

TOS innovation: reducing cost and maximising efficiency



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The container terminal industry is undergoing a lot of changes. The Panama and Suez Canals are expanding, terminal equipment is getting increasingly automated, or at least semi-automated, and terminals and vessels are getting bigger and bigger. The 19,000 TEU mark has recently been cracked by CSCL, and there is more to come in the near future. However, processes are still run rather traditionally and involve a lot of paper and manual work. Driving process automation requires a TOS that does not put any constraints on a terminal's objectives and optimisation targets. Automated vessel planning and automated yard planning have been in place for a long time already, yet even automated vessel planning is a rather static process in a dynamic environment.

Berth planning optimisation

Berth planning at large terminals with a high number of vessel visits has become highly complex due to the increased volume of vessels and number of discharge and load containers to be handled in a given time frame.

In response to such demand and expectation, TOPX-Expert supports an automated berth planning function

that gives terminal management and planners the best tool on the market to automatically assign and optimise berth and crane planning at the beginning of an operation. Berth planners primarily benefit from the routine of the work implemented and schedule optimisation.

TOPX-Expert uses a smart heuristic algorithm to analyse and optimise all available real-time data to produce these results:

- Automatic allocation of vessel to optimum berth location
- Automatic assignation of best possible quay cranes to each vessel
- Automatic calculation of the optimum travel distance for container discharge/load to/from the yard prior to operation
- In complex situations, it creates and compares different optimisation results and allows a user to select the best possible scenario to suit the situation
- Intuitive berth visualisation and graphical representation of each optimised scenario rendering planner tasks more effective and efficient
- Assistance in quay crane allocation

Taking into account the above results, a terminal gains the following benefits:

- Cost forecasting and operational time/cost at the time of berth planning – from

the beginning of the process to the future execution

- Foresight into the actual work flow in relation to vessel operations
- Achieves ETA/ETD of vessels with increased veracity
- Saves fuel/energy costs by optimising travel distances
- Provides a more accurate forecast of container availability which results in better truck delivery flow and decreases yard congestion

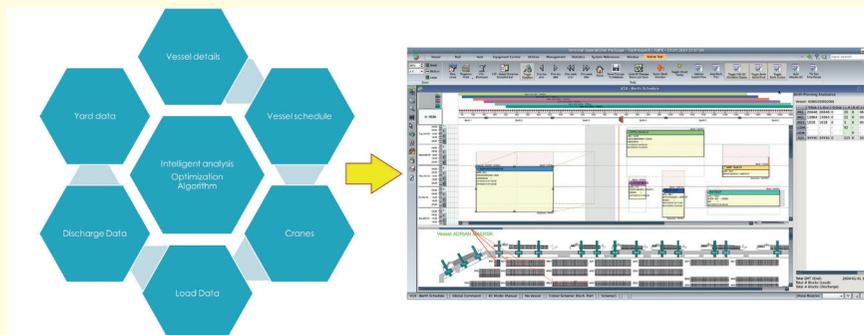
Yard planning and reverse engineering

The key to port and terminal efficiency is the automation of the yard. This involves a detailed strategy concerning the storing and stacking of containers in the optimum yard slot to increase a terminal's throughput and decrease a ship's turnaround time. Yard organisation is another major factor in good terminal operations as better yard organisation results in smoother yard operations. It can help to view yard operations as a chess game in which each move must be carefully considered. TOPX-Expert takes this approach and provides solid functionality for yard planners in order for them to build a unique yard strategy using a smart algorithm. This aids in:

- Automatic yard management build-up: exhibits the best possible pattern based on the principle/rules of unique terminals
- Attaining optimum yard management
- Accurate placement of containers: also contributes to the improvement of traffic flows at terminals during peak work periods which leads to a reduction in the cost of running equipment

Summary of terminal benefits:

- Minimises unproductive moves
- Minimises re-handled moves



- Avoids congestion and bottlenecks
- Allows vessel streamline planning
- Minimises equipment usage and fuel cost

