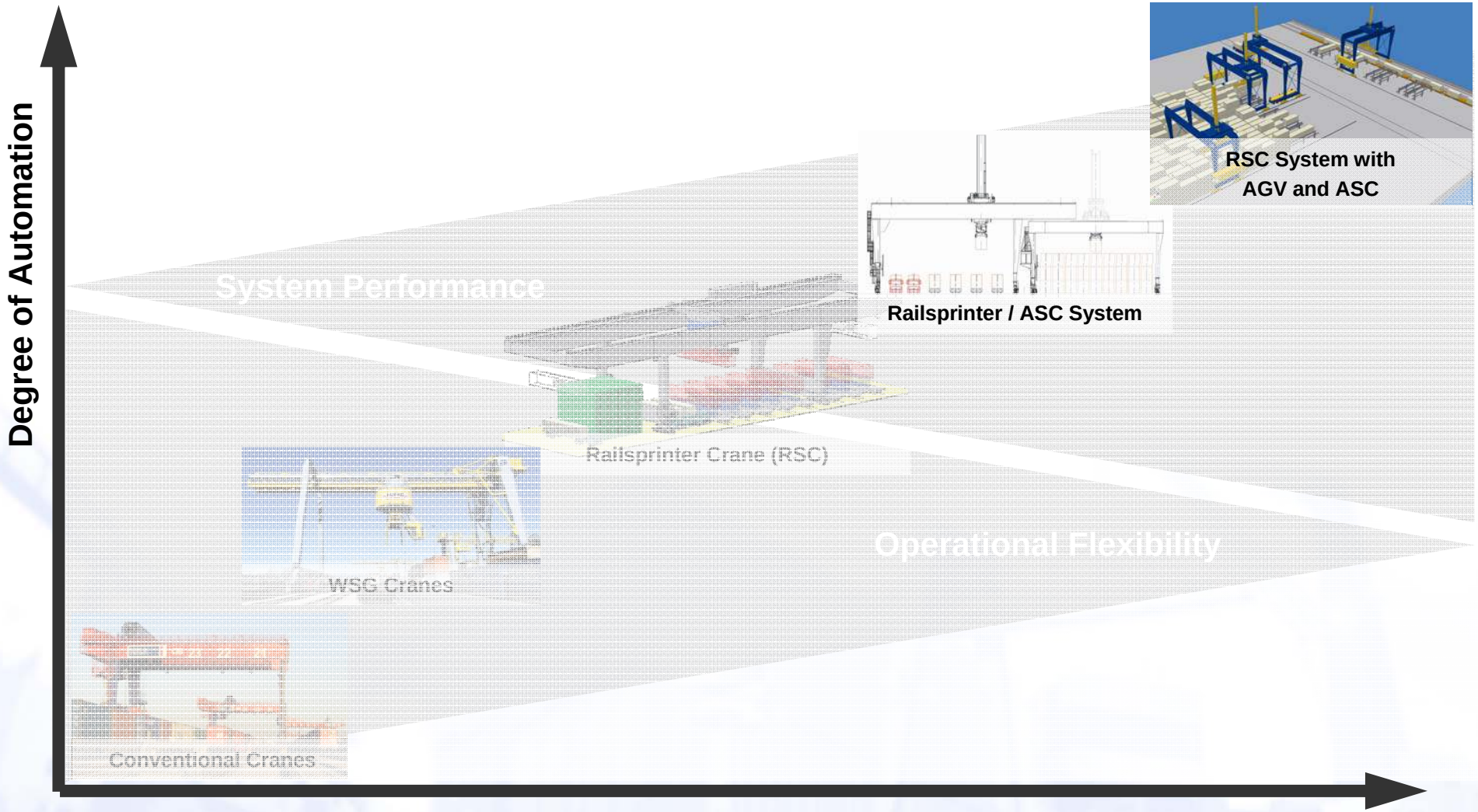

# Large Size Wide Span Gantries




- Wide Span Gantries
- Box-type girder: width approx. 100 m
- Semi-automated operation
- Span: 46 m, Height: 23 m
- 8 rail tracks, 4 truck lanes under portal and cantilever

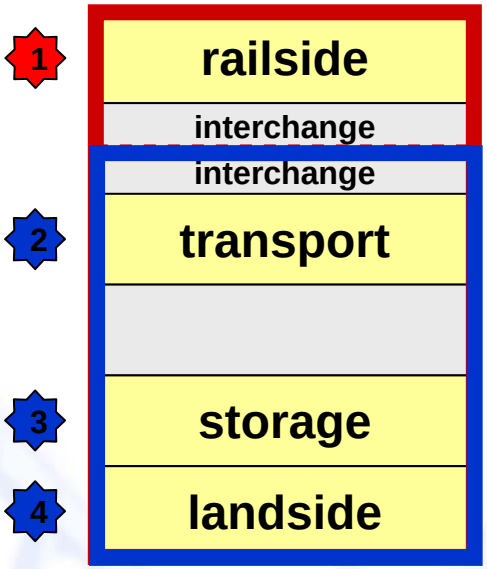
# Flexible Design of Type 1 Terminal with Manual Horizontal Transport

