

# Intermodal Terminal Automation Opportunities & Challenges

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DESIGN - IMPLEMENT - OPTIMISE

# Intermodal Terminal Automation- Opportunities & Challenges

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1. Automation technology & benefits for intermodal
2. Intermodal automation challenges & difference from port automation
3. A few diverse examples
4. Discussion and conclusion

## Industry backdrop:

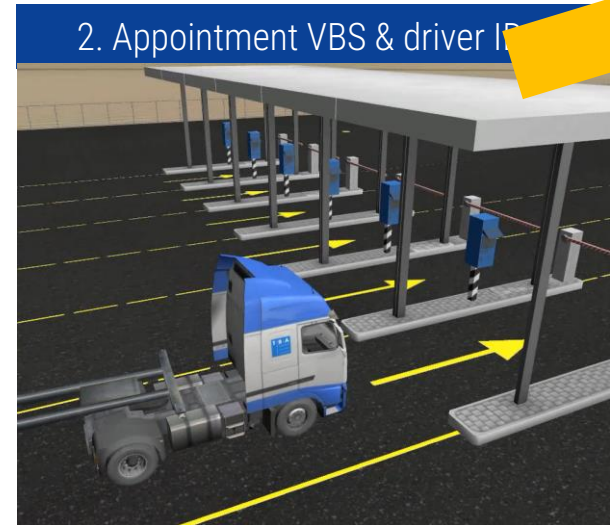
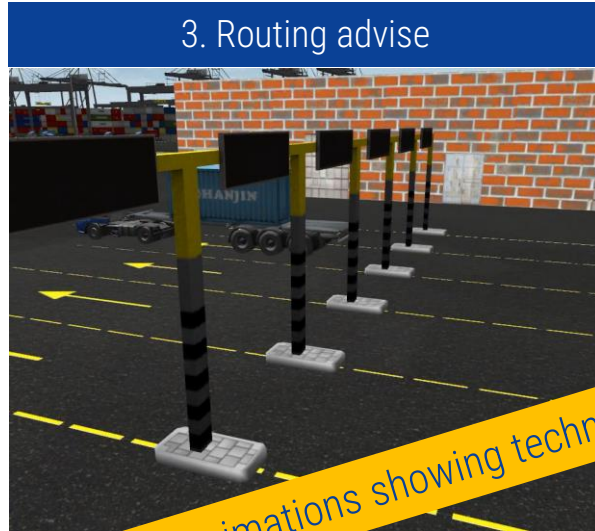
- *Focus on rail like never before*
- *Port & terminal automation technology has come of age*
- *Post Covid - supply chain industry is in the limelight and in transition – adapting to Industry 4.0*

*We are up for a fascinating next few years in intermodal freight and terminals !*

About TBA – We are a specialist container & rail terminal design, simulation & automation consultant. We are HQ in the Netherlands but work globally.



# Automation technology which is readily applicable to rail



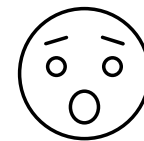
Animations showing technology

# Intermodal terminal automation benefits

Some of the port automation technology is readily applicable and equally beneficial for intermodal terminals.

Often the business case/building blocks for intermodal automation is argued similar to port terminals

- ✓ reduced labour & admin, improved data quality & extended working hours
  - ✓ more electrification, reduced consumption
  - ✓ improved safety
- ❖ Intermodal terminals, however, have significant operational differences and some challenges to port automation/cranes operations.
- ❖ Good & high terminal performance is, therefore, not always a direct result of automation.
- ❖ Let us see some key difference and some example of how to overcome these.



