OPTIMIZATION DILEMMAS

IN MEGASHIP HANDLING

CyberLogitec

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Competition between container terminals is becoming fiercer, and because of this handling fees have plummeted. Since it is becoming more and more difficult for terminal operators to maintain even mediocre profit rates, they are increasingly focused on optimizing resources like berths, machines, and the workforce.

Terminal optimization involves the following essential elements:

- Minimization of vessel turn-around time
- Berthing of as many vessels as possible
- Minimization of machine idle time and travel distance
- Assigning enough gangs to finish vessel operations on time
- Meeting the target productivity rate

There are many optimization theories such as vessel planning optimization and yard block optimization. These can be implemented to optimize terminal maintenance in line with the above goals, however terminals tend to face unexpected issues after implementing certain solutions.

For example, vessel operational productivity can be enhanced if containers are allocated in blocks near the vessel, but this can create a problem, as allocating containers in blocks near the vessel eventually leads to a time gap between the containers already earmarked for loading jobs and newly allocated containers. Either the loading plan must be adjusted or re-handling must occur within the blocks.

Also, an excessive number of jobs may be concentrated on one machine, causing the yard productivity rate to decrease, which also has a negative effect on vessel productivity. Bottlenecks in the yard block increase Yard Tractor (YT) waiting time, and increased waiting time for the YT finally leads to low productivity for the STS.

In another example, reducing the number of container re-handlings by dispersing container allocation in the yard may cause vessel productivity rates to drop due to an increase of YT travel distance. Maintenance teams will then need to assign more yard trucks to reach the target productivity rate.

Container handover is completed differently depending on whether the terminal is vertical or horizontal. In a vertical terminal, container handover is completed in the following order: STS – Shuttle Carrier (SC) – Rubber Tyred Gantry (RTG)/Rail Mounted Gantry (RMG) while in a horizontal terminal, the operation is completed in the following order: STS – YT – RTG/RMG.

Even though berths, machines, and workforce may be taken as separate entities, inside a terminal with a limited amount of time to complete the operations, they become correlated.

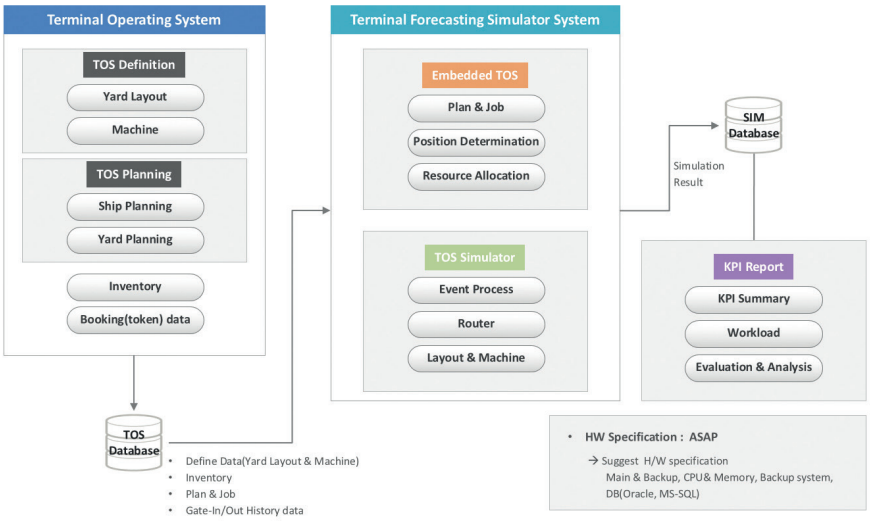
The tasks that occur on the terminal are thus related. If optimization is implemented without changing the overall operation paradigm, the productivity may decline and cost may rise, becoming an "optimization dilemma".