# Type 2 Terminals
# Equipped with Cranes by Gottwald

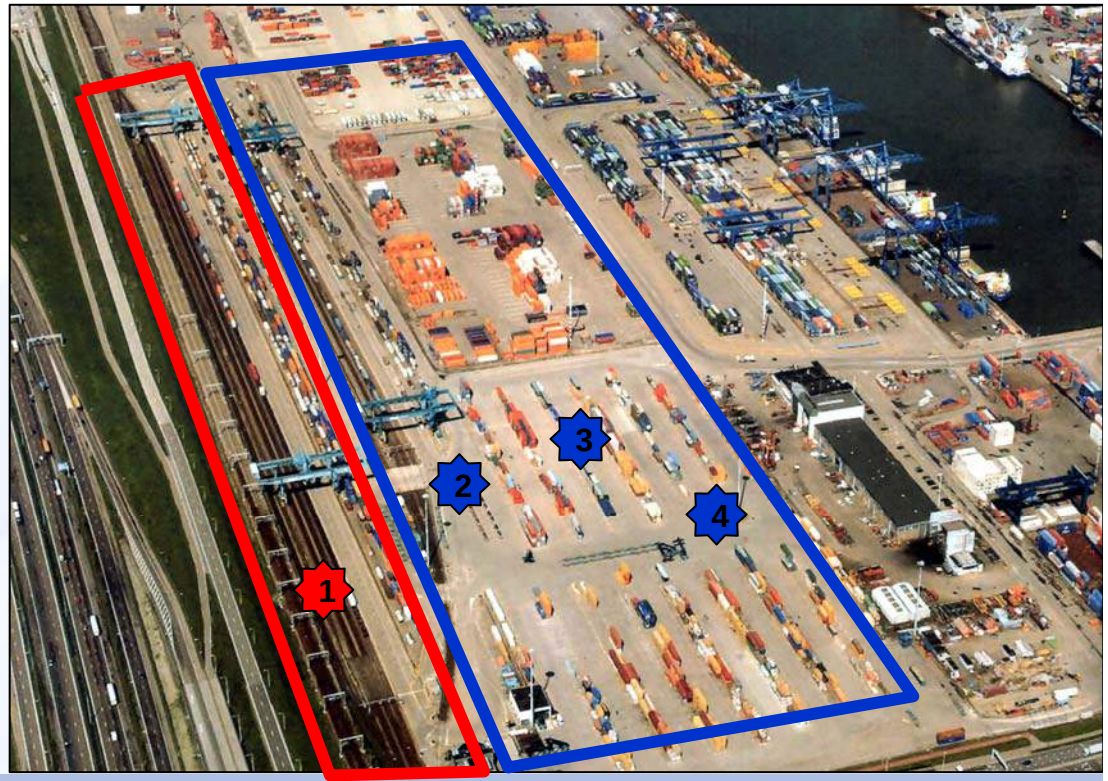


# Type 2 Terminal – a More Modern Approach

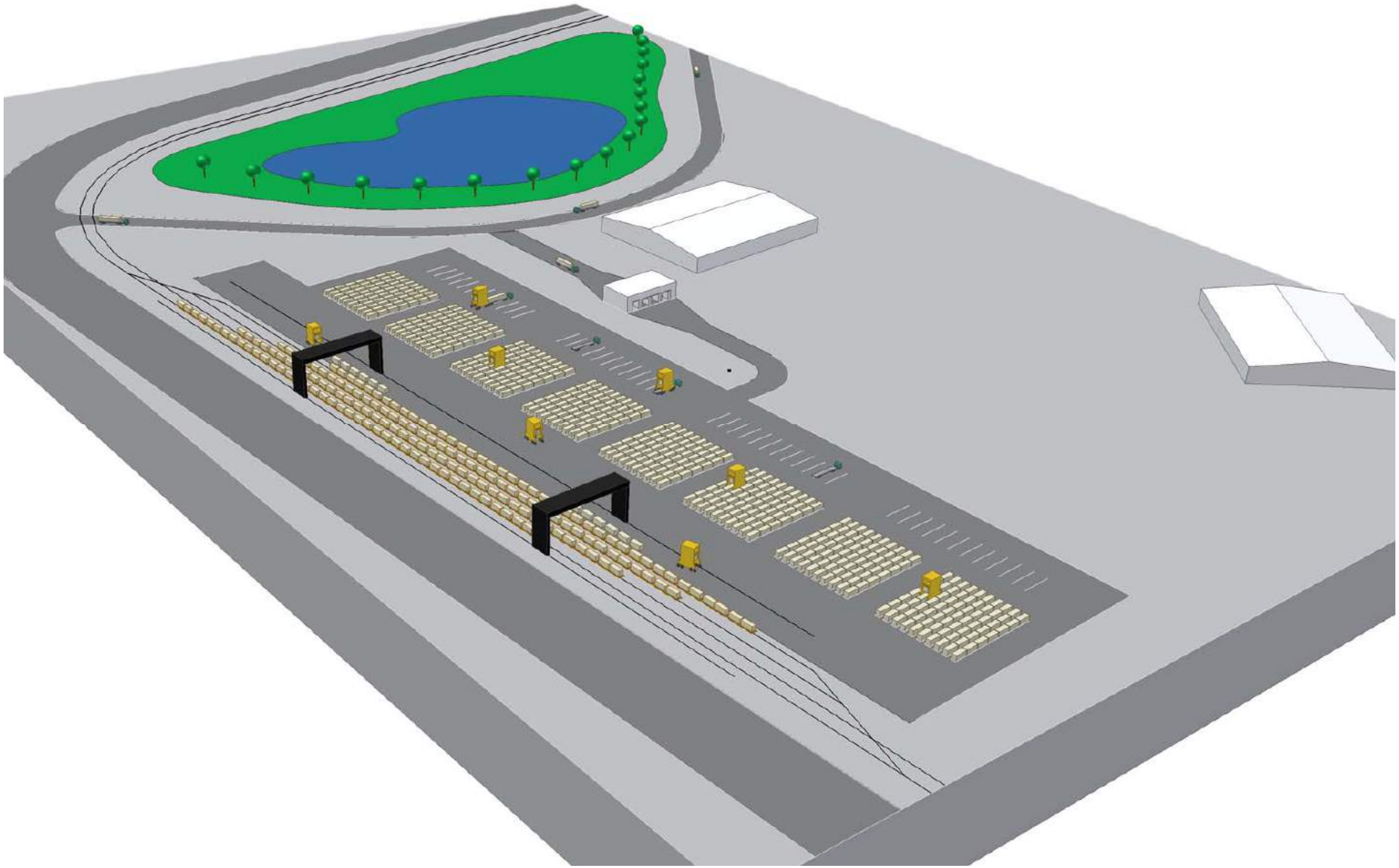
## Type 2



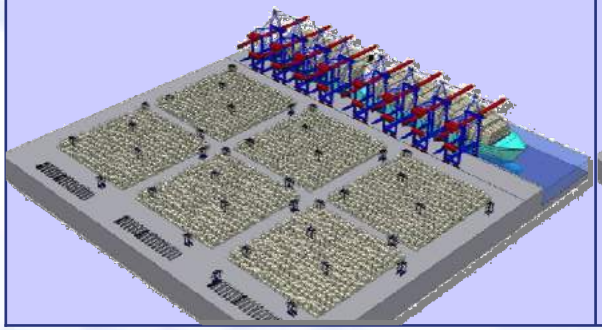
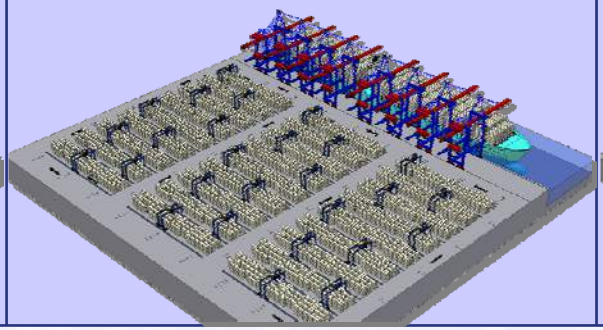
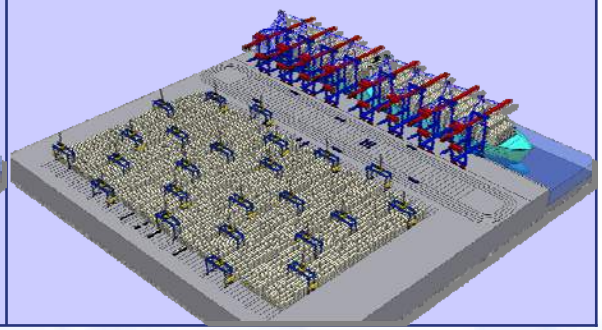

**2 systems type**



# Type 2 Terminal



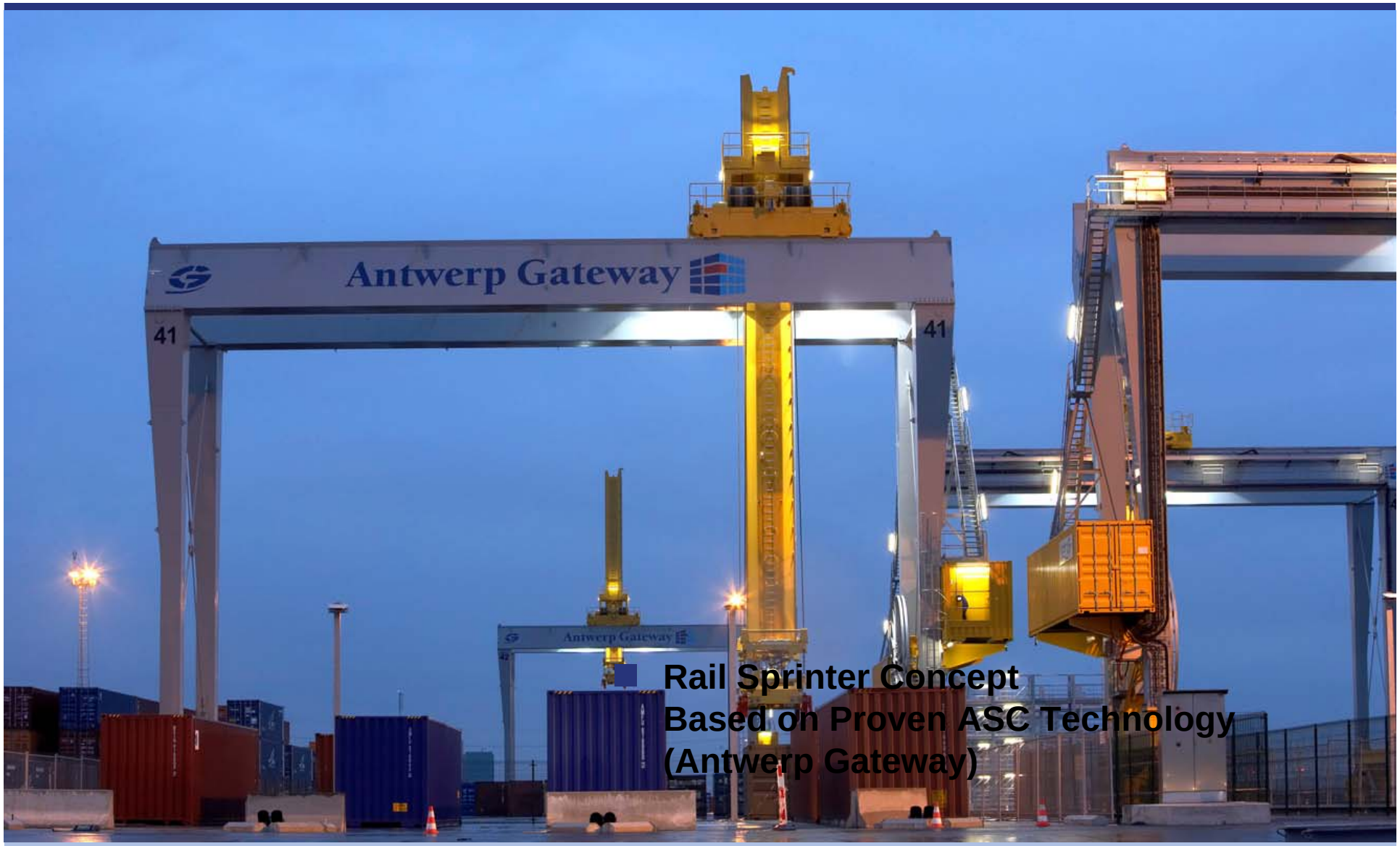
# Improvement of Productivity
# Stacking Density in Terminals (Overview)

| Conventional solution 1<br>Straddle carriers | Conventional solution 2<br>Terminal trucks and RTG | Automated solution<br>AGV and ASC |
|---|---|---|
|  |  |  |
| **Increase in Stacking density** | | **1,150 – 1,350 TEU/ha** |
|  |  |  |

* based on our own calculations

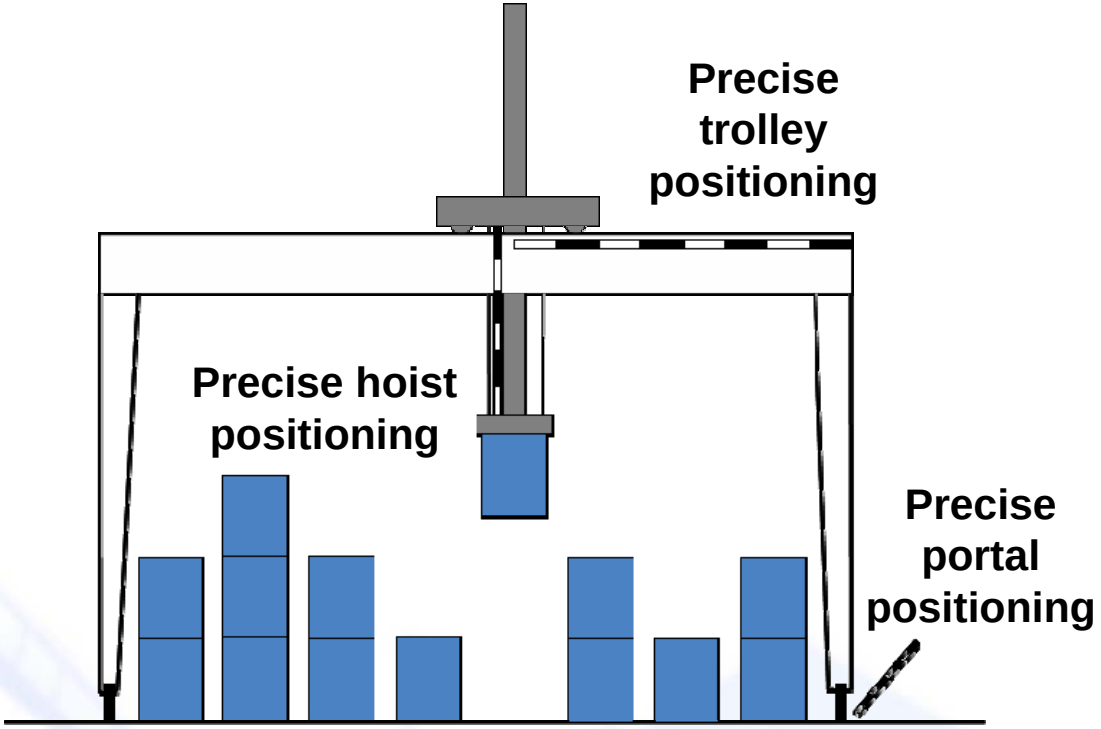
**Automation significantly increases the stacking density as compared with conventional solutions**