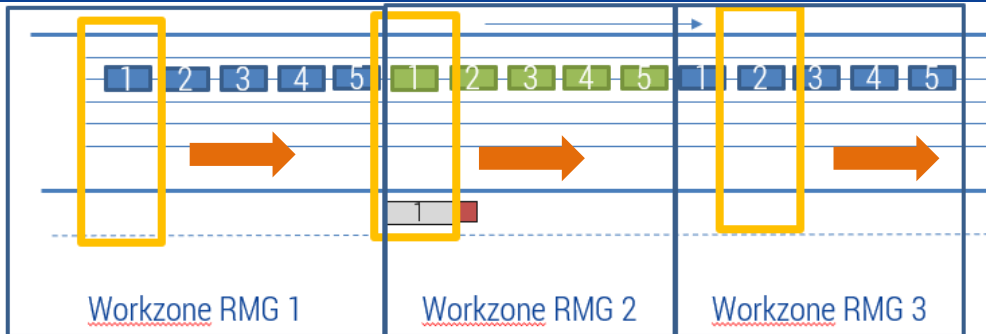


# Intermodal automation challenges & differences from port

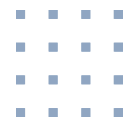


- Rail cranes support three functions:
  - Handling wagons, yard stacking and servicing trucks
  - Port quay & yard cranes – handle two
- Sequence and rail job priority results in RMG long travel which slows and disrupts operation.
- Automated rail operation is also frequently disrupted for locomotive transit, pin and safety crew on tracks.
- Intermodal terminal have fewer operating cranes so saving of labour is limited vs typical port operation.
- There are large variation in wagon types, container sizes and high frequency of bottom lift rail containers. (Exceptions disrupt automation)

RMG stripping & loading back, but this is often disrupted



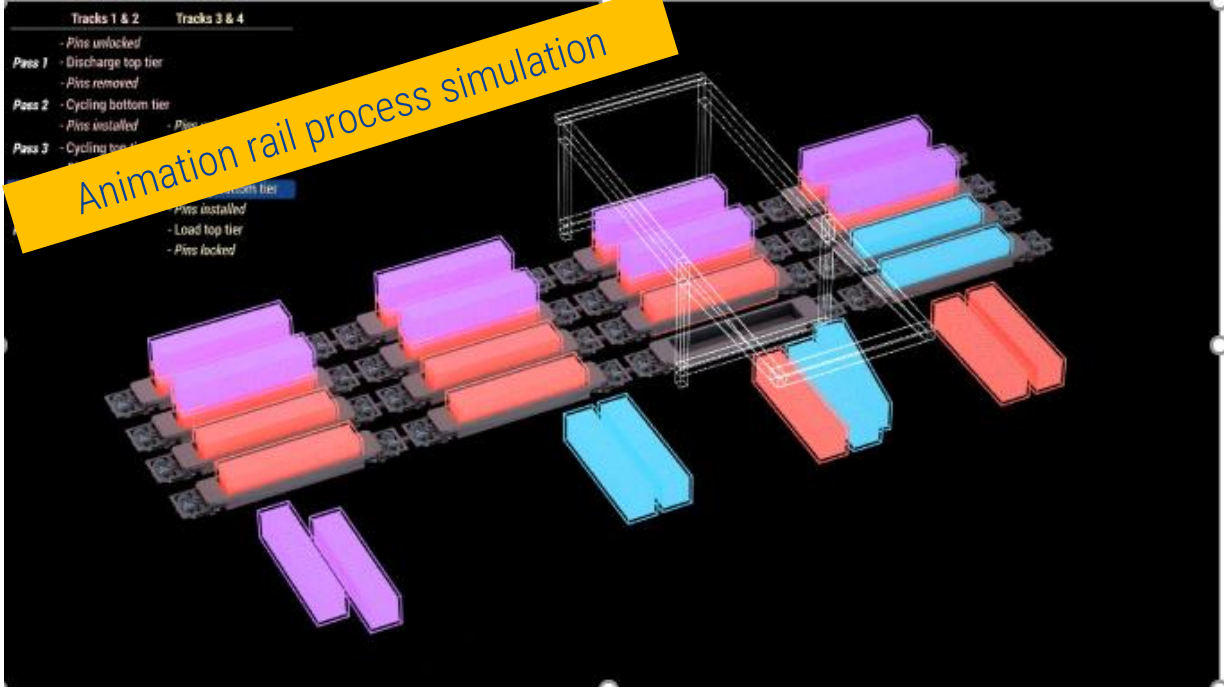
# Examples of intermodal automation & how they have tackled the challenges – North America -



