

## Summary

A bulk terminal for dry raw bulk materials can be installed in many different configurations. This report will discuss two common configuration and compare them with each other. Configuration 1 consists of a bulk terminal with multiple lanes in which the stacking of the materials is done by a stacker and the reclaiming by reclaimers. Configuration 2 uses a machine which can perform both functions, which is named a stackerreclaimer. Using a computer simulation, made with Delphi in combination with Tomas, the two configurations will be compared with each other. By changing various input parameters, the computer simulation model can calculate different situations. Based on these data, the following conclusions can be made:

- Demurrage costs (rather than the costs of equipment) are dominant determining the average yearly costs.
- The capacity of a stockyard depends on the number of reclaimers, not on the number of stackers.
- Using configuration 1, it is advisable to install an odd number of lanes.
- Configuration 1 can handle more throughput for a small number of lanes (2-5), while configuration 2 can handle more throughput for a large number of lanes (more than 8 lanes).
- Both configurations show the same performance for 6-8 lanes.
- The average waiting time for ships decrease when more reclaim jobs are done.
- When the occupation of (stacker)reclaimers reaches 100%, demurrage costs – and therefore average yearly costs – will increase extremely.
- A larger turning time (and larger down times) causes an increase in the occupation of reclaimers (configuration 1) and stackerreclaimers (configuration 2), while the occupation of the stackers (configuration 1) remain nearly constant.
- From a ship unloading point of view, it is advisable to keep the average stock filling as low as possible. (Since the reclaim jobs are much smaller, this is not that important for the trains).

It is recommended to do further research for other configurations, based on a combination of stackers and reclaimers in a different order or based on stackerreclaimers and reclaimers. The influence of other reclaim methods should be investigated in order to reduce the number of gaps in the stockyard. It might be valuable to use real input data instead of generated ships and trains. Finally it is recommended also to take incomes into account, since they might influence the large demurrage costs. Implementing these recommendations will give better insight in the relations between different configurations, however they will not influence the conclusions made above.