# RSC Concepts for Intermodal Operations Related to Individual Demands




- Rail Sprinter Concept
  Based on Proven ASC Technology
  (Antwerp Gateway)

# Positioning System of ASC: Works like a Pick and Place Robot





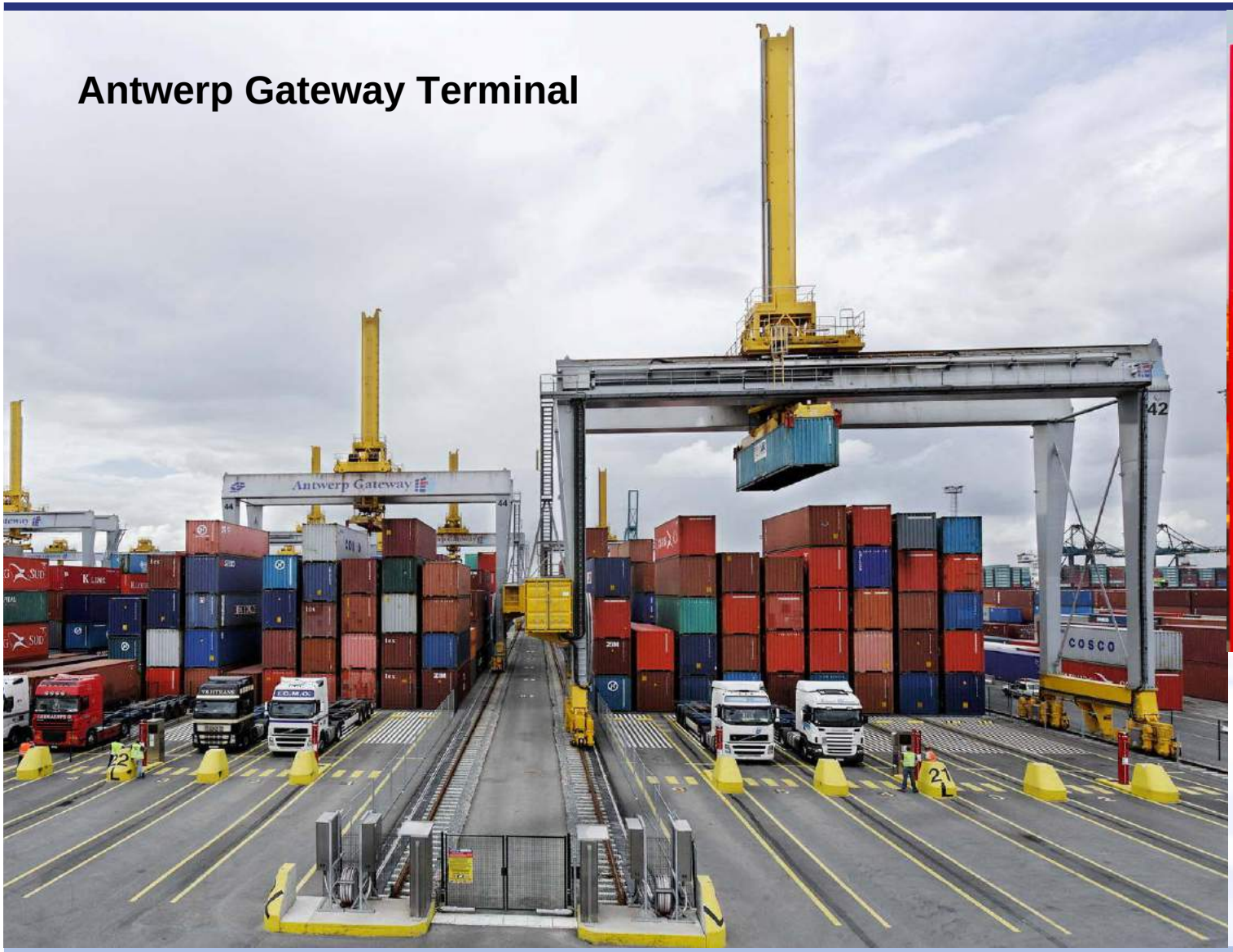
- Orientation similar to robots with controlled axes
- No ground markers, no target detection, very fast positioning
- Precise positioning sensors are installed
- Rigid ASC crane structure prevents structural movement

# Special ASC Design Aspects

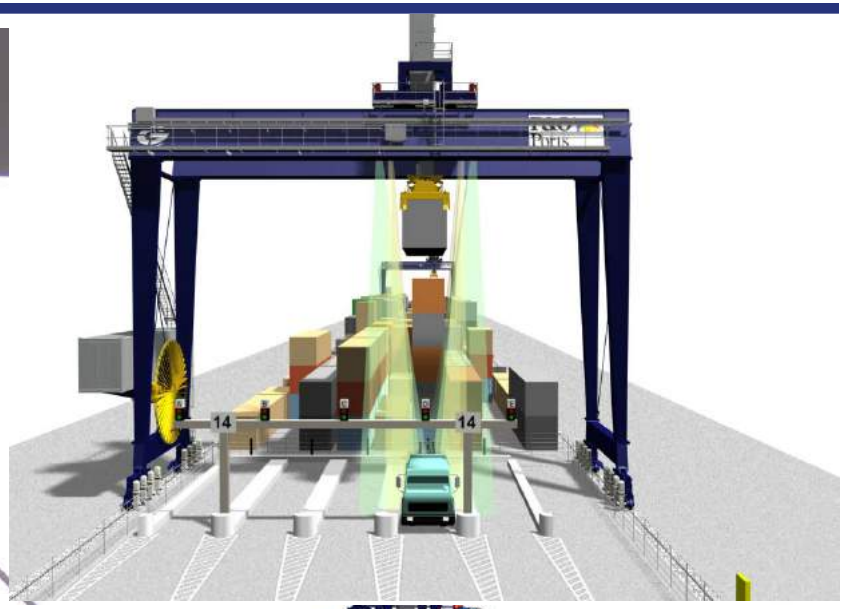
- Portal structure
- Load guiding
- Positioning system
- Interchange zones

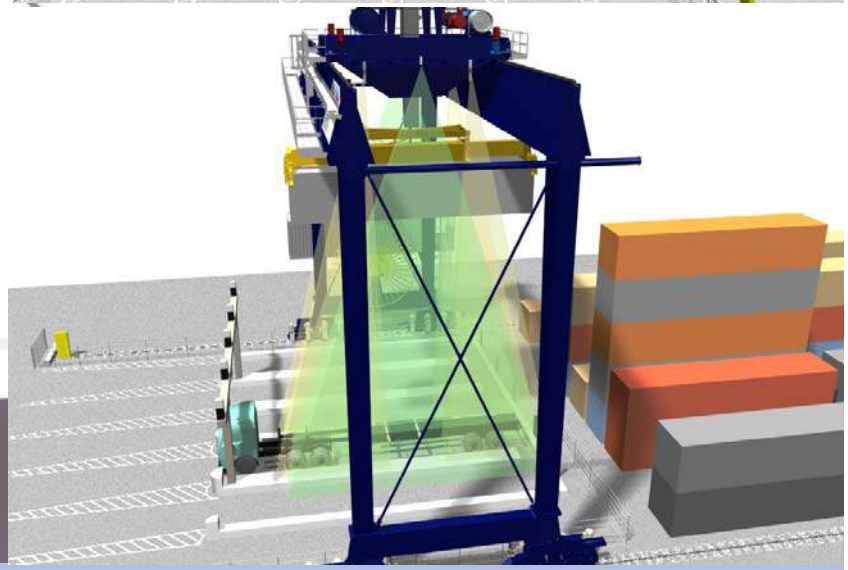
# ASC Technology I
# Landside Interchange Zone