Track crew and safety system

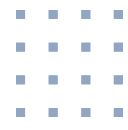


Rail shunting break up & rail process





# Examples of intermodal automation & how they have tackled the challenges – Georgia Port



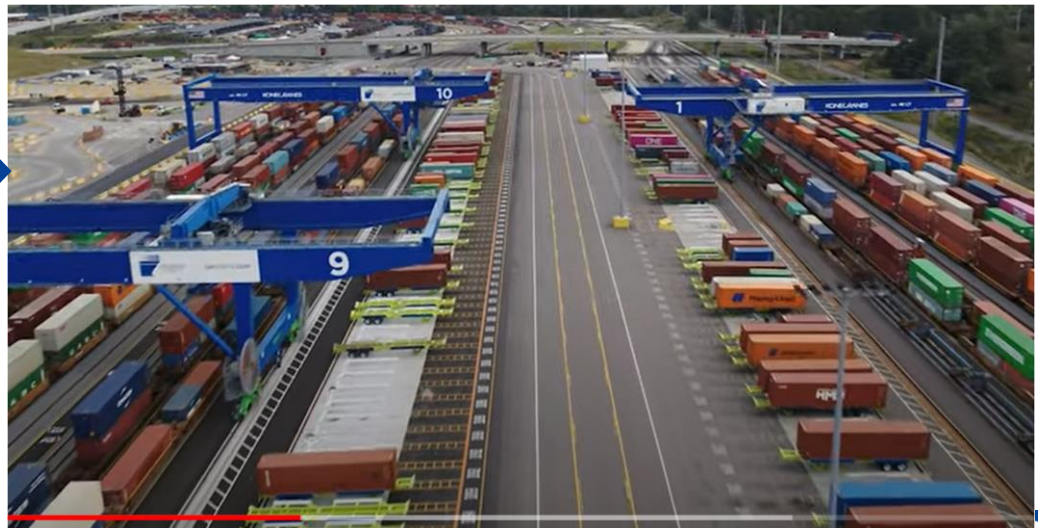
Two rail bundles RTG + Top handler



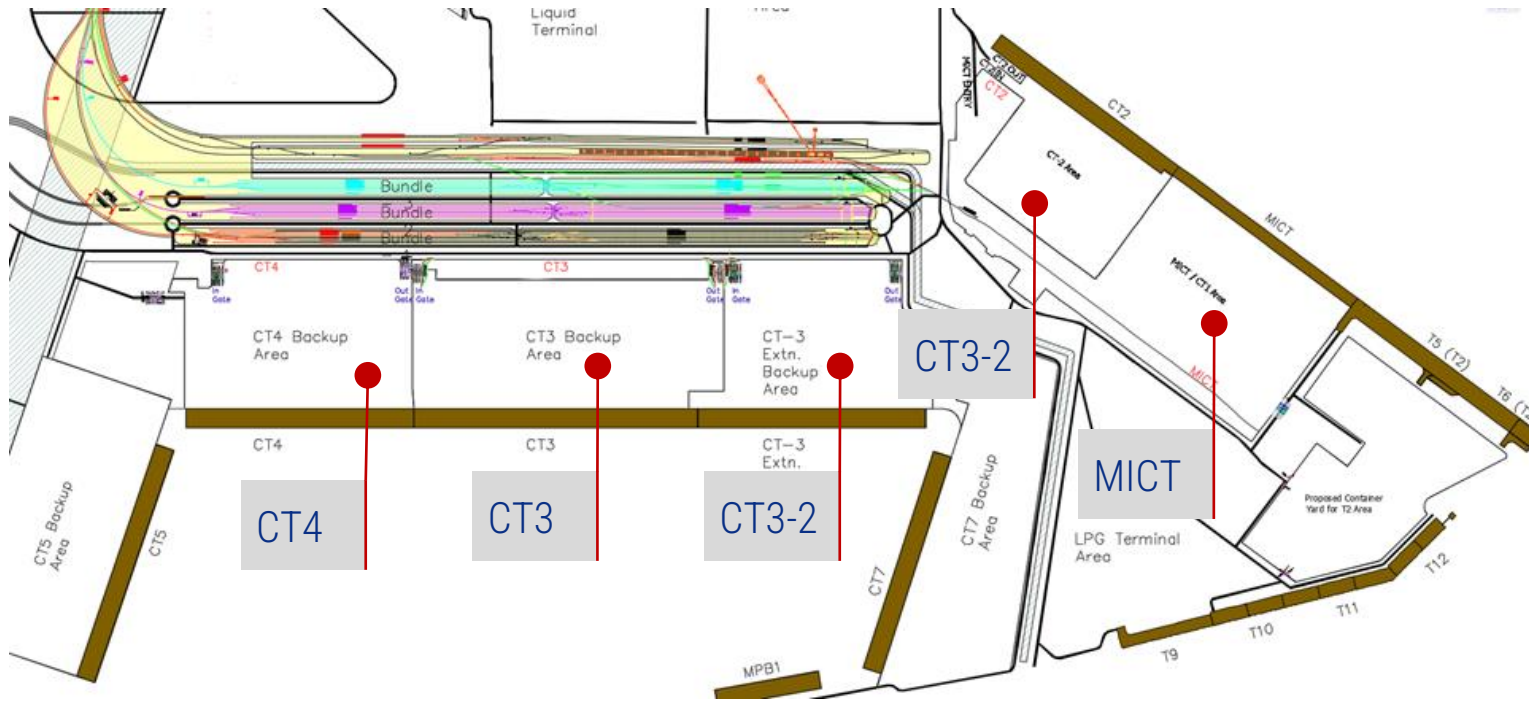
Simulation to validate

- Capacity & tracks including shunting tracks