TOPX-Expert CHE Strategy and Forecast

There are several questions that need to be addressed in order to combat the major issues in RMG, RTG, and trailer operations:

- What equipment is needed and in what timescale
- What is the optimum figure of machinery needed to meet a vessel's ETD
- When to utilise an RTG
- What are the early signs of congestion
- How long to complete a vessel operation with a limited amount of equipment
- What equipment can be utilised to speed up operations

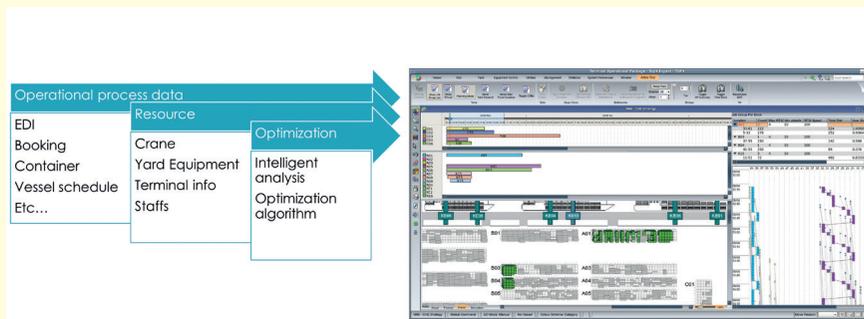
For all of the above questions, TOPX-Expert CHE (container handling equipment) Strategy and Forecast provides a planning and operational tool designed to improve terminal operations. From planning insight into how much yard equipment is required for a particular operation, to simulating different scenarios to ascertain the optimum number of equipment that is required for a particular job, the TOPX-Expert CHE Strategy feature supports this. By streamlining operations, optimising equipment usage, reducing congestion, reducing bottlenecks and minimising equipment idle time, it is unrivalled in its capabilities.

Other tricky scenarios concerning idle time that occur during port operations include:

- Quay cranes waiting to discharge a container because there is no available trailer
- Quay cranes waiting to load a container from a trailer that has not arrived yet
- A trailer waiting to unload a container on the yard because there is no available RTG
- An RTG waiting for a trailer

All of these idling issues can be solved by implementing the TOPX-Expert CHE Strategy solution, which:

- Ensures the correct amount of machinery is assigned and available in each location at the required time
- Forecasts the amount of equipment needed prior to operations
- Forecasts any issues that may occur during operations that could cause delay
- Simulates operations by the clock to foresee any congestion and/or bottlenecks



- Offers instant and accurate information at the fingertips to manage and optimise operations
- Offers strategic resource planning to meet vessel ETD and maximise quay crane productivity
- Tests and validates strategies before the start of operations
- Forecasts the number of CHEs required for operations in following shifts
- Offers cost effectiveness because of CHE utilisation as the number of moves and exceptions are known before any actual operation takes place
- Forecasts estimated container move times, offers management a view of CHE actual performance during the operation and after it is completed
- Improves staff performance
- Reduces fuel consumption and labour costs, and increases RTG productivity
- Allocates CHEs in the right place at the right time
- Synchronises every quay crane move with yard CHE move in order to read any possible delay
- Identifies yard clashes before they happen

The new features in the TOPX-Expert will address the future business needs and allow terminals to take on new challenges. The TOPX comes with a top to bottom approach and allows terminal planners to optimise operations and automate processes at the starting point of each plan: the berth. Afterwards, there is a straight line in planning process optimisation until planners can validate the planning in the integrated 3D module SimOne. When handing over operations to new scheduling engineers, TOPX Expert takes over and

allows a dispatcher to run operations on a defined rules basis. Bigger vessels, bigger terminals and automated processes can all go together with TOPX Expert.

About the organisation

RBS successfully implements its TOPS TOS system on terminals of all sizes 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, RBS TOS systems are the basis for true berth optimisation.

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 24 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.

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