## Antwerp Gateway Terminal




# ASC Technology II
# Landside Interchange Zone



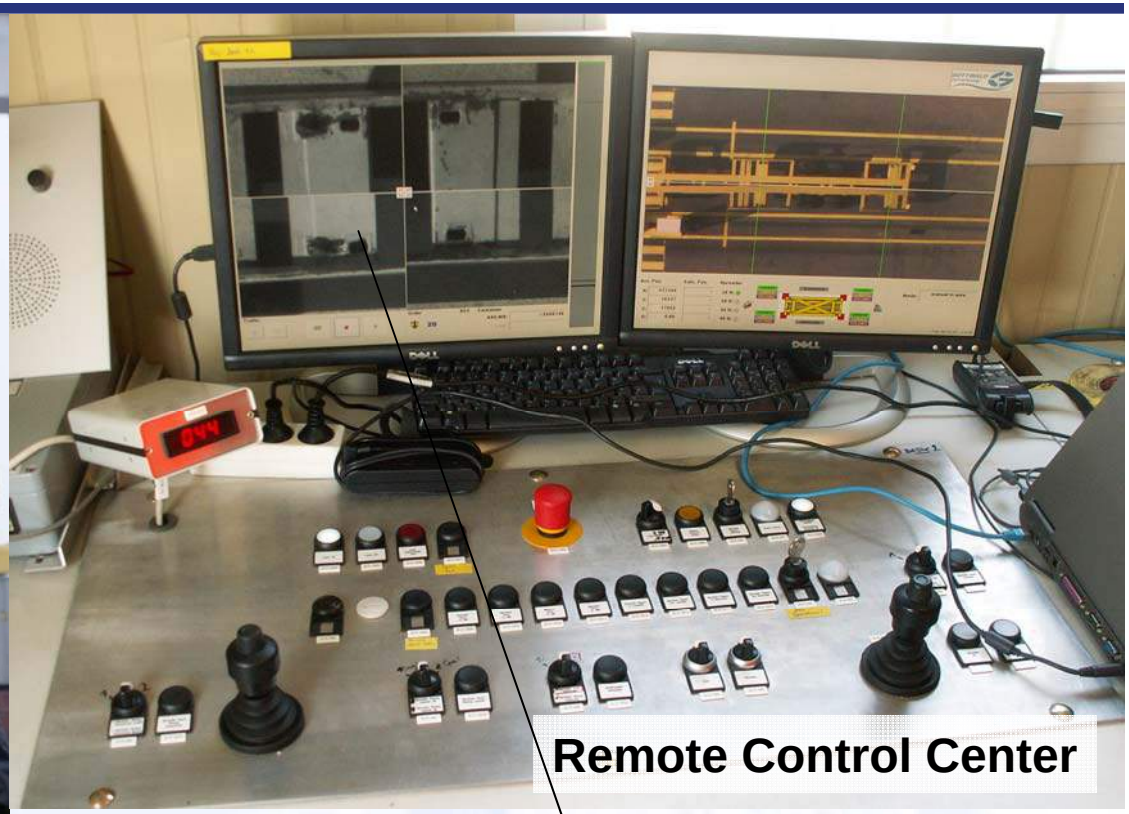



# ASC Technology III
# Landside Interchange Zone

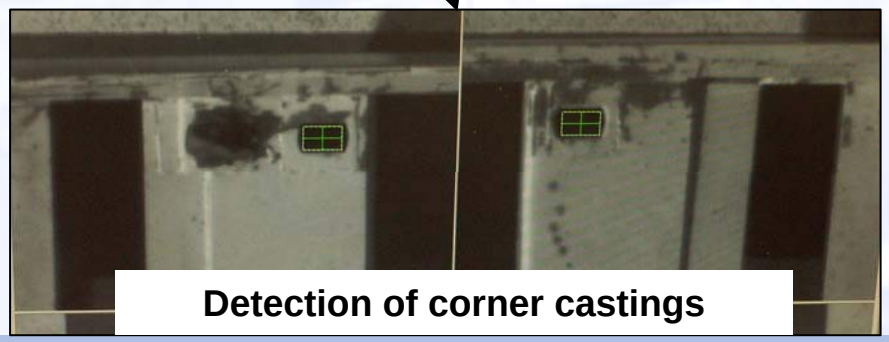

Remote Control Center

- Crane enters interchange zone
- Crane is pre-positioned by RCC
- Position is calculated and confirmed
- Truck driver pushes safety button