- Waiting time for trains
- Performance validation and train turn times
- Impact of safety measures
- Stacking buffer area & equipment fleet
- Operational strategy

2 x 9 tracks span

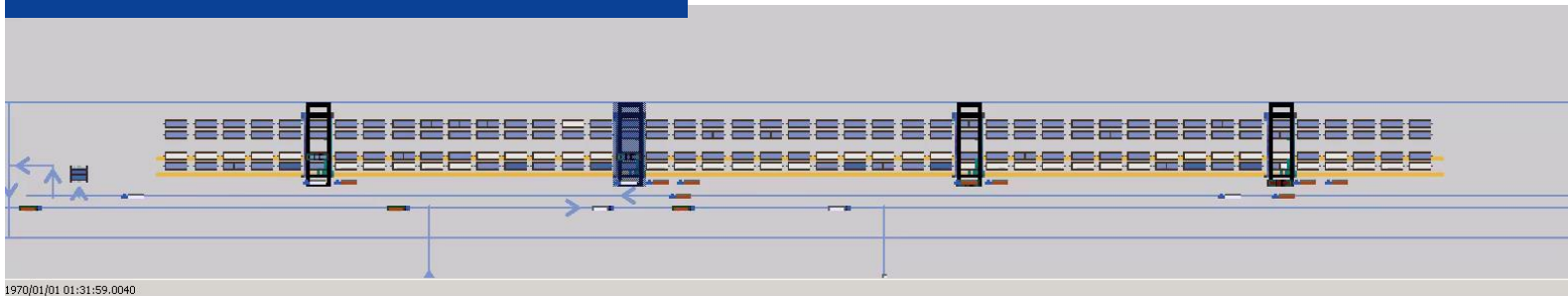


# Examples of intermodal automation & how they have tackled the challenges – South port rail head – 1,800m Double stack, 1.2 M TEUs



