

Intermodal Terminal Automation – Opportunities & Challenges

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Summary

Most jurisdictions wish to increase intermodal rail modal volume to support a transition to reduced and greener energy use. Improved intermodal terminal efficiency and performance based on the use of automation, and the latest technology are, therefore, key focus areas for the operators and the industry. While there is a lot of information on port container terminal automation¹ there is less understanding of the potential and associated issues for automation of intermodal container terminals. This paper addresses this gap by highlighting opportunities and challenges with intermodal terminal automation. Some global case studies will be discussed to showcase some examples of innovative approaches to the automation of intermodal terminals.

Keywords: (intermodal terminal automation, innovation in rail terminals, new technology, rail technology)

Introduction

The importance of increasing rail modal share is now well recognised by national Governments as well as the industry. While there is a lot of information on automation in port container terminals, there is less understanding and clarity on the potential for intermodal container terminal automation and its challenges. The paper aims to briefly discuss intermodal terminal automation, the opportunities, and some challenges it poses.

In Australia there are two main types of intermodal terminals:

- Import Export (IMEX) – Shuttle service to the port (typically single stack)
- Long haul regional trains – typically long trains up to 1,800m & double-stack where possible

(A few select rail transshipment operations are also undertaken in Australian terminals, but this is not common).

Based on the type of terminal and its operating requirements, including the types and variations of wagons handled, the optimal level of use of technology can differ, there is no one size fits all.

Main discussion areas

- Benefits for intermodal terminal automation;
- Port terminal & intermodal terminal key similarities and differences;
- Challenges with intermodal automation;
- A few diverse examples/potential case studies
 - Lehrte (Mega hub, Germany)
 - Georgia Port Authority (USA)
 - Moorebank (Qube, Australia)
 - Vancouver (Canada)
 - Khorgos Intermodal (Kazakhstan)
 - South Port Rail Head (India)
- Discussion and conclusion;

Benefits of intermodal terminal automation

Most of the benefits of intermodal terminal automation are similar to port container terminals, namely, reduced operating costs, more reliable operation, extended working hours, reduced

administration and increased data accuracy, improved safety, etc.

While uninterrupted operation improves operating time, high performance is often not a direct outcome of automating intermodal terminals. This is due to the need to isolate an area for worker presence within the automated machine zone. As a result, advanced safety systems and or isolation of an area is required during operation. Automation and safety systems add to the initial CAPEX requirement, the complexity of the operations, and the initial project start-up. Using the right level of automation and technology is, therefore, the key to achieving the most optimal outcome.

Port terminal & intermodal terminals have some similarities, but also key differences

Some established technologies used in port terminal automation are readily usable in intermodal terminals as well. These include technologies such as Vehicle Booking Systems (VBS), Optical Character Recognition (OCR), RFID detection technology, radar, Differential Global Positioning Systems (DGPS) & vision-based technology, container profile check, and stack safety features. (see Figure 1)

The use of the above technology and digitising the operation is considered a low-hanging fruit and the first step of automation which is applicable and beneficial for most intermodal terminals.

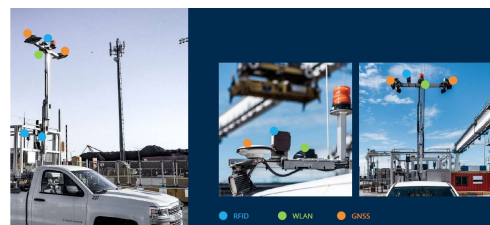


Figure 1 – Terminal technology, vehicle & position detectionⁱⁱ

Crane and handling automation is an area where intermodal terminals differ from port terminals, due

to some significant differences in operation and service requirements.

Some key differences

- Rail RMG cranes support three main functions: handling rail wagons, yard stacking, and servicing external trucks. In comparison, port quay and yard cranes handle only two of these functions. (Quay crane does not handle external trucks and yard crane does not handle rail wagons).
- Rail cranes often have to gantry long distances to service trucks which disrupt rail handling operations. Priority between rail & truck handling is also an issue.
- The intermodal terminal has a much fewer number of the yard and transport handling equipment and labour requirements as compared to a traditional manual marine terminal.
- The rail RMG operation is frequently disrupted, whereas yard and quay cranes in port terminals typically work undisturbed on one task. Examples of such disruptions in the intermodal domain are locomotive transit, wagon pin setting & locking, twist-lock handling due to double-stack train operation, safety inspections, etc.
- Rail crane automation and the associated safety system have to consider the need for worker safety, locomotive transit as well as safe handling of trucks.

Challenges with intermodal automation

Traditionally, rail terminals were operated with reach stackers, and the deployment of wide-span rail gantries has paved the way for more automated handling in the intermodal terminals. With many instances of workers on the tracks, however, it poses some additional challenges which require an innovative approach and solutions.

Advanced Intermodal terminal examples

Georgia Port Authority (GPA) – decoupled wheeled operation using perpendicular buffers. (see Fig 2)



Figure 2 – GPA. Automated RMG, de-coupled truck

Mega Hub Lehrte is one of Germany's most advanced freight hubs with automatic electric AGVs

for moving containers within the terminals. This terminal has only recently started operation. (see Figure 3)



Figure 3 – Lehrte, Rail Mega hub, AGVs

Discussion and Conclusion

Automation can unlock significant benefits for intermodal terminals, but no one size fits all. The intermodal operation historically has used much lesser manning than a port terminal due to direct truck handling, short dwell times, and efficient RMG operations. This means that the OPEX benefit of automation compared to port business is also significantly lower.

Some established technologies, such as gate & VBS systems, OCR, Radar, DGPS & vision-based technology, container profile check, and stack safety features can be considered a low hanging fruit applicable and beneficial for most intermodal terminals.

The right level of crane automation & handling automation is influenced by many factors such type of intermodal operation, the wagon types, the need for people on the tracks for checks, pin-setting, double tier handling, etc.

Automation and remote handling of rail cranes are still useful, but it also requires, a well-designed layout and safety system, along with proper testing and validation of planned operations and technology to ensure the right balance between the CAPEX costs vs operational savings.

In summary, intermodal terminal automation provides good opportunities for improved efficiency, but it is not without its challenges.

References

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