# ASC Technology III
# Landside Interchange Zone

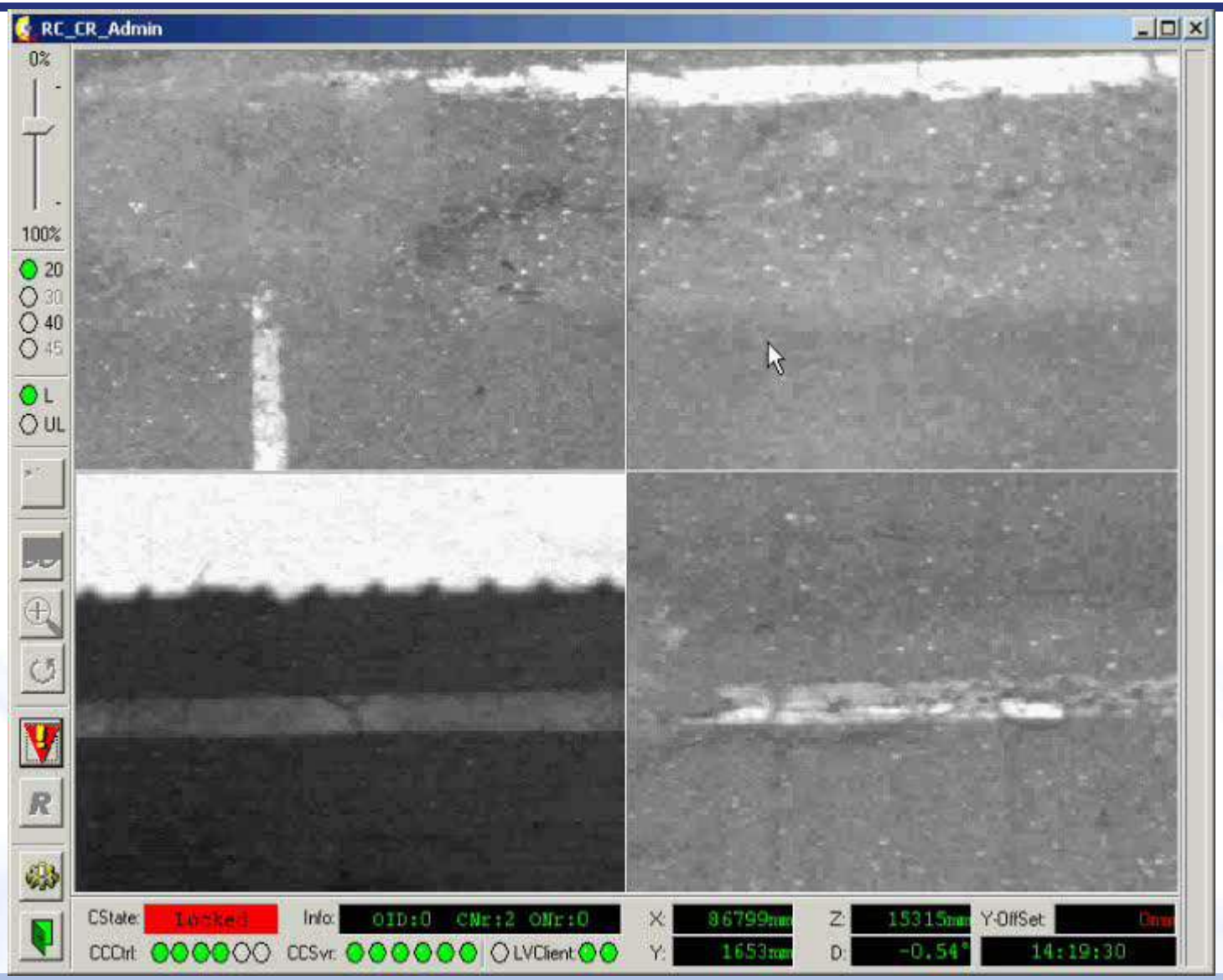



Remote Control Center



Detection of corner castings

# ASC Technology III
# Landside Interchange Zone

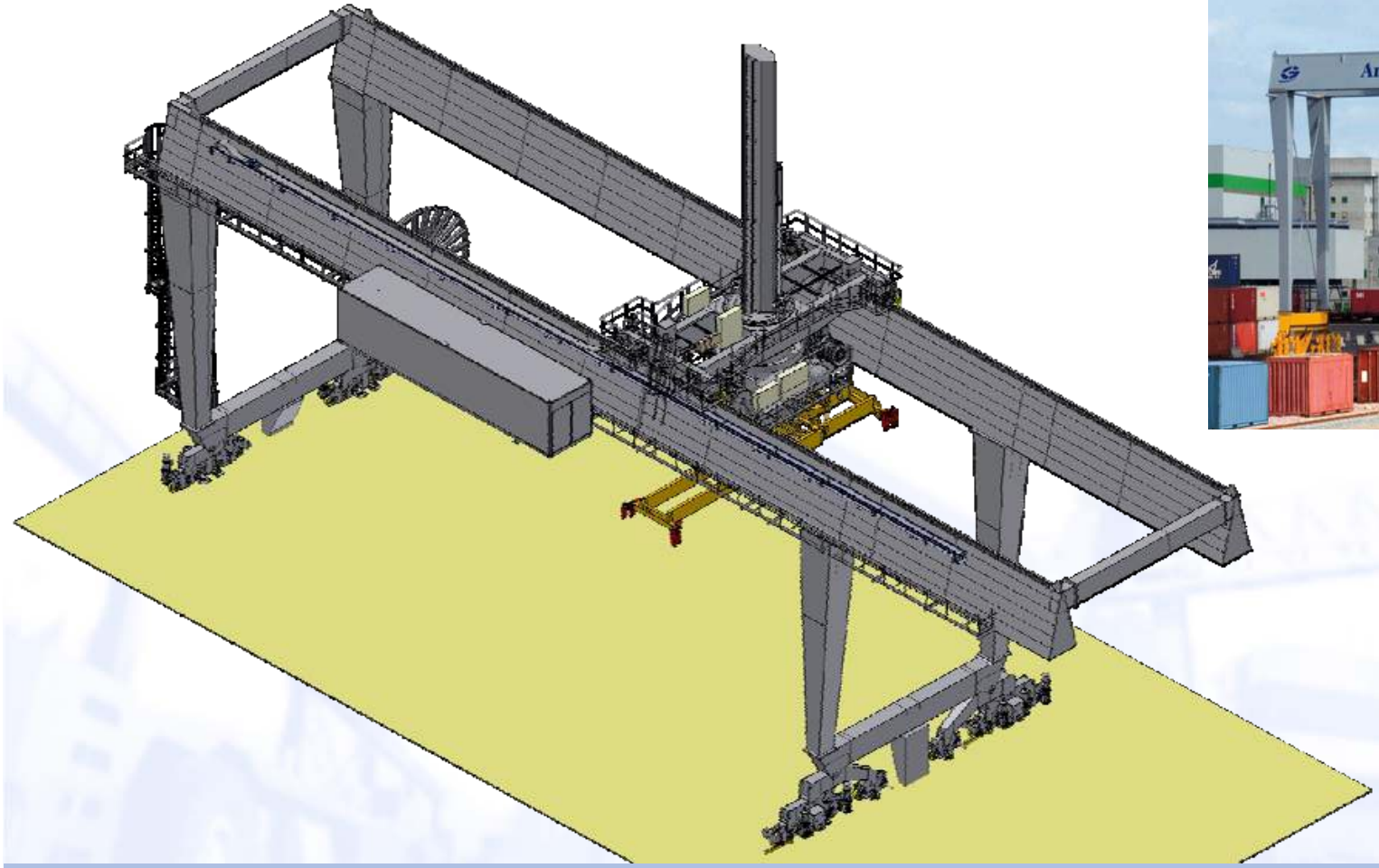


# Environmentally Friendly Rail-Mounted Equipment
# External Power from the Terminal Supply

**Energy obtained from braking and working motions is fed back into the supply system**

# ASC System at Antwerp Gateway

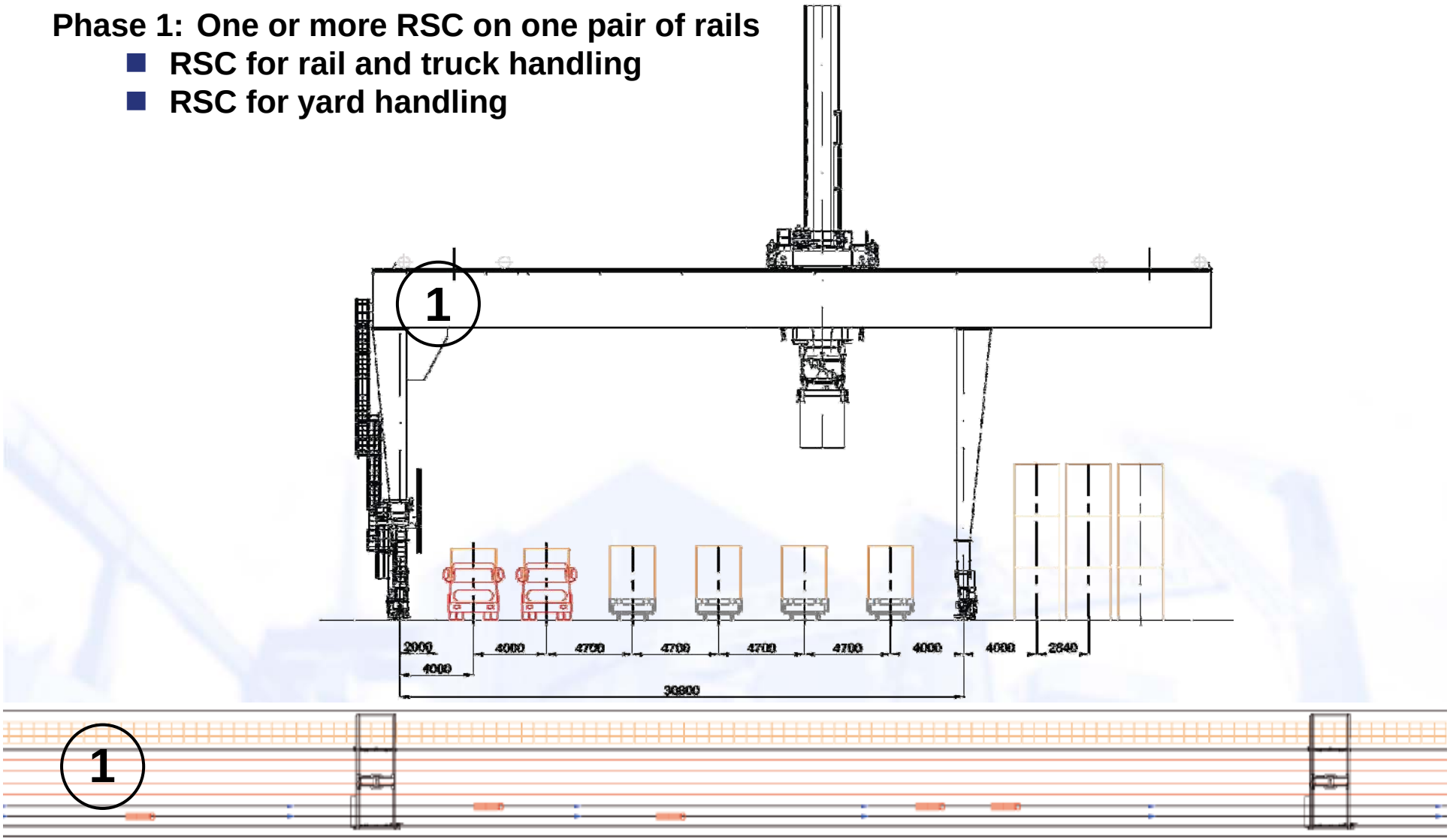
# Gottwald Railsprinter Crane (RSC)
# Based on Proven ASC Technology



# Gottwald RSC Concept – Flexible Step-by-Step Approach for Type 2 Terminals

**Phase 1: One or more RSC on one pair of rails**

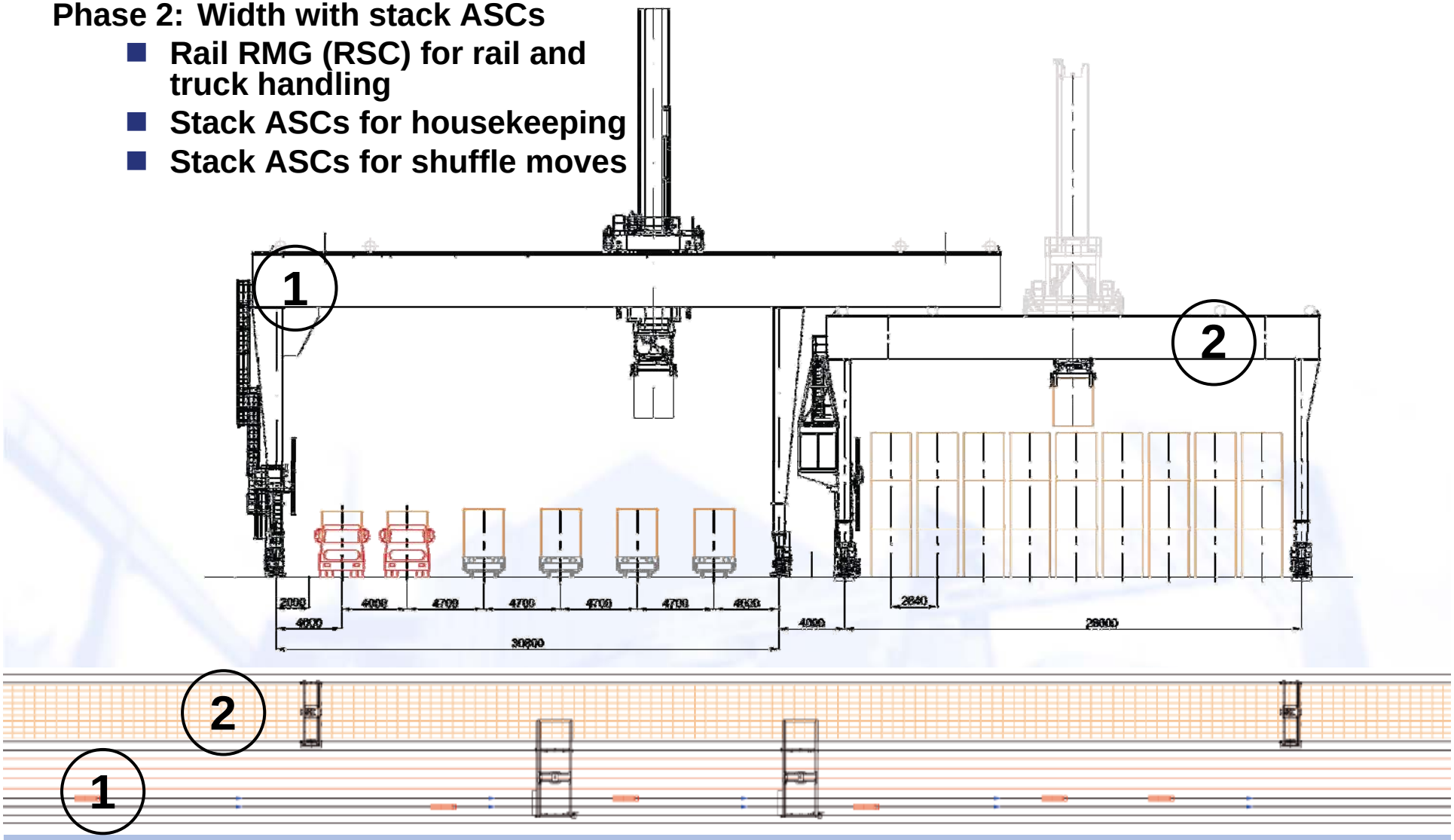
- **RSC for rail and truck handling**
- **RSC for yard handling**



# Gottwald RSC Concept – Flexible Step-by-Step Approach for Type 2 Terminal

**Phase 2: Width with stack ASCs**

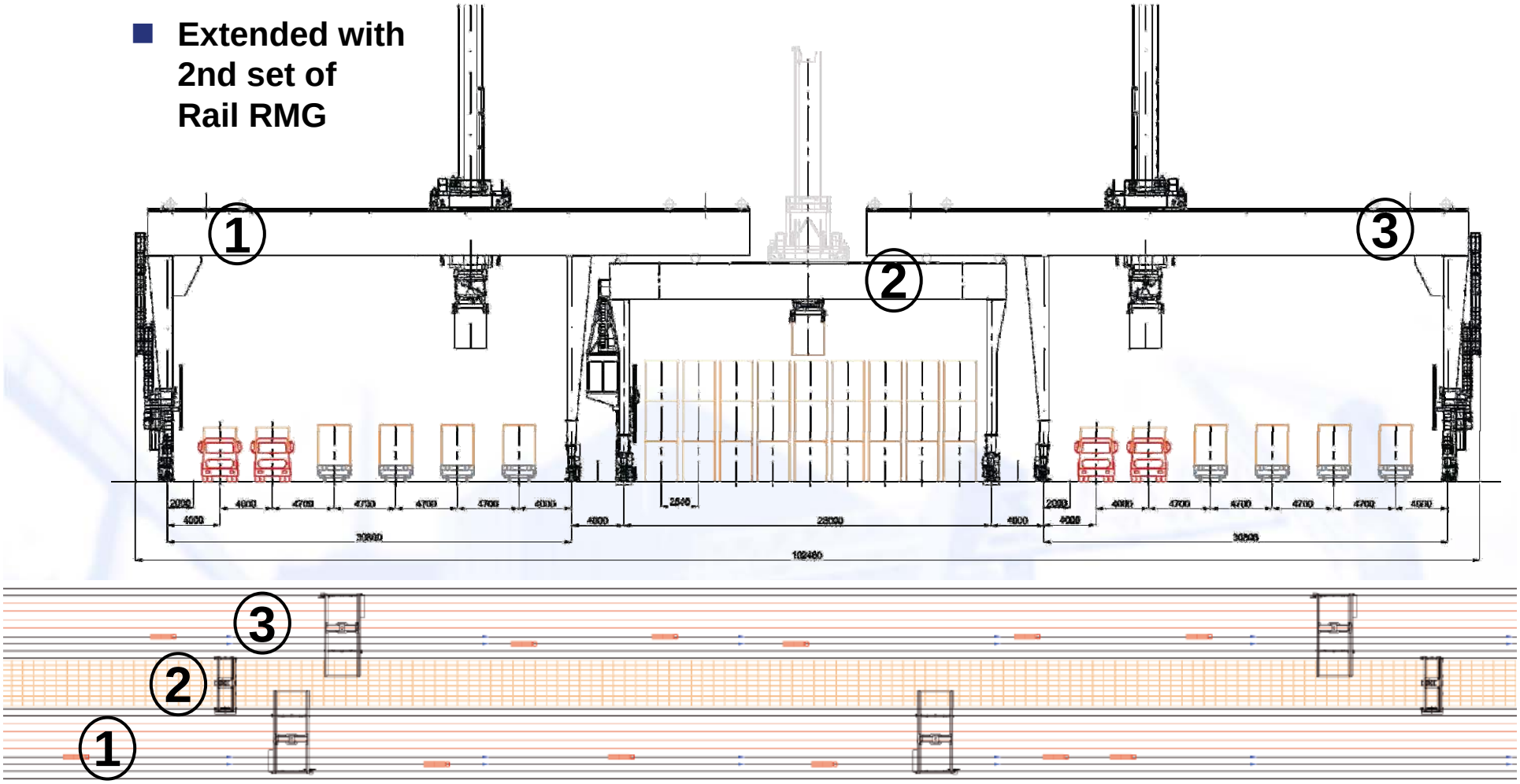
- Rail RMG (RSC) for rail and truck handling
- Stack ASCs for housekeeping
- Stack ASCs for shuffle moves