- Servicing 5 full container terminals with multi-operating systems
- Dual cycle handling, in one rail cycle discharge and load on adjacent tracks
- Rail RMG does not stack boxes, but delivers direct to truck
  - Active & detailed management of truck to maximize rail while serving 5 terminal (each with its own TOS)
  - TBA simulated various options

Rail RMG Simulation 2D





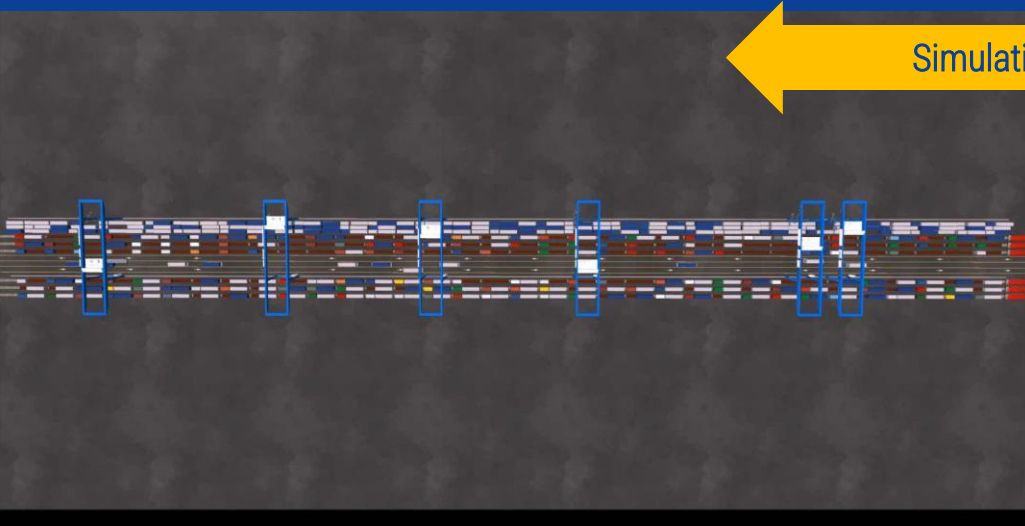
# Examples of intermodal automation & how they have tackled the challenges – Mega Hub Lehrte (Deutsche Bahn)

- Mega HUB Lehrte
  - Celebrated opening 2021 of this efficient, green and revolutionary terminal.
  - Automated guided vehicles within the centre of the terminal connect rail transshipment. External trucks on the outside
- TBA worked extensively on simulation & emulation testing
  - From design (~10 years ago) to realisation. TBA also supplied automation AGV software TEAMS
  - Implementation - Emulation testing. (virtual model testing software & automation)



Central highway for Automated guided vehicles

Terminal simulation with central Automated Guided Vehicles (AGVs)



Simulation Vs. Reality





## Conclusions & summary

- Many container port automation technologies, such as, gate automation, GPS, RFID & vision-based technology, digital tools etc. are readily applicable and equally beneficial for intermodal terminals.
- There are, however, significant differences and many more operational challenges in intermodal terminal.
- Intermodal terminals require much lesser manning than a port terminal therefore the OPEX benefit of automation is also significantly lower.
- Automation can still unlock significant benefits for intermodal terminals, especially for dense RMG rail operations, but no one size fits all.
- Specialized design and proper testing with well tested simulation tools which consider processes, safety features, TOS logic, machine-to-machine interaction, train delays etc, are vital when designing & or performance testing an intermodal facility.



# Intermodal Terminal Automation- Opportunities & Challenges

## Food for thought



*"We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run"*

*Roy Amara.*

*Past president of The Institute for the Future*



*In the current technology buzz, this is especially relevant for intermodal terminals, where no one size fits all, terminal specific planning, design, performance validation and testing is a prerequisite for success*

# Thank you for listening



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