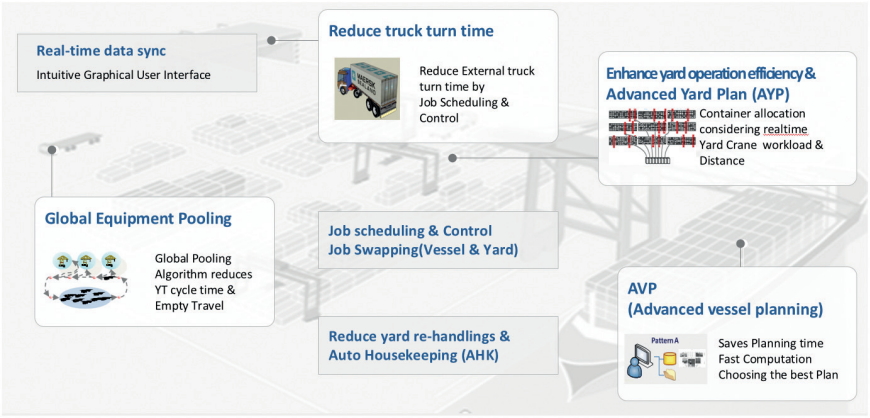
All in all, if only a portion of the terminal uses a particular optimization tool and theories, terminal optimization cannot be achieved. The whole terminal needs to be optimized. Total optimization must consider container inventory, container location, estimated working hours, current machine location and workload, long-term berth schedule and gang plan information.

Such an integrated terminal optimization can be accomplished through a Terminal Operating System (TOS).

CATEGORY LOADING

How the TOS is used to optimize terminals must change from loading plan-centered to management-centered. The most time-consuming stage of a particular ship call for





Main Features for Improving Productivity

- Terminal productivity enhancement
- Smart Yard allocation and Advanced vessel planning
- Job Scheduling & Auto Housekeeping
- Global Terminal Truck Pooling system

terminal operators is making a loading plan. A terminal's cargo closing time and container loading list received through EDI, MOVINS (stowage instruction plan), and its allocated container list are used to create the loading plan.

Due to the recent trends in the shipping industry of increasing vessel size, loading plans are often changed when mega-sized vessels berth in the terminal.

In order to solve the loading plan problem for mega-ships, it is pivotal to assess the problem from a management point of view. This means not changing the actual loading plan, but having the operating system to find the right container in real time.

A question arises then : Why does the quay crane job list have to be planned beforehand if the loading container list is finalized, and the stowage instruction requested by the shipping line is secured through MOVINS?

Even though terminal operating systems are becoming more complicated due to the overall operations being loading-plan centered, unfortunately overall terminal productivity drops due to complexity. The advanced and automated planning tools of TOS can decide which candidate group of containers to load.

Accordingly, the actual STS working sequence should be determined in real time, at the time of ordering a job by the system. It is essential to change the operating system's paradigm from planning to real-time assignment and decide the machines' jobs and container loading order at the time of the actual loading operation.

SHORT TERM SIMULATION

The TOS must be able to accurately forecast if the existing operational policy is to be deemed suitable. Forecasting must be undertaken to plan the gang assignment, especially to decide the number of machines to assign and the timing. Then the first 24 hours of operation must be simulated before the terminal is operated according to the new set of policies.

In order to run this kind of simulation, a TOS must have the following features:

- Machine emulator reproducing movements of actual machines with their locations and sensor information
- Interface system with third party devices installed on the gate such as Optical Character Recognition (OCR), damage camera, and RFID, to name a few
- Advanced planning system creating a discharge and loading plan based on the category loading and user-defined rules
- Advanced yard system able to assign yard location based on container attributes and job status
- Dual cycling logic minimizing un-laden traveling time for YT
- Equipment control system to control all machines and equipment in the terminal
- Dashboard providing Key Performance Indicators such as Yard capacity, external truck turn time, yard travelling distance, RTG/RMG productivity, and berth productivity

To enhance user-friendliness, the operating system must be able to produce good terminal performance continuously, regardless of the system settings or user's familiarity with the system.

The terminal operation environment is changing dramatically. However, the operating system is still being centered on an obsolete loading-plan-based structure. The "optimization dilemma" can be solved by enhancing or changing the operating system. True optimization is possible when a user is able to see short-term simulation results based on the immediate situation.

ABOUT THE AUTHOR

Lucy Lee has specialized in maritime engineering and has experience of container TOS in the United States, Spain, and Hong Kong. She has worked for CyberLogitec and for OPUS Stowage and OPUS Terminal as a system engineer and business analyst. Also she has participated in the automated container terminal project TTI Algeciras in Spain and Hanjin Incheon Terminal in South Korea. Now she is focusing on finding efficient solutions through combining and utilizing the software and terminal platform including equipment and establishing the strategy and vision of CyberLogitec's solutions, its TOS (OPUS Terminal) and Terminal Process Automation System (Eagle Eye).

ABOUT THE ORGANISATION

CyberLogitec has ample experience in implementing different terminal automation solutions for global terminal operators. We provide highly experienced professional teams and cutting-edge technology solutions to ensure customer satisfaction.

ENQUIRIES

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