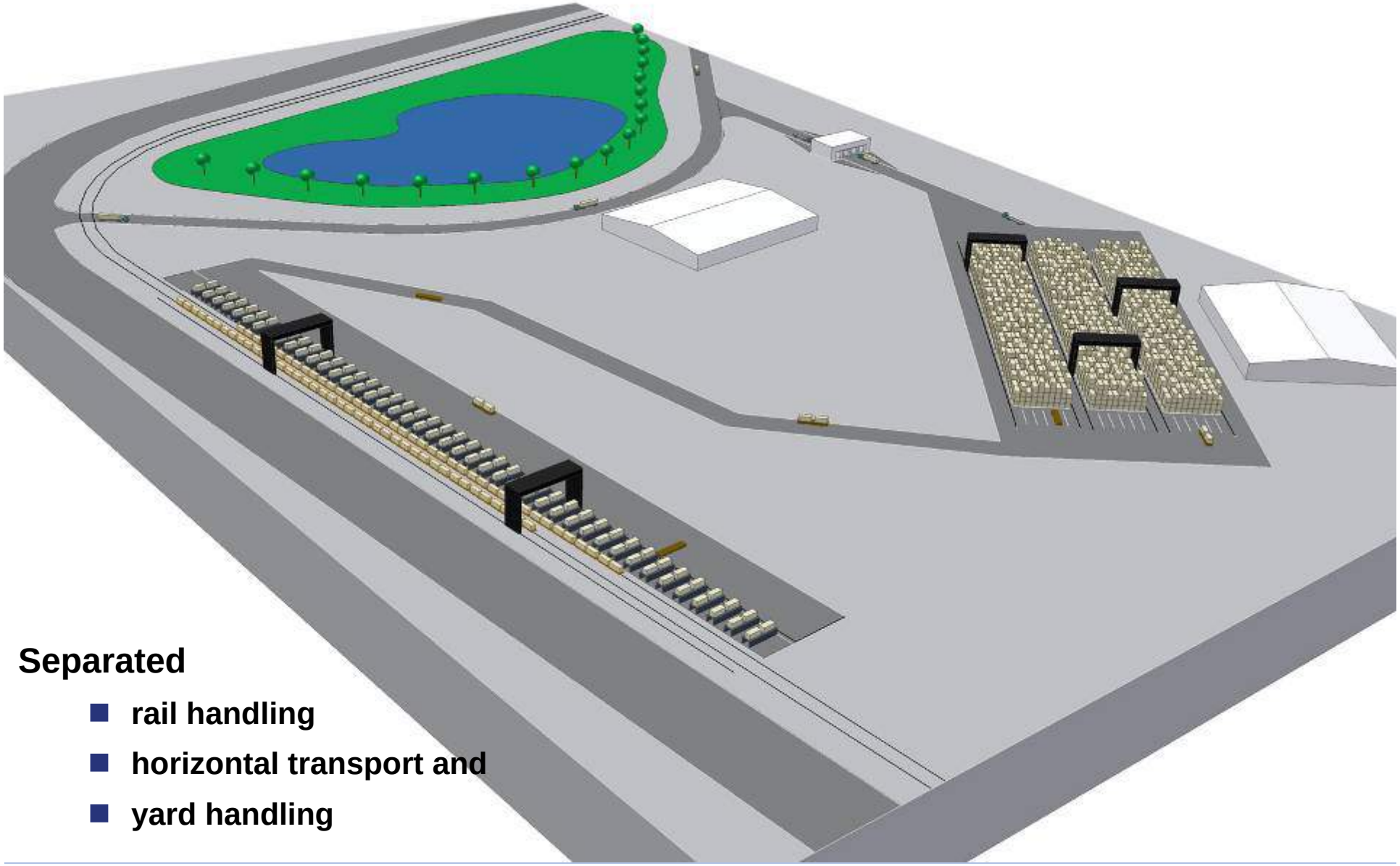
# Gottwald RSC Concept – Flexible Step-by-Step Approach for Type 2 Terminal

**Phase 3: Further extention with second RSC module**

- **Extended with more tracks**
- **Extended with 2nd set of Rail RMG**



# RSC for High Performance and Maximum Flexibility – Type 3 Terminal

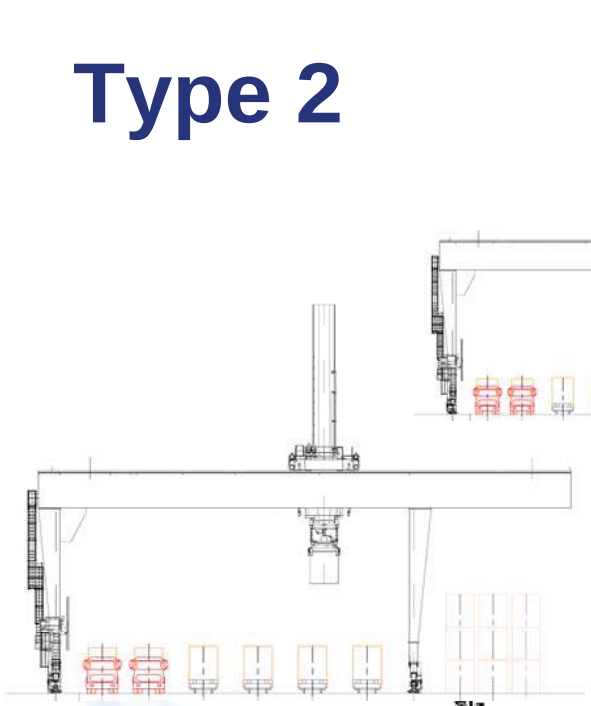


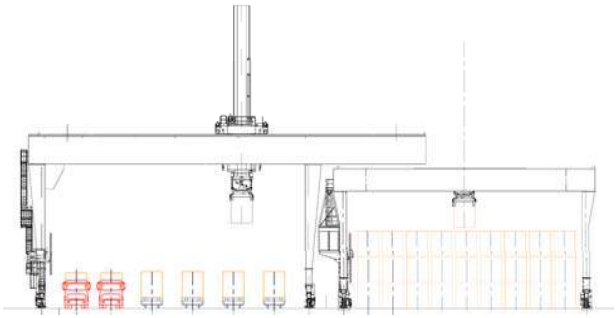
**Separated**

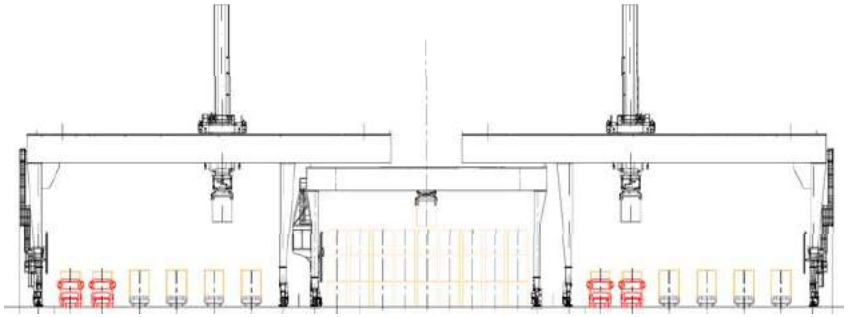
- rail handling
- horizontal transport and
- yard handling

