

# MEGA-SHIP MATTERS

## OPTIMAL TERMINAL PERFORMANCE

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In 2015, the largest ship had a capacity of 19,200 TEU, but larger ships with up to 21,100 TEU are to be built in coming years. The race for mega-ships is moving on and terminals must adapt to handle such mega-ships. Economies of scale are dependent on mega-ships being loaded at near full capacity with minimum time at port and more time at sea. This creates real challenges to terminals.

Port operators have to invest heavily in infrastructure to attract and handle the new mega-ships. Terminals need larger cranes, longer and deeper berths, and higher levels of crane productivity, as well as more yard space, the ability to handle more trucks, railcars and barges to move containers in and out of terminals. And even more challenging, mega-ships are enforcing peak traffic to the terminal by bringing and demanding more cargo in a short period of time.

Other parties in the supply chain must also link up with ports in the most effective way so the huge number of containers that can be unloaded and loaded from mega-ships can be handled adequately. Apart from terminal infrastructure needing to be built to accommodate mega-ships the remaining challenge is how this can be managed to fully optimise the cost of terminal operations as well as reduce berthing times of megaships.

### BERTH OPTIMISATION

The berth is the first point of connection between vessel and terminal and it's important that berth allocation is the first issue that must be addressed. So, should terminals focus on how to minimise vessel berthing time or maximise berth utilization? The questions are:

- Which objective should we use for allocating each vessel?
- How should the vessel berth allocation be produced?
- How does it impact on other vessels?
- How long should the vessel scheduling window be?

These decisions affect the size of the problem that we need to solve in each vessel scheduling window. For each vessel, there are several factors must be considered in the berth allocation process, including:

- The berth and vessel length-overall
- ETA/ETD
- Number of containers for discharging and loading
- The possible yard location of outbound/ inbound containers
- Travel distance when moving container from and to vessel
- Number of cranes available
- Yard equipment available
- Existing vessels in operation
- Staff skill
- Customer contracts

Berthing and the fight for "good" berthing windows will be intensified by the bigger vessels and higher volumes. The berthing capacity that is able to accommodate mega-ships is limited, only large terminals with good infrastructure can receive such vessels, which makes the fight even harder. To ensure a reliable planning process for both terminal and liner an overall game plan is required.

Berthing is not an individual decision between one, two or three vessels. With bigger vessels an integrated view on the terminal is required to forecast and plan with future information and consider multiple criteria in the planning right from the beginning.

To manage these complex scenarios and consider multiple outcome factors, information from and for all sides of the logistics chain is the key. This information needs to be available, but also accessible at all time and in minimum time.

To find out the best possible results based on the above factors it is impossible to be fully planned by humans. Accurate information is the key attribute, and smart heuristic optimisation algorithms can be used to analyse and produce different scenarios in selecting the best possible result that satisfies a terminal's requirements. One of the key items here is repeatable results from processes. When working with mega-ships the berth process will be one of the key elements in planning.

## CRANE ALLOCATION

A second issue that is closely coupled to berth optimisation is how to allocate cranes to each vessel, so it needs to be addressed at the same time. The objective of the problem is to minimise the sum of the handling time, waiting time and the delay time for every vessel at berth and then integrate quay crane assignment decisions in the berth planning process. The questions are:

- How many cranes are needed?
- When are these cranes available?
- How do we create the optimal crane schedule to meet vessel ETA/ETD?
- How well are these cranes integrated with other yard equipment?
- How do we distribute the workload equally to each crane where possible?
- How do we assign cranes to vessel bays in each time slot?

Terminal operators will benefit from crane allocation if the above questions are resolved. The foreseeable benefits are:

- Reduced operational costs for vessel
- Reduce vessel berth time
- Increase move per hour (MPH)

Similar to berth optimisation, the smart heuristic optimisation algorithm can be used, to address the problem of determining the optimum number of quay cranes assigned to each vessel.

## TERMINAL AUTOMATION: ROBOTISATION

In recent years, the notable ongoing trend is the implementation of automated container handling and transportation technology such as ASCs/ARMGs/ARTGs/AGVs/Auto Straddles and so forth. The full potential of such automated equipment can be fully utilised only with sophisticated optimisation methods within a TOS. Automation technology and/or TOS tools are a great benefit to terminal operators to address the mega-ship matter. Automation, especially for mega-ships operations, needs to be more than only robotising the equipment. There needs to be more cleverness in all parts of the process. Automated equipment can:

- Maximise operational time with 24x7 operations
- Improving and maintaining operational performance
- Improving and maintaining reliability
- Increased safety

## SOPHISTICATED TOS OPERATIONS

The TOS optimisation process is to maximise a terminal's operations to feed the crane performance for servicing mega-ships. It includes:

- Optimised berth / crane planning
- Integrated simulation capabilities to forecast and predict issues before they occur, during the planning phase
- Real-time intelligent yard management systems
- Real-time decision-making for each container move instruction
- Intelligent equipment control to achieve optimum performance and reduce equipment waiting time
- Real-time automatic vessel planning to resolve any newly created scenarios by many late coming containers

## CONCLUSION

Line operators have been pushing for bigger and bigger vessels over the past decade. This race was sped up over recent years, pushing vessel sizes to new levels. Rising competition amongst ports and technical progress in ship design has resulted in higher capacity vessels: megaships. This has put enormous pressure on port and terminals operators to:

- Invest heavily in infrastructure
- Have highly trained professionals
- Implement terminal automation
- Acquire sophisticated terminal handling systems

Liners have invested and are still investing in the fleet; more and more ultra large container vessels are delivered with bigger ships to come. This has brought big competition into the scenario and changes into the liner landscape such as mergers of liners and consolidation of the market. Now, the other players in the supply chain also need to invest in design, infrastructure, processes and technology to be able to digest the push from the liners with mega-ships.

Terminal operators need to continuously improve their operational processes in order to adapt to the even larger vessels of the future and achieve the economies of scale. The duration of operations of mega-ships is longer and more intense than before. This requires your processes to be more rugged and more out looking. The integration of technology, engineering, processes and IT solutions through data exchange will be a key to success on operating more and bigger ships.

So beside all the investment in infrastructure, vessels and equipment, information that records data is the new valuable asset for a terminal handling large vessels.

A TOS can be a major contributor in providing integrated berth/crane optimisation, yard equipment utilisation, forecasting and predicting issues before they occur, and during the planning phase.

By following the above steps handling mega-ships need no longer be a problem for terminals.

## ABOUT THE AUTHOR

Harry Nguyen is the founder and CEO of Realtime Business Solutions (RBS). Since 1990, after the successful implementation of a TOS to Patrick Terminals in Australia, he nurtured the need to create a better TOS for the future. In the past 25 years, he has been involved in research, architecture, design and development of the TOPS solutions which has been implemented in over 30 terminals worldwide. He devotes his time in researching the best possible solutions for the container handling industry to adapt to an ever-changing world of terminal requirements. The TOPS-Expert product is the result of his experience and efforts.

## ABOUT THE ORGANISATION

RBS and regional offices like RBS EMEA successfully implement the TOPS terminal operating system in terminals of all sizes in order to manage the operations and deliver optimal customer service while keeping control over all resources. RBS has implemented systems on both manual and automated terminals. With highly sophisticated proven algorithms and the unique RBS in-memory architecture, the basis for true berth optimisation is formed. RBS systems anticipate yard strategy, provide efficient vessel planning and perform equipment control. With TOPS, terminals will improve speed, reduce turnaround time and increase quality and service levels. RBS supplies full implementation services around the whole project, and with partners, can supply terminals with IT turnkey solutions.

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