# RSC Concepts for Intermodal Operations Related to Individual Demands

## Type 2

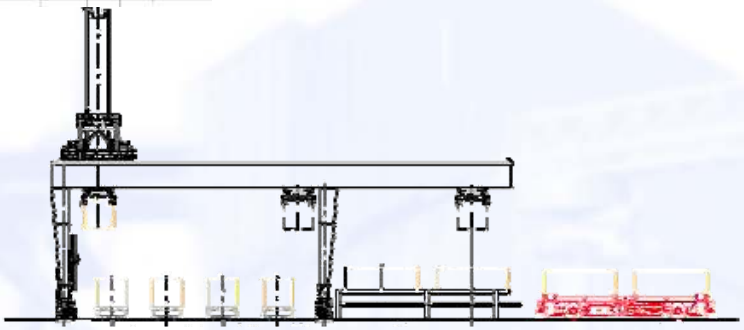


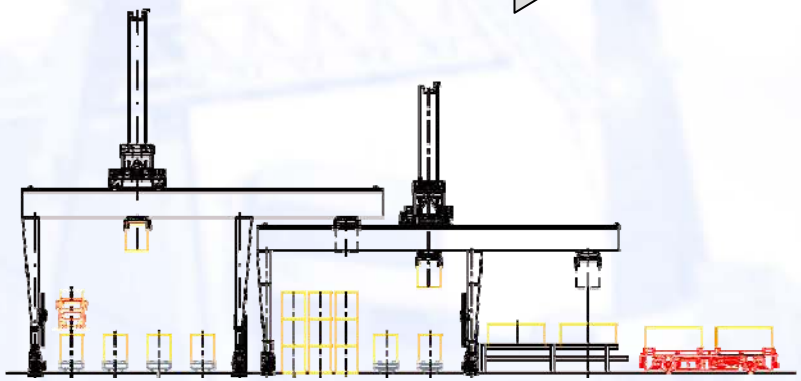




**increased productivity:**
**based on customised and modular concepts**

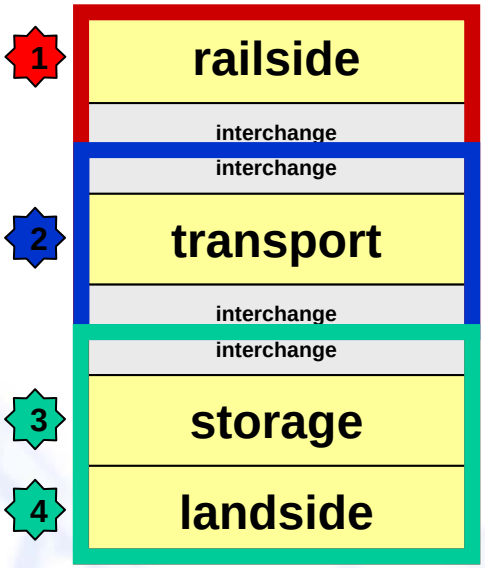
## Type 3



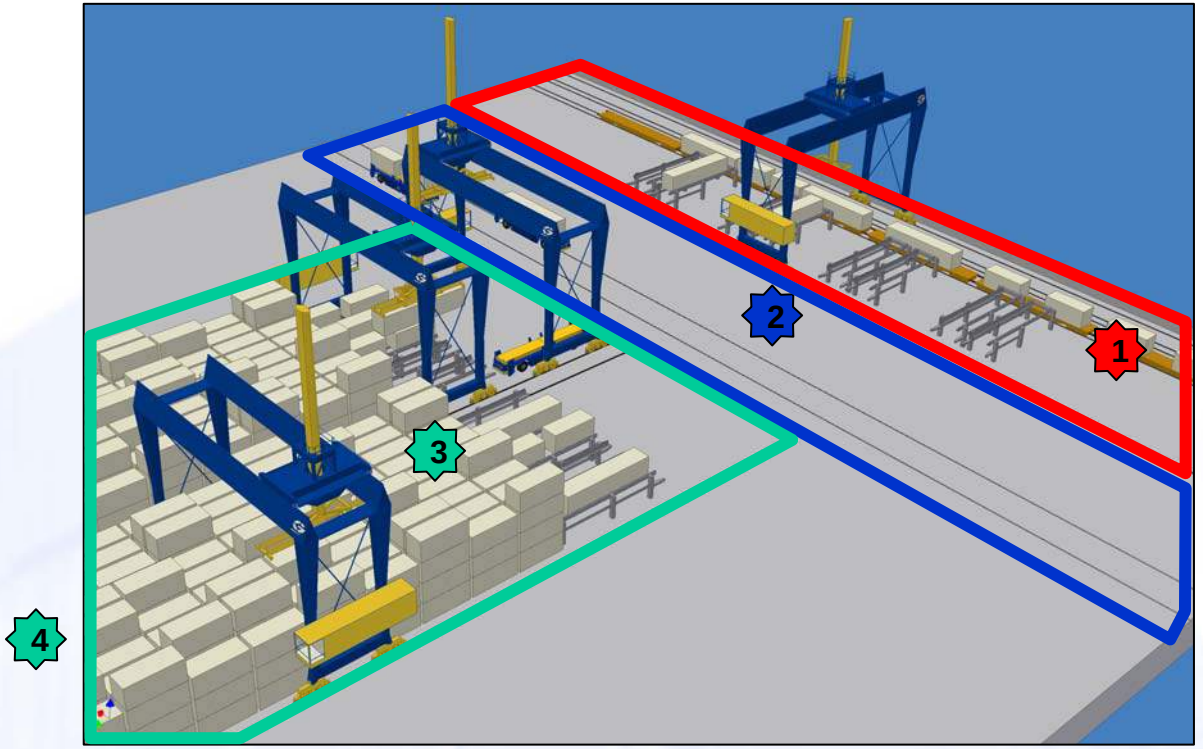


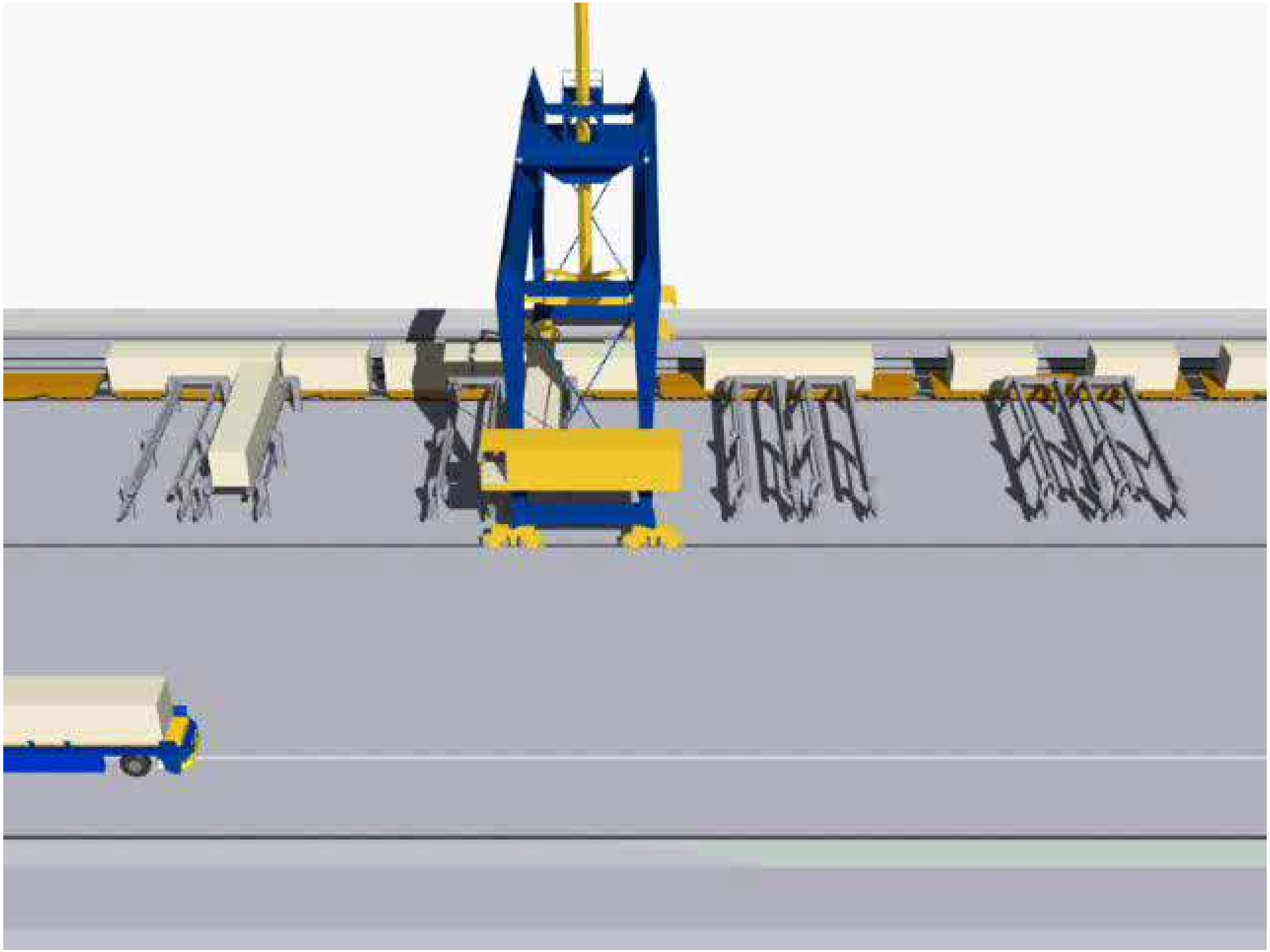
# Creating a High Performance and Fully Automated Terminal – Type 3 Terminal

## Type 3




**3 systems type**





# Rail Sprinter Concept
# Based on Proven ASC and AGV Technology

# The Gottwald Lift AGV

# Gottwald AGV
# Evolutionary Developments


Diesel-hydraulic AGV

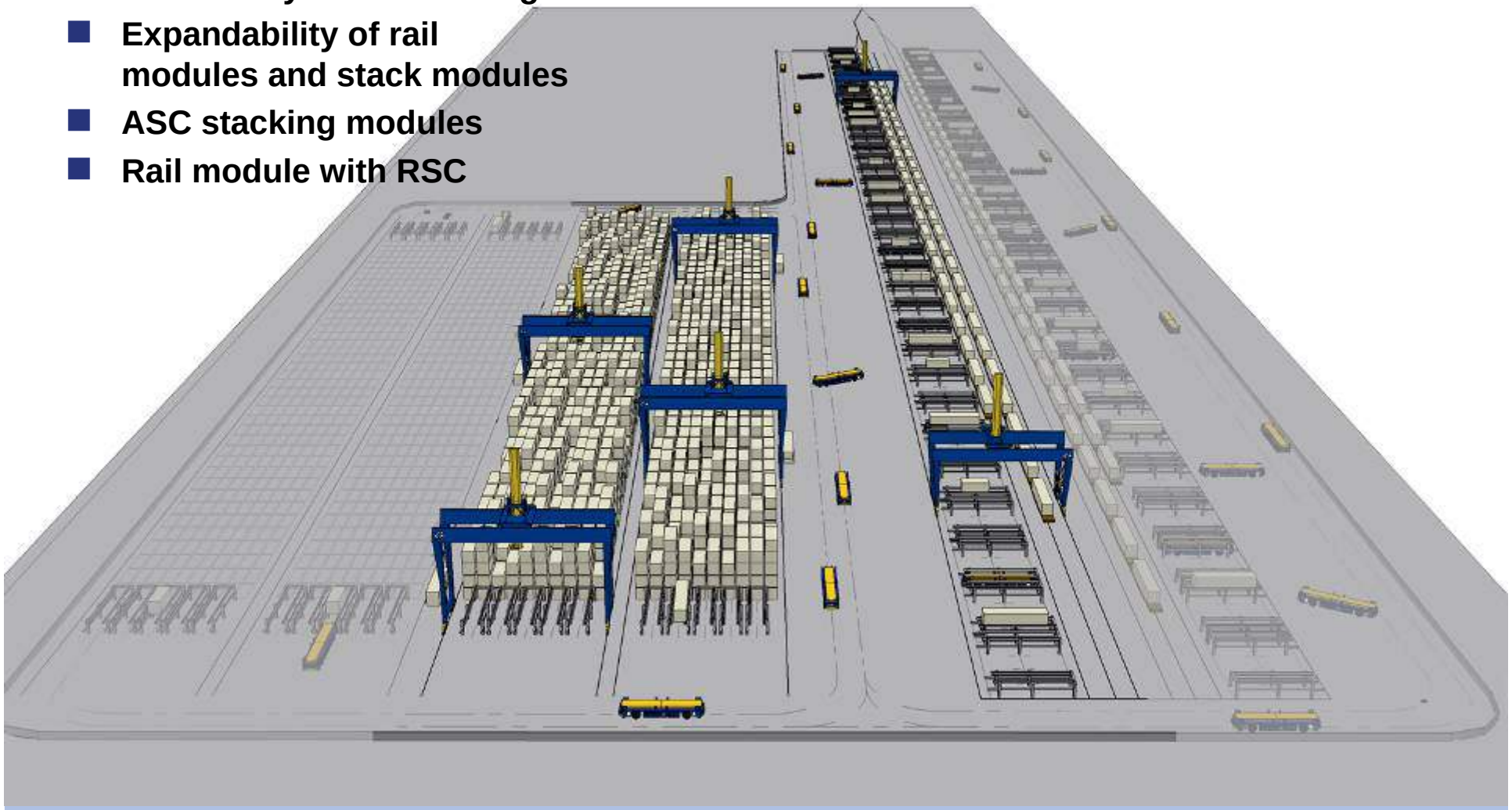

Diesel-electric AGV

Diesel-electric Lift AGV


Battery AGV/Lift AGV

# Innovative RSC Intermodal Terminal with Automated System Technology

- Final phase with yearly throughput > 1 m TEU
- Flexible layout of stacking modules
- Expandability of rail modules and stack modules
- ASC stacking modules
- Rail module with RSC



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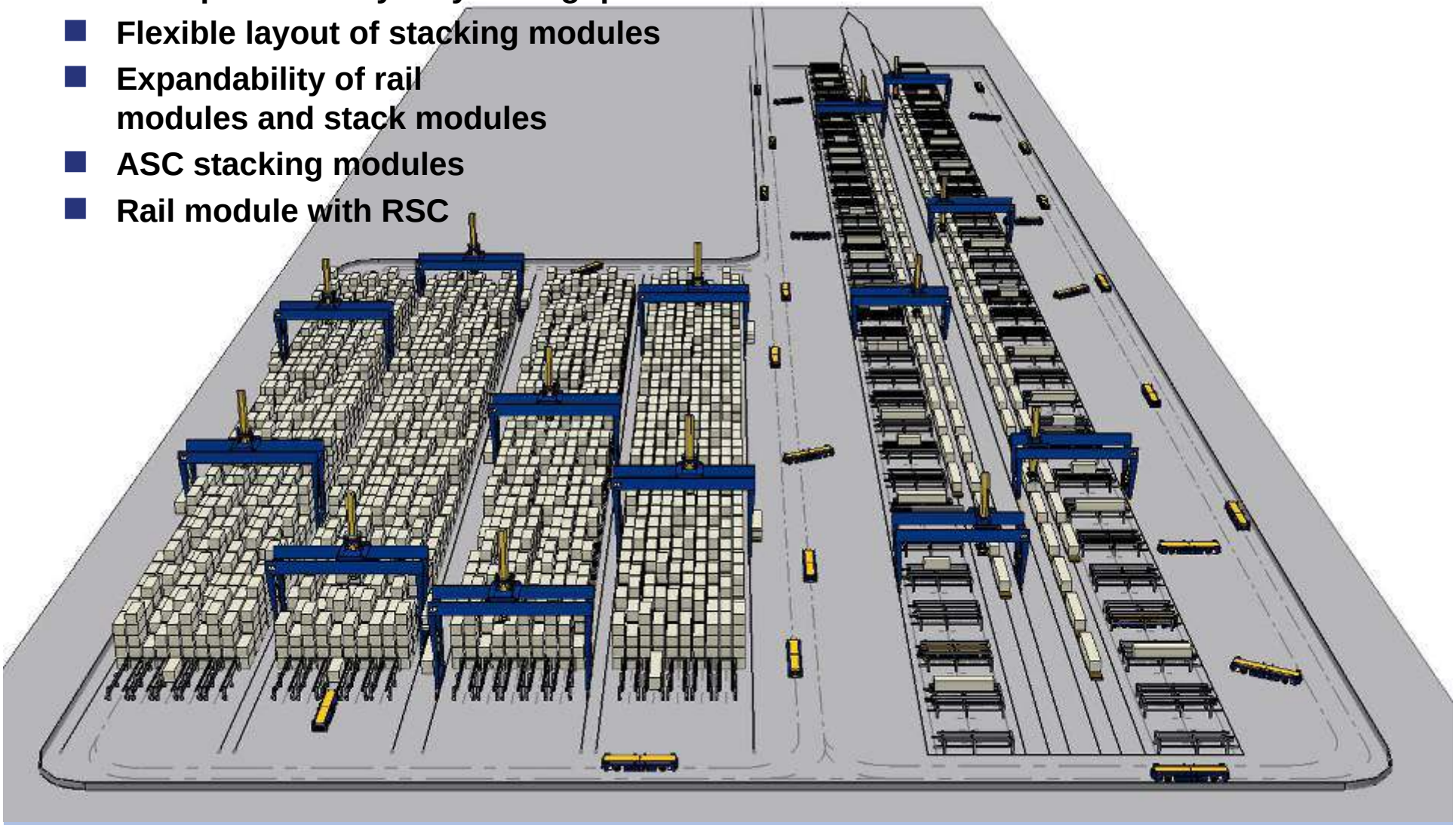
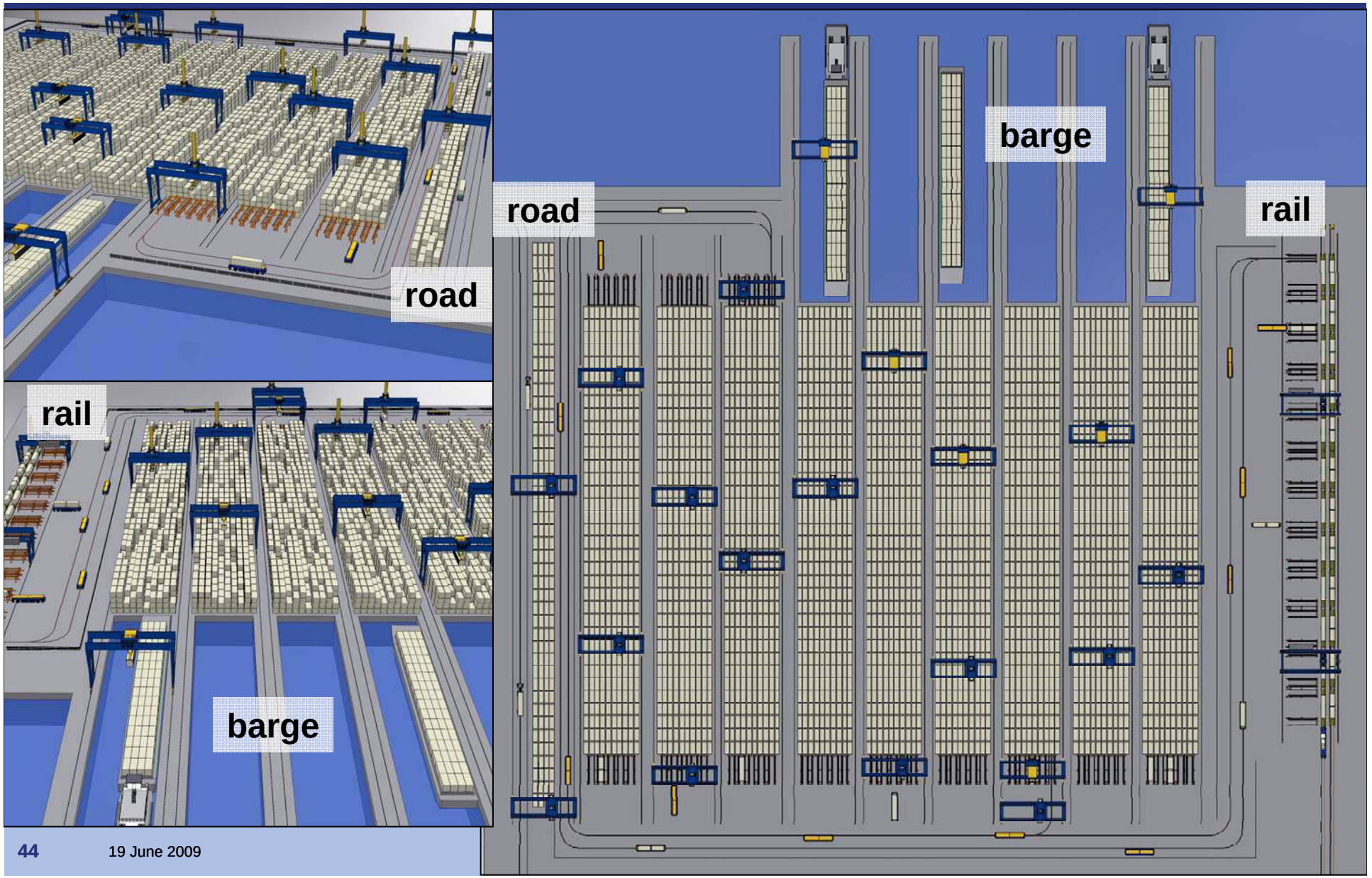


# RSC Terminal Layout Examples Including Handling of Mixed Units

# Vision of a high Volume Multimodal Hub (Road, Rail, Barge)



# Summary / Conclusions

- **Innovative concepts are required to cope with anticipated long-term volumes and anticipated cycle time performance.**
- **In addition to conventional terminal concepts, Gottwald has developed automated technologies derived from its proven products in ports (crane concepts, AGV technology, software) which are also offered for inland terminal applications.**
- **These technologies pave the way for new applications which provide opportunities for a new level of productivity and also offer savings in operating costs without substantial differences in capital investments.**
- **We invite all interested inland terminal operators to test the ideas in discussion with us and evaluate alternative concepts to conventional ones.**